Seeing like a Factory? Technocratic Nationalism in Catalonia, 1930–1939

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Abstract

This paper explores the role of non–state and private sector–oriented engineers in the rise of Catalan nationalism as well as in the making of a stateless nation (within Spain) in the interwar period.

After the fall of the Spanish nationalist Primo de Rivera dictatorship (1923–1930) and the proclamation of the Second Spanish Republic (1931–1939), a home rule for Catalonia was established. In this context, the members of the Barcelona Association of Industrial Engineers (AEIB) developed a techno–nationalist program with the double goal of both making technology Catalan and making Catalonia technological.

As an alleged 'third class' between the working and ruling classes, industrial engineers sought to use its former expertise in scientifically organizing the workshop to scientifically organize the whole nation. To this end, they participated in professional initiatives and official institutions from which they spread the 'factory ideals' beyond the factory, such as technical commandment, efficiency, productivism, rationalization and statistical monitoring. This paper focuses on the nationalist and technocratic engagement of two leading (and politically diverging) figures of Catalan industrial engineering: socialist Estanislau Ruiz–Ponsetí and liberal Josep M. Tallada.

Keywords: Techno-nationalism; technocracy; scientific management; Second Spanish Republic; socialism; liberalism; fascism; stateless nations.

Introduction

In the summer of 1922, Albert Einstein met industrial engineer Esteve Terradas in Berlin in order to schedule an intensive course on relativity in Barcelona.[1] After a long journey from Japan to Palestine, Einstein arrived at the Catalan city in February 1923. He took advantage of the occasion to visit some of the cultural landmarks of Catalonia: ancient Paleochristian churches and a Cistercian monastery, but also new scientific and technical institutions such as a night school for workers in Barcelona, the Escola del Treball. The director of this school was the industrial engineer and socialist advocate, Rafael Campalans (1887–1933), with whom Einstein had a friendly – but lively – argument. The physicist argued that nationalism and socialism were at odds as much as nationalism and science were.[2] The engineer replied that nationalism in 'subdued' stateless nations such as Catalonia and Asian colonies had nothing to do with the 'classical nationalist political doctrine – essentially traditional, imperialist and xenophobic' which had spread throughout Europe.[3] In fact, he stated that Einstein himself had exclaimed during the discussion: 'But this is not a true nationalism!'[4]

This paper analyses how Catalan nationalism, politics, and engineering were entangled during the decade after Einstein's visit, especially, during the democratic period between the Spanish military dictatorships of Miguel Primo de Rivera (1923–1930) and Francisco Franco (1939–1975).[5] After the establishment of the Second Spanish Republic (1931–1939) and the Catalan home rule (1932-1939), the members of the Barcelona Association of Industrial Engineers promoted a techno-nationalist vision, defined by the double goal of making technology Catalan and making Catalonia technological. The study of this political vision seeks to enlarge our understanding of techno-nationalism, a topic of growing interest among historians of technology.[6] Nationalism (and, in particular, techno–nationalism) has been a transnational phenomenon which cannot be restricted to the borders and policies of the states involved.[7] Most of the works dealing with the nation and technology as categories, however, have not paid attention to stateless nations and regions asking for political autonomy within a state.[8] The exception are the studies on regions that became

independent states, such as Czechoslovakia, Poland, Bulgaria, Romania and Finland.[9] Nonetheless, the non-negligible (geographical and political) dimension of autonomist movements and stateless–nations such as Catalonia makes them historiographically very significant.[10]

The techno-nationalist program of Catalan industrial engineers was strongly permeated by technocratic ideology and its faith in technical expertise to organize the nation, which especially arose in midst of the social unrest, instability and political challenges of the decade after the 1929 crash. To put it differently, industrial engineers developed what I call 'technocratic nationalism,' a specific form of techno-nationalism bringing together two 'politically promiscuous' and 'conceptually elastic' ideologies: nationalism and technocracy.[11] In this sense, Catalan engineers in the interwar years were not only part of international networks and projects based on the principles of 'technocratic internationalism', to use Johan Schot and Vicent Lagendijk's terms.[12] If 'technocratic internationalism' drew on the 'myth of networks', making motorways and power lines the guaranty of international peace and global prosperity,[13] 'technocratic nationalism' preferred the 'myth of the bridge', devising engineers as a 'third class' bridging bourgeoisie and workers and ensuring social peace and national abundance. This technocratic positioning was more than just a professional claim by engineers defining themselves as apolitical or an expression of straightforward rejections of party politics (many of the most renowned industrial engineers participated in parliamentary politics, were political party members or were part of politically-engaged institutions).[14] Technocracy pointed instead at how engineers embodying the alleged 'neutrality' and 'objectivity' of science and technology were envisioned as crucial political actors, promoting the rationality and efficiency of decisions, and ultimately making politics possible. In this sense, 'technocratic nationalism' became a sort of 'background ideology', deeply shaping other political ideologies in confrontation, such as communism, socialism, liberalism, fascism, or even anarchism.[15]

In addition to bringing the topic of technological thought to the international historiography on nationalism, this paper engages Spanish historiography in at least two ways. First, it shows how the nationalist projects and identities of engineers became dynamic 'gears' in the production of Catalan nationalism during the first decades of the twentieth century, a theme which has been mostly

overlooked by the abundant literature on the subject by political, social, and cultural historians.[16] Second, in line with other scholars' recent work, it makes the claim that technocratic politics in the history of Catalonia and Spain were not restricted to what is customarily called the 'technocrats' period' (1959-1969/75) of the Franco dictatorship, the economic policies of which were oriented by Opus Dei members. Engineering and technocratic ideologies also shaped the first years of the fascist regime,[17] as well as the previous democratic regime it brutally suppressed. In this sense, this paper confronts (or complements) the dominant narrative of a 'Silver Age' science in the Republican period based on internationalist and democratic practices, by underlining instead the nationalist and technocratic ideology in science and technology during the 1930s.[18]

The first section of this paper, 'A new "Applied Nation",' analyses who industrial engineers were, how they represented themselves by embracing the alleged internationalist features of modern science, and in which ways they sought to entangle 'applied science' with the nation. Different from the large civil and military corps which had been traditionally employed and regulated by the Spanish state, industrial engineers were mainly non–state engineers and private sector–oriented professionals.[19] During the 1930s, they keenly involved themselves in the design of Catalonia, and deployed a set of nationalist strategies of self–government and identity concerning language, ethnic discourses, stories of 'great men' and past icons.

