PROJECTING CAPITALISM

A History of the Internationalization of the Construction Industry

Marc Linder

Contributions in Economics and Economic History, Number 158

Greenwood Press
Westport, Connecticut • London

Library of Congress Cataloging-in-Publication Data

Linder, Marc.
Projecting capitalism : a history of the internationalization of the construction industry / Marc Linder.
p. cm.— (Contributions in economics and economic history, ISSN 0084–9235 ; no. 158)
Includes bibliographical references and index.
ISBN 0–313–29293–0 (alk. paper)
1. Construction industry—History. 2. Engineering firms—History. 3. International business enterprises—History. 4. Railroads, Colonial—History. 5. Capitalism—History. 6. Technology transfer—History. 7. International economic relations—History. I. Title. II. Series.
HD9715.A2L498 1994
338.8'872—dc20 93–50546

British Library Cataloguing in Publication Data is available.

Library of Congress Catalog Card Number: 93–50546
ISBN: 0–313–29293–0
ISSN: 0084–9235

First published in 1994

Greenwood Press, 88 Post Road West, Westport, CT 06881
An imprint of Greenwood Publishing Group, Inc.

Printed in the United States of America

The paper used in this book complies with the Permanent Paper Standard issued by the National Information Standards Organization (Z39.48–1984).

10 9 8 7 6 5 4 3 2 1

2

A Taxonomy and Etiology of International Construction Activities

> You see a child, a little thing perhaps of six years old, leading and guiding at its will a team of magnificent horses. This sight forces upon the mind a feeling of satisfaction at the immense preponderance of the human intellectual power, as shown in this child, over the brute force of these powerful creatures. Such has been the sway of capital, often very ignorantly, childishly we may say, applied in ordering the construction of railways. Schemes recklessly promoted, or at any rate promoted without any view to the general good, have been efficiently carried out by the docile contractor, whom, by the way, I am rather ashamed to compare for the moment, except for faithfulness and docility, to the horse.[1]

Exports of Prefabricated Structures

> [I]t was not the absence of stone and clay and timber and metal ores in Australia and South Africa and the West Indies which created the large market for prefabricated houses, warehouses, theatres and churches in these places in the nineteenth century. It was the absence of an infrastructure and population sufficient to meet locally the immediate needs of colonialism, combined with the existence of the metropolis and the economic viability of making and transporting prefabricated structures in the industrial age.[2]

Within the framework of world industrial markets, it is customary to distinguish between the export of commodities and the export of or investment in productive facilities for production beyond the producing firm's national boundaries. The limited scope of direct construction exports is said to result from the industry's "most important peculiarity"—its extraordinary dependence on physical location, that is, on particular geographic sites.[3] This argument is eminently plausible when applied to certain massive civil engineering projects. The construction of a highway through the Brazilian jungle, of a railroad in Turkey, or of a subway in Mexico City must perforce take place on-site: "Transportation of the product is impossible."[4] Even when such objects as bridges or tunnels are prefabricated and exported, on-site processes of excavation, assembly, and erection are still necessary.[5]

---

[1] Arthur Helps, *Life and Labours of Mr. Brassey: 1805-1870*, at 338 (1872).

[2] W. McGhie, "The Industrialisation of the Production of Building Elements and Components," in [4] *PBE. 1982: Labour in Building and Construction* 3-21, 3-33 (1983).

[3] G. Levin and I. Osmakov, "Reserven der Bauproduktion," in Autorenkollektiv, *Intensivierung und ökonomische Reserven* 285, 289 (Gerhard Krupp tr., 1972) [*Intensifikatsiia i rezervy ekonomiki* (1970)].

[4] Helen Rainbird & Gerd Syben, "Introduction," in *Restructuring a Traditional Industry: Construction Employment and Skills in Europe* 1, 5 (Helen Rainbird & Gerd Syben ed., 1991).

[5] See "Prefabricated Bridge Takes a Long Ride," *ENR*, Sept. 14, 1967, at 20 (exported by Dorman,

Viewed in this light, the issue of exports does not differ from the issue raised by location-dependence within a national market: to the extent that prefabrication methods become economical, the traditional location-dependence of certain types of structures diminishes.[6] The outstanding nineteenth-century example of domestic shipments of prefabricated housing units in the United States was the so-called balloon frame wooden house.[7] The international export of prefabricated buildings and other structures from Victorian Britain also attained remarkable dimensions and sophistication.

Prefabricated housing was sent to Australia and Africa as early as the late eighteenth century. In 1819 houses were sent from Boston to Hawaii. By the 1830s, the Manning "Portable Colonial Cottage for Emigrants," which could be assembled in a few hours, was being produced and shipped to the Antipodes in large numbers. In addition to mass-producing thousands of huts for soldiers during the Crimean War, British manufacturers such as William Fairbairn, Sons, & Co. and E. T. Bellhouse & Co. also produced and exported to Turkey, India, Hong Kong, Uruguay, South Africa, and elsewhere a variety of elaborate prefabricated structures including an iron house for a corn mill and a woollen factory.[8] As early as 1807 a firm shipped the components of an iron bridge weighing fifty tons to Jamaica. The transaction then became common during the ensuing decades. By the 1840s a 130-foot lighthouse was constructed, erected, dismantled, and shipped to Barbados. This type of prefabrication also spread.[9] Within a few years British firms were exporting houses and warehouses to Africa and the West Indies. The British firm of Henry Grissell, for example, exported a prefabricated iron building to Mauritius.[10]

Soon large iron residential, governmental, commercial, railway, and industrial buildings as well as hotels, churches, hospitals, and mining facilities were being prefabricated and exported for reassembly all over the world. In the 1850s, a British firm manufactured the entire Buenos Aires gas works, transporting 2,000 tons of building elements in ten ships. Another firm exported a lighthouse to the United States in 1851 for the federal government, while Grissell sent a fifty-ton lighthouse to the Falkland Islands in 1853. During the gold rush California became one of the largest markets for prefabricated houses. Producers on the east coast of the United States, forced to ship their products around South America to San Francisco, faced competition from Hong Kong, New Zealand, and Australia as well as from England and Belgium for the sale of thousands of houses, which three or four workers reputedly could assemble in three or four days.[11]

Long from England to Zambia to avoid labor and logistical problems); "Danish Specialty: Prefabricated Tunnels," *ENR*, Mar. 28, 1968, at 30 (exported to and installed in Belgium by Christiani & Nielsen).

