Journal of Global History (2009) 4, pp. 33–56 © London School of Economics and Political Science 2009
doi:10.1017/S1740022809002940

'Rich flames and hired tears': sugar, sub-imperial agents and the Cuban phoenix of empire

Jonathan Curry-Machado
Caribbean Studies Centre, London Metropolitan University, 166–220 Holloway Road, London N7 8DB, UK
E-mail: j.currymachado@londonmet.ac.uk

Abstract

This paper analyses the importation of foreign steam technology into Cuba in the course of the nineteenth century, and the experience of the migrant workers employed to operate it, in order to focus not on Cuba as an isolatable entity, but existing in the context of transnational networks that were involving the island in processes of globalization. This was, at the outset, a 'sub-imperial' globalization, operating independently, and implying liberation, from empire. The search for new technologies to enable improvements in sugar production necessarily took the Creole elite beyond the restricted possibilities of the Spanish empire to the industrial centres of the United States, Britain, and France. Such new links helped fuel the emergence of an independent Cuban identity; however, the same globalizing tendencies that were eroding the Spanish empire led Cuba into new forms of imperial domination. The increasing expense of the new steam technology necessitated a growing dependence upon investment from foreign merchant banks, which gradually assumed control over much of the island's production and trade. The same migrant engineers who had begun by assisting Cuban planters took on the role of agents for foreign companies. Rather than contributing their skills, as one more group of migrants in a nation formed out of multiple migrations, these engineers asserted their foreign identity and guarded their privileged position. They came to be seen as symbolic of the process by which Cuba shook off the Spanish yoke only to replace it with another.

'I write hurriedly and very late as I have just returned from a 2 days jaunt ... of a ride of 108 miles in the hot sun alternating with tropical rains', wrote Charles Edmonstone from Cuba in 1861. He continued:

> Some of the agents here assert that neither storm or sun has an effect on me. I am so wirey that I have offered to bet that I will kill any 5 horses that can be brought me without rest to myself and one after another with fair fatigue. Today they find me at Cienfuegos, next day at Villa Clara, next day at Sagua and two days after at San Juan de los Remedios.[1]

Edmonstone was a migrant engineer, one of many such skilled workers who came to Cuba in the course of the nineteenth century to install, run, and maintain the steam-powered

1 Museo de la Ciudad, Havana, Fondo Moreno Fraginals (henceforth MC, MF) 234/28/5.

machinery that was being introduced into the Cuban sugar industry, helping to turn the island into the world's leading sugar producer.[2] Although he was British-born, the activities of Edmonstone – and others like him coming from the North Atlantic industrial centres – reveal an independence from the narrow national concerns of the respective imperial powers from which they came, happily filling orders 'in the United States, England or wherever the buyer wishes to give his preference'.[3] Just like the diasporic merchants through whom much capital investment and external trade occurred,[4] these migrants demonstrate the globalizing processes, developing beneath the bounds of conflicting imperial projects, that were eroding Cuba's identity as a Spanish colony. At the same time that they were contributing to the island's liberation, however, they were also helping to lay the foundations for new manifestations of imperial control.

Despite the tendency for Cuban historiography to focus upon the developing national project, this has generally been done within an implicitly transnational context, with many historians seeing how the nation emerged not in isolation but in reaction to competing imperial designs over the island.[5] Others have focused on the economic aspects, in particular the island's dependency on sugar[6] and the imperialism resulting from this.[7] The strongest analyses have looked beyond the national boundaries to take a regional approach,[8] in which the geopolitical rivalries of the Atlantic powers provides the context for understanding the history not just of Cuba but of the Spanish Caribbean as a whole in the nineteenth century.[9] In this paper I take such approaches further, through the case of the importation of steam technology into Cuba in the course of the mid nineteenth century and the experience of the migrant workers employed to operate it. Here the focus is not on Cuba as an isolatable entity but within the context of transnational networks that were involving the island in processes of globalization.[10] However, rather than seeing these processes as the consequence of imperial designs, I argue that this was, at the outset, a 'sub-imperial' globalization, operating independently, and implying liberation, from empire.

---

2 Jonathan Curry-Machado, 'Indispensable aliens: the influence of engineering migrants in mid-nineteenth-century Cuba', PhD thesis, London Metropolitan University, 2003.

3 MC, MF 234/27/1.

4 Roland T. Ely, *Comerciantes cubanos del siglo XIX*, Havana: Editorial Librería Martí, 1960; Philip D. Curtin, *Cross-cultural trade in world history*, Cambridge: Cambridge University Press, 1984.

