HISTORY, TECHNOLOGY, AND POLITICS: THE POLITICAL USES OF RAILWAYS IN PORTUGAL (1850-1900)

HISTORIA, TECNOLOGÍA Y POLÍTICA: LOS USOS POLÍTICOS DE LOS FERROCARRILES EN PORTUGAL (1850-1900)

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ABSTRACT: In the nineteenth century, Portugal undertook a public works programme, spearheaded by railways, seeking the modernisation of the country. In this paper, I use the approach of technopolitics to study how the implementation of railways in Portugal influenced Portuguese politics and vice-versa. I analyse the interactions between engineers, policymakers, and local caciques, their associations in technopolitical regimes, in different arenas: the parliament, assemblies of experts, inauguration ceremonies, and the media (illustrated press that republished photographs). I show that railways became a powerful tool to pursue other objectives than those originally envisaged by its promoters, namely political goals related with governance, extension of the influence of central government to the periphery, and socio-political affirmation of the engineers. Sources include parliamentary debates, engineering journals, illustrated newspapers, and photography. I aim to contribute to the debate about the relationship between the technological implementation and politics, including rhetoric, material, and iconographic practices.

KEYWORDS: Technopolitics, History of Technology, STS, Engineering, Materiality.

RESUMEN: *En el siglo XIX, Portugal emprendió un programa de obras públicas, encabezado por ferrocarriles, buscando la modernización del país. En este artículo, utilizo el enfoque de tecnopolítica para estudiar cómo la implementación de los ferrocarriles en Portugal influyó la política portuguesa (y viceversa). Analizo las interacciones entre ingenieros, legisladores y caciques locales, y sus asociaciones en regímenes tecnopolíticos, en diferentes ámbitos: parlamento, asambleas de expertos, ceremonias de inauguración y media (prensa ilustrada que republicaba fotografías). Demuestro que los ferrocarriles se convirtieron en una herramienta para perseguir otros objetivos que los originalmente previstos por sus promotores: objetivos políticos relacionados con la gobernanza, extensión de la influencia del gobierno central a la periferia y afirmación sociopolítica de los ingenieros. Las fuentes incluyen debates parlamentarios, revistas de ingeniería, periódicos ilustrados y fotografía. Mi objetivo es contribuir al debate sobre la relación entre la implementación tecnológica y la política, abarcando prácticas retóricas, materiales e iconográficas.*

PALABRAS CLAVE: *Tecnopolítica, Historia de la Tecnología, STS, Ingeniería, Materialidad.*

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1. **Introduction**

Starting in 1850, Portugal initiated a public works programme to modernise its basic infrastructures, which became historically known as *Fontismo*, after its main promoter, engineer and statesman Fontes Pereira de Melo. In that programme, railways took a leading role. In this paper, I analyse the interconnections between the implementation of railways and Portuguese politics, using the approach proposed by technopolitics.

By 1850, Portugal was a country in disarray. The economic shock-waves of the independence of Brazil were still palpable; financially, the spectre of bankruptcy was looming, due to the accumulation of deficits in state accounts; agriculture was the dominant economic activity and industry was incipient – with archaic transportation technologies, neither could expect significant future developments. In political terms, the ideological disputes between political factions more than once evolved to armed conflict[1]. In 1851, a coup d'état instated a regime that vowed to put *progress* (that is, economic development) ahead of ideological disputes, and to apply the Saint-Simonianist technoscientific ideals with which Portuguese engineers were engaging since the 1820s[2]. In 1854, Portugal joined the gold-standard, which, albeit not crucial[3], facilitated the access to European financial markets[4]. By 1900, the Portuguese rail network extended throughout 2,356 km[5], reaching every province of the kingdom and including five cross-border links (figure 1).

The interconnections between *Fontismo* and railways (in its financial, economic, and geographical specificities) are well known in Portuguese historiography[6]. Recent works identified the key stakeholders and their role in the planning of the network and analysed the sociotechnical complexity of its implementation[7]. In this essay, I will add to this debate with an analysis of the influence the implementation of railways on Portuguese politics and vice-versa.

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[1] Marques, 2002, pp. 544-579.

[2] Matos, 2009, pp. 180-185.

[3] Spain, for example, built railways without adhering to it: Martín-Aceña, Martínez-Ruiz and Nogues-Marco, 2012, p. 146.

[4] Duarte and Andrade, 2012, pp. 618-619.

[5] Valério, 2001, p. 373.

[6] For a recent state of the art: Pereira, 2015.

[7] Isidoro, Marat-Mendes and Tângari, 2018, pp. 365-371; Pinheiro and Matos, 2016, pp. 34-44; Pereira, 2020.
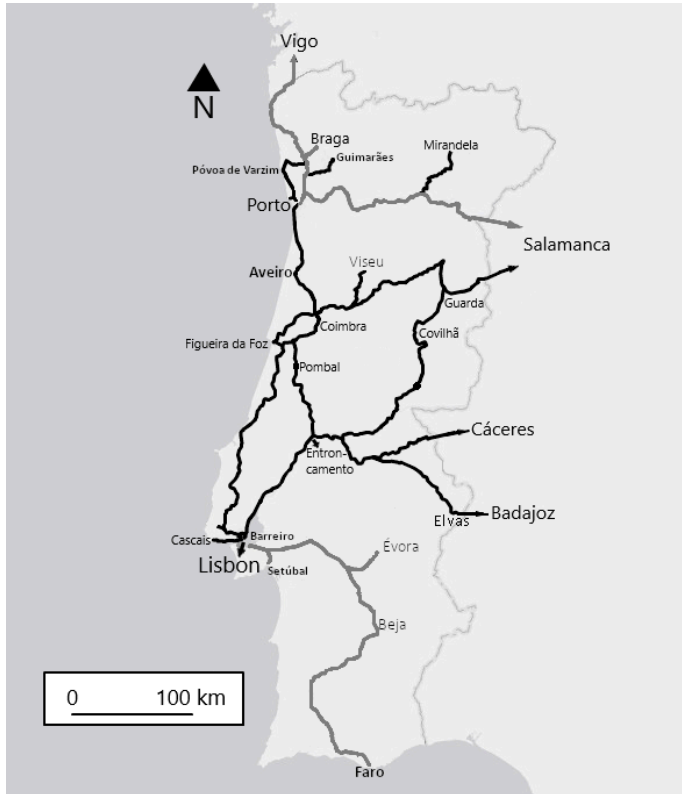
Figure 1

Portuguese railway network in 1900. Grey indicates lines managed by the state;
black, those managed by private companies.

Source: Author's version and sharemap.org

I use the approach of technopolitics, which can be defined as «the
strategic practice of designing or using technology to constitute, embody,
or enact political goals»[8]. Technopolitics differ from regular politics, but
it is also a form of political action. In this sense, it focuses on the actions

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[8] Hecht, 2009, p. 15.

of technologists – those who conceptualise the relationship between technology and politics. The concept highlights the role of those who derive their power from their expertise, bearing in account the broader political framework and political, financial, or economic agents. Additionally, it contemplates the associations between these agents to create technopolitical regimes (with common engineering and industrial practices, technical artefacts, political programs, and ideologies) to control technological development and conduct technopolitics. Hence, technopolitics grasp the mixed forms of power associated with technological systems, artefacts, and material, iconographical and discursive practices. It permits to examine how politics shape technological implementation and the relationship between technology and politics in each historical context, and to study how technological artefacts and practices act as forms of political negotiation, rhetoric and iconography[9]. The importance of a historical technopolitical perspective on infrastructure has been illustrated by different authors[10]. This paper adds another historical example to the debate, using a diverse array of sources, including parliamentary debates, technical reports, newspapers, and photography.