[6]See H. Brede et al., *Ökonomische und politische Determinanten der Wohnungsversorgung* 29 (1975). See also The Battelle Memorial Institute, *The State of the Art of Prefabrication in the Construction Industry* (1967); U.N. Economic & Social Council, Committee on Housing, Building & Planning, Fifth Session, *Industrialization of Building* 86-87 (1967).

[7]See Horace Greeley et al., *The Great Industries of the United States* 40-41 (1872); Siegfried Giedion, *Space, Time and Architecture* 345-51 (1959 [1941]); "The Prefabricated House," *AF*, Dec. 1942, at 49, 50; Carl Condit, *American Building* 43-45 (1968); Bob Reckman, "Carpentry: The Craft and Trade," in *Case Studies in the Labor Process* 73, 80-82 (Andrew Zimbalist ed., 1979); William Cronon, *Nature's Metropolis: Chicago and the Great West* 178-79 (1991).

[8]2 *MPICE* 125-26 (1843) (Fairbairn's exports to Turkey).

[9]See Peter Paterson, "An Account of the Cast-Iron Lighthouse Tower in Gibb's Hall, in the Bermudas," in 2 *MPICE* 182-85 (1843).

[10]Henry Grissell (1817-1883), was a civil engineer who also built bridges in Egypt and waterworks in Vienna and Leipzig, and promoted engineering works in Russia carried out by English capital. See the obituary in 73 *MPICE* 376-78 (1883).

[11]See generally Gilbert Herbert, *Pioneers of Prefabrication: The British Contribution in the Nineteenth Century* (1978); "Cast-Iron Lighthouse for the Falkland Islands," 11 *Builder* 573 (1853); Henry-Russell Hitchcock, 1 *Early Victorian Architecture* 516-17 (1972 [1954]); Charles Peterson, "Prefabs in the

Nor were the British the only major nonresidential construction exporters in the nineteenth century. Among their competitors was Gustave Eiffel, whose firm, Eiffel & Co., exported prefabricated churches throughout the world.[12] The dismantling, overseas transport, and reassembly of entire factories was also practiced in the nineteenth century, as witnessed by a steel-pipe plant that was moved from the United States to Russia and a sugar mill transported from Florida to the west coast of Mexico in the 1890s.[13]

The definitive separation in the colonies of the mass of the European settler population from the means of production and the concomitant rise of capitalist relations of production, however, reduced the need for imports of prefabricated buildings. The emergence of transitional economies in white settler territories, in which wage labor had not yet become second nature because ownership of the means of production, in particular, of land, had not yet become a categorical class distinction, made problematic large-scale enterprises that required considerable fixed capital.[14] As Henry George explained the consequences for the labor market of one version of this frontier hypothesis to the U.S. Congress in the 1880s:

> [L]and reform properly carried out would result in making wage-workers independent; that is, instead of men competing with each other for the privilege of working, most employments would be competing for men to work at them, because, the land being free, there would be a constant opening there and the present conditions would be reversed, so that instead of the workingmen seeking employment the employers would seek workers; and whoever seeks is a slave.[15]

But as state land and immigration policies promoted the proletarianization of the colonial population and thus increased "the availability of labor—always the controlling factor of local production of houses and the inverse key to prefabrication"—capitalistically organized construction operations could be inaugurated.[16] When, for example, "Melbourne was in course of erection, stores, shops, houses, hotels, and offices were immediately and urgently required, ...it was only by the constant supply of competition which immigration furnished that labour...was kept at such a price as to be at all accessible."[17] Once the labor question was resolved in favor of capital, as newly colonized or settled regions such as Australia and California developed, they were able to dispense with extraordinary injections of advanced technology in the form of prefabricated construction imports.

The so-called scramble for African colonies in the last quarter of the nineteenth century reignited demand for prefabricated housing by the European colonizers. At the request of the governor of German East Africa, for example, a German firm in Altona shipped framework houses to Dar es Salaam to provide

---

California Gold Rush, 1849," 24 *JSAH* 318-23 (1965).

[12]"Alexandre Gustave Eiffel: A Towering Engineering Genius," *ME*, Feb. 1992, at 58, 61.

[13]John McKay, *Pioneers for Profit: Foreign Entrepreneurship and Russian Industrialization 1885-1913*, at 184 (1970); J. Sitterson, *Sugar Country: The Cane Sugar Industry in the South, 1753-1950*, at 363 (1953).

[14]This noncapitalist interlude associated with gold rushes disturbed Engels at mid-century when he still believed in the imminence of an economically determined revolution: "California and Australia are two cases, which were not provided for in the 'Manifesto': Creation of large new markets out of nothing. They still have to go in [to our theory]." Letter from Engels to Marx, 24 Aug. 1852, in Karl Marx [&] Friedrich Engels, 28 *Werke* 117, 118 (1963).

[15]U.S. Senate, 1 *Report of the Committee of the Senate upon the Relations Between Labor and Capital* 800-801 (1885). See also Karl Marx, 1 *Das Kapital: Kritik der politischen Ökonomie* 745-56 (1867 [reprint 1959]).

[16]Herbert, *Pioneers of Prefabrication* at 22.