5 Herminio Portell Vilá, *Historia de Cuba en sus relaciones con los Estados Unidos y España*, 4 vols., Havana: Jesús Montero, 1938–41; Jorge Ibarra, *Nación y cultura nacional*, Havana: Editorial Letras Cubanas, 1981; Manuel Moreno Fraginals, *Cuba/España: España/Cuba*, Barcelona: Crítica, 1995; Christopher Schmidt-Nowara, *Empire and antislavery: Spain, Cuba, and Puerto Rico, 1833–1874*, Pittsburgh, PA: University of Pittsburgh Press, 1999.

6 Ramiro Guerra y Sánchez, *Azúcar y población en las Antillas*, Havana: Editorial de Ciencias Sociales, 1970 [1927].

7 Oscar Zanetti and Alejandro Garcia, eds., *United Fruit Company: un caso de dominio imperialista*, Havana: Editorial de Ciencias Sociales, 1976.

8 José Benítez, *Las Antillas: colonización, azúcar e imperialismo*, Havana: Casa de las Américas, 1977.

9 Luis Martínez-Fernández, *Torn between empires: economy, society and patterns of political thought in the Hispanic Caribbean, 1840–1878*, Athens, GA: University of Georgia Press, 1994.

10 Jonathan Curry-Machado, 'Sin azúcar no hay país: the transnational counterpoint of sugar and nation in nineteenth-century Cuba', *Bulletin of Hispanic Studies*, 84, 1, 2007, pp. 18–21.

There are a number of uses of the term 'sub-imperial', elements of which can be seen in this Cuban case. On the one hand, it can be a description of the way in which 'white settler states acquired more autonomy from the "mother country" and acted as partners in the exercise of imperial power'.[11] The term was first employed in this way in the early 1970s by the Brazilian economist Ruy Mauro Marini, to describe the way in which Brazil aspired to become a regional power, not merely succumbing to imperial dictates (in this case from the United States) but 'rather of collaborating actively with imperialist expansion, assuming in this expansion the position of a key nation'.[12] Among historians of the British Empire, the term came to be employed in a variety of contexts, in particular with reference to South African white settlers: 'Such colonies articulated their own interests, which did not always synchronize with metropolitan imperial policy and developed an "internal" colonial relationship with indigenous peoples'.[13] But these 'indigenous peoples' themselves have sometimes come to act in a 'sub-imperial' manner, as in India, where the economically and politically expansive interests of local elites continued to come into conflict with the interests of the metropolitan British presence and control.[14]

In Cuba, the growth in sugar production from the end of the eighteenth century saw the emergence of a Creole elite who sought the development of the island. They did so in what could be described as a 'sub-imperial' way, as they strived to define themselves in a manner that was distinct from that of the Spanish, developing the sugar industry in pursuit of their own interests, and pushing the frontier of their cane-growing activities and control ever further down the island. As with the white settlers in South Africa, this entailed a different, more exploitative relationship, not with the 'natives' (who had been all but eradicated from Cuba – or thoroughly absorbed – by the nineteenth century) but with the black slaves upon whom they depended for labour.[15] The search for new technologies to enable improvements in sugar production necessarily took them beyond the restricted possibilities of the Spanish empire to the industrial centres of the United States, Britain, and France.

---

11 Barbara Bush, *Imperialism and postcolonialism*, London: Pearson Eduction, 2006, p. 45.

12 Ruy Mauro Marini, 'Brazilian "interdependence" and imperialist integration', *Monthly Review*, 17, 7, 1965, p. 21. Marini appears to have first employed the term 'sub-imperial' to describe such processes in 'Brazilian sub-imperialism', *Monthly Review*, 23, 9, 1972, pp. 14–24. The term was more recently resurrected as the Brazilian economy grew, along with its regional influence (Daniel Zirker, 'Brazilian foreign policy and subimperialism during the political transition of the 1980s: a review and reapplication of Marini's theory', *Latin American Perspectives*, 21, 1, 1994, pp. 115–31; Matthew Flynn, 'Between subimperialism and globalization: a case study in the internationalization of Brazilian capital', *Latin American Perspectives*, 34, 6, 2007, pp. 9–27.