While the first section especially addresses the issue of nationalism in 'technocratic nationalism', the second section, 'From the factory to the nation', deals in more detail with the issue of technocracy. Paying special attention to the claims for scientifically organizing the factory workshop (in social and production terms) offered by two politically diverging figures, this section studies how they sought to construct a nation in the image and likeness of their profession.[20] Factory discourses, the ideals of industrial efficiency and technical proficiency, and the practices on management, standardization and statistics were embedded in the image of the Catalan nation.[21] To a great extent, it seems industrial engineers kept on – paraphrasing James C. Scott – 'seeing like a factory' outside the factory, being willing to provide the statecraft with the most efficient tools of 'legibility' whereby it could centrally record and monitor the nation.[22]

A new 'Applied Nation'

On 12 April 1930, in the luxurious hall of the Ritz Hotel, the Barcelona Association of Industrial Engineers (hereinafter, AEIB) celebrated what they called 'the triumph of applied science'.[23] A gala dinner paid homage to all the industrial engineers who had contributed to the 'success' of the 1929 Barcelona International Exhibition. In front of representatives of the local and regional governments, the AEIB president got up and in a lively speech in Catalan stated that the engineering profession could afford much more than workaday outcomes:

> Industrial technology, which could be considered just a way to achieve prosaic material purposes, produces… artistic effects of such beauty and grandeur that it impresses human senses, and leaves an indelible mark of contemplative happiness, which could be compared to that obtained by the most cultured minds from a painting by the most renowned painter... [We are] conscious of such a professional triumph.[24]

Having only half a thousand members, the AEIB was proud that one hundred of them had participated in the making of the most impressive display of light, water and mechanics in the city up to that time.[25] Almost all the officers in charge of the technical sections of the Exhibition – 'Electricity', 'Communications and transports', and 'Lighting and water' – had been industrial engineers; and many others participated as independent consultants, or as staff and owners of hired private companies. The self–claimed 'professional triumph' in the 1929 International Exhibition mirrored the rise of industrial engineering in Catalonia of the former decades.

Industrial engineering was officially born in 1850 as part of the economic and political project of the Spanish liberal state.[26] However, the financial difficulties of the state soon led to the closing of all the schools of industrial engineering, except for the Barcelona School of Industrial Engineers, which had the active support of the city council, the regional government and the industrial elites in Catalonia after 1866.[27] Industrial engineers were mainly attached to private-oriented activities, companies and non–state institutions, and its associations worked as private organizations.[28] The corps of military engineers and civil, mining, forestry

and telegraph engineers were created throughout the nineteenth century, but this was not the case for industrial engineering. In 1911, a royal decree finally created the National Corps of Industrial Engineers, and during the following years legislative provisions were defined to formally establish a body of professionals at the service of the state. However, as of 1930 the state corps of industrial engineering had not been regulated yet, and was just an inoperative legislative by–product.

Since the nineteenth century, industrial engineers had served industry with the 'lexicon' and 'syntax' of science (especially mathematics), while strengthening the role of technology expertise in liberal economy.[29] These processes went hand in hand with the engineers' rhetoric that the professional 'scientification' (nearly homophonic with 'sanctification') was a means to to make usefulness respectable.[30] During the first decades of the twentieth century, by following a new international understanding of 'technology', the industrial engineers defined themselves as 'applied scientists' (as the first quotation of the section clearly shows).[31] In their view, they were the ones who possessed the most suitable skills for the new regime of knowledge which enhanced product standardization, industrial streamlining, scientific management, hierarchical organization and corporate concentration:[32] the ones, in short, who could best apply science to rationalize the nation.

This view spiked in 1929, the year of the Barcelona International Exhibition and the first global economic crisis. At that time, the AEIB was a prestigious association aiming at displaying 'modernity' and 'internationality' in the city and beyond. In 1925, its headquarters moved to an office building in the Chicago Style of architecture, located on Laietana Avenue, an artery which had split the socially-convulsive city center some years before and embodied the political, economic and financial powers of Catalonia.[33] During the following years, the AEIB official journal, *Tècnica*, adopted the aesthetics of the progressivist art Deco, and, later, the rationalizing forms of modernist architecture. [34] What's more, it was standardized according the *Deutsches Institut für Normung*'s guidelines, and its articles were organized following the Universal Decimal Classification. Translations from foreign engineering journals, reports of international conferences, news on novelties and factories around the world, and advertisements of German mechanical pieces and US electric companies, were

published alongside articles of cutting–edge engineering fields, such as aeronautics and fluid dynamics, risk assessment, reinforced concrete, light alloys, air conditioning, waste management, vacuum tubes, electro–optics, sound films and television.

New divisions appeared at the core of the AEIB, which sought to train its members as 'intellectuals' able to face the contemporary world challenges, thanks to the expertise in social engineering, standardization, psychotechnics, modern statistics, or state planning.[35] At the same time, Catalan industrial engineers actively participated in international networks and institutions, such as the International Labor Conference, the International Conference on Psychotechnics, and the *Institut International d'Organisation Scientifique du Travail*, as well as in projects developing 'technocratic internationalism', such as the World Power Conference and the *Conférence Internationale des Grands Réseaux Électriques a Haute Tension*.[36]

The AEIB internationalist program of modernization ran parallel to its techno–nationalist program, which especially arose during the 1930s. Once the Second Spanish Republic was proclaimed in April 1931, the AEIB publicly defended the political autonomy of Catalonia.[37] Shortly after, Rafael Campalans – the industrial engineer who had been discussing nationalism with Einstein – played a key role in the drafting of the Catalonia Statute of Autonomy; that is, the main set of laws establishing Catalan home rule and regulating the institutions, competences and financing of the Catalan government. One of the requested competences for the autonomous Catalonia (to be transferred from the Spanish state) was public education and its whole institutional system. Campalans had a recognized voice on this matter, as he had been very active for some time in official bodies and non-official institutions devoted to technical education, such as the above-mentioned Escola del Treball and the Ateneu Polytechnicum. Moreover, Campalans served as the head of the Department of Public Education of the provisional Catalan government.[38] As the final approval of the statute in Madrid in 1932 did not meet the demand of education competences, the industrial engineer defended the creation of the Autonomous University of Barcelona and (probably) was behind the failed proposal of an Autonomous Industrial University.[39] For Campalans and AEIB engineers such as Estanislau Ruiz-

Ponsetí, education – and especially technical education – was a key piece of the nationalist project.

In parallel, the AEIB went after its 'own' self–government. Even before the Statute of Autonomy was definitively approved by the Spanish Courts, the association broke its dependence on the centralized association in Madrid, and managed to create a Spanish Federation of Associations of Industrial Engineers.[40] For the AEIB, the professional sovereignty was a *sine qua non* for an effective national sovereignty.

Moreover, many industrial engineers were involved – as we will see in further detail in the next section – in the new Catalan government, as leading figures in the first Parliament of Catalonia, in the city council of Barcelona, in the organization of the official departments, and in consultant committees seeking to efficiently monitor the national resources. But they sought to intertwine profession, technology and the nation in a further extension, fostering a cultural endeavor concerning three main issues: language, ethnicity, and history. I will deal with them in turn.