[17]"The Demand for Labour in Melbourne," 1 *Engineer* 345 (1856).

shelter for the new arrivals until the colonial government could organize its own.[18] The 1880s also witnessed the first exports of cabins and labor camps from Germany. In the aftermath of the devastation of World War I, U.S. firms exported demountable houses to France; and in the 1920s, Swedish firms began exporting houses.[19] Again during and after World War II international—and especially U.S.—exports of prefabricated military facilities and housing increased strikingly.[20] By 1949, Swedish firms alone had exported $45 million dollars worth of prefabricated houses, chiefly to Persian Gulf oil centers and Israel.[21] An English firm exported prefabricated aluminum housing to the British West Indies and Portuguese East Africa, while German firms found a ready market in Australia and New Zealand for prefabricated wooden houses.[22] The Korean War provided a further spike of demand for exports of prefabricated shelters. By the 1960s, Japan was also exporting prefabricated houses.[23]

Physical exports of elements of the built environment resumed in the second half of the twentieth century on a much higher technological plateau. Thus in spite of the often unique properties of many large commercial buildings and industrial plants, new construction techniques and transportation facilities have made exports possible that would have been impossible earlier in the century. In 1930, for example, it was a relatively simple process for the Stalingrad Tractor Plant, Europe's largest, to be built in the United States, dismantled, shipped to the Soviet Union, and reassembled by Americans and Germans under the supervision of the Austin Company.[24] A half-century later, however, a 6,500-ton prefabricated hydroelectric plant could be built in France, shipped across the Atlantic Ocean to New Orleans, and then floated 1,600 miles up the Mississippi and Ohio rivers to an Army Corps of Engineers lock and dam in Ohio.[25] The Japanese firm that built a polyethylene plant in a shipyard for turnkey delivery on an ocean-going barge to Argentina offers shipment to any location accessible by deep water.[26] Japanese firms also built a nine-story hotel on a barge. Designed especially for developing countries in which construction is hampered by shortages of land and skilled workers, the floating hotel can be delivered to any coastal area in the world.[27]

International exports of modern prefabricated houses have also resumed. Manufacturers of prefabricated houses have located markets even in advanced capitalist countries. In Sweden, for example, where prefabrication technology dominates housing production, firms have been increasingly successful in shipping their products to Europe, Japan, and the United States. Direct construction exports

---

[18]Friedrich Gurlitt, "Die ersten Baujahre in Deutsch-Ostafrika," 55 *ZB* 57, 75 (1905).

[19]Burnham Kelly, *The Prefabrication of Houses* 9-12 (1951); "French Housing Contract Awarded to New York Firm," 83 *ENR* 393 (1919) (2000 houses by MacArthur Bros.).

[20]See e.g., "Army Engineers Package and Ship Hospitals to Southwest Pacific," 134 *ENR* 719 (1945); "British Cancel Orders for Houses Designed and Prefabricated in the U.S.," 135 *ENR* 355 (1945); "Sell Prefabricated Homes to France," *id.* at 557; 136 *ENR* 385 (1946) (from Sweden to Denmark).

[21]*ENR*, Sept. 8, 1949, at 31.

[22]140 *ENR* 596 (1948); "German Prefabs for Antipodes," *ENR*, Jan. 25, 1951, at 50. The export of prefabricated housing from Britain to Australia was curbed by the imposition of a high import duty in the early 1950s. *ENR*, Aug. 21, 1952, at 54.

[23]"Defense Needs Prod Prefabs Upward," *ENR*, Jan. 25, 1951, at 25; "Japan Will Export Prefab Houses," *ENR*, Aug. 29, 1963, at 42.

[24]Anthony Sutton, *Western Technology and Soviet Economic Development 1930-1945*, at 185-86 (1930).

[25]"Low-Head Hydro Finds Ohio Home," *ENR*, Jan. 8, 1981, at 22; "Prefab Powerplant Floats into Place," *ENR*, Sept. 10, 1981, at 14.

[26]E. Stallworthy & O. Kharbanda, *International Construction* 32-34 (1986). See also Suzanne Shelley, "Making Inroads with Modular Construction," *ChE*, Aug. 1990, at 30 (Nexis).

[27]"World's First Floating Hotel," *IC*, Nov. 1983, at 5.

from the United States, on the other hand, have been limited during the post-World War II period although federal legislation mandating that new housing for U.S. troops stationed in Europe be manufactured in the United States by U.S. firms may provide an impetus for such transatlantic shipments.[28]

International Production

> [T]he extension of railway communications into wild and uncivilised countries, demands from the Engineers, Agents, and Contractors...the exercise of more than ordinary observation, self-discipline, and energy. ... It becomes...the wise policy of all foreign Railway Companies, and of all Contractors...to exercise the greatest strictness...in ascertaining that the agents sent out from this country...are...possessed of gentlemanly feelings and habits...converting the Railway Engineer into a pioneer of civilisation and a missionary of science.[29]

In contrast to the causes of direct foreign investment in manufacturing industries, which have long been the object of controversy,[30] the reasons underlying expansion beyond national boundaries in construction are relatively straightforward. In close analogy to the situation of the extractive industries—for which international construction firms also build facilities and infrastructure—those reasons are bound up with the search for sites of production.[31] Firms may be impelled to diversify geographically by the relative saturation of a domestic market that no longer allows realized profits to be reinvested (or the existing fixed capital to be utilized adequately). Firms also "increasingly spread[] their projects around the globe to even out business cycles" and make themselves "less vulnerable to fluctuations in domestic construction."[32] As a leading promoter of international trade and capital export observed during World War I: "'[T]he foreign field offers to the American contractor the same advantage which export trade offers the manufacturer—the stabilization of his business by diversification of his outlets. It spreads his risk, and he is more certain of normal business than if all activities are confined to one country.'"[33] Finally, other countries may offer projects and profits of a magnitude not currently available on the national construction market.[34]

So long as the security of domestic capital investment was so much greater than that of investment outside the protective reach of the national state that it

---

[28]See e.g. Kelly, *Prefabrication of Houses* at 365-66; "Danish Blues," *Building*, Dec. 17, 1976, at 32; U.S., International Trade Administration, *Foreign Builders Target the United States: Implications and Trends* 8-10 (Nat. Tech. Infor. Serv. PB88172457, 1988); U.S. Bureau of the Census, *Historical Statistics of the United States, Colonial Times to 1970*, pt. 1 (1975), ser. F 668-723 at 272-83; U.S. Bureau of Labor Statistics, *The Structure of the U.S. Economy in 1980 and 1985*, at 382-87 (Bull. No. 1831, 1975); U.S. Bureau of the Census, *SAUS: 1975*, tab. 1363 at 813 (96th ed. 1975); Military Construction Authorization Act, 1984, Pub. L. No. 98-115, § 803, 97 Stat. 757, 784-85 (1983); "Prefab Housing: Military Push in Europe Gives U.S. Firms a Boost," *ENR*, Aug. 30, 1984, at 22.

