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Shaping the Common Ground: State-Building, the Railway Network, and Regional Development in Finland

The introduction of a new system of overland transport in the nineteenth century allowed Finland to devise regional development policies for its entire territory, stimulating unprecedented economic growth and ultimately enabling Finland to become a modern nation. This complicated process began in the 1860s with the construction of the first railway line between Helsinki and Hämeenlinna, continuing until the late twentieth century. It occurred within a context of state-building throughout Europe that provided the process with not only a practical but also an ideological impulse. Several countries made it a priority to unify the whole of their respective societies and to promote growth in all regions rather than only in what were already their most economically developed areas. In Finland, a country with a low density but highly concentrated population, this strategy was particularly relevant. The introduction of a railway network there made it possible to spread regional development and to create the pre-conditions for take-off.¹

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1 Charles Tilly and Gabriel Ardant, *The Formation of National States in Western Europe* (Princeton, 1975); Stein Rokkan and Derek Urwin, *The Politics of Territorial Identity: Studies in European Regionalism* (New York, 1982); Martí-Henneberg, “European Integration and

This article interprets the impact of a railway network on the regional development of a country with abundant natural resources that had remained underexploited on account of its extreme climate. In the process, it examines three research questions—“How was Finland’s railway network planned within the context of state-building?”; “How did its railways expand over time?”; and “What effect did this have on the country’s distribution of population and the consolidation of its national territory?” The answers to these questions requires an understanding of Finland’s historical context, focusing on its economic and political geography, its transport-planning policies, and the main trends in the distribution of its population.

Our research was explorative, focusing on historical data referring to three main variables—population, national territory, and railway infrastructure. In each case, we compiled data from primary sources, based on information provided by official geographical and statistical services, and then adapted them to meet our needs. Geo-referencing all the data and integrating the results within a Geographical Information System (GIS) allowed us to perform descriptive and quantitative analysis. The time series provided information at ten-year intervals from 1870 to 2000. The database was structured using information at two different levels. First, it included total population data at the municipal level, for each census year, obtained at ten-year intervals. Second, it charted the evolution of the railway network and of the railway stations that were in service during each period, enabling us to exploit the data series, produce evolutionary maps, apply appropriate indicators to quantify the variables, and interpret the results. The empirical results have been presented in a descriptive format and contextualized with respect to the national dynamics observed in other countries.²

National Models for Railway Networks (1840–2010),” *Journal of Transport Geography*, XXVI (2013), 126–138; Greet De Block, “Designing the Nation: The Belgian Railway Project, 1830–1837,” *Technology and Culture*, LII (2011), 703–732; Kaloyan Stanev, Alvarez-Palau, and Martí-Henneberg, “Railway Development and the Economic and Political Integration of the Balkans, c.1850–2000,” *Europe-Asia Studies*, LXIX (2017), 19201–1625; Walt Rostow, *The Stages of Economic Growth: A Non-Communist Manifesto* (New York, 1990).

2 Jeremy Atack, “On the Use of Geographic Information Systems in Economic History: The American Transportation Revolution Revisited,” *Journal of Economic History*, LXXIII (2013), 313–338. The historical database was created by Johanna Hätilä, as part of the project “The Development of European Waterways, Road and Rail infrastructures: A Geographical

THE ECONOMIC AND POLITICAL CONTEXT In 1809, the signing of the Treaty of Fredrikshamn (Hamina) between the Kingdom of Sweden and the Russian Empire put an end to the Finnish War. It also defined new international borders and determined how the islands in the Gulf of Bothnia were to be shared. After six centuries, Finland belonged to Sweden no more; it became a grand duchy within the Russian Empire. This new political status came with a certain amount of autonomy and also implied the recognition of some previously obtained rights relating to religious tolerance, the freedom of the peasantry, and low trading taxes.³

Even so, the situation at the beginning of the nineteenth century remained precarious. The country's peripheral location, its pre-industrial economy, and its low level of wealth all constituted important obstacles to development. From a European perspective, the Nordic countries, except for Denmark, formed part of the continent's poor periphery, separated from its main body by the sea and by the Russian Empire on land. As a result, communications required different means of transport, which complicated trade and market integration. Furthermore, in the coldest months of the year, when the waters of the Gulf of Bothnia froze, communications effectively ceased.

Russia's annexation of Finnish territory in 1809 did little to improve this situation. For the vast Russian Empire, the grand duchy was no more than a remote province. Despite its relative nearness to the then-Russian capital of St. Petersburg, its connections with this city remained limited for several decades, and its level of economic development stayed low. Beyond the self-sufficiency of its national market, the prosperity of Finland's economy continued to be based on its primary sector. Most of the national labor force was employed

information System for the History of European Integration (1825–2005),” led by Jarmo Rusanen. Ossi Kotavaara, Harri Antikainen, and Jarmo Rusanen, “Urbanization and Transportation in Finland, 1880–1970,” *Journal of Interdisciplinary History*, XLII (2011), 89–109. The HGIS project, led by Marti-Henneberg, incorporated material obtained from the Finnish Transport Agency into a historical database for the whole of Europe. The period covered ranged from the construction of the first passenger railway in Europe to the year 2000, providing data at ten-year intervals. Mateu Morillas, “Creation of a Geo-Spatial Database to Analyse Railways in Europe (1830–2010): A Historical GIS Approach,” *Journal of Geographic Information System*, IV (2012), 176–187.

3 Kerstin Enflo, “Finland's Regional GDPs 1880–2010: Estimates, Sources and interpretations,” working paper, Lund Papers in Economic History: General Issues, No. 135 (Lund Univ., 2014), available at [https://portal.research.lu.se/portal/en/publications/finlands-regional-gdps-18802010-estimates-sources-and-interpretations\(2bf53d5b-1c2b-403c-abbf-ec3af08a9e47\).html](https://portal.research.lu.se/portal/en/publications/finlands-regional-gdps-18802010-estimates-sources-and-interpretations(2bf53d5b-1c2b-403c-abbf-ec3af08a9e47).html).

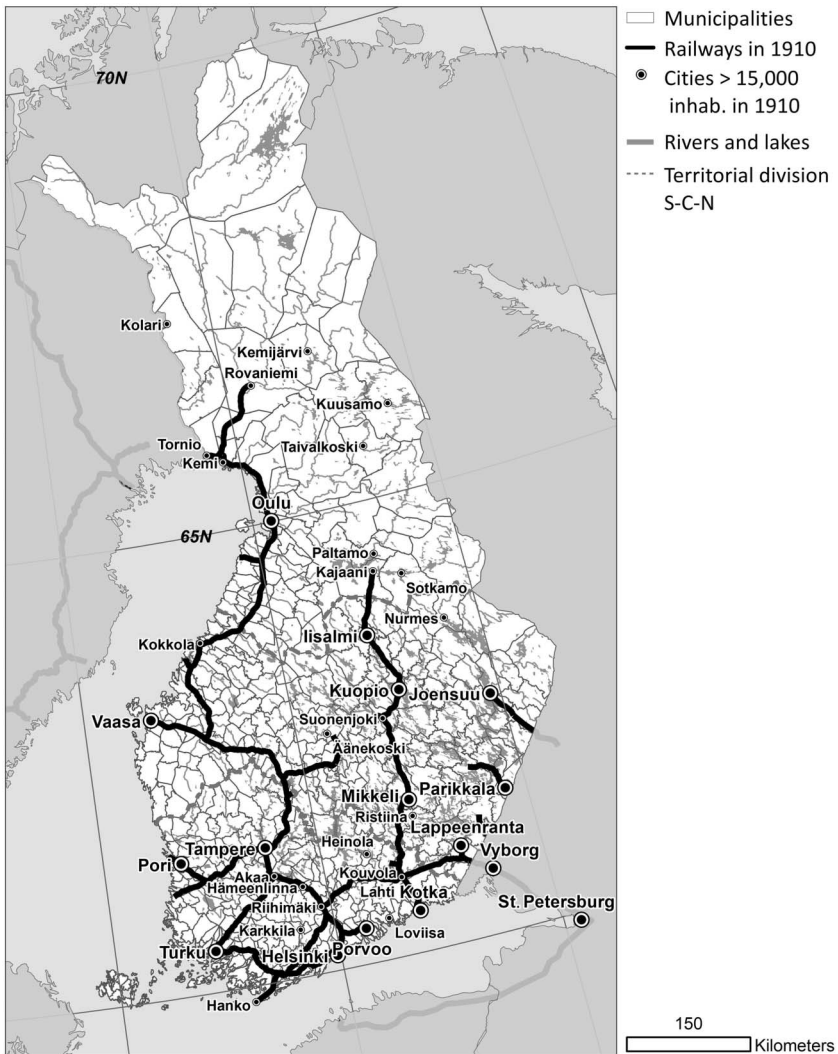
in activities related to fisheries, agriculture, and forestry. The possibilities for capitalization and the accumulation of wealth therefore remained extremely limited.