Catalan language had always been a key feature of Catalan identity claims, and industrial engineers took it as their 'professional language'. In the first meeting of the AEIB Board after the proclamation of the Second Republic, Catalan was officially set as the *lingua franca* of the association, at the expense of Spanish which had been used as the official professional language up until then.[41] Alongside lower-ranked engineers, technicians and skilled workers,[42] industrial engineers used more and more the daily language – at home and at the factory – in scientific and academic journals and institutions: for example, in *Tècnica*, *Ciència*, *Indústria Catalana*, and the publications of the Institut d'Estudis Catalans (Institute for Catalan Studies, IEC). The AEIB expressed its pride that the ancient compatriot Ramon Llull (Raymond Lully) had been one of the pioneers in using vernacular as a 'scientific language' in the thirteenth century, and that an industrial engineer, Pompeu Fabra, was the main responsible for the project to standardize the Catalan language undertaken under the auspices of the IEC.[43]

Besides language, industrial engineers developed some ideas on ethnicity that had previously been taken up and disseminated by other scientists and technicians. According to these ideas, the character of the Catalan people was – in opposition to the Spanish people – entrepreneurial, industrious, ingenious and

scientific.[44] Some of these statements were based on the fact that Catalonia, with the Basque Country, was the most industrialized region in Spain, the economy of which was strongly reliant on the primary sector. One of the most influential public intellectuals in these debates was the industrial engineer Carles Pi–Sunyer (1888–1971). Some years before becoming mayor of Barcelona (1934 and 1936–1937) and head of the Department of Culture in the Catalan government (1937–1939), he had already participated in the making of such a national identity through widely read books and articles in newspapers, asserting that, 'Catalan people love industrial and technological progress'.[45] The reasons for such love were supposedly found in their deep-seated ethnic characteristics:

> In all its racial outcomes, Catalan thought provides the same enduring character. Reason as a system, appropriation as a tool, and practical realities as a goal, these being the faculties of the wider context of our mindset, which Catalan intelligence places at the service of collective economic function.[46]

Last but not least, AEIB members fostered a new 'technological past' for Catalonia. Like the Watt machine, the Eiffel Tower and the landscapes of the Tennessee Valley in the powerful nation-states of England, France and the US respectively, they looked for 'great inventions' and 'great inventors', which were to embody the national identity. In 1931, *Tècnica* opened a brief section of hagiographies of 'figures of industrial engineering' who represented key values of both the profession and the nation: for example, Àlvar Llatas, a devotee of technological and humanist cultures 'who could recite from memory fragments [by Goethe and Dante] in the original language'; Fèlix Cardellach, 'the philosopher of structures'; Manuel Solé, an 'exemplary life' devoted to research and work; Narcís Xifra, the Catalan 'Edison'; or Josep Albert Barret, a martyr of the 'industry of the fatherland' after being killed in strange circumstances in 1918.[47]

The 'invention of the invention' was also part and parcel of the 'invention of tradition'. [48] The Bergadana machine and the so-called Catalan forge are exemplary of past 'inventions' which were brought to the forefront of the national identity. The Bergadana was a local appropriation of the eighteenth-century

English spinning machines known as *jennies*, equipped with 130 spindles at the beginning of the nineteenth century. A century later, industrial engineer Ramon Soler studied this machine from archaeological evidence and oral testimonies, and named it the 'Catalan cotton spinning frame'.[49] The Catalan forge or Catalan procedure was an internationally–renowned metallurgical technology which had mainly been developed in the eighteenth century, despite being dated to the Early Middle Ages. During the 1910s, two young industrial engineers and members of the ramblers' association Centre Excursionista de Catalunya, Santiago Rubió (1888–1971) and Antoni Gallardo (1889–1942), regarded the forge as the 'technological soul' of the nation, and searched for its remains in remote valleys in the Pyrenees. In the aftermath of the 1929 Barcelona International Exhibition, they displayed a faithful reproduction (with original pieces and fake elements) at the Pavilion of Metallurgy. In addition to this 'made–in–Catalonia' artifact of the supposed 'golden ages' of Catalan technology, Santiago Rubió and other engineers were behind the proposal of the Technology Museum of Catalonia in 1937, in which the display of past and current technologies supposedly had to assure efficient productivity for the nation as much as a national place of honor for the engineering profession.[50]

From the Factory to the Nation

During the 1920s and 1930s, industrial engineers sought to use their expertise in scientifically managing the factory to in turn scientifically organize the whole nation. These ideas were shared by AEIB members supporting a wide–range of different ideologies and political projects. In the next subsections, I will examine two telling cases dealing with the activities of socialist Estanislau Ruiz–Ponsetí and liberal Josep M. Tallada.

Estanislau Ruiz–Ponsetí and a nationalist 'third class'

In 1920, a union of engineers and technicians was created in Barcelona, the Sindicat General de Tècnics de Catalunya (SGTC).[51] The heads of all its sections were industrial engineers (except the Section of Transports and Communications, directed by Leonor Ferrer, a woman technician at the telephone company S. G. de Teléfonos). Estanislau Ruiz–Ponsetí (1889–1967) was in charge of the

Chemistry Section, and, most importantly, he was the leading figure behind the union. The SGTC devoted its efforts to defending professional rights and attain better wages and working conditions, but it also asked to explore new ways of management in the factory. At that time, the AEIB president Alfred Ramoneda (1918–1924) had just translated the book *Man to Man: The story of industrial democracy*, written by US manager John Leitch, and the debate on 'industrial democracy' laid on the table of Catalan industrial engineers.[52] Despite these terms being defined as 'the organization of any factory or business institution into a little democratic state', Leitch's ideas did not challenge managerial prerogatives. To the contrary: they presented a way to cope with (and restrain) the workers' demands that arose during World War I.[53]

From the SGTC bulletin, Ruiz-Ponsetí and other members also contributed to the debate on 'industrial democracy', but they resignified these terms in the following way: 'as everyone else who lives in factories and workshops, [we] are convinced that the spirit of proletarian rebellion is not dead', and that nations have to implement 'wise formulas of social collaboration' as 'the only means for the renewal of satisfaction in the workplace'.[54] For this goal, engineers were supposed to play a central role, as radically expressed by Ruiz-Ponsetí: 'the first solution that appears as a feasible solution, the more urgent and pressing one, is to ask for the absolute technical and economic direction of our industry to be assigned to technicians', so 'if it is wanted to intensify [productivity]', – he continued – 'the technician has to have unbounded power'.[55] 'Technicians of the industry, unite!,' he claimed in some conferences.[56]

'Industrial democracy', differently from the mid–nineteenth century use by Pierre–Joseph Proudhon (asking for workers' self–management),[57] or from Leitch's ideas (aligning managers' interests), meant for Ruiz-Ponsetí more control to technicians, engineers and experts. These ideas were part of the breeding ground for the emergent technocratic ideology and its most radical proposals which peaked globally by 1933.[58] In fact, the US consultant engineer William Henry Smyth had earlier defined technocracy in 1919 as a 'rationalized industrial democracy', which was to drive the 'national social machine' towards 'a new commonwealth'.[59]

At the beginning of the 1930s, the SGTC gathered around eight hundred members, and became part of the renewed labor union Federació d'Empleats i

Tècnics de Catalunya (FET). The FET aimed at defending clerks, salaried employees and technicians who were left out of 'the workers organizations, which... disastrously are ruled according to the principle of workman equality', in the words of its president and main leader, Ruiz-Ponsetí himself.[60] In the FET journal *Lluita* ('Fight', 'Struggle', in Catalan), the engineer argued that a rising 'third class' would be more than useful to the Catalan nation:

> It is quite clear that a third class can provide a great benefit to everybody... being a permanent mediator between the two elements in traditional conflict. For its higher scientific training and its command skills which are required in managerial work, this class can be on a higher plane than the ruling and the working classes.[61]

While claiming that they were the mediators between science and society (as 'applied scientists'), industrial engineers argued that they constituted a 'third class' which was able to act as a go–between for the working class and the bourgeoisie, that is, a 'bridge' for achieving social peace, apart from the (especially in times of crisis) discredited government bureaucrats.[62] These ideas were shared by socialist and left-wing professionals, but also by liberal engineers and right–leaning technicians, such as above-mentioned Leonor Ferrer, Antidi Layret, Patrici Palomar and Miquel Garau. 'Only one hope remains and it is on technicians, true apostles between capital and labor', exclaimed Ferrer in a newspaper article.[63] Antini Layret also contended: 'What is to be done is to eradicate the tensions – and even the hate – between employers and workers, and for this mission no one is better–placed than engineers'.[64] As a high–ranked employee at the metallurgical company Maquinista Terrestre i Marítima (MTM), Layret regretted the resistance of both workers and owners to the introduction of scientific management in the factory: the former were in fear of losing their jobs; the latter were unwilling to hire specialized staff.[65] Engineers usually felt misunderstood by both social classes, and they voiced such an uncomfortable feeling in several cases:[66] 'Both parts have lost the confidence in [the engineer]', Miquel Garau explained, 'He is an employee to employers, and an employer to employees'.[67] Engineers had even been targets of the class violence of the period on some occasions. This was the case of the chief engineer of the foundry

Girona, Jaume Prat Lluch, who was shot in the streets of the Barcelona city center during a period of protests against the layoffs policies in the company in 1932.