[29]John Brunton, "Description of the Line and Works of the Scinde Railway," 22 *MPICE* 451, 473 (1863).

[30]See e.g., John Dunning, *Explaining International Production* (1988).

[31]Klaus Busch, *Die multinationalen Konzerne* 245-49 (1974); John Dunning, *Multinational Enterprises and the Global Economy* 57 (1993).

[32] Gerald Parkinson & Ken Fouhy, "Riding the E&C Wave," *ChE*, Sept. 1991, at 30 (Nexis); "One Firm's Formula for Success: Diversification," *ENR*, Apr. 11, 1957, at 34, 40 (referring to Utah Construction Co.).

[33]"Will Help American Contractors in Handling Work in Foreign Fields," 73 *ER* 93, 94 (1916) (quoting Williard Straight, vice-president, American International Corp.).

[34]Roland Neo, *International Construction Contracting: A Critical Investigation into Certain Aspects of Financing, Capital Planning and Cash Flow Effects* 78-81 (1976); "The Top International Contractors," *ENR*, July 16, 1981, at 68, 73; Chester Lucas, *International Construction Business Management* 2 (1986).

more than compensated for potentially higher rates of profit abroad, internationalization of production was impeded. The extension of European nation-states' power to the conquered colonies in the nineteenth century then created the requisite degree of security. Since that time the salient question in the construction industry has been not so much why firms seek cross-border orders, but rather how they can compete with local firms. Historically, the answer lay chiefly in the peculiar configuration of international construction markets, which were largely confined to the less developed countries. Western European and U.S. construction firms, responding in part to a demand for infrastructure in those countries generated by European and U.S. industrial capital, competed with one another outside of their own domestic markets. Not until the late twentieth century has the more complicated phenomenon—which appeared much earlier in manufacturing—of the interpenetration of advanced capitalist construction markets arisen as a consequence of world construction market depression. In particular the evanescent OPEC building boom forced the European and U.S. multinational firms that had accumulated enormous capital in the Middle East to invade certain sectors of one another's domestic construction markets in order to continue to valorize that capital.[35]

The microeconomic possibility of the existence of profitable international production operations is rooted in the structure of monopolistic competition. As Charles Kindleberger, a leading contemporary theorist and historian of international economics, has pointed out, such overseas direct investment makes no sense unless the invading firms

> possess some advantage which they can transfer from one country to another but which cannot be acquired by local firms. With perfect international markets for technology, management, labor skills, components, and other material input, the market abroad will be served by a local firm.
>
> Put the matter another way: in a world of perfect competition for goods and factors, direct investment cannot exist. In these conditions, domestic firms would have an advantage over foreign firms in the proximity of their operations, so that no firm could survive in foreign operation. For direct investment to thrive there must be some imperfection in markets for goods or factors, including among the latter technology, or some interference in competition by government or by firms, which separates markets.[36]

Kindleberger groups the monopolistic advantages that can induce overseas direct investment under the headings of goods markets, factor markets, and economies of scale. Departures from perfect competition in goods markets include such strategies as product differentiation and special marketing skills. Departures from perfect competition in factor markets run the gamut from patents and discriminatory capital access to "differences in skills of managers organized into firms rather than hired in competitive markets."[37]

Since the types of construction that have traditionally been performed abroad almost exclusively both are one-of-a-kind and enter as inputs into other firms' production processes, they tend not to be subject to the marketing strategies that promote the sale of mass-produced fungible consumer products. Economies of scale and privileged access to labor and embodied and liquid forms of capital therefore constitute the principal bases for internationalizing construction.

Kindleberger himself rejects the notion that foreign investors could derive any competitive advantage from discriminatory access to labor "other than

---

[35]See chapter 12 below.

[36]Charles Kindleberger, *American Investment Abroad: Six Lectures on Direct Investment* 12-13 (1971 [1969]).

[37]*Id.* at 14.

management and technical staff."[38] Both nineteenth-century railway building in Europe and the colonial areas and contemporary construction in thinly populated Third World countries belie this argument. Privileged access to and exportation of navvies and skilled workers from Britain then and of workers from the so-called labor-surplus countries of Asia today have formed a crucial element in the ability of firms from advanced capitalist countries to undertake construction abroad.[39]

Privileged access to the most efficient means of production, the cheapest and strongest building materials, and to engineering knowledge that may not have been proprietary but that had nevertheless not yet been appropriated by a critical mass of engineers in the periphery played a significant part in the international construction activities of European and, to a lesser extent, of U.S. construction firms in the nineteenth century. In the hydrocarbon era, in contrast, proprietary engineering technology has assumed greater importance than during the railway age.[40]

Many specialists in construction economics have contended that the fact that firms build one-of-a-kind products is inconsistent with economies of scale and hence concentration in construction. This thesis was not even accurate in the nineteenth century, when oligopoly prevailed, and a "handful of bankers and contractors controlled nearly all railway building in the world, outside the U.S.A., between 1840 and 1870, and a large share of transport developments in the half-century after."[41] At the beginning of the twentieth century, one of the leading U.S. construction-engineering journals spoke admiringly of "[t]he monopoly of large and difficult work, which the more powerful firms deservedly possess...."[42] And by mid-century, one large U.S. firm explained its post-World War II attachment to the world market by reference to the fact that because international projects called for "more than the ordinary amount of knowledge, know-how and construction ability...only larger contractors are equipped to handle" them.[43] In effect, the scale of the projects themselves created functionally equivalent barriers to entry—as it still does.[44]

Since even the greatest mid-Victorian entrepreneurial contractors such as Thomas Brassey and Morton Peto lacked training as engineers, a question arises as to the basis of their role as international carriers of engineering technology.[45] This question poses itself with even greater force at the end of the nineteenth and beginning of the twentieth century with respect to a contractor such as George Pauling, who, "with no capital but his brains and magnificent physique," excelled chiefly at physically assaulting those who got in his way. Yet he is credited with having built a number of railways in South Africa and all of Rhodesia's.[46]

The civil engineering knowledge and technology required to build

---

[38] *Id.* at 16.