13 Bush, *Imperialism and postcolonialism*, p. 45. See also Robert Ross, *Adam Kok's Griquas: a study in the development of stratification in South Africa*, Cambridge: Cambridge University Press, 1976; P. R. Warhurst, 'Smuts and Africa: a study in sub-imperialism', *South African Historical Journal*, 16, 1984, pp. 82–100; Timothy Keegan, 'The making of the Orange Free State, 1846–1854: sub-imperialism, primitive accumulation and state formation', *Journal of Imperial and Commonwealth History*, 17, 1, 1988, pp. 26–54; Hew Strachan, *The First World War in Africa*, Oxford: Oxford University Press, 2004. Patrick Bond has more recently shown how the term can also be applied to post-apartheid South Africa: 'The ANC's left turn and South African sub-imperialism', *Review of African Political Economy*, 31, 102, 2004, pp. 599–616; idem, 'Bankrupt Africa: imperialism, sub-imperialism and financial politics', *Historical Materialism*, 12, 4, 2004, pp. 145–72.

14 Robert J. Blyth, *The empire of the Raj: India, eastern Africa and the Middle East, 1858–1947*, Basingstoke: Palgrave Macmillan, 2003.

15 See, for example, Christopher Schmidt-Nowara, *The conquest of history: Spanish colonialism and national histories in the nineteenth century*, Pittsburgh, PA: University of Pittsburgh Press, 2006.

On the other hand, 'sub-imperialism' can also be taken to mean a different set of processes, whereby migrants coming from metropolitan powers to colonial societies benefited from their sojourn in these lands, not as imperial representatives (even if they often held formal official positions) but rather in their own individual or collective interests, 'even against the declared will of their governments in Europe'.[16] In the Cuban case, we can see how, in the mid nineteenth century, the sugar plantation owners were assisted in their efforts to develop their industry both by the migrant engineers who accompanied the new machinery and also by the often foreign-born merchants who enabled the island's involvement in the transnational commercial networks through which sugar was exported and industrial goods imported. Such tendencies made Spanish dominion over Cuba increasingly irrelevant and helped fuel both the emergence of an independent Cuban identity and the explosion of the independence struggle after 1868.

However, the same globalizing tendencies that were eroding the Spanish empire were causing Cuba to fall into new forms of imperial domination. Already in the mid nineteenth century, the 'sub-imperial' migrants had come to act as the conduit through which Cuban planters (along with the island's industry and economy) became subjugated to new imperial forces. The increasing expense of the new steam technology led to a growing dependence upon investment from metropolitan merchant banks, which gradually assumed control over much of the island's production and trade. Despite some efforts to develop indigenous industry, Cuba remained dependent upon imported technology. The same migrant engineers who had begun by assisting Cuban planters took on the role of agents for North American and European engineering companies. Rather than contributing their skills, as one more group of migrants in a nation formed out of multiple migrations, engineers such as Charles Edmonstone tended to assert a 'foreign' identity[17] and guarded their privileged position; alongside the advantages of which they became singled out negatively, pointed to as convenient scapegoats, and seen as symbolic of the process by which Cuba shook off the Spanish yoke only to replace it with another.[18] Just as the phoenix emerges reborn from the flames that consumed it, so too did empire in Cuba from that which at one time appeared to be hastening its demise.

Sugar and technological advances

Although sugar production first began in Cuba in the sixteenth century, it remained a small-scale business until the final years of the eighteenth century, when Cuba found itself particularly well placed to benefit from the vacuum in the world sugar market resulting from revolution in neighbouring Saint Domingue.[19] This occurred at a time of growing world

16 Trutz von Trotha, 'Colonialism', in Stefan Berger, ed., *A companion to nineteenth-century Europe, 1789–1914*, Oxford: Blackwell, 2006, p. 439.

17 Curry-Machado, 'Indispensable aliens', pp. 209–13.

18 Jonathan Curry-Machado, 'Privileged scapegoats: the manipulation of migrant engineering workers in mid-nineteenth century Cuba', *Caribbean Studies*, 35, 1, 2007, pp. 207–45.

19 Benítez, *Las Antillas*, pp. 136–8; Julio Le Riverend, *Historia económica de Cuba*, Havana: Editorial de Ciencias Sociales, 1967, p. 161; Sherry Johnson, *Social transformation of eighteenth-century Cuba*, Gainsville, FL: University Press of Florida, 2001.

demand for sugar, as it became an increasingly important element of proletarian diets in Europe and North America.[20] Thus, sugar prices rose rapidly, making an expansion in cane fields particularly attractive for Cuban planters who had previously devoted most of their land to coffee.[21] The rise in Cuban sugar production was later assisted by the crisis in the British West Indies following slave emancipation,[22] at a time when, despite the outlawing of the slave trade, the use of chattel labour in Cuba intensified.[23]