In the 1st Congress of Employees and Technicians of Catalonia, Valencia and Majorca (the main Catalan–speaking regions in Spain), the FET explicitly entangled these professional tenets with the making of the Catalan nation: 'Our Catalan nationalism is, more than ever, inherent to our [third] class consciousness... Our Catalan nationalism is completely linked to our intense desire to radically change the economic structure of our country in a fairer, more unselfish, human, social sense'.[68]

The technocratic ideas of Ruiz-Ponsetí that had grown in technicians' labor organizations took a wider dimension once he was elected as one of the five deputies representing the socialist party Unió Socialista de Catalunya in the first Parliament of Catalonia.[69] Ruiz–Ponsetí and other outstanding members of this party – such as Rafael Campalans – called for internationalist, anti-liberal, anti–war, anti–waste policies, and large programs of scientific and technical education. However, they did not do so through anti–nationalist discourses as was more common among socialist scientists and engineers in countries such as England or the Netherlands.[70] It is important to underline that in parliamentary discussions Ruiz-Ponsetí did not ask for a 'technical class' to substitute the 'political class' in national politics (especially when it came to technicians under the wing of other political parties): what he defended was the avoidance of putting politicians in charge of those official posts that should be occupied in his view by experts.[71] Alongside with his activities in the Parliament, he led a group of seven experts in charge of creating and organizing the office of Industry Services of Catalonia in 1934. This was a division of the Department of Economy, which was directed by engineers and tasked with studying and regulating the private industrial sector as well as advising the government in economic and scientific policies. Ruiz–Ponsetí compelled the authorities to invite, as a consultant group for this project, the AEIB, which in turn had been lobbying for institutions to efficiently organize Catalonia since 1931.[72]

The role of Ruiz-Ponsetí in the design of the nation became more apparent during the Spanish Civil War (1936–1939). After the coup d'etat in July 1936, he was a representative of the renewed socialist party in the Economic Council of Catalonia, of which he became under–secretary. In fact, Ruiz-Ponsetí was the leading light

of the ambitious government planning called *Nova Economia* (New Economy).[73] Besides undertaking large national projects such as the so-called 'integral electrification of Catalonia', the New Economy aimed at centralizing, streamlining and controlling the extraction of natural resources, the war production, and the operation of industries that had been collectivized by the working class and the anarchist organizations shortly after the outbreak of the war. The decree to legalize and regulate the worker control over these industries was approved in October 1936.[74] According to Ruiz-Ponsetí, the collectivized companies in Catalonia had been experiencing an 'excess of democracy' and 'lack of organization'.[75] The engineer kept on arguing in favor of the 'technical proficiency of the managers' and the 'principle of the unity of command' as applied – in his words – by 'our fellows of the soviet Russia'.[76]

As George Orwell roughly – but compellingly– described in 1938 *Homage to Catalonia*, the May Events in 1937 constrained the role of the anarchists and non–Stalinist marxists and 'sovietized' the social revolution. Less visible at the time, the reinforcement of the government was attached to the strengthening of the political agency of technicians and engineers who were essential to what has been called by historians 'the statist process'.[77] In June (1937), the secretary-general of the socialist party, Joan Comorera, substituted a member of the anarcho–syndicalist Confederació Nacional del Treball (CNT), Andreu Capdevila, as head of the Department of Economy, and counted on the (quite silent) expert assistance of Ruiz–Ponsetí. At the first party's National Conference, celebrated in July, Comorera brought up again the issue of 'industrial democracy' based on a single–person management, and contended that the wage differentiation between workers and technicians was needed as long as technical problems 'neither have nor must have democracy as a benchmark, but efficiency, competence and fairness'.[78] The influence of Ruiz-Ponsetí's ideas also seemed to be very present when Comorera underlined at the conference that:

> the most known and blamed faults of the old parliamentarianism have leaked in the factories in Catalonia, and the unavoidable consequences are the indiscipline, the inoperativeness, ... the administrative mess, the lack of foresight and a nonsense empiricism in urgent actions, the out–of–control increasing costs of production,

> the decline of production, and the systematic, demoralizing and counter–revolutionary decrease of the individual performance. In any case, the workers councils will not interfere in the technical and economic sphere, which is in charge of the duty of management.[79]

The engineering ideology of the 'third class' and the managerial proficiency actually reached the political spheres during the Spanish Civil War, and intertwined with the political program of the socialist party in charge of high posts in the Catalan government – shaping, at the end, the course of the social revolution and the economic program during the conflict.

Josep M. Tallada and the quantitative turn

In 1922, the AEIB member Josep M. Tallada (1884–1946) published the first wide attempt to defend (and appropriate) scientific management in Catalonia, *L'organització científica de la indústria*.[80] Tallada stood up for the availability and the benefits of introducing the Taylorist principles into the little workshops and medium–sized factories that shaped the industrial landscape in Catalonia. He was very interested in chronometric and kinematic analyses, process standardization and work fatigue, and argued that the working class would also benefit from these new scientific methods of work. Like contemporary international research on the 'human motor', Frederick Winslow Taylor's *Art of cutting metals* (1906) and *The principles of scientific management* (1911) had been quickly translated by technicians and engineers in Catalonia (in 1912 and 1914, respectively).[81] Once the work by Tallada was published, many other engineers also vindicated the principles of Taylor, Henry Gantt, Wallace Clark or Winifred Raphael in order to develop scientific organization and standardization in the office and the factory.[82]

In *L'organització científica de la indústria*, Tallada contested social resistance to scientific management; in particular, the fierce criticisms that Cebrià de Montoliu – a social reformer and aristocrat heavily influenced by John Ruskin and Patrick Geddes – had addressed some years before from the Museu Social (Social Museum).[83] Founded in Barcelona the year of the workers' uprising and riots called the Tragic Week (1909), the museum was devoted to promoting industrial

hygiene, occupational safety and social protection.[84] Tallada had been its director, and represented its liberal wing in line with the interests of the Catalan industrialists and the Catalanist and conservative party La Lliga. This wing became dominant in the museum by 1917 until it closed two years later.[85] One of the main projects during this period was the creation of the Institut d'Orientació Professional (Institute for Professional Orientation), which promoted statistics, the measurement of human efficiency, and psychotechnics as complements of Taylorism. Significantly enough, it was this institute which published Tallada's book.