The text is divided in seven sections. I will start by characterising the Portuguese parliamentary system (section 2), before analysing specific interactions between technology and politics in parliament (3), engineers between political awareness and technical expertise (4), dangerous liaisons between political power, corporate/financial lobbying, and the territorial politics of local caciques (5), and the importance of material tokens of progress, like inauguration ceremonies and the use of photography (6). Conclusion wraps-up the paper with some final remarks.

2. **The Portuguese parliamentary monarchy**

In 1820, a revolution overthrew the absolute monarchy and replaced it with a parliamentary regime with separation of powers: legislative (the parliament), executive (the government), judiciary (courts), and moderator (the monarch). Until 1850, the legislative branch underwent some transformations (unicameral system, bicameral system by election and/or

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9 Hecht, 2009, pp. 5, 10, 16, 89-91, 334; Hecht, 2011, p. 3.
10 For instance: Folkers, 2017.

appointment), but it eventually stabilised in a parliament consisting of a lower house (chamber of deputies, elected) and an upper house (chamber of Peers, by appointment, heredity, or official function). The sovereign held the moderator power to keep the other powers in harmony[11].

Elections for parliament did not reflect the will of the people. The government was chosen by the sovereign and afterwards organised the elections, which, to a large extent, were rigged to provide comfortable majorities in the lower house of parliament (the upper house normally voted alongside the government, but, if necessary, the monarch could assign new members to guarantee a favourable vote). The scheme involved the combined action of the Home Office, district governors, mayors, and caciques. Those in the opposition accepted this arrangement, as they would benefit when the sovereign decided to change government. Moreover, the electorate was easily manipulated. The number of voters was limited, due to narrow eligibility criteria to vote, and many did not know how to read or write and voted in whoever candidate the cacique instructed them to[12].

This gave predominance to the government over the parliament in policymaking, but it does not mean that the latter was irrelevant. The debates, which were published in diaries and in the press revealed the agendas of political factions and the personal interests of congressmen[13], illustrated how government and opposition used railways to achieve their goals[14], and, considering the growing presence of engineers in parliament[15], evidenced the input of technical experts in a political context.

Both engineers and non-engineers assembled in larger groups/technopolitical regimes to govern the implementation of railways and to use them to pursue their own agendas. The latter gathered in political parties. In this period, some parties usually found their way to parliament, but two dominated the political scene: the Regenerator Party (to which Fontes was associated) and the Historical Party (renamed in 1876 Progressive Party

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[11] Santos, 1986, pp. 17-18.
[12] Almeida, 1991, pp. 39-42.
[13] Santos, 1986, p. 127.
[14] According to Portuguese law, all railway contracts had to be discussed in parliament, except those with less than 20 km that did not benefit from any public allowance: Pereira, 2012, p. 102.
[15] Almeida, 1995, pp. 133-165.

after its merger with the Reformist Party). There were not many differences between them, just enough to justify the division of power[16]. Engineers grouped in the advisory bodies of the ministry of Public Works: the Conselho Superior de Obras Públicas e Minas (High Council of Public Works and Mines, henceforth HCPWM), later renamed to Junta Consultiva de Obras Públicas e Minas (Advisory Board of Public Works and Mines, henceforth ABPWM). In 1869, they created the Associação de Engenheiros Civis (Association of Civil Engineers, henceforth ACE). Hovering above these regimes, were private railway companies that also had their own agendas.

All participated in policymaking. A company/entrepreneur proposed or was hired to build a railway. The proposal was evaluated by the engineers in the ministry of Public Works and/or ACE. In specific cases the government could validate the contract with an executive order (see note 14), but most of the times the parliament had to be heard. If approved in both houses, the contract was validated by the sovereign. All those regimes had a specific agency regarding railways, which influenced the evolution of Portuguese politics and the railway network.

3. **Technopolitics of progress**

When Portugal inaugurated its first line in 1856, railways were an ordinary infrastructure across Europe. Countries like the United Kingdom, France, or Germany began building lines in the 1820s and by the mid-nineteenth century their networks were thousands of miles long. Latecomers like Spain or Italy (where construction began in the late 1830s and mid 1840s) were also investing in the creation of large railway networks[17]. To all, but especially to the latecomers, railways were a measure of progress. In the nineteenth century, technology became the gauge to evaluate each nations' worth[18].

During the first half of the nineteenth century, many members of the Portuguese elites went abroad to study engineering and/or to escape the political unrest in Portugal, and they contacted closely with the techni-

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[16] Sousa and Marques, 2004, pp. 229-245.
[17] Cipolla, 1976, vol. 4.
[18] Adas, 1989, p. 134.

cal sublime of railways[19]. When they returned home, they advocated for the construction of railways in Portugal. Congressman Faustino Gama once said in parliament: «nobody […] desires more than I that railways are built amongst us. I witnessed their birth […] in England, near the city where I lived then – I speak of the line between Manchester and Liverpool […]. I know that the advantages of building railways are invaluable»[20]. As it happened in so many other contexts, technological prowess was deemed a key factor for national regeneration[21].

Consequently, any government had to include railways in its political programmes, which were accompanied by a new kind of rhetoric that invoked technical inventions to announce a new era – a technopolitical rupture-talk[22]. A good example is a 1852 speech of Regenerator representative Casal Ribeiro, to whom «railways are for us a matter of life or death, as they are the most powerful incentive to our agriculture, our industry, our national wealth; on them lies the solution to the country's economic and financial problems»[23]. Those legislators who delayed the approval of railway contracts were accused of being enemies of progress and blackmailed to cut the debates short. In 1855, MP Lobo d'Ávila retorted to his adversary Cunha Sotomayor: «either the honourable congressman deems this railway useful or he does not; if he does, he should approve the project, instead of incumbering it»[24]. A milder alternative was to associate progress with nationalism: railways meant modernity, therefore it was a patriotic duty for those in the opposition to side with the government when it came to the construction of railways[25].

For this reason, most governments often broke parliamentary rules and the law to hasten the implementation of railways: alterations to the contracts after parliamentary approval, parliamentary debates cut short, railway leases without parliamentary hearing, etc.[26]. The justification was that progress could not wait for all the legal requirements. In 1876, minister of Public Works Cardoso Avelino validated an irregular alteration in

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[19] For the concept of technical sublime: Kasson, 1976, pp. 162-180; Nye, 1999, pp. XIII-XX.
[20] *Diario da Camara dos Deputados* (henceforth *DCD*), 2-5-1855, p. 32.
[21] Hecht, 2009, pp. 1-2, 27.
[22] Lampland, 2011, p. 156.
[23] *DCD*, 26-5-1852, p. 31.
[24] *DCD*, 13-3-1855, p. 151.
[25] *DCD*, 16-3-1860, p. 153.
[26] Pereira, 2012, p. 300.

a railway contract arguing that it «could be considered illegal; it was illegal, but it was not dishonest (Hear, hear). It was motivated by public interest»[27].

The Regenerator Party was usually keener to promote railway construction. After the 1851 coup, it was appointed by queen Mary II to form government. Until 1856, it signed three contracts to build the lines Lisbon-Elvas, Lisbon-Sintra and Barreiro-Vendas Novas (figure 1), besides sundry legislation to encourage construction[28]. In other occasions, they frequently pushed for more railway contracts. They held the belief that progress was proportional to the amount of technology installed[29]. Fontes illustrated this well when he responded to an opponent (Carlos Bento): «the honourable congressman is satisfied with one railway; I am hardly satisfied with two; I regret I am unable to crisscross my country with such means of transportation»[30].