[39] See chapters 4-6, 9, and 10 below.

[40] See chapters 4, 5, 9, and 10 below. For an example of embodied technology conferring a competitive advantage in railway construction in the 1860s, see Robert Middlemas, *The Master Builders: Thomas Brassey; Sir John Aird; Lord Cowdray; Sir John Norton-Griffiths* 96 (1963).

[41] Middlemas, *Master Builders* at 307.

[42] "When Contract Work is Advisable," 53 *ER* 468 (1906) (editorial).

[43] "One Firm's Formula for Success: Diversification" at 40 (Utah Construction Co.).

[44] See chapter 12 below.

[45] Revealing light was shed on the diffusion of the requisite engineering knowledge by a British colonel in the Bengal Engineers, who stated in the 1850s that although his military engineers could construct the bridges, embankments, and viaducts for railways, they would have to go to England for experience for building stations and engine-sheds. *Report from the Select Committee on East India (Railways)*, Q. 3454 at 243 (14 *PP* 1857-58 [161]).

[46] *Times*, Feb. 13, 1919, at 14, col. 2 (obituary) (quotation); *The Chronicles of a Contractor: Being the Autobiography of the Late George Pauling* 60-61 (David Bucahn ed., 1926).

technically challenging mountain routes for many non-European railroads generally exceeded the capacities of formal and informal colonial societies in the nineteenth and early twentieth centuries.[47] This gap widened when it came to boring long tunnels through rock[48] or erecting bridges such as the spectacular 135-meter high, two-hinged spandrel-braced steel arch Victoria Falls Bridge, the world's highest railway bridge when constructed cantilever-wise over the Zambezi at the turn of the century.[49] In the 1850s, for example, when the Brazilian government sought to build the country's first railway linking Rio de Janeiro with regions beyond the coastal escarpment, the British contractor "was given the freedom to build the road as he saw fit, since the Brazilians frankly admitted that they did not know the first thing about the special problems involved in crossing the *serra*."[50]

Even the Japanese Meiji state, which consciously sought to avoid dependence on foreign capital, not only borrowed almost £1 million in London in 1870 to finance construction of its first railway, from Yokohama to Tokyo, and mortgaged the loan with railway receipts and customs duties, but also employed English engineers (in part to train Japanese engineers) to build all of its initial lines.[51] Significantly, however, after internal political opposition to this concession erupted, the Japanese government decided to carry out the work itself rather than to engage foreign contractors. The English engineers were therefore required to follow the terms dictated by the government.[52] The Japanese learned much from this experience and soon established their own engineering schools—initially staffed by Westerners.[53] Contrary to the foreign engineers' advice, Japan proceeded to use its own contractors for future rail construction.[54]

---

[47]See e.g., F. Baltzer, *Kolonial- und Kleinbahnen*, pt. 2: *Bauliche Ausgestaltung von Bahn und Fahrzeug* 36-37 (1983 [1920]). For a detailed technical description of the engineering aspects of one colonial railway project followed by a discussion by the leading engineers of the day, see William Ridley, "The Grand River Viaduct, Mauritius Railways," in 25 *MPICE* 237 (1866).

[48]On the compressed-air boring machinery that made possible tunneling through rock in the Alps in the 1850s and 1860s, see "The Seven-Mile Tunnel Through the Alps," 8 *Builder* 231 (1850); "Passage of the Alps—Railways in Italy," 11 *Builder* 354-55 (1853); "An Account of the Tunnel Through Mont Cenis," 20 *Builder* 381 (1862); "The Tunnel Through the Alps," 21 *Builder* 666-68 (1863); Helps, *Life and Labours of Mr. Brassey* at 178-80. Yet at the same time an Australian firm built a tunnel in New Zealand through "basaltic rocks of the hardest description, against which the machinery employed at Mt. Cenis would be powerless." "The Lyttleton Tunnel, Canterbury, New Zealand," 21 *Builder* 811 (1863).

[49]See "The Victoria Falls Bridge," 99 *Engineer* 339 (1905); George Hobson, "The Victoria Falls Bridge," 170 *MPICE* 1 (1907); G. Hobson, "The Great Zambezi Bridge," in 2 *The Story of the Cape to Cairo Railway and River Route, from 1887 to 1922: The Main Line as It Exists To-Day from the Cape to the Nile Delta* 43-59 (n.d. [1922]); F. Baltzer, *Die Kolonialbahnen mit besonderer Berücksichtigung Afrikas* 139-43 (1916). For an overview of the engineering design of mid-Victorian railway tunnels and bridges, see G. Drysdale Dempsey, *The Practical Railway Engineer* 103-249 (1855).

[50]Richard Graham, *Britain and the Onset of Modernization in Brazil 1850-1914*, at 53 (1968). See also Stephen Haber, *Industry and Underdevelopment: The Industrialization of Mexico, 1890-1940*, at 30 (1989).

[51]See *Times*, Apr. 5, 1870, at 12, col. 1; "Railways in Japan," 29 *Engineer* 194 (1870); *Times*, Mar. 14, 1876, at 10, col. 4 (the line was sold for £600,000 to a Japanese corporation); J. Rein, *The Industries of Japan* 513 (1889); E. Herbert Norman, *Japan's Emergence as a Modern State: Political and Economic Problems of the Meiji Period* 114-17, 121-22 (1940); W. Macpherson, *The Economic Development of Japan c. 1868-1941*, at 37 (1987). See also Richard Brunton, "The Japan Lights," 47 *MPICE* 1 (1877) (when Britain, France, and the United States demanded the erection of lighthouses in the treaty ports, Japan acquiesced, but lacking the technology, let foreigners build them).