The interest of the industrial engineer in scientifically organizing the spaces and methods of production extended little by little beyond the walls of the factory towards the borders of the Catalan nation. The statistics department of the Museu Social had been collecting records on the cost of living, prices, rents, wages, population and strikes in Catalonia.[86] In fact, in one of his last (and most influential) works at the museum, *Demography of Catalonia* (1918), Tallada highlighted the relevance of statistics in the understanding of Catalonia through numbers.[87] After the closure of the museum, he kept on promoting the ‘quantitative turn’ in economic and social sciences, particularly from the Escola d’Alts Estudis Mercantils (High School of Commerce). But it was from 1931 onward that he extensively developed this turn. At that time, Tallada was called upon to be part of the expert committee devoted to design four key departments of the new Catalan government: the departments of Economy, Public Works, Labor, and Treasury. Other industrial engineers also participated in the endeavor, such as Lluís Creus (1904–1990), a young and devout engineer linked to La Lliga party who became secretary of the committee. The president of Catalonia, military engineer Francesc Macià, stressed the importance of this committee in ‘organizing the rich and thriving Catalonia of tomorrow’.[88]

The Catalan government gave priority to quantifying the means of production and to scientifically inventory the natural resources: to reach the ‘nation of tomorrow’, a great ‘statistical leap forward’ had to be done.[89] With the aim of promoting and centralizing the research in statistics and economics, and providing the nation with the so-called ‘inescapable need’ of data, the government created the Institut d'Investigacions Econòmiques (Institute for Economic Research, 1931), and some years later the Servei Central d’Estadística (Central Service of Statistics,

1934).[90] Tallada was one of the leading promoters and main consultants behind these institutions. His influence, however, was far beyond the doors of these expert spaces. He was a fairly well-known public figure, regular contributor of widespread journals and newspapers, especially *La Veu de Catalunya,* and driver of the Unió Catalana d'Estudis Polítics i Econòmico–Socials (Catalan Center for Political and Socio–Economic Studies).[91] The above-mentioned journal and center were under the umbrella of La Lliga party. Most importantly, he was also a representative of this party in the Catalan Parliament, where he daily met (and on occasion cynically replied to) 'his friend Ruiz-Ponsetí'.[92]

Despite the political differences, AEIB members agreed that the lack and the de–centralization of data were major pitfalls when designing national planning and streamlining resources. In 1931, an official decree created a consulting commission to study the land–use planning of Catalonia, with the aim of preserving the national landscape from 'the anti–human and anti–economic mess'.[93] The consultants in charge were the left–leaning brothers Rubió-Tudurí, an industrial engineer and an architect who had actively participated in the Societat Ciutat Jardí, a garden city society, the main promoter of which was Cebrià de Montoliu. At the same time, Lluís Creus was working on another ambitious project to inventory the 'past and current wealth' of the nation, in which the measurement of Catalonia, through industrial, farm, hydraulic, networks, labor and social statistics, were to drive it to its potential 'grandeur'. To reach this end, Creus stated that it might be worth applying to Catalonia some aspects of the corporatist state of Mussolini (a project that was not applicable to Spain due to its actual economic conditions, in his opinion): 'in default of that,' he also wrote, 'I appeal to liberal planned economy as the lesser evil'.[94]

During the 1930s, engineer Tallada repeatedly advocated for a renewed political system to overcome 'the crisis of the civilization' in Catalonia, as well as for a 'new order' beyond capitalist and socialist 'materialisms', beyond the US 'speculative capitalism' and the soviet 'state capitalist', in his own terms. For these purposes, at least three things seemed to be unavoidable according to him: for one thing, the nation had to be provided with scientific data and institutions; for another, more technical bodies were needed to make the political institutions efficient; finally, Catalan nationalism was essential to face the problems the world raised.[95] 'We cannot see, in the horizon, the new civilization that has to substitute

the current one. If we seek to create a new order, we need to create another spirituality', he stated.[96]

Once the Spanish Civil War began, right–wing industrial engineers who moved from Catalonia to Franco–controlled territory called for a new 'spirit', and argued that the rationalization of both the factory and the nation was not to the detriment of the national–catholic doctrines of the fascist regime, but quite the opposite. In his book *Paganismo y cristianismo en la economía*, Lluís Creus referred to the Pius XI's *Quadragesimo Anno* encyclical of 15 May 1931 in order to state that scientific management, psychotechnics and economic planning meant the final triumph over matter:[97]

> All this represents the most gigantic effort through which human ingenuity has been able to reach the highest apex of progress, in the form of economic efficiency... Being the triumph of intelligence over matter, technology and economic rationalization are also a glorious hymn to the boundless Creative Intelligence.[98]

Right–wing industrial engineers provided the fascist intelligence services with confidential data on key economic and industrial issues, and sabotaged war research run by the Catalan government.[99] Most importantly, once the Francoist army defeated the Second Spanish Republic, many of them played an important role in the making of the Spanish fascist dictatorship.[100] Ideas of the engineer as a guarantor of the social peace permeated the corporatist system and economy, and the aim of scientifically managing and recording the nation became a piece of the totalitarian project of the regime.[101] After 1939, the Catalan association of industrial engineers did not exist anymore, but former AEIB members such as Josep M. Tallada, Lluís Creus, Antoni Robert–Robert, Antidi Layret, Miquel Garau, and Patrici Palomar did not put aside their technocratic will to manage the nation through engineering practices(even though this time the national framework was again the Spanish nation-state).[102]

Final Remarks

In 1936, the two main local radio stations in Barcelona broadcast for the first time a series of conferences at the AEIB.[103] The conferences were devoted to discussions about economic planning and political systems all over the world, from fascist corporatism in Italy and national socialism in Germany, to catholic reformism in Belgium and the New Deal-capitalism in the US, to the state socialism in the USSR. The speakers were some of the most prominent industrial engineers, including, of course, Estanislau Ruiz–Ponsetí and Josep M. Tallada. The talks were given by enthusiasts of the economic model under analysis (except in the case of nazism, in which the speaker was more skeptical). Antoni Robert–Robert ended his overview of *Il Duce*'s proposals with these words: 'It is up to us, Engineers. We are called to write the economic standing of our nation. We hope that our action will rise to the occasion'.[104] Just one month after the last conference on 18 June 1936, the Spanish Civil War broke out, and some industrial engineers – as seen above – became leading figures in the organization of the New Economy program of the Catalan government, while others offered their knowledge and services to the government of Franco.

During the 1930s, AEIB members leaned towards differing ideologies such as liberalism, left–wing reformism, socialism, communism or fascism, but shared an engineering thought: to make the nation efficient through 'applied sciences"', scientific management and economic rationalization. The industrial engineering agenda was developed through two engineering ideologies which reached the highest political spheres and shaped traditional politics: techno–nationalism and technocracy – an agenda which I call 'technocratic nationalism'. If, on the one hand, technocratic nationalism allowed Catalan industrial engineers to participate in common nationalistic projects before the Civil War, on the other hand, technocratic nationalism could sharpen the divisions among these professionals during the conflict, either to sovietize the Republican side or to catholicize the Francoist side.

While internationalizing their professional activity and milieu, industrial engineers in Barcelona asked for home rule for the Catalan nation, participated in the making of the new Catalan government institutions, were active in politics and nation-wide engineering projects, and promoted a federation of engineering associations to avoid professional dependence on Madrid. In parallel, they

searched for a technological identity and a technological past for the Catalonia. Traditional components of nationalism – language, ethnicity, history and heritage – were translated by industrial engineers into technological terms.