The Historical/Progressive Party could not oppose the construction of railways; therefore they focused their criticism on the inability of the government to uphold the contracts it signed, the lack of transparency in their execution, line routes, and the financial impact on the Treasury (most included public subsidies to construction or guarantees of yield), presenting themselves as custodians of a balanced public exchequer. For instance, when the company hired to build the line between Lisbon and Elvas failed, the Historical congressman Morato Roma did not miss the opportunity to criticise the government: «had Mr Fontes [minister of Public Works] listened to reason, had he heeded our warnings, the country would not have witnessed this scandal»[31]. When the Historical/Progressive Party was appointed to government, they also tried to add more lines to the network[32]. In one occasion, Fontes sarcastically accused: «it is as if the noble ministers crossed the Lethe before sitting in those chairs»[33]. By 1890, Regenerator representative João Franco summed up the feuds between both parties with a reply to his opponent Ressano Garcia:

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[27] *DCD*, 7-3-1876, p. 569.
[28] *Collecção Official de Legislação Portuguesa*, 1852, pp. 383-384; 1853, p. 168; 1854, pp. 246-247; 1855, p. 245.
[29] Cf. Hecht, 2009, p. 80.
[30] *DCD*, 25-2-1854, p. 191.
[31] Roma, 1856, p. 202.
[32] Pereira, 2012, pp. 82-153.
[33] In Greek mythology, the Lethe was one of the rivers of the underworld. Those who traversed it experienced complete forgetfulness. *DCD*, 1-6-1857, p. 569.

> when my illustrious colleague wanted to prove the liability of the Regenerator Party, he said: «so much money for the Ambaca line; so much money for the Torres Vedras line; so much money wasted by Regenerator governments». But when he wanted to show that the Progressive Party had done something, he would say: «we built in four years, so many kilometres of tracks» (Laughter – Hear, hear). «We built?!» But this is utterly false (Hear, hear)[34].

Any hesitation in policymaking regarding railway construction was met with harsh criticism. All realised that Portugal lagged 30 years behind other European nations; therefore, «to wait one year is to wait a quarter of a century»[35]. To an extent there was a true technical and economic concern underlying this rhetoric, as Portugal needed railways to encourage economic development and to show its modernisation effort; but it was also a way to erode the government seeking its resignation. As MP Gomes de Castro so aptly put it: «what seems to be more important when it comes to the railway question, is the establishment of a kind of accelerated route to power»[36].

If a government clearly omitted investment in railways in its programme, it faced a strong opposition, as an enemy of progress. Arguably, the best example happened in the late 1860s, when the Reformist Party was appointed by the king to rule, after a couple of financial scandals with two railway companies. The reformists strongly advocated that the country was wasting resources in railways, and they approved extensive budget cults that halted the investment. The strongest opposers to this strategy were the engineers. In a small booklet published in 1868, two of the most renowned engineers of that time argued that large technological infrastructures were essential to progress; without them Portugal could even lose its merits as an independent nation; order would be replaced by chaos; progress by obscurantism; barbarism instead of civilisation[37]. The rhetoric that associates the absence of technology with bedlam and savagery is common in technopolitics, as an attempt to prove the indispensability of technologists[38]. Regardless, the government was not moved, which motivated the engineers to create ACE to lobby for more

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[34] *DCD*, 19-6-1890, p. 787.
[35] *DCD*, 2-8-1854, p. 40.
[36] *DCD*, 11-4-1859, p. 125.
[37] Sousa and Ávila, 1868.
[38] Hecht, 2009, pp. 62, 93.

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public works[39]. Again, it is possible to find here a double motivation: on one hand, railways were technically crucial to modernise the country; on the other hand, they granted job opportunities, social prestige, and power to engineers.

4. **The technopolitics of engineers**

Fontismo was an extraordinary opportunity for engineers to apply their skills and acquire social prestige as agents of progress. This was a role they had welcomed gladly in other European nations, especially in latecomers, where they were regarded crucial to catch up with more developed neighbours[40]. Both in Portugal and abroad, these experts sought to obtain a much more important political role in the nation's modernisation process and governance, considering that their training also included political economy besides technical expertise. The image of engineers as economic planners was also a trait of the Saint-Simonianist ideology[41]. Engineers, «as a scarce resource […], became valuable mediators of technopolitics»[42].

Saint-Simonianism was an ideology created in the late eighteenth century that emphasised industrialisation, science, and technology as directors of social change, universal peace, and creation of wealth. It believed that the construction of transnational infrastructures would enhance circulation of people, goods, capital, and ideas, and promote a confederation of European states. In the 1830s, one of its followers, French engineer Michel Chevalier, deemed railways as the best tool to materialise Saint-Simonianist promises[43]. Saint-Simonianism also advocated the idea of an engineering-state, managed by engineers, that governed the economy[44].

Throughout the second half of the nineteenth century, Portuguese engineers strived to grasp a stronger hold on the planning of the railway network. As soon as their training was complete, they were usually hired by

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[39] Rodrigues, 1999, pp. 67-70, 76-82.
[40] Kohlrausch and Trischler, 2014, pp. 1-114.
[41] Macedo, 2012, pp. 115-119.
[42] Mehos and Moon, 2011, p. 43.
[43] Laak, 2010, p. 27; Vleuten, 2006, pp. 289-290.
[44] Desrosières, 2003, pp. 554-555.

the state (only a few began working immediately in the private sector)[45], which could promote that control over the railway sector. However, until the mid-1860s, policymakers believed Portuguese engineers did not possess enough experience and preferred hiring English and French experts for the main tasks of railway construction. Portuguese engineers were assigned to surveying the territory or overseeing the work of the former. In the late 1860s, following a few disputes with foreign contractors, Portuguese engineers were entrusted by the government with the construction of the Minho and Douro lines (connecting Porto to the northern and eastern frontier with Spain) and with the operation and extension of the Southern line (Barreiro-Évora-Beja), nationalised in 1868 (figure 1)[46]. They excelled in both tasks, proving that the state could own railway lines and that engineers could be a valuable asset in *Fontismo*. As it happened in other European nations, it was rapidly understood that the relationship between experts and the state could be «a mutually beneficial exchange of resources»[47].

Simultaneously, Portuguese engineers were assigned to managing positions in private companies. In 1872, Afonso Espregueira became general manager of Companhia Real dos Caminhos de Ferro Portugueses (Royal Company of Portuguese Railways, henceforth RCPR), the major player in the sector[48]. Shortly after, Almeida Pinheiro, became general manager of Companhia Nacional de Caminhos de Ferro (National Railway Company) that built and operated a couple of narrow-gauge tracks in the north of Portugal[49]. Both brought some of their colleagues to those firms, paving the way for other engineers to work in the private sector. These assignments solidified Portuguese engineers' position as skilful planners of modernity, but it contributed to erode their role as defenders of public interest. In their condition of managers of private companies, their main goal was profit, which might not cope with the general interest of the nation. What is more, they illustrated that their inputs were not purely technical and objective and could serve other interests that did not seek the progress of the nation. For instance, Espregueira, as general manager of

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[45] Considering most got their training in a military school (Lisbon's Army School) they were assigned to the Ministry of War and then reassigned to the Ministry of Public Works as overseers and surveyors: Rodrigues, 1999, p. 76.

[46] Alegria, 1990, pp. 257-264, 271-274.

[47] Kohlrausch and Trischler, 2014, pp. 1-148.

[48] Salgueiro, 2008, p. 50.

[49] Cordeiro and Pereira, 2017b, pp. 137-138.

RCPR, convinced the government to forfeit the levy of the transit tax in exchange for the conclusion of the Northern line (between Porto and Lisbon). During the discussion of the general network plan in ACE, he was the only one who advocated for a cross-border line that served the agenda of RCPR but prevented the construction of another track that shortened the distance to Madrid, which was favoured by the government and the majority of ACE's engineers[50].