One of the first geo-strategic decisions of Russian Tsar Alexander I, in 1812, was to move the Finnish capital from Turku to Helsinki, on the Gulf of Finland much closer and more accessible to St. Petersburg. The change of capital also sought to move the country's political and economic power eastward and to weaken pre-existing power structures. The tsar's government invested an important amount of public money in improving public utilities and constructing administrative and military buildings. At this point, industrialization began to emerge. Agreements with the Russian Empire limited the entry of foreign capital but permitted small-scale investment from Sweden, Norway, and Russia, which encouraged economic activity. Paper, engineering, and textile industries subsequently started to develop. The customs union between the Russian Empire and the grand duchy particularly contributed to these activities, especially given the exemption from taxes afforded to Finnish exports. In fact, the Russian Empire remained the main destination for Finnish products until the 1880s, when the customs union exempted only timber exports from taxes.⁴

As industrialization developed, the overland transport system looked to be a fundamental element for guaranteeing progress. Until that time, maritime transport had been predominantly important for Finnish commerce and, as a result, most of the country's largest cities were located on its west coast. Maritime transport, which was normally less restricted by climatic conditions than other alternatives, could be exploited fully only in the Gulf of Finland. By contrast, the freezing of the sea during winter in the Gulf of Bothnia represented an important obstacle. Inland waterways also supported the timber industry in rural areas—the Saimaa Canal, which connected the Karelian municipality of Lappeenranta to the Gulf of Finland (Figure 1), providing a clear example. However, this option was viable for only a few months of the year. In the coldest months,

4 Anja Kervanto, "Following the Tracks—Railways in the City Centre of Helsinki: Bygone Past or Unwritten Urban History," in Ralf Roth and Marie-Noëlle Polino (eds.), *The City and the Railway in Europe* (Aldershot, 2003), 205; Esa Sundbäck, "The Baltic States, Finland, and British Economic Expectations in the Early 1920s," *Journal of Baltic Studies*, XXXIII (2002), 307–321; Hildor Arnold Barton, "Finland and Norway, 1808–1917," *Scandinavian Journal of History*, XXXI (2006), 221–236.

Fig. 1 The Railway Network, Main Towns (Those with More than 15,000 Inhabitants), and Waterway System in 1910



NOTE The figure also shows our south–central–north division of Finland’s national territory.
 SOURCES The railway database comes from the Historical Geographical Information System of Europe (HGISE) project and the territorial and population databases from historical municipal archives homogenized by the Finnish Statistical Services to fit the current municipal map.

when the lakes and rivers froze, transport became far more difficult, though some of these waterways froze so deeply that they turned into ice pavements, or winter roads. The transfer of cargo to roads implied higher costs because of the need for animal traction.

The expansion of the railway network in Europe demonstrated the possibility of structuring national territories with a rapid and reliable mode of transport that was relatively free from meteorological constraints. The railway offered the prospect of interconnecting the whole country and thereby establishing the minimum conditions required for state-building and subsequent economic development.⁵

The initial reaction of the conservative classes who ruled the grand duchy was to take caution. The transforming potential of the railway was evident, but the authorities feared that because they would not be able to control its effects, they might lose political power. In fact, Lars Gabriel von Haartman, vice-chairman of the Senate, preferred the construction of the Saimaa Canal (1845–1855) to the construction of railways on the grounds that the railway might endanger the social status quo. The leaders who prevailed in the end, however, saw the railway as presenting a clear opportunity for economic progress and state-building, as well as for a national culture, an increase in the level of schooling, promotion of the country's languages, and consolidation of the Protestant faith. Haartman lost his position, and Tsar Alexander II agreed to construct the first rail links between Russia and the Grand Duchy of Finland—from Helsinki to Hämeenlinna and from Riihimäki to St. Petersburg, via Vyborg.

Nonetheless, the actual effects of the development of the railway network remain the subject of debate. According to Päivärinne, “The expectations about railway technology varied from meeting very practical needs to ideological illusions. Hopes that the railway would transport food supplies, raw materials and timber—just to mention a few of the main goods—were reasonable and almost always fulfilled. On the other hand, the idea that the railway would form the long longed-for connection to the Western world and thus lead to Westernization of

5 Ikka Seppinen, “Competition between Modes of Transportation in Finland,” in Heli Mäki and Jenni Korjus (eds.), *Railways: As an Innovative Regional Factor* (Helsinki, 2009), 103–125. At the beginning of the twentieth century, there were almost 17,000 miles of roads and a further 10,400 miles of what were referred to as winter roads. See Erland Nordenskiöld, “Finland: The Land and the People,” *Geographical Review*, VII (1919), 361–376.

the eastern parts of Finland was—at least from today’s perspective—over-optimistic and ideologically untenable.”⁶

RAILWAY PLANNING WITHIN THE CONTEXT OF STATE-BUILDING Finland’s greater autonomy in the second half of the nineteenth century coincided with the consolidation of state-building in most of Europe. At that time, new ways of understanding the relationship between the nation and the state were emerging. The possibility of structuring the national territory, thanks to improvements in its transport systems, made a decisive contribution to this process. According to Von Bogdandy, state-building consisted of the “establishment and strengthening of a public structure in a given territory capable of delivering public goods,” a procedure that reinforced the importance of the railway as a viable mode of transport. Unlike previous modes of transport, the railway was able to break many of the temporal and spatial constraints that the physical size of a country and the distances to be covered had previously imposed.⁷

The construction of these new states was not, however, solely based on providing goods and public services. The idea of bonding together the nation and the state also implied resorting to Riemer’s three key policy dimensions—security, socio-economy, and psychology. In other words, providing goods and services was not sufficient in itself, but it was a necessary precondition for a series of other complementary conditions. The state had to show that it was working with, and on behalf of, society and capable of following complementary planning and developmental strategies.⁸

Within this context, the railway network played a central role in the construction of the future Finnish state. The arrival of the railway helped to redefine the country’s economic geography. At first, new railway lines were the result of both public and private

6 Seppinen, “Competition between Modes,” 114–116; Tiina Päivärinne, “‘If Only We Had a Railway!’ The Role of the Finnish Railway Network in the Nation’s Technological Progress,” in Mäki and Korjus (eds.), *Railways*, 128–129; Riita Hjerpe, *The Finnish Economy 1860–1985: Growth and Structural Change* (Helsinki, 1989).

7 Armin Von Bogdandy, Stefan Häußler, Felix Hanschmann, and Raphael Utz, “State-Building, Nation-Building, and Constitutional Politics in Post-Conflict Situations: Conceptual Clarifications and an Appraisal of Different Approaches,” *Max Planck Yearbook of United Nations Law Online*, IX (2005), 579–613.

8 Andrea Riemer, “The Concepts of State Building, Nation Building and Society Building,” *AARMS*, IV (2005), 367–379; Marti-Henneberg, “The Influence of the Railway Network on Territorial Integration in Europe (1870–1950),” *Journal of Transport Geography*, LXII (2017), 160–172.

initiatives, but in 1872, the Finnish Parliament decided that trunk lines should also be built but operated only by the state. From that point onward, private companies could develop only narrow-gauge railways. This development ensured the minimum conditions required for economic development, helped to secure national sovereignty, and enabled authorities to spread their ideas and influence across the whole country. Surprisingly, however, despite repeated consideration of these policies in the national parliament, no master plan was ever approved because of controversies concerning the priorities for railway construction and Finland's lack of independence at the time. No central government had the authority to manage a full, nationwide, railway planning policy. The main lines were approved only gradually, on a case-by-case basis, which required general agreement among the different regional interests.⁹

Strategies to Encourage Socioeconomic Development The view that structuring the national space looked like the best way to promote socioeconomic development led to the creation of a regional hierarchy and to the promotion of specific growth poles. This structuring unfolded via railway coverage across the whole country, establishing a platform for future development to which every region could contribute and from which it could benefit. The design was essentially a grid network—well-defined corridors within a series of connected nodes—highly conditioned by the country's difficult geography. The country's rivers, lakes, and marshlands highlight the difficulties inherent in this task (see Figure 1). In any case, the new railway network resulted in improved reliability, greater haulage capacity, higher speeds, and much lower transport costs than the alternative modes of land transport. The reliability of the regular services and the speeds reached by the new trains significantly reduced the previous sense of territorial isolation. Journey times were now in hours rather than days, not only for people but also for products and staples. In a territory that had suffered terrible famines in the late 1860s, these new circumstances implied a veritable paradigm shift.¹⁰

9 Jan-Erik Wiik, *Vägar av järn till landets värm: Storfurstendömet Finlands järnvägspolitik* (Roads of Iron to the Protection of the Country: The Railway Politics of the Grand Duchy of Finland) (Tijos Ab, 2016).