This techno-nationalist endeavor was intertwined with proposals to foster scientific methods and technocratic ideals. Industrial engineers had heartily advocated to maximize the efficiency of processes, tools and the 'human motor' in the factory workshop since the beginning of the twentieth century. The technological streamlining of the 'national machine' seemed to be just a further step after 1929. The institutional changes after the proclamation of the Second Spanish Republic and the establishment of the Catalan government opened new doors for political engagement to industrial engineers, who did not miss the occasion to shape the Catalan nation through allegedly universal 'factory ideals' such as technical commandment and scientific monitoring.

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[1]Glick, *Einstein in Spain*.

[2]Sallent–Colombo and Roca–Rosell, “La cena ‘relativista’ de Barcelona,” 81.

[3] Campalans, “Nacionalisme i nacionalisme. Un confusionisme perillós” (1923, reproduced in Balcells, *Campalans, socialisme català*, 309-312; his thought on Catalonia “as our only vehicle of universality”, p. 130-132); Coll *et al.*, *Quatre enginyers industrials*, 89-109.

[4]Translations of quotes into English are mine.

[5]In general terms, Catalan nationalism did not vindicate the independence from Spain at that time. Catalan nationalism mainly asked for a home rule and, in some cases, pushed for a Catalan state within a Spanish Federal Republic.

[6]About the concept "techno–nationalism" as part of "the politics of engineers" and something more than an "ideology of the state", see: Zaidi, "The Janus–face of techno–nationalism," 64. See also: Edgerton, "The contradictions of techno–nationalism and techno–globalism," 1–6; Antoniou, Assimakopoulos and Chatzis, "The National Identity of Inter-war Greek Engineers," esp. 255; Saraiva, "Inventing the Technological Nation." "Techno–nationalism" has also been applied to refer to the economic nationalism that is engendered by the technological private sector: Low, "Displaying the future."

[7]Edgerton, "The contradictions of techno–nationalism and techno–globalism."

[8]I use the term "stateless nation" to refer to "nation without a state," as current literature about Catalan nationalism does. In this sense, the word "stateless" has here a completely different meaning than in "stateless person" and in "stateless peoples," as James C. Scott has named the communities which "deliberately placed themselves at the state's periphery." Furthermore, "without a state" has not to do with its use in "societies without a state," as Pierre Clastres defined "primitive societies." See: Álvarez, *Los dioses útiles*, 213-234; Scott, *The Art of Not Being Governed*, 8; Clastres, *Society against the State*.

[9]See, for example: Meer, "The nation is technological"; Kohlrausch and Trischler, *Building Europe on expertise*, 21–28; Kostov, "Les ponts et chaussées français et les pays Balkaniques"; Karvar "Les élèves roumains de l'École polytechnique"; Myllyntaus, "Foreign models and national styles." The cases of Asian, Middle–East and North–African nations before being post–colonial nation–states have been more explored, for instance, in Bassett, "MIT-Trained Swadeshis" and Karvar, "L'idéal technocratique des ingénieurs."

[10]In order to have in mind to what extent (and to what extension) stateless–nations and regions asking for political autonomy are relevant within (and across) European states today, it could be worthwhile to check the number of parties (43) involved in the European Free Alliance (EFA). Member parties are from the Basque Country, Aragón, Catalonia and Galicia in Spain; Corsica, Brittany, Alsace, Savoy and Occitania in France; Aosta Valley, South Tyrol, Friül and Veneto in Italy; Lusatia, Silesia, Moravia, Schleswig–Holstein, Bavaria and Frisia in Germany, Poland, Czech Republic and Netherlands; Scotland, Cornwall and Wales in the UK; Carinthia in Austria; Flanders in Belgium; Rijeka in Croatia; and Åland in Finland. Other nationalist and autonomist movements also exist in Europe, such as in Northern Epirus, Asturias, Russian Latvia and Chechnya. "Member Parties", European Free Alliance, <http://www.e-f-a.org/whos-who/member-parties> (last acceded: November 2nd 2018).

[11]Fischer, *Technocracy and the politics of expertise*, 21–30 and 144–197; Nolan, "Productivism and Technocracy in Historical Perspective."

[12]About the concepts (and legacy) of "technocratic internationalism," see: Schot and Lagendijk, "Technocratic internationalism in the interwar years."

[13]Schot and Lagendijk, "Technocratic internationalism in the interwar years," 197–199.

[14]Fischer, *Technocracy and the politics of expertise*, esp. 21–22 and 181–197.

[15]Schot and Lagendijk, "Technocratic internationalism in the interwar years," 199. Other works exploring the entanglement between nationalism, internationalism and technocratic politics in the interwar period: Picon, "French engineers and social thought"; Antoniou, Assimakopoulos and Chatzis, "The National Identity of Inter-war Greek Engineers"; Somsen, "Science, Fascism, and Foreign Policy"; Zaidi, "'Aviation Will Either Destroy'"; Edgerton, *Britain's war machine*. For the next decades in France, see: Hecht, *The radiance of France*.

[16]Among the broad literature on nationalism in Catalonia and Spain, see, for instance: Mar–Molinero and Smith, *Nationalism and the nation in the Iberian Peninsula*; Álvarez, *Los dioses útiles*; Álvarez, *Mater Dolorosa*; Moreno and Núñez, *Ser españoles*. About the presence of engineers and technicians in the birth of Catalan nationalism: Marfany, *La cultura del catalanisme*. On the Portuguese case, see: Macedo, *Projectar e construir a nação*.

[17] Roca-Rosell, "Professionalism and Technocracy"; Camprubí, *Engineers and the making of the Francoist regime* (despite the point that "the engineers who figure in this book could hardly be called politically neutral technocrats," as the author suggests).

[18]About the concept of "Silver Age" applied to the development of physics in Spain during the the first third of the twentieth century, see: Sánchez Ron, "La Edad de Plata de la física española". An essay on science, politics and democracy which especially deals with twentieth-century Spain: Gómez, Balmer and Canales, "Science Policy under Democracy and Dictatorship."

[19]I use the concept "non–state engineer" in contrast to "state engineer" as it is broadly used in current literature. The latter concept applied to the case of France, which was the main institutional reference for Spanish engineering during the nineteenth century and the first decades of the twentieth century, in: Picon, "Engineers and engineering history"; Picon, "French engineers and social thought." It could be worth to recall that, beyond the École Nationale des Ponts et Chaussées and the *grandes écoles*, non-central or non-state engineering schools in Nancy, Metz, Mulhouse, Lille, Nantes, Grenoble and Toulouse had a strong influence in the making not only of France, but also of several Eastern European and Maghreb countries, such as Russia, Poland, Bulgaria and Morocco. See, for instance: Grelon and Birk, *Des ingénieurs pour la Lorraine*; Birk and Grelon, *Un siècle de formation des ingénieurs électriciens.* Some seminal works are: Nye, "The scientific periphery in France"; Nye, *Science in the provinces*; Fox and Weisz, *The organization of science and technology in France*; and Weisz, *The emergence of modern universities in France*.

[20]Valentines, *Tecnocràcia i catalanisme tècnic a Catalunya*.