Throughout Europe, engineers became increasingly politicized, and Portugal was no exception[51]. A privileged stage where Portuguese engineers exerted technopolitics was the parliament. In a regime that valued a technoscientific view of progress, engineers' expertise was a vital asset. They tried to take advantage of their knowledge to conquer a prominent position in the planning of the railway network over those who did not possess technical skills. This is visible in a debate between engineer Lobo d'Ávila and lawman António José Ávila in 1854. The former belittled the latter, arguing that «the illustrious congressman is not under any obligation to know this [technical details of a contract], because I believe you have travelled more as an amateur rather than as an expert»[52]. Nevertheless, considering that engineers were affiliated with different political parties, they often entered in parliamentary bickering where technical arguments fell into the background or could be used to sustain opposite claims. A good example was the debate about the Western line (Lisbon to Figueira da Foz) in the late 1870s and early 1880s. The track was originally proposed by a Progressive government, but criticism in parliament (including technical, military, and economic arguments) was so harsh that the king decided to change the cabinet. As soon as the Regenerators were appointed to the government, they proposed the same line, with a bill very similar to that presented by their political rivals[53]. In sum, although engineers possessed a very specific set of skills, they could use them to pursue political goals and not the general interest. In this sense, it is important to quote the example of congressman Lobo d'Ávila, who began his political career with the Regenerators, but turned his cloak to join the Historical Party, after realising that in the former he would always be under the shadow of Fontes[54].

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[50] Pereira, 2012, pp. 123, 128.
[51] Kohlrausch and Trischler, 2014, pp. 15.
[52] *DCD*, 1-8-1854, p. 22.
[53] Pereira, 2012, pp. 133-135.
[54] Mónica, 2006, vol. 1, pp. 244-247.

Engineers also assembled in technopolitical regimes to exert techno-politics and control the railway programme more efficiently. Initially, they gathered in the advisory institutions within the ministry of Public Works (HCPWM and ABPWM). Both pursued a technocratic stance that privileged technoscientific objectivity, rebuffed ideological confrontations, and combined engineering with political economy, aiming to serve as mediators between the state and private enterprise[55] – a common ambition in technopolitics[56]. In the late 1860s, ACE harboured the community of engineers in a more informal environment, including the publication of a journal, *Revista de Obras Públicas e Minas* (Journal of Public Works and Mines, henceforth *ROPM*). ACE worked closely with the government, and it provided feedback to governmental queries, but it also acted on its own initiative, anticipating problems[57]. Both technopolitical regimes contributed to solidify the power and influence of engineers in the management of the railway sector, as all proposals of private entrepreneurs or state engineers (including individual lines, regional networks, or sundry issues) were taken to HCPWM/ABPWM, and some were also assessed by ACE[58].

Hecht argues that technopolitical regimes were not uncontested and, like political regimes, they faced opposition, dissent, and resistance, both internally and externally[59]. In the case at hand, many of the suggestions made by engineers in the advisory bodies of the ministry of Public Works, in ACE, and in the parliament were disregarded by the government. In the 1850s and 1860s, some engineers supported the idea that the network should be built and managed by the state, so that railways served the interests of the nation and not those of private capital[60], stimulated national identity and technological nationalism (not with a Portuguese technology

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[55] Macedo, 2012, pp. 112-113. Portuguese engineers shared with their European comrades the self-perception of unbiased and apolitical forces for progress. Cf. Kohlrausch and Trischler, 2014, pp. 51-52.

[56] Hecht, 2009, pp. 92, 128.

[57] Rodrigues, 1999, pp. 67-70, 76-82.

[58] Arquivo Histórico do Ministério das Obras Públicas, Lisbon, Conselho de Obras Públicas, henceforth AHMOP-COPM, several books and boxes. For a detailed analysis of the HCPWM/ABPWM proceedings and the opinions in *ROPM* about Portuguese railways: Pereira, 2012, pp. 82-278.

[59] Hecht, 2009, p. 17.

[60] AHMOP-COPM, book 30, 1869, fs. 189v-190; *DCD*, 18-3-1857, pp. 157-167; *Diario de Lisboa* (henceforth *DL*), 13-12-1865, p. 2861; Vieira, 1868, p. 157.

so to say, but with a technology controlled by Portuguese), and legitimised even further the position and power of the engineers[61]. Those suggestions were declined by policymakers, who argued that the state lacked both capital and expertise. Eventually, two governments decided to nationalise the Southern line[62], and to build the Minho and Douro lines[63]. In the following years, many experts argued that additional railways should be built by the state[64], and some even suggested the nationalisation of the tracks leased to private companies[65]. Nevertheless, the governments were always closer to re-leasing its lines to private enterprise than to nationalise private railways.

Arguably, the best example of how policymakers in central government snubbed the technical authority of engineers was the issue of the network general plan. In the parliament, in the press, in the advisory bodies of the ministry of Public Works, engineers suggested it to different governments on several occasions[66]. Nonetheless, a bill approving it was never discussed. Between 1876 and 1878, ACE promoted a discussion to draw up a proposal for a general network to present to the government. Two years later, the debate was concluded, and ACE presented its plan[67]. Again, it was never discussed in parliament, even though it served as a general guideline for the extension of the network[68]. Figures 1 and 2 illustrate the similarities between ACE's plan and the actual network.

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[61] Cf. Hecht, 2009, p. 13.
[62] Vieira, 1983, pp. 204-226.
[63] Pereira, 2012, pp. 307, 393.
[64] *DCD*, 11-3-1873, pp. 633-634; 31-3-1874, pp. 968-969; 1-3-1875, pp. 568-569.
[65] Brandão, 1878, pp. 166-170; Larcher, 1883; Pais, 1876; Pais, 1878.
[66] Almeida, 1851, pp. 7-23; *Boletim do Ministerio das Obras Publicas, Commercio e Industria* (henceforth *BMOPCI*), 1854 (3), pp. 209-219; 1858 (1), pp. 96-101; 1862 (1), pp. 43-45; *Diario do Governo*, 22-5-1857, p. 691; 28-3-1859, pp. 571-572; *DCD*, 18-3-1857, pp. 157-167; 18-4-1857, pp. 198-203; 10-8-1861, pp. 2226-2227; *DL*, 7-3-1862, pp. 727; 23-12-1865, pp. 3004-3005; 17-1-1866, pp. 189-191; 21-6-1867, p. 2011; AHMOP-COPM, book 22, 1865, fs. 18-29v; book 32, 1871, fs. 280-299; book 32-A, 1871, fs. 1-8v; book 34, 1873, fs. 97v-100v; box 18, 1875, report 6418, 7-1-1875.
[67] *ROPM*, several issues between 1876 and 1878. *ROPM*, 9 (102-103), pp. 289-304.
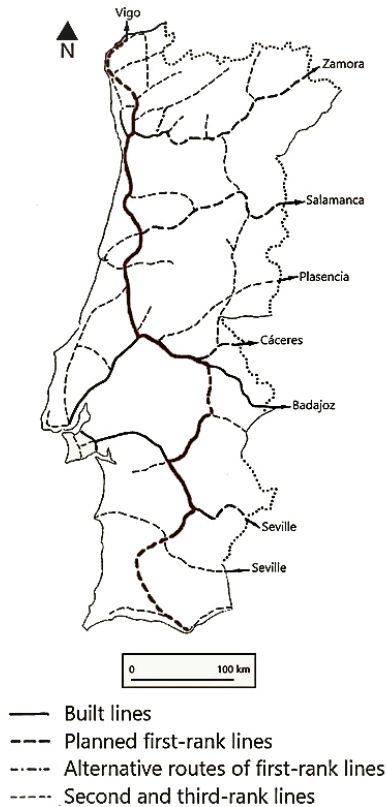[68] Pereira, 2020, pp. 10-12.