10 Cristina Purcar, "Designing the Space of Transportation: Railway Planning Theory in Nineteenth and Early Twentieth Century Treatises," *Planning Perspectives*, XXII (2007), 325–352.

The layout of the railway network, however, was not uniform. As highlighted by Dupuy, all networks must respond to a series of topological characteristics as reflected in the territories that they cover. The course followed by the development of infrastructure resulted in pronounced variation in accessibility: The nodes located nearest the corridors had good access, though some of them better than others. A hierarchy arose in the interior of the national territory; the population centers distributed along the corridors and located at railway junctions tended to enjoy the greatest benefits, particularly the nodes corresponding to the most important historical settlements. Since these population centers held the highest demand for passengers and merchandise, they had to be well connected. In these cases, the railway acted like a factor of production, reducing the cost of transport for both raw materials and finished products. The railway therefore reinforced the roles of these nodes as regional hubs, fostering the intensification of their economic activity. Prior to World War I, the three institutions to which Finland dedicated most of its spending to establish were public administration, a national educational system, and a railway network.¹¹

The railway network reached remote corners of the country that had previously lacked development. In many of these areas, authorities took full advantage of this opportunity to exploit natural resources, such as forests or mines, and thereby to increase the value of the newly settled territory and to disperse the creation of wealth. As these activities commenced, population also began to concentrate in the interior of the country, and the activities there with the lowest added values, such as reindeer husbandry, began to move into the areas with the least connectivity. Within a few decades, the capital generated by these primary-sector activities stimulated the development of other sectors offering greater added value. Oinas defined three fundamental stages in this developmental process—the first based on tar, the second on timber and wooden products, and the third on wood pulp and paper. Oinas also observed that in the 1950s, almost 90 percent of Finland's national income came from the export of products associated with the forestry sector. Company towns sprung up in remote areas to promote extractive activity, which was mainly based in forestry, thus spurring the

11 Gabriel Dupuy, "Géographie et économie des réseaux," *Espace géographique*, XXII (1993), 193–209; Hjerpe, *Finnish Economy 1860–1985*.

development of a highly specialized, efficient, and competitive industrial sector that attracted technological clusters around it.¹²

Policies to Improve National Security Geostrategic policies could also have been important in determining the location of the railway network. Notwithstanding the absence of any specific reference document, a consistent pattern of activity appears to indicate the existence of a distinct set of policies in the national interest. Transferring the capital to Helsinki redefined the political, economic, and social system, marking an obvious break from previous dynamics. In railway terms, the initial investment that centered on the new capital was crucial to extending the capital's area of influence and to the creation of its incipient metropolitan surroundings. The geopolitical interests went even further; to be more precise, greater emphasis was placed upon guaranteeing the security of Finland's national borders. Moreover, protecting the borders and controlling cross-border connections probably had an important influence on the design of the railway network. Witness that from 1917 onward, the newly independent state of Finland constructed the majority of its new railway lines in the eastern part of the country, but without facilitating connections to the Soviet Union. This odd case as regards frontier territories can be explained only by a desire to consolidate its own periphery before facilitating cross-border movement.

Despite forming part of the Russian Empire until 1917, Finland had only one rail connection with Russia before that date—the line between St. Petersburg and Vyborg. In fact, of the two main lines emanating from Vyborg, the more important one, in terms of demand, led to Helsinki. The second line, built in the direction of Nurmes, via Joensuu, which would later continue to Kontiomäki and Taivalkoski, followed the border between the newly independent Finland and Russia. Notably, after Finland's independence, several new by-passes were constructed to ensure that all the track ran within Finnish territory, most likely to ensure control of the border, to permit detection of any potential incursions, and to

12 John Gilpin, "International Perspectives on Railway Townsite Development in Western Canada 1877–1914," *Planning Perspective*, VII (1992), 247–262; Joseph Black, "The Canadian Pacific Railway as a Model for the Trans-Siberian Railway," *Sibirica: Journal of Siberian Studies*, IV (2004), 186–200; Jean Debrie, "From Colonization to National Territories in Continental West Africa: The Historical Geography of a Transport Infrastructure Network," *Journal of Transport Geography*, XVIII (2010), 292–300; Päivi Oinas, "Finland: A Success Story?" *European Planning Studies*, XIII (2005), 1227–1244.

guarantee and reinforce ties between Finland's local authorities and the state capital.

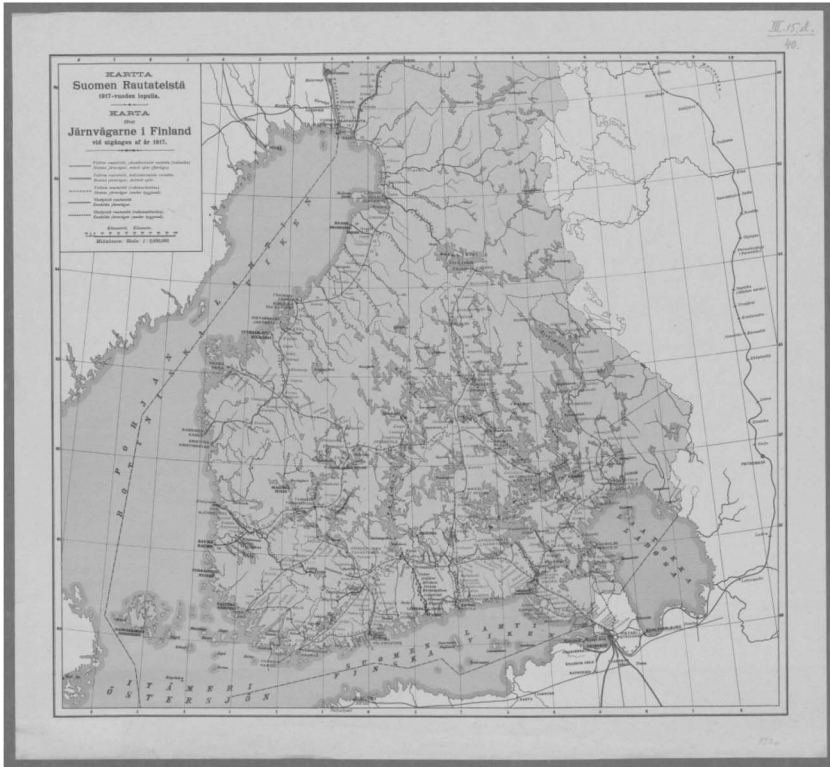
At that time, Finland also had no direct cross-border connection with Sweden. By 1903, the railway had reached Kemi, and work then began to extend the line to Rovaniemi. The borders of Lapland have been a source of tension and territorial disputes for centuries; Lähteenmäki reveals that Sweden's and Russia's interests in colonizing the region continued throughout the nineteenth century. Under the banner of "a promised land for new farmers," both these states actively encouraged migratory movements toward the north. The scientific expeditions that occurred in this area included those of Roland Bonaparte in 1884 and of Göran Wahlenberg multiple times in the early 1800s. The Church also extended its presence northward. All the while, the number of economic activities based on the extraction of natural resources increased in this region. The inevitable result of these incursion was the eventual displacement of the autochthonous Sápmi population to points further to the north. Whatever the case, the railway connection with Sweden was not completed until after World War I. Even today, no electrified line runs between the two countries.¹³

Finland's declaration of independence from Russia in 1917 changed the country's geopolitical interests and influenced its cross-border relations (see Figure 2). The threat to the sovereignty of its border territories forced it to take defensive measures, such as the construction of the Kontiomäki–Taivalkoski line, and its subsequent narrow-gauge extension to Kuusamo. This line saw further work during World War II, in collaboration with Germany—probably, at least in part, to defend the border with the Soviet Union. Nonetheless, this use of the railway network to protect the border did not have the desired effect. When the Allies won the war, Finland lost the border areas and all the railway infrastructure that they contained in eastern Karelia and, to some extent, in Salla and Petsamo, which were all incorporated into the Soviet Union. Besides the emotional turmoil, this annexation produced a mass migration of 430,000 refugees to the rest of Finnish territory.¹⁴

13 Patrik Lantto, "Borders, Citizenship and Change: The Case of the Sami People, 1751–2008," *Citizenship Studies*, XIV (2010), 543–556; Maria Lähteenmäki, "Scholars Discover Local History: The Case Of Northeast Lapland in the 18th Century," *Polar Record*, XLVIII (2012), 291–303.