[52]Kōtsū hakubutsukan, *Tetsudo no nihon: Tokaido shin kansen kaitsū shuppan* 5-11 (1964); Masaho Noda et al., *Nihon no tetsudo: seiritsu to tenkai* 7-27 (1986).

[53]See e.g., "Engineering Education in Japan," 21 *Engineering* 152 (1876); "The Imperial College of Engineering, Tokei, Japan," 24 *Engineering* 74 (1877).

[54]See "The Railways of Japan," 24 *Engineer* 179, 180 (1877); "The Construction of Railways in Japan," 25 *Engineer* 379 (1878) (racist account); William Potter, "Railway Work in Japan," 56 *MPICE* 2, 14 (1879); W. Cargill, *id.* at 17-20 (discussion contribution). Where necessary, the Japanese continued to permit Western and especially English firms to transplant new technology to Japan, after which indigenous contractors took control. See e.g., John Turner, "The Construction of the Yokohama Water-Works," 100 *MPICE* 277 (1890).

Shortly after the turn of the century, the Chinese financed, engineered, and built their own railway, demonstrating that foreign-built lines in the territorial concession areas were more politically imposed than technologically required. The fact that the Chinese even built their line more cheaply than the foreigners, in part by dispensing with the "middlemen or compradors" used by Western firms,[55] inspired the leading U.S. construction-engineering journal to engage in an unwonted polemic against "this occidental, or perhaps Caucasian condescension," which refused to grasp that Western-trained engineers were all brothers under the skin—"that off on the other side of the globe yellow men in queer costumes are working out the same problems as are we, and apparently are doing it equally as [sic] well."[56]

Despite the technological gap between metropoles and periphery in the nineteenth century, Latin American engineers in a number of cases also built—or prepared the plans for, or approved the plans of, European or U.S. contractors for—several technically demanding railways in the Andes.[57] While some South American states continued to rely on European or U.S. firms,[58] others, in order to avoid bond issues, promotion expenses, and contractors' profits, built their own, co-opting a few foreign engineers.[59] By the 1930s, the formation of a critical mass of native engineers prompted the Mexican government to stop hiring foreign engineers and Mexican engineers to petitition the legislature to exclude U.S. engineers altogether.[60]

Another way of posing the question articulated by Kindleberger is as follows: If the labor, scientific knowledge, technology, means of production, and the money capital to buy them all can be purchased on the world if not the local market, why did or do less developed countries permit, invite, or prefer advanced capitalist conquistadors to produce their built environment rather than assemble the requisite organizations themselves? This question is particularly pertinent for the mid-nineteenth century when even the largest British international railway contractors "were not multinational corporations, []or even a limited company, but a loose partnership with a variety of other partners and agents, constantly dissolving and reforming in new guises."[61]

The question becomes more pointed still with regard to the spectacular mountain railway construction in South America in the 1860s and 1870s by the American, Henry Meiggs, who had fled San Francisco after committing forgeries, without an organization, training or experience as an engineer or building

---

[55]See J. Dobbins, "The Imperial Peking-Kalgan Railway and Its Extension," 64 *EN* 191, 192 (1910).

[56]64 *EN* 207 (editorial).

[57]See A. Currie, *The Grand Trunk Railway of Canada* 28 (1957); Brian Fawcett, *Railways of the Andes* 44 (1963); Daniel Headrick, *Tentacles of Progress: Technology Transfer in the Age of Imperialism, 1850-1940*, at 69-70 (1988); Wolfgang Schivelbusch, *Geschichte der Eisenbahnreise: Zur Industrialisierung von Raum und Zeit im 19. Jahrhundert* 90-92 (1977); Watt Stewart, *Henry Meiggs: Yankee Pizarro* 49, 87-89, 104-108, 110-11 (1968 [1946]); Rory Miller, "Transferring Techniques: Railway Building and Management on the West Coast of South America," in Rory Miller & Henry Finch, *Technology Transfer and Economic Development in Latin America, 1850-1930*, at 1, 10-13 (1986) (on Chilean engineers). For nontechnical accounts of the relevant engineering technolgies in the nineteenth century, see L. Vernon-Harcourt, *Achievements in Engineering During the Last Half Century* (1892); Archibald Williams, *How It Is Done; or, Victories of the Engineer* (1908); Richard Kirby & Philip Laurson, *The Early Years of Modern Civil Engineering* (1932).

[58]See e.g., G. Sawyer, "The Transandean Railway from Arica, Chile, to La Paz, Bolivia," 70 *EN* 1059 (1913) (built by the firm of Sir John Jackson [Chile] Ltd.).

[59]See e.g., "Railway Construction in Ecuador Just South of the Equator," 71 *EN* 1053, 1054 (1914).

[60]See "Mexico to Stop Hiring Foreign Engineers," 117 *ENR* 875 (1936); "Mexicans Move to Exclude American Engineers," 119 *ENR* 533 (1937).

[61]R. Joby, *The Railway Builders: Lives and Works of the Victorian Railway Contractors* 73 (1983). On why Britain's largest international builders—Brassey and Peto—rejected legal forms that would have limited their liability, see Middlemas, *Master Builders* at 98.

contractor. In performing the contracts that the governments of Chile and Peru had awarded him, Meiggs was constrained to purchase all the factors of production in the relevant markets, which were generally located outside the country of performance. If the state financed all of Meiggs's operations itself by hypothecating state revenues and guano sales in Europe in any event, what did Meiggs offer that Peruvians lacked? In Meiggs's own case they appear merely to have been wanting the ingenuity to devise the system of pyramiding bribes that Meiggs developed to "manage[] the men who managed Peru."[62]

The point made by the story of this one particular buccaneer is larger than its sordid context. In contrasting Victorian railway engineers and contractors, the social historian Asa Briggs inadvertently focuses on the latter's international raison d'être:

> [C]ontractors had to make their terms with governing classes in the cities, in Parliament, and in distant and difficult countries like Egypt and Mexico. A local contractor would have to learn how to handle the Mayor: an international contractor had to learn to handle Prince Couza or Porfirio Diaz. The engineer's skills came to depend more and more on the possession of expert knowledge, even though there was often long and bitter disagreement between...experts about answers to particular problems: the contractor's skills were more varied, requiring a combination of judgement and imagination. ... The skills could only be learnt through experience.... Four of the skills implied different kinds of judgement—first financial manipulation; second, knowledge of bricks and mortar, iron and steel; third, ability to handle a heterogeneous and often foreign labour force; and fourth, political capacity, measured not only by the winning of contracts but by the orderly and profitable completion of them.[63]

In short, the early international construction contractors were the archetypical Schumpeterian innovating entrepreneurs who

> revolutionize[d] the pattern of production.... To undertake such new things is difficult and constitutes a distinct economic function, first, because they lie outside of the routine tasks which everybody understands and, secondly, because the environment resists in many ways.... To act with confidence beyond the range of familiar beacons and to overcome that resistance requires aptitudes that are present in only a small fraction of the population and that define the entrepreneurial function....[which] does not consist in...inventing anything.... It consists in getting things done.[64]

The enormous competitive advantage of being a pioneer who has succeeded "in getting things done" cannot be neglected in this context. Where an enormously expensive infrastructure project such as a nineteenth-century railway or a twentieth-century hydroelectric dam or nuclear power plant involves obvious long-term multifaceted fundamental transformations of the natural, physical, and social-economic environments that are also perceived as capable of unleashing catastrophic damage,[65] the first firms to perform successfully are able to erect a reputational barrier to competition for orders from risk-averse purchasers eager to avoid the kind of "public, spectacular, visible" failure that would "reflect badly on the prestige of the country and its regime."[66]

---

[62]Stewart, *Henry Meiggs* at 110-15, 119, 158-64, 96, 263-70, 44-55 (quotation at 47).

[63]Asa Briggs, "Foreword," in Middlemas, *Master Builders* at 13, 15.

[64]Joseph Schumpeter, *Capitalism, Socialism and Democracy* 132 (1966 [1942]).

[65]See e.g., *Dams in Africa: An Interdisciplinary Study of Man-Made Lakes in Africa* (Neville Rubin & William Warren ed., 1968); 1 Edward Goldsmith & Nicholas Hildyard, *The Social and Environmental Effects of Large Dams: Overview* (1984).

[66]J.E. Goldthorpe, *The Sociology of the Third World: Disparity and Involvement* 151 (1975). Successful performance by a leading construction firm emphatically does not mean that it adopted a holistic ecological

This particular aspect of entrepreneurial innovation is well illustrated by the career of the overtowering figure of nineteenth-century British international railway constructors. In 1834, for example, when Brassey completed his first successful railway contract:

> The construction of railways...was...altogether a novelty, not only to him, but to all persons engaged in it. [I]t required new modes of operation, and the creation of skilled labour of a new kind; also the management of larger bodies of men than hitherto had been brought together for public works, and a more rapid movement of these *armies* of labouring men....[67]

Because George Stephenson, Britain's leading railway engineer, recognized that he could rely on Brassey's organizational talents, Brassey's career was launched. The experience and reputation thus gained then inspired Joseph Locke, the engineer in charge of the first British overseas railway project, to select Brassey to build the line in France over untested French contractors submitting untrustworthy bids.[68] Once such organizations had acquired extensive practical knowledge of the potential sources of miscalculation on bidding, it became difficult for invaders to underbid them without disastrous consequences for the safety of the finished product or the neophytes' finances.[69]

The oligopolistic structure of the world construction market in the twentieth century has often thrown into relief not so much the question as to why and how First World multinational firms compete with local Third World firms, but rather the fact that many of their projects would not be built at all in the absence of such penetration. For the nineteenth century, when contractors' organizations were much more primitive, the situation was much less clear cut; perhaps at most such projects would have been built but with some delay.[70]

Analysis of international oligopolistic competition is complicated by firms' linkages to and differential intervention by the various national states. Kindleberger has proposed a tripartite classification of firms operating outside the political borders of their head offices: the national firm with foreign operations, the multinational corporation, and the international corporation. The national firm, which is "[f]irst and foremost...a citizen of a particular country,...must earn a higher return on foreign than on home investment because the former is risky, the latter risk-free." The multinational firm, which "seeks to be a good citizen of each country where it has operations," accepts varying rates of profit. The international corporation, in contrast, which "has no country to which it owes more loyalty than any other,...equalizes the return on its invested capital in every country, after adjusting for risk which is free of the myopia that says home investment is automatically risk-free and all foreign investments are risky." Perceiving a tendency toward ultimate evolution into the international corporation, Kindleberger suggests that the latter "can develop as a monopolist or as an instrument of national goals, or it can operate in the cosmopolitan interest to spread

---

approach that anticipated and avoided numerous adverse environmental impacts, but simply that the narrow reductionist economic-technological goal, for example, of producing cheap electric power, was achieved without the short-term self-destruction of this particular element of the built environment. See Barry Commoner, "Summary of the Conference: On the Meaning of Ecological Failures in International Development," in *The Careless Technology: Ecology and International Development* xxi-xxix (M. Farvar & John Milton ed., 1972); Gilbert White, "Organizing Scientific Investigations to Deal with Environmental Impacts," in *id.* at 914-26.

[67]Helps, *Life and Labours of Mr Brassey* at 27.

[68]Joseph Locke, "Address of the President," 17 *MPICE* 128, 143 (1858).

[69]Helps, *Life and Labours of Mr Brassey* at 25-30, 58.