Figure 2

The Portuguese network suggested by ACE

Source: Adapted from Alegria, 1990, p. 287

Despite the technoscientific expertise of engineers, their recommendations were often overridden by the political power seeded in the parliament and in the government. The difference of opinions amongst engineers contributed to undermine their authority. The debate about the general network plan is illustrative. The discussants had very diverse visions about the shape of the network, according with their economic views, political affiliations, and whether they were employed in the pri-

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vate or public sector (see above). These dissimilarities were also visible in the parliament, where engineers sitting in opposite sides of the chambers could easily support diametrical opinions that favoured their own parties. Even within state engineers —whose self-cognisance of a specific social role has historically bound them closer together[69]— the differences were palpable. Consequently, by accepting non-technical criteria and practices into their work, engineers paved the way for other forms of expertise and authority and rendered their own more vulnerable[70]. When the government needed a specialist, the selection was most of the times political and ideological, and not technical[71].

More importantly, the idea of the engineering-state cherished by engineers was a threat to the power of the majority of stakeholders whose expertise was non-technological. If assembled, the technoscientific view of the engineering-state would remove them from the decision-making process about railways, which dealt with large sums of money and was a source for social capital and political power. The technopolitics of engineers was countered by good old-fashioned politics that prevented them from acquiring further power. The case of the network again provides a good example. From a technical point of view, it made sense to have a blueprint that directed the implementation of the grid. However, from a political point of view, it restricted the agency of the government that could no longer favour a given entrepreneur, decree the construction of a railway to gain political supporters or decide against the opinions of the technical experts. Without a network plan, the governments had more liberty to decide, according with the circumstances of the moment.

5. **Railways as a political tool**

Keeping control of the decision-making process and not handing it completely to the engineers allowed non-technical policymakers in the central government and parliament to use railways as a tool to achieve political goals. When it became clear that the criteria to decide the construction of railways was not exclusively technical, many felt motivated to in-

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[69] Cf. Hecht, 2009, p. 25.
[70] Cf. Hecht, 2009, p. 129.
[71] On the importance of ideology in the selection of experts: Lampland, 2011, p. 175.

tervene in the discussion, looking to shape the implementation of railways in the territory according with their political agendas.

Parliamentarians often used their position to propose railway routes that traversed their own constituencies without any solid argument to back those suggestions other than to serve their political goals and strengthen their influence in those areas. A good example is provided by MP José Estêvão, who in the 1850s lobbied for the construction of the line between Lisbon and Porto (traversing his constituency of Aveiro) when most opinions recommended the connection to the Spanish border in Elvas/Badajoz (figure 1). Estêvão did not want to «be hostile to all those wonders, all those fairy tales people tell about the railway from Lisbon to Badajoz», but the construction of the Northern line «was the best decision one could take to inflate a new life into our nation. From any perspective, its importance is paramount. Since we rounded the Cape of Good Hope, we never accomplished a feat of such magnitude»[72].

This kind of speech became more frequent from the mid-1860s onwards, after the opening of the Northern and Eastern lines (1863-1864). Most congressmen lobbied for construction in the regions they represented (or where they held economic interests). Some entered in disputes with other representatives from neighbouring constituencies. In 1875, the parliament debated whether the next cross-border track should go from Coimbra to Guarda (traversing the Beira Alta province) or from Entroncamento to Castelo Branco (across the neighbouring Beira Baixa province, to the south). To advocate for the former, congressman Luis de Campos described Beira Baixa in the following terms: «it is arid, sad, and poor as no other region I know. To draw a darker picture, vultures swarm in those cliffs; and in the top of the valley, there is a small village —Vila Velha de Ródão— where […] the houses still do not have glass windows!»[73]. Even if they were not successful in their lobbying, they showed to their constituents that they had advocated for the modernisation of their territories. In this regard, MP Elias Garcia once shared in parliament an episode he had witnessed in a town in the countryside:

> I was dining with some acquaintances when a fellow who spoke very loudly arrived. I asked: «who is this gentleman?». I was told: «It is the representative of that constituency» […]. And, quite satisfied,

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[72] Quoted by Guillemois, 1995, p. 67; *DCD*, 21-7-1852: 288.
[73] *DCD*, 13-3-1875, p. 1067.

> I watched this man telling the others what he had said in parliament. He made a great speech describing what he had said. This shows that a congressman, when he returns to the province, to the midst of his electors, is very satisfied just by saying that he spoke a lot[74].

Stakeholders in the government also took advantage of those disputes between parliamentarians to impose their views and goals associated with railways. Particularly, railways became an argument to appease the contestation of the representatives of a given region and to exert control over caciques.

A governmental strategy that became common was to present and approve bills to build railways that were not meant to be fulfilled. Either the bills did not mention how to finance the construction, or there were no surveys for the proposed lines, or, in case of transnational tracks, the agreements with Spain for the cross-border linkages were wanting. Regardless, the promises were made, and the government gained some time. Eventually, it could even acquire some allies or at least provoke disagreements within the ranks of the opposition[75]. Some legislators saw right through this political trickery. Cunha Sotomayor had little doubts about the true goals of this scheme: «when [the government] feels threatened, it immediately proposes a railway»[76].

As for the relationship between central government and caciques, we do well to remember that the latter played a relevant role in the Portuguese political system. The influence of the central government waned when it moved from the capital to the countryside. Caciques were crucial to extend its grasp to the periphery (and to assure governmental victories in the elections as I explained above). In exchange, caciques in the periphery bargained with the capital city to obtain certain perks – a relationship that Bulpitt calls territorial politics[77], that was also teemed with technopolitics, as railways became a valuable currency in these exchanges between stakeholders in the capital and caciques in the periphery. Folkers reminds us that infrastructural networks were crucial for modern states to rule the entirety of their territories and respective populations[78]. I add that

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[74] *DCD*, 31-5-1887, p. 920-921.
[75] Pereira, 2012, p. 301.
[76] *DCD*, 9-5-1853, p. 72.
[77] Bulpitt, 1983, pp. 1-3, 58-65.
[78] Folkers, 2017, p. 858.

this could also be achieved via the (techno)politics behind the decision to build a railway in a certain area.

Portuguese historiography records several examples of those interactions between central government and local caciques: the detour to Aveiro, constituency of local influent José Estêvão, in the Northern line, not advised by any engineer[79]; the alteration of the starting point of the Southern line from Aldeia Galega to Barreiro, hometown of former prime-minister Joaquim António de Aguiar[80]; or the construction of the Tua line to Mirandela, lobbied by local landowner Clemente Menéres[81].

The parliamentary debates also record some instances where representatives from the periphery offered their support to the government in exchange for a railway in their areas of influence. In 1877, Marçal Pacheco, member of the Regenerator Party, even promised to turn his cloak to the Progressive Party if the government built a railway towards the Algarve: «the minister of Public Works may count me amongst his allies; His Excellency may consider me a supporter, an enthusiastic supporter, of the government; he may even consider me his political coreligionist, provided that he promotes the public works needed in the Algarve, most importantly, a railway» – he said[82]. In another occasion, the bishop of Bragança admitted in the House of Peers that he had only voted favourably the Beira Alta line, because he expected that the government decreed the construction of a railway in his district[83].

Of course, it was impossible to indulge every caprice of these men and the vain promises to build railways only worked for so long. Consequently, on a few occasions, the parties lost the support of some caciques. The best example is arguably Vaz Preto, a wealthy landowner in Castelo Branco affiliated with the Regenerator Party that for twenty years lobbied for a line traversing that region. Tired of the hollow words of the party's leaders, he abandoned it and formed a party of his own[84]. This situation was unusual, as most caciques were not extremely wealthy as Vaz Preto was. Their power lied in their bureaucratic and administra-

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[79] Sousa, 1941, p. 123.
[80] Cruz, 1977.
[81] Viseu, 2012, pp. 79-80.
[82] *DCD*, 16-3-1877, p. 656.
[83] *Diario da Camara dos Dignos Pares do Reino* (henceforth *DCDPR*), 3-4-1878, p. 277.
[84] Pousinho, 2016, pp. 92-94, 103-107.

tive influence[85]. Therefore, their ability to coax the government was not unlimited, which created an equilibrium between the central and the peripheral political forces.