14 Hanuu Tervo, "Cities, Hinterlands and Agglomeration Shadows: Spatial Developments in Finland during 1880–2004," *Explorations in Economic History*, XLVII (2010), 476–486.

Fig. 2 Map of the Finnish Railways at the end of 1917



SOURCE National Library of Finland (CCo 1.0), available at <http://um.fi/URN:NBN:fi-fe201209138028>.

Looking beyond the border railway lines and the international connections, the choice of the railway gauge was also critical. The grand duchy opted for the same railway gauge as the Russian Empire—1,524 mm, rather than the standard gauge adopted in central Europe. This decision benefited trade with Russia but proved an obstacle to closer links with the other Scandinavian countries.¹⁵

Plans to Promote a Social Identity Finland made a concerted attempt to spread education, language, religion, and national culture

15 In fact, the Russian Empire's railway infrastructure was designed with a 1,520 mm gauge, but trains can operate between the countries without wheelset changes. Because European standard gauge is narrower (1,435 mm), however, trains need some technical adjustments when crossing the border.

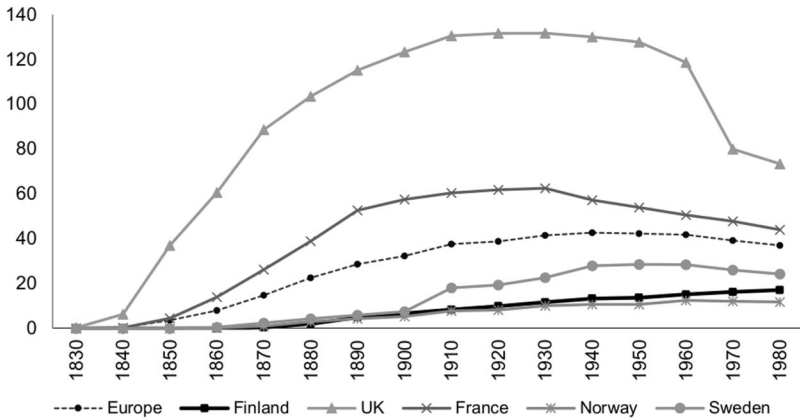
via the expansion of the railway network. In the middle of the nineteenth century, the French engineer Perdonnet published *Traité élémentaire des chemins de fer*, in which he analyzed railways in terms of their public utility. Perdonnet viewed economic profitability as intrinsically combined with matters of public interest, which included the role of the administration in society. The expansion of the Finnish railway network was part of a concerted effort to reduce the country's isolation and improve the provision of goods and services. The regional hierarchy imposed by the new infrastructure concentrated the rural population in small towns and villages, many of which took form around newly established railway stations. These nodes were provided with schools, churches, and public buildings to give them a cultural base. Between the beginning of the eighteenth century and the end of the nineteenth century, the level of literacy in Finland passed from less than 50 percent to more than 70 percent; technical studies were introduced into the curriculum; a money-based economy was consolidated; and new political ideas emerged. The creation of a collective perception of modernization and progress reflected the administration's efforts to purvey a unitary social identity.¹⁶

EXPANSION OF THE RAILWAY NETWORK AND TERRITORIAL DEVELOPMENT

The development of the Finnish railway network occurred late in comparison with that in the pioneer countries, such as the United Kingdom and France (Figure 3). The European states intensively promoted their respective rail networks during the second third of the nineteenth century. By 1900, the network was approaching its historical maximum in core countries before it entered a period of stagnation in the first third of the twentieth century. In contrast, the countries on the northern periphery experienced a late expansion in their networks between 1900 and 1940. From the 1940s onward, a new phenomenon arose in Europe—the closure of lines because of financial and political considerations. In the core countries, the number of line closures was considerable, reaching almost 50 percent of the U.K. network. In Finland, where the density of rail infrastructure was much smaller, these adjustments were far less drastic. The number of lines fell by only 5 percent between the

16 Sami Moisio and Anssi Paasi, "From Geopolitical to Geoeconomic? The Changing Political Rationalities of State Space," *Geopolitics*, XVIII (2013), 267–283; Auguste Perdonnet, *Traité élémentaire des chemins de fer* (Paris, 1858). Seppinen, "Competition between Modes," 117; Cornelius Castoriadis, *The Imaginary Institution of Society* (Cambridge, Mass., 1997).

Fig. 3 Evolution of the Density of the Finnish Railway Network in Comparison with Those Elsewhere in Europe and the European Average



NOTE Density expressed as km of network/km² of national surface area.

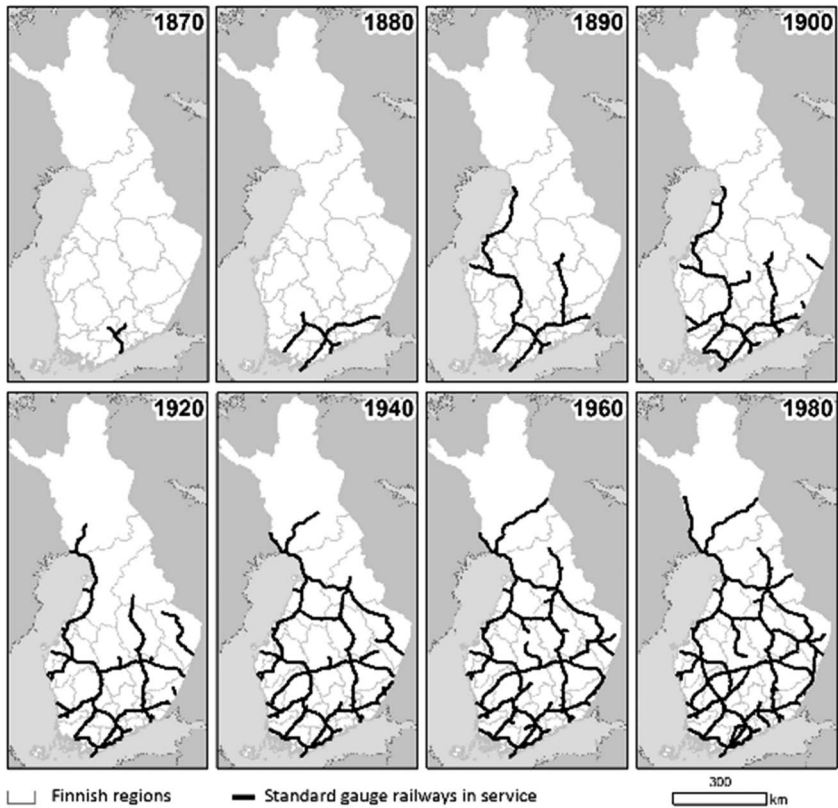
SOURCE Data based on HGISE project (<http://europa.udl.cat/>).

point of maximum extension in 1980 and the following decade, though the number of stations fell precipitously between 1960 and 2000 in an attempt to maintain the connectivity of strategic nodes while reducing costs and increasing the velocity of commercial train services.¹⁷

Going beyond this comparative perspective, an analysis of the morphology that the geographical expansion of the railway network produced in Finland is revealing. The selection of specific lines and their prioritization had clear implications for the future development of the country's different regions, which evinced three phases of expansion. First came the reinforcement of Helsinki as the national capital and the consolidation of its area of influence. Next followed the development of the inner network, which allowed a progressive spread of population into the country's interior and toward the north. Last was a process of concentration toward the newly emerging metropolitan areas. Figure 4 shows the gradual construction of the Finnish railway network with respect to the country's current borders.