[21]About the relevance of factory workshops and other "ordinary and ugly" spaces in the process of nation–building (despite being "epistemic peripheries" in the history of techno–nationalism), see: Macedo and Valentines, "Technology and the nation," 974. In another (but complementary) direction, Gabrielle Hecht has highlighted the co-construction of Frenchness and the "beauty" of high-tension power line towers and nuclear power plants, in: Hecht, *The radiance of France*, 40-42.

[22]Scott, *Seeing like a state*, 2, 11-52. On the different ways of "seeing like a state" (and, we could add, of seeing like a factory), see: Coronil, "Smelling like a market."

[23]"Banquete de homenaje," 79.

[24]"Banquete de homenaje," 79.

[25]Hochadel and Nieto–Galan, *Barcelona*.

[26]In Spain, industrial engineers were high-ranked professionals trained in a wide range of engineering fields, such as mechanical, metallurgical, chemical, electrical and structural engineering (along with other areas such as political economy, industrial hygiene, labor law and statistics). In this sense, "industrial engineering" does not refer to the branch that gathers management, process and systems engineering, which were mainly developed in the second half of the twentieth century.

[27]Lusa–Monforte and Roca–Rosell, "Historia de la ingeniería industrial," 29–30.

[28]Silva, "The engineering profession in Spain."

[29]Lusa–Monforte, "Debates sobre el papel de las matemáticas."

[30]Martykánová, *Los ingenieros en España y en el Imperio Otomano*, 171–222.

[31]Kline, “Construing 'technology' as 'applied science'”; Schatzberg, “*Technik* comes to America.”

[32]Pestre, *Science, argent et politique*, 51–64. See also the classic books: Hughes, *American genesis*; and Noble, *America by design*.

[33]Fuster, Nicolau and Venteo, *La construcció de la gran Barcelona*.

[34]The influence of international architecture styles in the representation of science and engineering in Barcelona and Madrid has been explored in Hochadel and Nieto–Galan, *Barcelona*; Lafuente and Saraiva, “The Urban Scale of Science.”

[35]The new divisions were the Economics and Sociology Division, and the Training and Occupational Hygiene Division, both created in 1933. The other divisions were Mechanics, Construction and Railways, Chemistry and Metallurgy, Electricity, and Professional Action. “Estatuts de l'Associació.”

[36]Schot and Lagendijk, “Technocratic internationalism in the interwar years,” 208. See: “Actes de la Junta Directiva,” 13 May 1931 and 3 September 1934; “Congreso de Psicotécnica Industrial de Utrech,” 7 November 1928, Arxiu Històric de la Diputació de Barcelona (AHDB) folder 4186/110; “Conferencias sobre 'organización científica del trabajo' y 'tracción eléctrica',” 7 February 1928, AHDB folder 4186/110.

[37]“Els enginyers industrials davant l’Estatut de Catalunya.”

[38]Balcells, *Campalans, socialisme català*, esp. 163-165.

[39]Joaquim Torrens–Ibern, “Qüestions d’ensenyament tècnic,” Arxiu Centre de Recerca d'Història de la Tècnica/UPC (A–CRHT/UPC), [s.n.]; “Actes del Consell Assessor (ETSEIB),” 19 January 1934, Arxiu Històric de l'Escola T. S. d'Enginyeria Industrial de Barcelona (AhEIB); “Ponencia sobre un estatuto de la Universidad Industrial de Barcelona,” [1933–1934], A–CRHT/UPC, 6. See: Lusa–Monforte, “La Escuela de Ingenieros, de la Dictadura a la República,” 103–106, 219–229; Roca-Rosell, “The Autonomous Industrial University.”

[40]The statutes of the Federation (approved on 4 April 1932) in “Crònica de l’Agrupació.”

[41]“Actes de la Junta Directiva,” 6 May 1931, Arxiu de l'Associació/Col·legi d'Enginyers Industrials de Catalunya (A–AEIB).

[42]Some examples in: *Butlletí del Sindicat General de Tècnics de Catalunya* (1920–1923), *Lluita: òrgan de la Federació d’Empleats i Tècnics del Comerç i de la Indústria de Catalunya* (1931–1936), *Portantveu. Butlletí de la Federació d’Alumnes i Ex–alumnes de l’Escola del Treball* (1931–1937, 1938), *Butlletí de l’Associació de Directors d’Indústries Elèctriques i Mecàniques del I.E.M.A.* (1930–1938), *Indústria catalana* (1933–1935), *Butlletí del Departament d’Agricultura* (1936–1938), and *A.C. Documents d’Activitat Contemporània* (1937).

[43]About Fabra's career as a professor of sciences in engineering schools and academies, and the possible influence of this career in his works in linguistics (including the interest of coping with scientific terminology in his dictionary), see: Garriga *et al.*, *Pompeu Fabra i Poch, enginyer*; Coll *et al.*, *Quatre enginyers industrials*, 58.

[44]See, for example, the work by politician, scientist and expert in animal husbandry Rossell Vilà, *Diferències entre catalans i castellans*.

[45]Pi–Sunyer, *L’aptitud econòmica de Catalunya*, 71.

[46]Pi–Sunyer, *L’aptitud econòmica de Catalunya*, 79.

[47]Authorities pointed an accusing finger at anarcho–sindicalists in the context of the radicalization of the class struggle in Barcelona. However, the death of the engineer was related to a war crime by German agents in charge of destabilizing the Catalan industries that collaborated with Allied powers in the context of the First World War. Monés, *Formació professional*, 158.

[48]Hobsbawm and Ranger, *The invention of tradition*; Harrison and Johnson, *National identity*.

[49]Soler, *Ensaig sobre la màquina catalana.*

[50]Valentines and Sastre–Juan, “The Failed Technology Museum of Catalonia.”

[51]In Barcelona, non–manual workers and technicians – most of them born in Catalonia – used to group together in Catalan nationalist labor unions and associations, such as the SGTC and the CADCI (Autonomous Organization of White–Collar and Shop Workers, 1903). In general terms, these institutions were cut off from the larger labor unions that gathered the poorest and migrant workers, such as the Confederació Nacional del Treball (National Labor Confederation, 1910). See: Smith “From subordination to contestation,” 35–43; Durgan, “The search for unity”; Lladonosa, *Catalanisme i moviment obrer*; Ballester, *Marginalitats i hegemonies*; Ferré, “Estanislau Ruiz i Ponsetí”; Ealham, *Class, culture, and conflict in Barcelona*. About engineering labor unions during the interwar period in other European contexts, see: Hugot–Piron, “L’improbable unité des ingénieurs.”

[52]Leitch, *De Hombre a hombre*.

[53]McCartin, Joseph A. “'An American feeling',” 83.

[54]Ruiz–Ponsetí, “La democràcia industrial,” 1.

[55]Ruiz–Ponsetí, “Constitució i orientacions del SGTC,” 7.

[56]Ruiz–Ponsetí, Estanislau. “Els tècnics de la indústria, els conflictes socials i la futura organització paritària,” Ms, [1931?], Arxiu Biblioteca del Pavelló de la República (ABPR-UB).

[57]Proudhon, *De la capacité politique des classes ouvrières*, 116. See also: Hayat, “Démocratie industrielle.”

[58]A classic work is Akin, *Technocracy and the American dream*. About how this techno-ideology circulated towards (and within) Catalonia, see: Valentines, *Tecnocràcia i catalanisme tècnic a Catalunya*, 261-280.