Besides political machinations, railways also paved the way for financial speculations with private companies, which also accounts for the allure associated with the control of the sector. Railway construction required the creation of large, capital-intensive companies that established steady flows of capital towards Portugal, via foreign direct investment[86]. Even though a large part of this capital flowed back abroad (as steamers, rails, and engineering works were purchased in France, Belgium, Germany or England), some was used internally, to acquire small utensils for the permanent way and pay the wages of local workers[87]. Employment also became an important political argument, brought about by the investment in railways[88].

Additionally, there was the detail of policymakers getting managing jobs within the companies' hierarchies. Usually, the accords between public authorities and private initiative were clinched with the inclusion of members of government or the ruling party on the boards of the leasing companies, not only in Portugal[89]. This may seem like a trivial aspect in the usual intrigues of politics, but it holds more than just the mere preconceptions of politicians as privileged and crooked individuals who used the power granted by the people for their own personal gain. It was a form to have some say in the management of companies, who, as technopolitical regimes of their own, could —and did— influence the implementation and the design of the network, and more importantly to haste the construction of new lines.

Examples of this interlocking between public representatives and private interests include the lobbying of foreign and national entrepreneurs to build new railways or to improve existing lines. The most notable was the count of Burnay, a Belgian-Portuguese businessman, who convinced the government to subsidise a redundant railway (Western line) and other in Spain (connection of the Douro line to Salamanca)[90]. Companies often

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85 Almeida, 1991, pp. 135-136.
86 Lopes and Simões, 2017, pp. 1085-1086.
87 Pinheiro, 1988, pp. 751-752.
88 Pereira, 2012, pp. 301-302.
89 For the Spanish example: Cuéllar, 2018, pp. 530, 538.
90 For an analysis of this influence in the Portuguese railway system: Pereira, 2020, pp. 15-16.

lobbied for roads around their lines, which explains why the road network followed the railway network closely, instead of spreading out evenly across the country[91]. Other examples include the lobbying of those MPs and members of government in the board of the RCPR to hurry the approval of construction projects in the 1860s[92] or to forfeit the levy of the transit tax (as a public aid to the company) in the early 1870s[93]; or the manoeuvrings of António de Serpa, simultaneously member of the board of Companhia dos Caminhos de Ferro da Beira Alta (Beira Alta Railway Company, henceforth BARC) and minister of Foreign Affairs, to aid this firm in a dispute against the RCPR in 1882[94].

The promiscuity between policymakers and private companies fuelled parliamentary contestation to the government. For many years the Regenerator Party was closer to the RCPR. To counter the influence of that firm, the Progressive Party favoured on some occasions BARC that operated a competing transnational track[95]. In 1884, minister of Finance and member of the Progressives, Mariano de Carvalho, promoted a coup in a general meeting of RCPR that granted control of the company to one of his partners, the count of Foz[96].

In sum, both major parties engaged in suspicious liaisons with private companies. In this regard, member of the House of Peers Câmara Leme told the following fable in the upper house of parliament, to denounce the promiscuity between politicians and corporations:

> It was a rat and a fox who lived near a farm. The rat wished to enter the hennery and so did the fox […] One day, the fox, savvier than the rat, managed to enter the coop and it devoured as many chickens as it could. One dawn, the rat saw the fox escaping the farm and it approached it:
>
> «—Where are you running to, in such a hurry? – asked the rat.»
> «—Ah, my friend, I was falsely accused, and I was beaten out. You do realise I was the keeper of the hennery. In such a dire job, I lost my health and peace of mind; I didn't eat or sleep well; regardless, they hate me and all due to a vile slander. […] As if I could take that which

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[91] Alegria, 1990, pp. 156-163.
[92] Abragão, 1956.
[93] Pereira, 2012, p. 122.
[94] Pereira, 2012, p. 137.
[95] Pereira, 2012, pp. 133, 377-378.
[96] Fernandes, 2010.

does not belong to me […]. I ask you, my friend. Have you ever saw me commit such a crime? […].»

«—Nay, that, I didn't; but what I often saw was your snout covered in feathers».

And the rat continued making fun of the fox, calling it a liar and a hypocrite. Well, in this sense, the most remarkable thing happened in this chamber, because some of the Honourable Peers who sit here swore that they did not belong to any business syndicates, that it was all a slander. However, one could tell that that was not true, because there was a document that proved their allegiance to those corporations. And does Your Excellency know what document that was? It was a bunch of feathers… on their noses (Laughter)[97].

From time to time, there were some attempts to regulate the relationship between politics and private capital (for instance a law that determined that some posts were not compatible with the office of congressman), but nothing was ever truly accomplished. The regulations were either rejected or easily circumvented[98].

6. **From rhetoric to materiality: inauguration ceremonies and photography**

Technopolitics can be associated with material and iconographical practices. In this section I will analyse two examples of such practices: inaugurations and photography of railways.

The importance of inauguration ceremonies is well documented. They were theatrical performances that proclaimed the future, confirmed progress, and served as heralds for a new order. They celebrated, but also benefited from that «religious feeling, aroused by the confrontation with impressive [technical] objects». Engineers themselves promoted this sensation, as they «imbued technology with moral values» and bonded «practical goals with politics and spiritual regeneration»[99]. Therefore, inaugurations were also an important tool of technopolitics[100], especially when we

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[97] *DCDPR*, 13-4-1901, p. 334.
[98] Pereira, 2012, pp. 302-303.
[99] Nye, 1999, pp. XIII, XX, 65.
[100] Hecht, 2009, pp. 89-90.

remember that most Portuguese were illiterate and more prone to material manifestations[101].

These events were ravishingly celebrated in the cities where the main stations were located, but also along the railway routes, even when the infrastructures were a technical failure[102]. The sublime of the locomotive was accompanied by banquets, fireworks, flags, and sundry decorations of public spaces[103]. Both attracted thousands of people that either gathered in the city centres or waited along the line for the passage of the inaugural trains[104]. In other contexts, the date of the inaugurations was very relevant (in the United States of America, for instance, many coincided with the 4th of July)[105], but in Portugal that was not a concern: the dates apparently were chosen at random.

Regardless, inaugurations were the perfect stage for technologists to engage with the crowd, seeking political gains. Not surprisingly, these ceremonies frequently counted with the presence of several public figures: the monarchs, members of government, and local authorities; engineers, members of parliament, clergymen, army officers, public and private administrators, and university professors were also habitués[106].

If participating, the spotlights were on the king, who acted as the main character in this play and as go-between between policymakers, local authorities, and general populace. The former attached themselves to the royal figure for political dividends, whereas local caciques often took the opportunity to engage in capital city bargaining with the stakeholders from the centre. Engineers and workers were usually outshined in these events. Kings Louis (who reigned between 1861 and 1889) and Charles

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[101] Saraiva, 2007, pp. 263-264.

[102] The inauguration of the first railway in 1856 (a 36 km track between Lisbon and Carregado) was a disappointment, as the locomotive malfunctioned and could not bring all the partakers back to Lisbon. A few years later, another locomotive, deemed as a revolutionary technical innovation (the *Larmanjat*), could not climb a hill on the outskirts of Lisbon: *A Illustração Luso-Brazileira* (*ILB*), 8-11-1856, p. 360; Gaio, 1957, p. 69.

[103] *ILB*, 8-11-1856, p. 360, *A Revolução de Setembro* (henceforth *RS*), 16-6-1858, p. 1; *Jornal do Porto* (henceforth *JP*), 24-9-1863, p. 2; 20-5-1875, p. 2; 21-5-1875, p. 2; 22-5-1875, p. 1; 8-9-1891, p. 1; *RS*, 16-2-1864, p. 3; *Diario Illustrado* (henceforth *DI*), 6-11-1877, p. 2.