17 Martí-Henneberg, "Influence of the Railway Network."

Fig. 4 Evolution of the Standard Gauge Railway Network in Finland (1870–1980)



SOURCE Research based on HGISE project.

The Consolidation of Helsinki's Metropolitan Area (1860–1880)

The first phase, until 1880, was characterized by the establishment of railway connections to Helsinki, Vyborg, and St. Petersburg. Helsinki was also connected to the emergent industrial city of Tampere, to the country's most southerly port of Hanko, and to Turku, its former capital. Although Helsinki was connected to these towns, the rail links were not specifically planned to improve the connectivity of the capital but instead to foster competition with Helsinki. The reasoning behind the railway to Hanko was to establish a direct connection between this port and St. Petersburg without passing through the capital. The railway to Turku had a similar *raison d'être*—to divert a

some of the goods from the interior of Finland to the harbor at Turku without them passing through Helsinki.

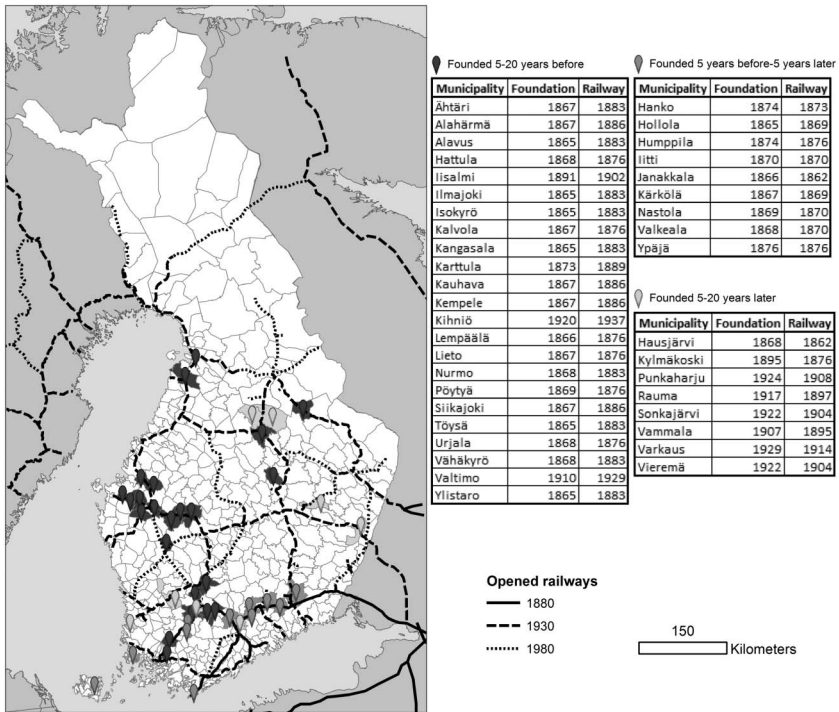
The morphology of the network did not mirror the radial design of the infrastructure around Helsinki. The Russian Empire's imposition of St. Petersburg as its center benefited Vyborg on account of its strategic location. In fact, the cities within Helsinki's large metropolitan area, including Lahti, Akaa, and Tampere, had a better connection to the network than did the capital. This situation affected the subsequent development of the region, giving less weight to Helsinki and favoring a more decentralized model that enhanced contribution from the periphery. This situation seems less strange, however, with the consideration that cities like Tampere had already industrialized at the end of the eighteenth century.

The growth of municipalities near new railway infrastructure occurred during the years immediately before, and after, the opening of the first railway lines (Figure 5), owing to a massive influx of migrants—from rural regions into the surrounding areas—who were employed in labor-intensive public works. The prospects for progress associated with this new infrastructure also encouraged significant flows of migrants to the best-connected municipalities, once their railway lines were operative. As a result, the growth of Helsinki and its hinterland in this first period was considerable, showing the effect of this new mode of transport on the distribution of population.

The Development of the Inner Network (1880–1940) The second phase saw the expansion of the railway infrastructure to serve the main nodes in the interior of the country and to create a regional network there. By 1900, three lines had been projected to run from south to north—the Tampere–Oulu line, connecting the port cities of Vaasa and Kokkola; the Kouvola–Kuopio line; and the Vyborg–Joensuu line. According to Taaffe, Morrill, and Gould's model for the development of transport networks in developing countries, the main objectives of building these lines would have been (1) to extend political and military control over the interior, (2) to provide access to and from mining regions, and (3) to increase the surface area suitable for farming. Finland clearly met all these objectives, while also establishing new municipalities within the new infrastructure's sphere of influence (Figure 5).¹⁸

18 Edward Taaffe, Richard Morrill, and Peter Gould, "Transport Expansion in Underdeveloped Countries: A Comparative Analysis," *Geographical Review*, LIII (1963), 503–529.

Fig. 5 New Municipalities Created in Association with the Arrival of Improved Rail Connections



NOTE Municipalities are distinguished by the year of their founding—between five and twenty years before the railway, within a margin of +/- five years, and between five and twenty years after the railway.

While maintaining the previous urban hierarchy, the transversal connections were designed to optimize the connectivity of the network within the interior of the country. In contrast to that in other European states, however, Finland’s increase in railway density was less pronounced around its capital and largest cities. Instead, parallel east–west connections brought a reasonably homogeneous level of accessibility to the inner regions. Although less profitable in economic terms, these railway connections favored a more decentralized model of economic growth that helped to reduce dependence on the main economic centers.

Once the network had been established, the plan was to produce further extensions to link strategic locations. The availability of large

areas of underused terrain and the progressive discovery of new mining deposits were of great interest to the country's political, economic, and military institutions. The Tornio–Kolari and Paltamo–Taivalkoski lines into the northern part of the country were clearly intended to support extractive activities, and the Kemi–Kemijärvi line, which served Rovaniemi–Lapland's main population center, facilitated the exploitation of timber resources.¹⁹

Not every region had natural resources available to be exploited. The expansion of the railway network was also followed by the transformation of a vast area of forest and pasture into arable land. Because these newly connected locations could develop only by attracting new settlers, the authorities encouraged agriculture and livestock farming to replace the previous extensive activities, thereby inducing further internal migration from the provinces of Vaasa and Turku, as well as bringing back international migrants from overseas. This new policy also implied significant challenges to the traditional cropping system. Wheat was grown only in the southern regions. Rye was the best crop for human consumption in the middle latitudes, but its inability to adapt to extreme climatic conditions prevented its production beyond latitude 64°N (see Figure 1). Barley, however, was viable to 68°N. Since the railway could deliver imported wheat and rye for people to eat, farmers could specialize in more adaptable crops like barley. Thus could they increase and extend the total area of crop production through regional specialization.²⁰

The Polarization into the Emerging Metropolitan Areas (1940–1980) The third phase of railway development was the construction of small branch lines around large cities and those earmarked for industrial development—such as Kajaani and Sotkamo in the interior—as well as the southern cities within Helsinki's metropolitan area—such as Loviisa, Karkkila, and Ristiina. These connections focused on providing better accessibility to industrial enclaves and to areas with highly concentrated economic activity after World War II.

The socioeconomic situation during the postwar period was dire. The authorities had to relocate almost half a million people from the territories lost after World War II, fund the reconstruction of damaged infrastructure, and settle an important debt with

19 In 1928, the first 79 km of the track from Tornio to Kaulinranta came into service. In 1967, the remaining 123 km to Kolari were finished.

20 Keijo Virtanen, *Settlement or Return: Finnish Emigrants (1860–1930) in the International Overseas Return Migration Movement* (Helsinki, 1979); Nordenskiöld, "Finland: The Land and the People."

the victors. The first step was to enact a policy of industrialization at the national level, the idea being that intensive economic activity would enable them to pay the war debt and reconstruct the country. Their top priority was to promote industrial metropolitan areas and to organize specific transport networks to serve them. This policy also favored, and outright encouraged, internal migration to these developing areas, which benefited overall growth.