[59]Smyth, *Technocracy*, 7–24.

[60]Ruiz–Ponsetí, “La FET és una central sindical,” 1.

[61]Ruiz–Ponsetí, “Els tècnics de la indústria i els dependents.” Ruiz–Ponsetí's ideas on the role of technicians in the factory and in labor and social movements were also spread in journals and conferences at the AEIB, technical institutions and beyond. See: Ruiz–Ponsetí, “Els tècnics de la indústria, els conflictes socials.” See also the following documents preserved at the Arxiu Biblioteca del Pavelló de la República (ABPR-UB): “Els tècnics de la industria i les noves orientacions de les lluites socials” [193–]; “Posició de la FET en el moviment sindical català” [193–]; “Els dependents del comerç i els tècnics d'indústria dintre del moviment social” [193–].

[62]See also: Meiksins and Smith, *Engineering labour*, 256–285; Reymaker, “Between capital and labour.”

[63]Ferrer, “Para todos.”

[64]Layret, “La organización científica del trabajo y la resistencia obrera,” 163. See also: Palomar “La organización corporativa y los ingenieros.”

[65]The following years, the chief engineer of MTM Josep Serrat Bonastre kept on trying to legitimize scientific organization of work at work. See, e.g.: Serrat Bonastre, “La organización del trabajo para la producción.”

[66]For other European contexts, see, for example: Malatesta, *Society and the professions in Italy*.

[67]Garau Riu, “Los ingenieros y la economía,” 445.

[68]“I Congrés general d’empleats i tècnics,” 1.

[69]Students of industrial engineering got lured by the ambitious USSR technological endeavour during the 1920s and 1930s. The journal of the student association *Ergon* published an enthusiastic report of a visit to the technological “jewel” of the soviet

Five–Year Plans, the Dneprostroi Dam, in: Boyer “En la URSS (II).” Two classical case studies on socialist engineers beyond socialist countries: Werskey, *The visible college*, and Kline, *Steinmetz*.

[70]Estanislau Ruiz-Ponsetí, “La socialització de Catalunya”, January 1933, ABPR-UB; Estanislau Ruiz-Ponsetí, “El desarmament total com a condició per a vèncer la crisi econòmica mundial,” 16 April 1932, ABPR-UB. See: Werskey, *The visible college*; Somsen, “A History of Universalism”; Somsen, “Scientists of the world unite.”

[71]“Diari de sessions. Parlament de Catalunya,” 28 May 1936, 4509, Arxiu del Parlament de Catalunya. An analysis of the Ruiz-Ponsetí's politics in the parliament, in: Portella. *Estanislau Ruiz i Ponsetí*, 85.

[72]“Actes de la Junta Directiva,” 1 February 1934, A–AEIB.

[73]Artal *et al.*, *El pensament econòmic català*, 167–203; Cendra, *El Consell d'Economia de Catalunya*, esp. 23–80; Pagès, *War and revolution in Catalonia*, esp. 74-92.

[74]The decree was signed by the head of the Department of Economy, Joan P. Fàbregas, a member of the anarcho–syndicalist Confederació Nacional del Treball (CNT) who was very influenced by technocratic and Taylorist ideas. See: Valentines, “Engineering the Social Revolution”; Valentines and Sastre, “The Failed Technology Museum of Catalonia.”

[75]Ruiz–Ponsetí, *Les empreses col·lectivitzades*, 10 and 17-18.

[76]Ruiz–Ponsetí, “Introducció,” 20-21; Ruiz–Ponsetí, *Les empreses col·lectivitzades*, 17.

[77]Castells, *Desarrollo y significado del proceso estatizador*., esp. 115–133; Madariaga, *Las industrias de guerra de Cataluña.*

[78]Comorera,“Informe presentat a la primera Conferència Nacional,” 14. All this in spite of the good results in terms of productivity of the main collectivized industries: Castells, “Revolution and collectivizations in Civil War Barcelona.”

[79]Comorera,“Informe presentat a la primera Conferència Nacional,” 21.

[80] *Tallada, L'organització científica de la indústria* (this work was also published in Spanish in 1922).

[81]Amar, “La utilización racional de la energía humana”; Rubió, *El trabajo humano*; Tomàs and Estivill, “Apuntes para una historia de la organización del trabajo en España.”

[82]One example of the influence of Tallada in other professional groups such as electrical and mechanical engineers, in Barenys Vergés, “Organitzacio científica del treball.”

[83]Montoliu, *El sistema de Taylor y su crítica.*

[84]Tallada was a member of the International Association for Labor Legislation, and published several texts on injury insurances and safety in domestic and industrial workplaces, such as *Los venenos industriales en el trabajo a domicilio* (1911), and *Conclusiones de la ponencia del seguro de accidentes del trabajo en la industria* (1917).

[85]González, Muñoz and Pujolar, *El Museu Social*, 54-74; Galí, *Història de les institucions*.

[86]*Butlletí del Museu Social* 12–61 (1912–1919).

[87]Tallada, *Demografia de Catalunya*.

[88]*Consell dels Interessos Econòmics de Catalunya*, 7–8.

[89]Artal *et al.*, *El pensament econòmic català*, 235–244.

[90]*Butlletí Oficial de la Generalitat de Catalunya*, 175 (24 June 1934), 1892.

[91]Tallada's role in this institution regarding the debates about unemployment in Catalonia, in: *Conferència sobre l'atur forçós*.

[92]“Diari de sessions. Parlament de Catalunya,” 16 June 1933, 1869, Arxiu del Parlament de Catalunya.

[93]*Butlletí de la Generalitat de Catalunya*, 7 (10 November 1931), 113–114; Rubió Tudurí and Rubió Tudurí, *El pla de distribució en zones del territori català*, 13–15.

[94]Creus, *Visió econòmica de Catalunya*., esp. 328-329.

[95]Tallada, *Paraules als joves*, 8, 10, 18.

[96]Tallada, *La crisi d'una civilització*, 11, 16; Tallada, *Paraules als joves*.

[97]This work was published in the Basque Country which was occupied by the fascist army at that time. Many Catalan right–wing engineers exiled to the Basque Country, and a new board of professors of the Barcelona School of Industrial Engineers was constituted in 1937 in the Basque capital Vitoria–Gasteiz. See: Lusa–Monforte, "Depuración y autarquía."

[98]Creus, *Paganismo y cristianismo en la economía*, 11–12.

[99]Lusa–Monforte, "La Escuela de Ingenieros en guerra," 48–65.

[100]About the case of former AEIB engineers Patrici Palomar and Antoni Robert–Robert, see: Camprubí, *Engineers and the making of the Francoist regime*, esp. 137–157; Valentines, *Tecnocràcia i catalanisme tècnic a Catalunya*, 298–303.

[101]Camprubí, *Engineers and the making of the Francoist regime*, 77–136. About the co-evolution of fascist and technological ideologies, see: Saraiva and Wise, editors, "Autarky/Autarchy."

[102]Between 1938 and 1941, these former AEIB members made it explicit in *Dyna,* the official journal of the Spanish industrial engineers after the Spanish Civil War (published in the Basque Country). See, for example: Creus, "Un plan de vigorización económica de Cataluña," and Tallada, "Técnica y Economía."

[103]See: *Tècnica* LIX, no. 208–211.

[104]Robert, "La política econòmica d'Itàlia," 76.