[70]See Stewart, *Henry Meiggs* at 345 (railways would have been built but later without Meiggs); Middlemas, *Master Builders* at 21, 45, 88 (infrastructure would have been built a decade later).

technology, reallocate capital, and enlarge competition.''[71]

From Brassey to Bechtel, global construction firms have always performed all three of these roles because as individual capitals seeking the greatest possible self-valorization they are also creators and agents of the world market. By incorporating new regions, products, and producers into the system of universal production for exchange and universal appropriation of nature, they demonstrate ''the great civilizing influence of capital.''[72] But the tendency of capital, including construction capital, to reproduce on an expanded scale of accumulation is common to all national capitals; consequently, they all seek to overcome their national overproduction crises through the world market, which in turn cyclically both counteracts and globalizes those national crises.[73] Individual capitalist and individual national advantage-seeking is inextricably bound up with the aforementioned civilizing influence: that linkage is the form in which the invisible hand operates on the world market.

Like large-scale manufacturing capital, which was driven to export its commodities and to invest abroad, Brassey and other large nineteenth-century contractors were ''compelled...to continuous activity'' outside of Britain and then outside of Europe in order to amortize their fixed capital: ''There was in fact no choice for him but to go on.''[74] In the most intense crises, such as that of 1866, which bankrupted Brassey's sometime partner, Peto, such capital had to be liquidated.[75] The quasi-monopoly that Brassey or Peto had forged in the non-European periphery offered an escape to ''secure profits'' from a domestic market competitively ruined by the presence of many small contractors ''who were content with profits on a scale too narrow to satisfy him or the enormous overheads of his organization.''[76]

Just as the nineteenth-century railway builders acted as agents both of the world market and of British capital in general by internationalizing in order both to amortize their capital and to maintain their accumulatable profit, so, too, late-twentieth-century construction firms have willy-nilly become bearers of internationalizing forces. Such world market forces, in turn, both favor the aggregate national capitals and states of which these firms are still constitutent components and promote the accumulation of new capitals in the erstwhile periphery, while creating the possibilities of crises on a global scale.[77]

These tensions created by the anarchy of private production for profit that is enmeshed in a universal social system are mirrored in the career trajectories of several pioneering British contractors, the results of whose activities on the programmatic level ''were as much random as planned: there was no...great conspiracy to subject countries to 'economic imperialism'....''[78] Yet in examining the details, their biographer inadvertently conceptualizes the systemic impact of the world market:

> Brassey became a determining figure in the economy of whole states; enticing

---

[71]Kindleberger, *American Business Abroad* at 180, 182, 183, 184.

[72]Karl Marx, *Grundrisse der Kritik der politischen Ökonomie (Rohentwurf) 1857-1858*, at 313 (1953).

[73]See Karl Marx, 3 *Das Kapital: Kritik der politischen Ökonomie*, in Karl Marx [&] Friedrich Engels, 25 *Werke* 247-50 (1964 [1894]); [Klaus] Busch, [Wolfgang] Schöller, [& Frank] Seelow, *Weltmarkt und Weltwährungskrise* 14 (1971).

[74]Middlemas, *Master Builders* at 59.

[75]See ''Messrs Peto, Betts, and Co.,'' *Economist*, June 16, 1866, at 698-99; Middlemas, *Master Builders* at 29-32, 105-10. Hedley Smyth, *Property Companies and the Construction Industry in Britain* 70-77 (1985), fails to grasp this connection for the nineteenth or the twentieth century.

[76]Middlemas, *Master Builders* at 91. On Brassey's organization, see *id.* at 42.

[77]See chapters 12-13 below.

[78]Middlemas, *Master Builders* at 24.

> them by the initial and enormous capital outlay to acquire a huge national debt and in the end to the necessity of creating national industries—forcing them to specialize in order to trade with the West and to make the railways pay: an economic determinant of far greater importance than he himself saw...; almost a random consequence....[79]

Consequently, these international infrastructuralists could no more escape the web of the world market than the raw-materials-producing countries in which they operated:

> In underdeveloped countries enormous tracts of land or controlling blocks of shares were to be part of the price paid, and the contractor's return could not...be in cash, but in increased land values, in the profits of colonization, in the growth of ports and of trade which increased the value of their holdings;...they had to be colonizers and gamble on the future needs of a world market....[80]

Late-twentieth-century policy-oriented discussions of the role of such multinational enterprises tend to avoid the linkages between national rates of profit and the dynamics of the world market. Instead, implicitly denying the assumption that a "business firm's behavior is determined by" requirements of profit maximization, "not by its nationality,"[81] national industrial policy advocates have formulated a dichotomized view of transnational firms. Over against the "pure multinational" or so-called denationalized firm—Kindleberger's "international" corporation—which seeks to maximize its own net earnings and hence "owes its allegiance to no particular country," these policymakers set the "national multinational." The latter type of firm "is pledged to promote the welfare of its home country's citizens." As "agents of their national economies," the national multinationals' "foreign investments are...geared to increasing the real wages" of their national working class.[82]

In light of the fact that even purely national firms do not categorically evince such quasi-eleemosynary behavior, it is unclear what mechanisms might be supposed to trigger this supra-class transmogrification of the firm once it has become drawn into the world market.[83] Although, again, from Brassey to Bechtel, construction firms have profitably served avowedly national goals in projecting the economic power of individual and collective capitalist customers and the political-economic and military power of their nation-state customers, these commercial engagements have always taken place within frameworks constrained by antagonistic national class and international politics.[84]

---

[79] *Id.* at 80.

[80] *Id.* at 80, 81. On such a concession in connection with the railway that Brassey and Wheelwright built in Argentina in the 1860s, see *id.* at 100-101.

[81] Stephen Hymer, "Direct Foreign Investment and the National Economic Interest," in *idem. The Multinational Corporation: A Radical Approach* 173 (1979 [1966]).

[82] Robert Reich, *The New American Frontier* 260-61, 263 (1983). On the possibility of internationally induced denationalization, see Ernest Mandel, *Der Spätkapitalismus* 306-307 (1973 [1972]).

[83] See e.g. Peter Drucker, *The New Society: The Anatomy of Industrial Order* (1962 [1949]). For evidence that Japanese firms have begun to be forced to abandon the role that Reich ascribes to them, see Andrew Pollack, "Japan's Companies Moving Production to Sites Overseas," *NYT*, Aug. 29, 1993, sect. 1, at 1, col. 3 (nat. ed.).

[84] See chapters 4-9, 12 below.