Furthermore, throughout the period studied, more than 200 km of narrow-gauge track came from private enterprise. Although this new track never became part of the wider network, it connected the basic standard-gauge network with isolated industrial and mining nuclei. The state railway company undertook additional investments to modernize and improve the network through electrification of the trunk lines. When private motor vehicles subsequently began to drive economic development, however, the railways started to lose predominance.²¹

THE EFFECTS OF THE RAILWAY ON THE DISTRIBUTION OF POPULATION
Having answered the first two research questions relating to transport planning and the expansion of the railway network, our attention must turn to the third, “What effect did the railway have on the distribution of population and the development of Finland’s national territory?” To address it, we must compare historical data relating to the distribution of population with several transport indicators. The results show how spatial planning, which relied primarily on railway transport, affected the geographical reorganization of population throughout the state.²²

By the mid-nineteenth century, the distribution of population was relatively stable throughout the nation—small cities on the southwest coast and small villages dispersed across the interior. The underlying demographic pattern throughout the previous century had been slow but sustained development, what Wrigley referred to as “organic growth.”²³

21 Seppinen, “Competition between Modes.”

22 Thor Berger and Enflo, “Locomotives of Local Growth: The Short- and Long-Term Impact of Railroads in Sweden,” *Journal of Urban Economics*, XCVIII (2017), 124–138.

23 Kotavaara, Antikainen, and Rusanen, “Urbanization and Transportation in Finland”; Sven Lilja, “The Geography of Urbanization—Sweden and Finland, c. 1570–1770,” *Scandinavian Economic History Review*, XLII (1994), 235–256; E. Anthony Wrigley, *Energy and the English Industrial Revolution* (New York, 2010).

The relocation of the nation's capital and the construction of new public infrastructure—such as the Saimaa Canal, which allowed new economic activity based on forestry and the extraction of natural resources—set in motion trends that encouraged demographic growth and caused a slight shift of the country's center of gravity, in terms of population, toward the south. The construction of the Finnish railway network coincided with, and reinforced, far-reaching changes to the country's territorial organization, as shown in Figure 6. Indeed, by 1880, the main cities were already located on the southwest coast and in the interior region of Savonia.²⁴

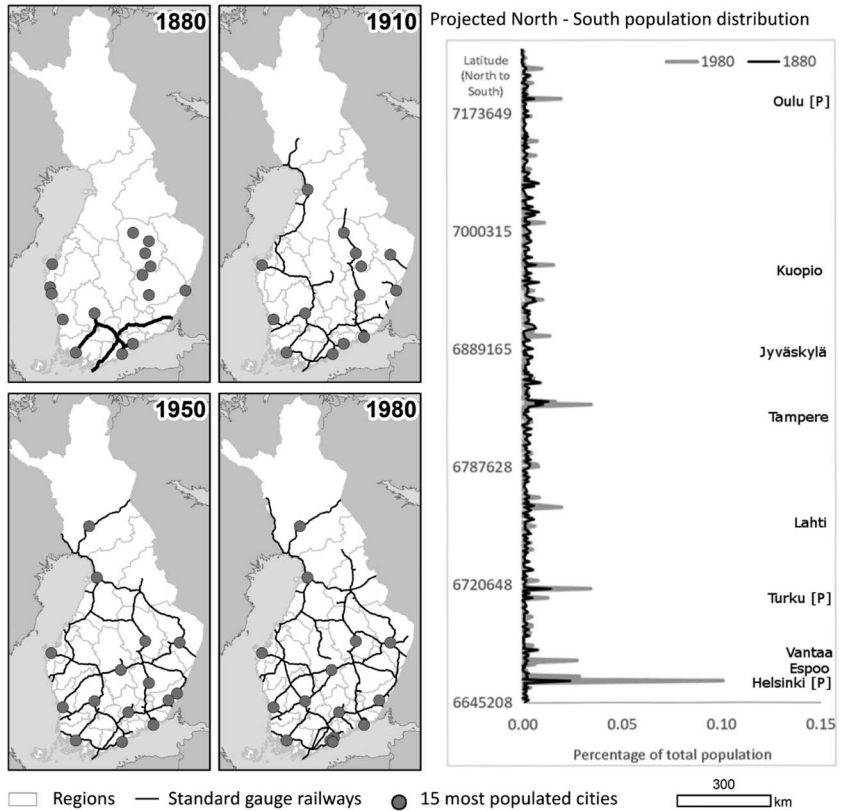
After 1880, the railway network continued to expand into the interior and toward the north. In demographic terms, the expansion of the inner network guaranteed a more homogeneous redistribution of population. This process was also accompanied by the creation of new municipalities that helped to consolidate these new territories. Some of the new nodes in the interior included people who relocated expressly to live closer to railway stations. Other citizens were migrants from elsewhere in the country who were attracted by new opportunities for economic and personal development. The resulting increase in accessibility put an end to the spatial isolation of many small-scale arable and livestock farmers and made a limited range of urban services more accessible. As the rural population began to organize around small nuclei, the process of urbanizing the interior began in earnest.²⁵

The population centers on the country's west coast began to lose importance. In fact, at this time, 400,000 people or so emigrated from Finland, mainly to America, most of them from regions with Swedish majorities. Henceforth, only the port cities and those connected to the railway network conserved their territorial rank while new territorial nodes emerged, such as Oulu in the northwest and Kotka in the southeast. Previous growth in the interior region of Savonia also began to lose momentum, largely because its waterway system lost predominance when economic activity became concentrated in the main cities. A large percentage of the population also moved nearer to Vyborg, forming a congregation of important cities along the country's eastern border. The resulting spatial pattern was clearly an

24 Between 1880 and 1980, the center of gravity of the population living in each municipality was displaced around 30 km southward and only 2.3 westward.

25 Moisiso and Passi, "From Geopolitical to Geoeconomic?"

Fig. 6 The Extension of the Railway Network and the Location of the Fifteen Most-Populated Municipalities—1880, 1910, 1950, and 1980.



NOTE The chart on the right shows the percentage of population by geographical latitude (north–south) and the main cities. [P] indicates the availability of a local port.

artifact of the railway network and ports; by 1910, all the main cities had connected to the national transport system. The railway therefore was crucial in the re-distribution of the population. The major nodes in the interior all concentrated around this infrastructure.²⁶

After 1945, the pattern changed dramatically, pursuant to a new political mentality that took root after World War II. The loss of the region of Karelia to the Soviet Union, the devastation produced by

26 Tervo, “Cities, Hinterlands and Agglomeration Shadows.”

the war, and the high level of debt associated with the cost of reconstruction prompted the authorities to promote industrialization in the country's large and medium-sized cities and to renounce the previous dispersed territorial development.

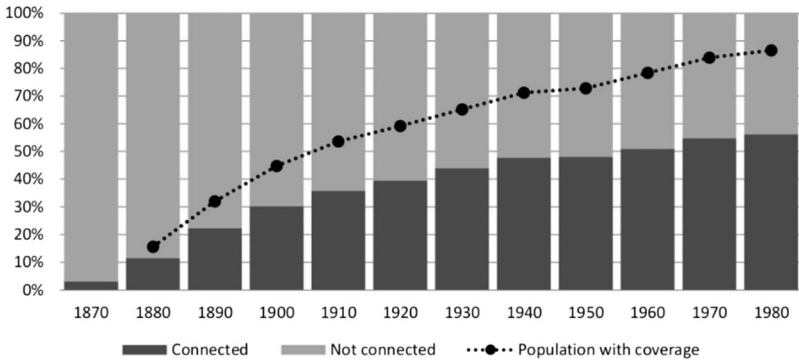
Concentrating investment in the cities with the greatest potential for economic growth had beneficial effects from an economic point of view. Within eight years, Finland had completely paid its foreign debt and installed a strongly competitive industrial sector. This policy, however, only exacerbated existing regional disparities. For example, Helsinki did not account for 5 percent of Finland's total population until 1880. By 1980, however, the situation was considerably different; the capital, with other important centers within its metropolitan region, accounted for practically 10 percent of the country's population. Turku, Lahti, Tampere, and Oulu also developed important metropolitan areas, each of them accumulating approximately 5 percent of the country's total population (Figure 6, right-hand panel). The flow of population from the towns located in the interior to the main cities was unstoppable, resulting in the depopulation of smaller population centers and their neighboring rural areas.²⁷

Railway Coverage and the Population Served To assess the relative importance of railway infrastructure for population distribution from a quantitative perspective, we calculated two different territorial indicators—railway coverage and the population served by the railway. First, we contrasted an evolutionary analysis of rail coverage with the population served by the rail network by differentiating the total number of municipalities with railway connections from those without them, working with data at ten-year intervals. Based on the connected municipalities, we then quantified the total population served by the railway system. Figure 7 shows that in 1870, only thirteen municipalities had railway connections, just 3 percent of the total number. By 1980, a maximum of 236 connected municipalities had been reached, 56 percent of the total. The slight decrease in this value thereafter reflects the decline of the network and the amalgamation of municipalities that occurred at the end of the twentieth century.