[104] *RS*, 16-6-1858, p. 1; 8-7-1864, p. 2; 31-7-1875, p. 2; *JP*, 21-5-1875, p. 2; 8-9-1891, p. 1; *O Commercio do Porto*, 30-7-1875, p. 2.

[105] Nye, 1999, pp. 47-48.

[106] *RS*, 16-6-1858, p. 1; 16-2-1864, p. 3; *JP*, 21-5-1875, p. 2; *O Primeiro de Janeiro* (henceforth *PJ*), 30-7-1875, pp. 1-2; Wolowski (1883).

(1889-1908) partook in the inauguration of the Eastern (1863), Minho (1875), Beira Alta (1882), Tua (1887), and Beira Baixa (1891) railways and the Maria Pia bridge across the Douro River between Porto and Gaia (1877)[107]. On all occasions, they were acclaimed and cherished by the people. The government looked at these events as occasions to borrow some of the monarchs' popularity.

By joining the kings in the celebrations, the government presented itself as the agent who gave the new technology to the people and therefore as promoter of progress. However, those railways lacked basic supporting infrastructures like roads to operate efficiently and provide all the benefits touted by its promoters. This constituted no impediment to the celebrations. Often, technology is presented as a token of modernity and a motive for national pride, although it does not serve efficiently the people it was supposed to serve[108]. The toasts made during lunch honoured the king, the government and undefined concepts like progress and freedom. Engineers, workers, local authorities, and the press were sometimes mentioned but with less prominence than the latter[109].

The press, most of which politically compromised, enhanced this message describing the inaugurations as «one step closer to modern civilisation» and the locomotive as the «new guest that announced progress and economic and social regeneration»[110]. Reporters commended the speed of trains, the easiness of communication, and the low fares, considering them imperative conditions for economic development and for bringing sundry regions of Portugal closer together in a «fraternal embrace»[111]. In this regard, two ceremonies hold a particular importance: the inauguration of the Tua line was particularly relevant, as it permitted for the first time in history to go from the shoreline to the most rugged province of Portugal (Trás-os-Montes) and back in one single day[112]; the Maria Pia bridge traversed the gorge of the Douro River with an impressive steel arch, which

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[107] *JP*, 20-5-1875, p. 2; 21-5-1875, pp. 1-2; 8-9-1891, p. 1; Cordeiro and Pereira, 2017a; Wolowski, 1883.

[108] Jones, 2011, pp. 220-224.

[109] *RS*, 16-6-1858, p. 1; *JP*, 20-5-1875, p. 2; 22-5-1875, p. 1; *PJ*, 30-7-1875, p. 2; *DI*, 6-11-1877, p. 2; Cordeiro and Pereira, 2017a, p. 161.

[110] *RS*, 16-6-1858, p. 1; 16-2-1864, p. 3; 8-7-1864, pp. 2-3.

[111] *RS*, 16-6-1858, p. 1; 8-7-1864, p. 2; *JP*, 8-7-1864, p. 2; 20-5-1875, p. 1; 21-5-1875, p. 1; *DI*, 6-11-1877, p. 2.

[112] Cordeiro and Pereira, 2017a.

for many years was the largest in Europe[113]. Railways' ability to bring territories closer together, which was so dear to the saint-simonianists, was especially celebrated in the inauguration of cross-border tracks, during which the juxtaposition of the Portuguese and Spanish national flags symbolised the union of both nations, but at the same time the sovereignty of each[114].

Undoubtfully the best example of the political use given to a railway inauguration is the opening of the Beira Alta line, in 1882. The government of the Regenerator Party was under heavy criticism due to diplomatic negotiations with Britain and a private-public partnership in the railway sector, and it organised a two-week trip for king Louis to visit a few towns along the route and in the north of Portugal. The opposition, led by the Progressive and the Republican parties, took the opportunity to criticise the government and the monarchic regime. The newspapers associated with progressives and republicans could not deny that Portugal was treading the path of progress, but they underlined that the celebration was not as exhilarating as the regenerators wanted people to believe and that there was contestation to both the government and the king[115].

Indeed, on some occasions, there was some controversy against the government, which included petitions by local authorities to resume railway construction to their constituencies or to ask for different favours. Occasionally, groups of children or young ladies were organised to offer gifts or poems to the king, preceding the presentation of the request or the petition[116].

These celebrations of technology brought a different group to techno-politics: the clergy. All inaugurations were overseen by the local bishop who celebrated religious ceremonies and blessed engineering works and locomotives[117]. The Church sought to attach itself to technology to make sure that the technological sublime and the profane «emotions of omnipotence, devotion, and awe»[118] were framed within the principles of Chris-

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[113] *DI*, 6-11-1877, p. 2.

[114] *JP*, 24-9-1863, p. 2; 22-5-1875, p. 1; Wolowski, 1883.

[115] Pereira, 2016, pp. 35-73. Similar situations, albeit not as revealing, happened in the inauguration of the Minho, Douro and Tua lines: *JP*, 21-5-1875, p. 1; *PJ*, 30-7-1875, p. 1; *O Seculo*, 1-10-1887, p. 1.

[116] *JP*, 22-5-1875, p. 1; Pereira, 2016, p. 64.

[117] *RS*, 16-2-1864, p. 3; *JP*, 21-5-1875, pp. 1-2; 8-9-1891, p. 1; *DI*, 6-11-1877, p. 2; Cordeiro and Pereira, 2017a, p. 164; Wolowski, 1883.

[118] Noble, 1997, p. 5.

tianity. Simultaneously, it shunned away any suspicions that the Church might be an enemy of progress, while showing that both were inseparable and symbiotic[119]. Considering that the vast majority of Portuguese was Catholic, other lay participants were more than willing to join efforts with the Church in the inauguration festivities, by attending the religious ceremonies and by endorsing charity[120]. The latter was not only a token of Christian faith, but a tradition, particularly in the rural areas, where a interdependence between religious and secular benefaction was common[121].

The visual impact of the technical sublime present in the inaugurations was limited to the spectators who attended the event. Those who did not attend had to settle with descriptions in the press. In this sense, photography was an important technopolitical tool as it served as a window to observe the modernisation of the country and its promoters.

Photography was practiced in Portugal since the 1850s[122]. As a product of science and technology, it was considered a tool that depicted reality with complete objectivity, unlike drawings or paintings that were the product of the author's subjectivity[123]. Obviously, this was a fallacy, because the representations of the photographer were deeply imbedded in the photo[124]. Nevertheless, the alleged objectivity of photography turned it into an instrument to produce ideology[125].

From the beginning, several photographers recorded the implementation of the Portuguese railway network, but their activity was especially relevant from the 1880s onwards. This decade witnessed the publication of several railway albums (mainly by German photographer living in Portugal, Karl Emil Biel) illustrating the new tracks added to the system[126]. Some of these albums and photos were widely divulged in the emerging illustrated press (especially in the journal *Occidente*), using wood engravings that replicated the original images (publication of photos was not possible for technical and financial reasons until the early years of the twentieth century)[127]. Usually, the captions of these images underscored

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[119] Nye, 1999, p. 57.
[120] *JP*, 21-5-1875, p. 1; Cordeiro and Pereira, 2017a, pp. 161-162.
[121] Almeida, 1991, p. 138.
[122] Sena, 1998, pp. 40-51.
[123] Daston and Galison, 2007, p. 121.
[124] Mitchell, 1986, p. 2.
[125] Kelsey, 2016, p. 90.
[126] Serén, 1993.
[127] Sousa, 2017, p. 576.

that they were reproductions from original photographs, borrowing the alleged objectivity of photography to increase the journals' trustworthiness amongst its readers[128].