The results for the population with rail coverage showed a different trend. In 1880, the incipient railway network served only

27 Enflo, "Finland's Regional GDPs 1880–2010."

Fig. 7 The Evolution of the Percentage of Municipalities with Railway Coverage (Columns)



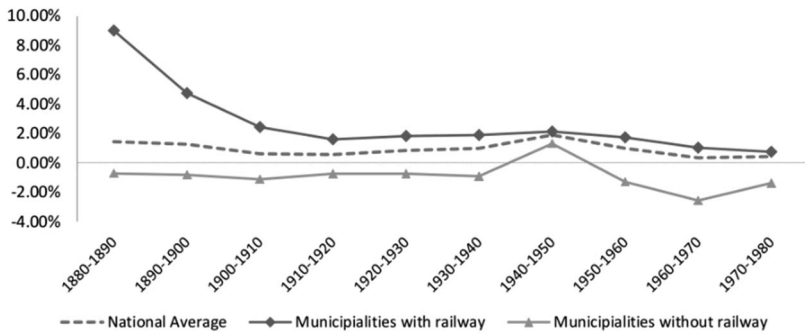
NOTE The dotted line also shows the percentage of the total population served by the system.

16 percent of the national population and connected slightly more than 11 percent of the country's municipalities. A century later, the percentage of the national population served by the railway network had risen to 87 percent, considerably greater than the 56 percent of the country's municipalities that it connected. The periods of greatest divergence were 1890–1920 and 1950–1980. The earlier period, which coincided with the second phase of railway construction, provided an incentive for an internal redistribution of population. The second period showed a marked change in tendency. Promoting the dispersion of Finland's population ceased to be a priority; the emphasis instead went to locating the country's economic activity around its most competitive cities, which coincided with the third phase of railway expansion into metropolitan areas. This type of analysis loses relevance from the 1980s onward, when air and road transport supplanted the railway as the dominant mode of transport.²⁸

Differential Growth and the Redistribution of Population
 Noting the discrepancy between the municipalities with rail coverage and the total population served by the railway system, we introduce another indicator into the analysis—average population growth in the municipalities connected to the railway network, as opposed to growth in those without connection (Figure 8).

28 Kotavaara, Antikainen, and Rusanen, "Population Change and Accessibility by Road and Rail Networks: GIS and Statistical Approach to Finland 1970–2007," *Journal of Transport Geography*, XIX (2011b), 926–935.

Fig. 8 The Evolution of the Rate of Annual Population Growth Aggregated according to the Availability of Rail Connections, 1880–1980



We estimated municipal population growth over a ten-year period, establishing whether each municipality had been connected to the national network at the beginning of the period. Bear in mind that the number of municipalities with railway connections constantly grew, whereas it declined in the other group. The results show that the connected municipalities consistently achieved higher growth rates than those that were not connected. In fact, the average rates of growth of the unconnected municipalities remained negative in all the periods studied, except for 1940–1950. Even if we cannot prove a cause–effect relationship, we show clearly that the municipalities connected to the railway network gained population while those unconnected to it constantly lost population.²⁹

A deeper look into the territorial dynamics reveals three interesting tendencies. Before 1900, the municipalities with rail connections passed from exorbitant growth rates, as much as 10 percent, to more stable values of around 4 percent. This tendency corresponded to the first phase of railway expansion and the consolidation of the railway network around the new capital and its sphere of influence. Since this phenomenon coexisted with other regional dynamics, which cannot be disentangled from it, we cannot ascertain just

29 Alvarez-Palau, Xavier Franch, and Martí-Henneberg, “Evolution of the Territorial Coverage of the Railway Network and Its Influence on Population Growth: The Case of England and Wales, 1871–1931,” *Historical Methods*, XLVI (2013), 175–191.

how much of this growth was exclusively attributable to the railway. The period of relative stability between 1910 and 1940 was due, at least in part, to the policies that extended the railway network into the interior of the country. After 1940, the influence of World War II was much in evidence, especially the mass migration from Karelia. Remember that the authorities opted for two different resettlement policies—to populate the rural interior and to reinforce the metropolitan agglomerations, which was much more popular in quantitative terms. The period of strongly divergent growth that followed was largely related to the progressive depopulation of the interior of the country and those areas without rail connections. It coincided with the third phase of railway development, adding fuel to a tendency for metropolitan polarization.

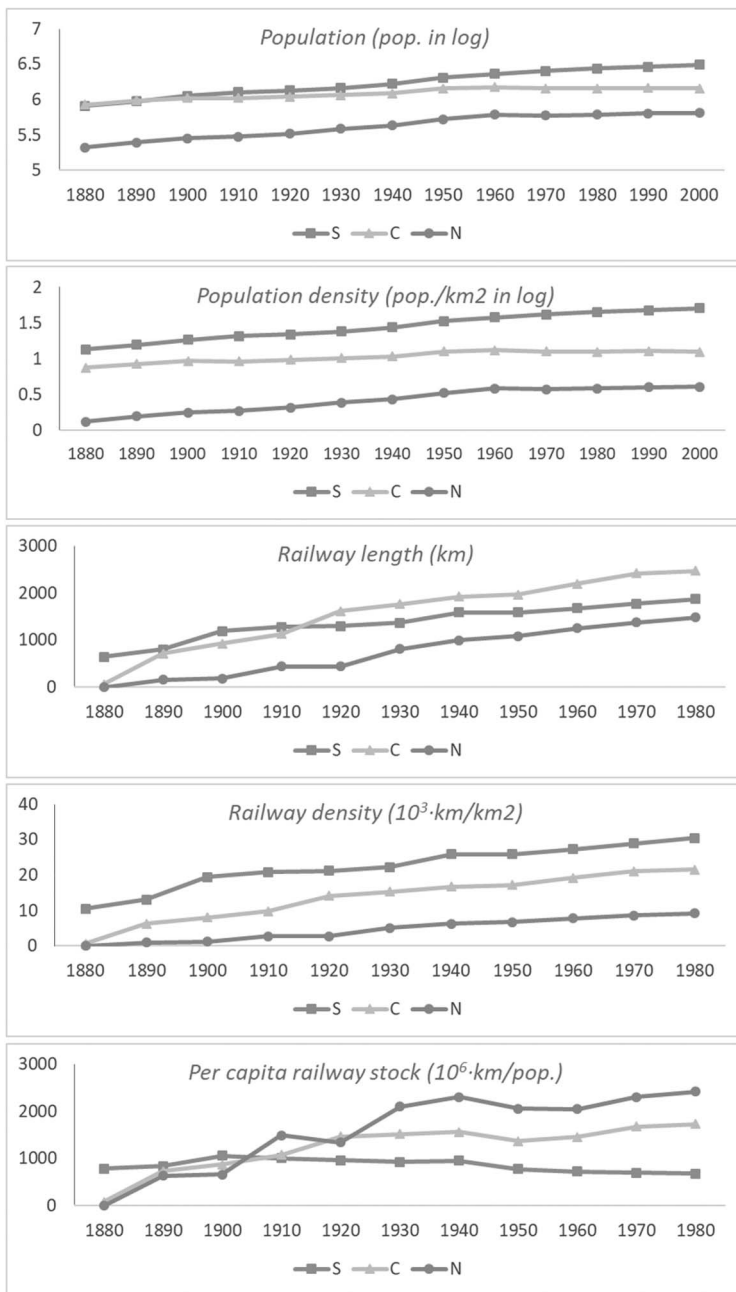
DIFFERENCES AT THE REGIONAL SCALE: THE SOUTH–NORTH PERSPECTIVE

To detect geographical patterns, we organized the municipalities into three groups—those lying in the south, center, and north, defining this territorial division on the basis of population density and the provision of regional railway services. The southern zone contained municipalities with a medium-high population density and good rail coverage. The central zone had municipalities with medium population densities and a relatively well-gridded railway network. The northern zone included municipalities with low population densities isolated from the main railway network (see Figure 1).

Figure 9 shows the evolution of the indicators that differentiate the aggregated values for each zone. The first two charts show the shift between the second and third phases of railway construction in terms of population. Policies aimed at re-centralizing around the main industrial areas after World War II caused a change of tendency readily apparent in the increasing differences between the southern zone and the other two zones during the 1990s. The picture is slightly different when it comes to the railway. As far as the length of the network was concerned, the southern zone concentrated the most infrastructure until 1910, when the central zone took the lead.

The evolution of the network density runs practically parallel for all three zones, though the southern zone is predominant. In per capita terms, however, the patterns are inverted, highlighting the greater railway per capita stock in the depopulated zones of

Fig. 9 The Evolution of Several Indicators by Regional Zone (South, Center, and North), 1880–1980



the north and center, as well as the trend toward widening disparity after World War II.

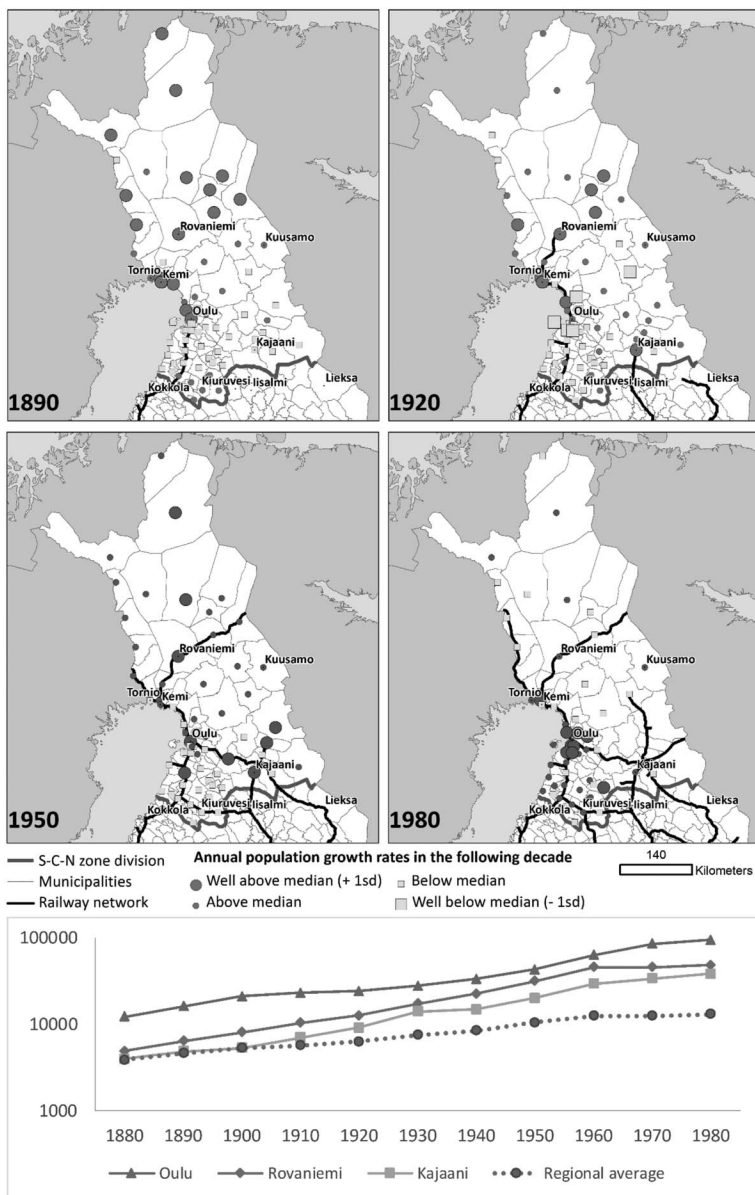
The corollary of this interpretation is that the railway network provided relatively homogeneous infrastructure in the south and center and more limited territorial provision in the north. Whatever the case, the tendency traced by the population variable indicates that the railway network helped to spread the population more widely across the national territory until 1940. Thereafter, all the previously observed trends effectively reversed. The relocation of industries toward the most developed areas, which were normally around the largest cities, lasted for several decades; the rural areas continued to experience increasing rates of depopulation, even when they received subsidies.³⁰

The Case of the Northern Zone A detailed analysis of the municipalities belonging to the northern zone enables us to identify the same phenomenon of population concentration that occurred at the regional scale. Railway lines in low-density regions had a morphology clearly designed to exploit the resources there. The main theories proposed suggest that, historically speaking, this type of railroad line has tended to reinforce pre-existing territorial structures—in Finland’s case, port cities, such as Oulu and Kemi, and previously consolidated nodes located in the country’s interior. In 1890, however, the railway had reached only the port city of Oulu. Not until the second third of the twentieth century did lines penetrate into the interior. Evidently, the authorities’ desire to control the country’s international borders favored the building of new railway lines that would benefit the development of extractive activity in the north.

The main debate concerns whether the railway was intended to influence the distribution of population or basically to serve geostrategic purposes. An analysis of Figure 10 provides an answer. First, it shows that all the municipalities in the region already had reasonably high levels of consolidated population, with an average of 4,600 in 1890. They also had relatively high rates of growth in relation to the national average. The populations integrated into the railway network, however, were the ones with the highest growth rates; Oulu consolidated its previous position as the main node in the region. By the end of the twentieth century, the medium-sized towns

30 Tervo, “Cities, Hinterlands and Agglomeration Shadows.”

Fig. 10 The Extension of the Railway Network into the Northern Zone, Showing the Main Centers of Population in 1890, 1920, 1950, and 1980



NOTE The chart at the bottom shows the evolution of population in the main cities (Oulu, Rovaniemi, and Kajaani), along with the average values for the northern zone.

connected to the railway network, such as Rovaniemi, Kajaani, Kemi, and Tornio, experienced high enough rates of growth to become the largest centers in the north. In fact, by 2000, Oulu, Rovaniemi, and Kajaani alone accounted for almost 45 percent of the total population in this region. The railway certainly influenced the concentration of population around the connected municipalities, modified the rankings of the existing population centers in the region, and helped to concentrate growth in the best-connected municipalities while abetting the decline of the worst-connected ones. The reorganization of this territory perpetuated the model of concentrated growth around places connected to the rail network. The rest of the municipalities remained strongly conditioned by this phenomenon, exhibiting practically nonexistent rates of growth for more than half a century.

Socioeconomic, cultural, and geostrategic policies are key for understanding the priorities behind the design of Finland's railway network. The transfer of territorial leadership to the southeast coast, the redistribution of population to inland areas to promote growth, and the subsequent process of polarization around metropolitan areas were the main territorial effects strengthened by the expansion of the railway network.

The distribution of Finland's main cities in 1880 had largely been determined by the location of Turku, Finland's original political center; Helsinki, its new capital; and the importance of the area around the Saimaa canal. The development of the country's national railway network broke this pattern as thousands of people migrated toward the newly connected municipalities. The ensuing socioeconomic development encouraged the spread and redistribution of population. By 1910, the country's fifteen largest cities already had railway service. The further expansion of the network reinforced this pattern. In demographic terms, the most significant trend was the migration to municipalities with railway coverage from those without it. The share of the national population with easy access to rail services increased from less than 20 percent in 1880 to almost 90 percent a century later. Although this development was not due solely to the presence of the railway, it was continuous. Throughout the entire period under study, the municipalities with railway coverage gained population while those lacking it suffered depopulation.

This study demonstrates that railways could serve different interests, from the reinforcement of preexisting economic activity

to the entry into areas with low population density. The design of the network is key to ensuring national needs, requiring in many cases different strategies for different regions. The scope and analytical methodology of the present study are equally applicable to other countries with similar conditions—low population density and a challenging geographical setting, such as in other peripheral areas of Europe and on other continents. This approach offers possibilities for a wide field of research, requiring only a minimal database charting the evolution of the national railway network and total population distribution, with data preferably available at the local level. Nonetheless, each country has its own characteristics that must be evaluated in any spatial-planning decisions. In the case of Finland, these unique features referred not only to the physical but also to the political setting. Before obtaining full independence in 1917, Finland was an autonomous grand duchy within the Russian Empire; such were the circumstances under which most of its railway network was built. Geopolitical questions were subsequently key to defining the country's regional development and the planning policies related to its transport system. The aftermath of World War II brought complications to which further work on the railway network was forced to respond. Finland's massive debt and the scarcity of its manpower required a new territorial strategy; railways were crucial to shaping industrial metropolitan areas around the most dynamic cities of that time.