These images illustrated and gave visual materiality to the saint-simonianist rhetoric of progress touted by policymakers and engineers (figures 3 to 6). They were proof of the modernisation effort undertook by the government. Additionally, they spread the technical sublime of railways to those places without any (the texts that accompanied the images strengthened this scenario with further information about the dimensions, makers, and builders of those structures and artefacts). Two specific objects served this purpose: locomotives/trains and bridges. The former was the spearhead of technical sublime[129], which evidenced the easiness of mobility across mountains and gorges that for centuries restricted circulation. Bridges (and to a lesser extent other engineering works as tunnels) were presented as civilising works[130] in their colossal size and intricate steel structures that contrasted with the surrounding natural landscape.

Figure 3

Bridge Maria Pia, across the Douro, in the Northern line: photo of Emil Biel (left) and drawing published in the press (right)

Sources: Republished in Serén, 2001; *DI*, 3-11-1877, p. 1

[128] Martin, 2006, pp. 43-44.
[129] Kasson, 1976, pp. 162-180.
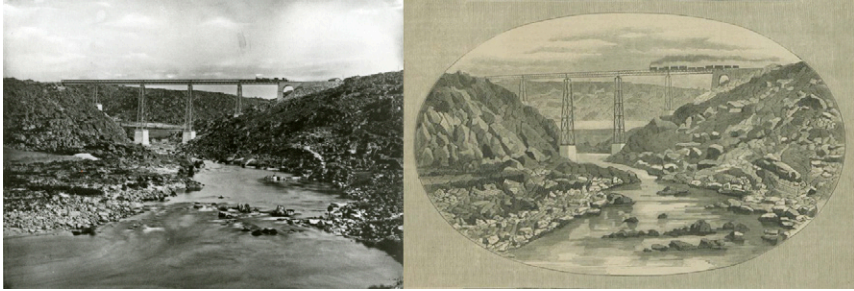[130] Cf. Dreicer, 2000, p. 139.

Figure 4

Bridge over the Côa River, in the Beira Alta line:
photo of Emil Biel (left) and drawing published in the press (right)

Sources: Arquivo Histórico da CP, Lisbon; *Occidente*, 1-12-1882, p. 268

Figure 5

Loureiro and Murta tunnels, in the Douro line:
photo of Emil Biel (left) and drawing published in the press (right)

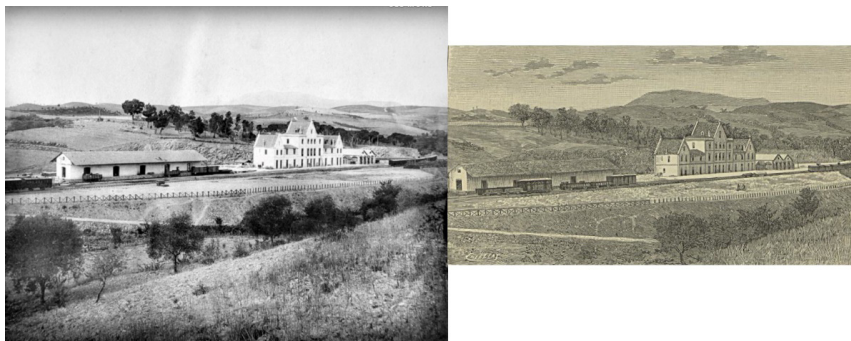*Sources:* Republished in Macedo, 2012, p. 353; *Occidente*, 21-12-1883, p. 281

Figure 6

General view of the Mirandela station, terminus of the Tua line:
photo of Emil Biel (left) and drawing published in the press (right)

Sources: Republished in Beira, 2014, p. 33 and *Occidente*, 11-2-1892, p. 37

In the technopolitical gambit, engineers were the group that most profited from photography. Images and descriptions of railways, engineering works, locomotives underlined the harshness of the landscape where engineers worked, highlighted the dimensions, and cost of some works, and emphasised the ingenuity of the experts to whom those improvements were due. Those accounts were often written in a technical language, hermetic to most and only accessible to a few, which magnified the sublime of technology and showed engineers as keepers of its secrets. The importance given by engineers to photography is well illustrated by the fact that they financed the publication and transport of several albums of Portuguese railways and public works to the Chicago World's Fair of 1893[131]. The newspapers could be deceptive, as they were biased towards a given party, but photography was seen as a product of science and technology that could not lie and opened a window to see progress and their main agents.

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[131] Macedo, 2012, pp. 323-324.

7. **Conclusion**

The case of Portuguese railways in the second half of the nineteenth century provides a good example of how technology became a tool for political dispute, lobbying and socio-political affirmation, although it supposedly should pursue technical and economic goals related with mobility, transport, and general economic development. Simultaneously, or consequently, these political uses determined the features of railway implementation in Portugal.

These outcomings are the result of the feuds between different agents (associated in diverse technopolitical regimes) who pursued dissimilar, and to some extent opposing, objectives that dwelled in uneven balances of power.

Engineers held the power of technical expertise. and they sought to use it to reach a higher position in the hierarchy of power, within the model of the state-engineer proposed by Saint-Simonianism. They also had specific political agendas, especially if they worked in the private sector, under private technopolitical regimes. Therefore, their input was not homogeneous, it depended on which technopolitical regime (or individual agendas) they served and was far from being utterly technical or objective.

In this model, engineers clashed with those stakeholders in central government who held the political power to decide which lines to build, following which routes, which caciques to appease and which companies to hire. They needed engineers to survey the land, oversee the contractors work and build railways, but they were not willing to share political power with them. Therefore, they kept most of the decision-making power to themselves, and they used it to achieve political goals related with governance, opposition to the government or extension of the central government influence towards the periphery via caciques under the model of territorial politics. Naturally, these interactions between technical and non-technical actors influenced the design of the network, considering that on some occasions political factors superseded the technical input provided by engineers.

Railway technopolitics developed in different arenas, where the agents involved had dissimilar influence and power. In the offices of the ministry of Public Works or the assemblies of ACE, engineers endorsed the ideals of technoscientific objectivity to offer a technologically sound network and at the same time to promote themselves as the best agents

to direct the modernisation of the country, aiming to the establishment of the state-engineer. In the media, through the novel technology of photography, they chased the same goals, benefiting from the objectivity attributed to the camera that allegedly showed the sublime of the technology as it was. However, these aspirations were restricted in the parliament by the government and the power associated with political parties, where non-technical agents engulfed technical experts. The prevalence of political power over technical authority is clearly visible in the inauguration of new tracks, where the former, associated with the figure of the monarch, was much more celebrated than the former[132].

To conclude, it is important to highlight here, as Gabrielle Hecht suggests, that technopolitics does not necessarily lead to «bad technology» – but it should be regarded as a key factor that must be taken into consideration in historical analysis of technology[133]. The case analysed in this paper, albeit restricted to a specific geographical and chronological context (Portugal in the second half of the nineteenth century), illustrates the importance of technopolitics and adds to the debate about the relationship between politics and technology (including the role of mass media, which grows in importance for more recent years). But regardless of the timeframe and the geography analysed, the technological sublime is constantly present (whether in large technical systems or in smaller technological artefacts) and it traverses different political regimes (from democracy to authoritarian regimes) where technical and non-technical agents fight for power, thus influencing the implementation of technology.

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[132] Another arena where technopolitics was practiced is the backstage of political decision-making, where technologists (technical and non-technical) sought to control technological development and achieve political goals away from the eyes of the public. Considering the unavailability of sources (namely private letters), this dimension was not analysed in this paper. However, it may constitute a broad avenue for additional research, provided that historical private correspondence is made available online by Portuguese archives.

[133] Hecht, 2009, pp. 338-339.

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