As a result, by the mid nineteenth century Cuba had become the world's leading sugar producer, accounting for more than 40% of all cane sugar,[24] with the island's importance seen not only in quantity of production but also in the quality of the sugar, it 'being of a dry, firm grain [and] therefore always sold readily and at good prices'.[25] This period saw the establishment of large numbers of new plantations and sugar mills, with the sugar frontier moving inexorably down the island.[26] The scale of production likewise increased, with the average output per mill growing from just 72 tons a year in 1830 to 316 tons by 1860,[27] with the largest producing as much as 3,000 tons in a single harvest.[28] Sugar came to dominate not only land use but also Cuba's trade. Between 1827 and 1846, sugar and its derivatives made up almost two-thirds of the island's exports, bringing with it considerable wealth to those in a position to benefit.[29] Although excluded from political power by the Spanish, prominent Cuban families, with fortunes accumulated from expanding sugar plantations, dominated not just rural society[30] but national life in general. This new economic elite was instrumental in the emergence of liberal, modernizing bodies, in particular the *Real Consulado* and the *Sociedad Económica de Amigos del País*, through which Enlightenment influences and scientific advances from Europe and North America found their way into Cuba.

---

20 Sidney W. Mintz, *Sweetness and power: the place of sugar in modern history*, New York: Penguin, 1985, pp. 74–150.

21 Louis A. Pérez Jr, *Cuba: between reform and revolution*, 2nd edn, New York: Oxford University Press, 1995, pp. 71–4.

22 Michelle Harrison, *King Sugar: Jamaica, the Caribbean and the world Sugar economy*, London: Latin America Bureau, 2001, p. 107; William A. Green, *British slave emancipation: the sugar colonies and the great experiment, 1830–1865*, Oxford: Clarendon Press, 1976.

23 Ramiro Guerra y Sánchez et al., *Historia de la nación cubana*, Havana: Editorial Historia de la Nación Cubana, 1952, p. 78; Franklin W. Knight, *Slave society in Cuba during the nineteenth century*, Madison, WI: University of Wisconsin Press, 1970, p. 24.

24 Manuel Moreno Fraginals, *El ingenio: complejo económico social cubano del azucar*, vol. 3, Havana: Editorial de Ciencias Sociales, 1978, pp. 35–7; Alan Dye, *Cuban sugar in the age of mass production: technology and the economics of the sugar central, 1899–1929*, Stanford, CA: Stanford University Press, 1998, p. 27.

25 Richard McCulloh, *Reports of the Secretary of the Treasury of scientific investigations in relation to sugar and hydrometers*, Washington, DC: Wendell and Van Benthuysen, 1848.

26 Levi Marrero, *Cuba: economía y sociedad*, Madrid: Editorial Playor, 1973–86, vol. 10, p. 278; Moreno Fraginals, *El ingenio*.

27 Pérez, *Cuba*, p. 75.

28 Benítez, *Las Antillas*, p. 200.

29 Marrero, *Cuba*, vol. 12, p. 115.

30 Laird W. Bergad, *Cuban rural society in the nineteenth century: the social and economic history of monoculture in Matanzas*, Princeton, NJ: Princeton University Press, 1990.

They also went out of their way to facilitate the introduction of the latest advances in steam technology and sugar-milling machinery, originally developed in eighteenth-century Britain for cotton manufacture but subsequently adapted to the demands of other industries and gradually extended to other countries, in large part through the migration of engineers.[31] These enabled an intensification in production and processing, along with a considerable improvement in the global transport of commodities.[32] Sugar, for all that it was an agricultural product, was – because of its need for some form of industrial processing to be turned into a usable, and marketable, product – particularly suited to the application of such technological advances. The high profitability of sugar production in the nineteenth century also provided this industry with the wherewithal to sponsor further improvements.[33] In Cuba, the earliest use of a steam engine connected to a sugar mill was not until the 1790s.[34] Joaquín de Santa Cruz purchased an engine from London for his 'Ceibabo' estate in 1796[35] and, although this does not seem to have met with much success, interest in exploring the application of steam technology on Cuban sugar estates did not wane.[36] By 1819, Pedro Diago was able to process an entire year's harvest using a steam-driven mill,[37] and his example encouraged other leading planters, many of whom had likewise installed steam engines by the 1830s.[38]

It quickly became evident how irrelevant Spain had become to the island's development. For example, in 1851 attempts were made by the authorities to facilitate the purchase of a first-class steam engine from Spain, out of a desire to stimulate Spanish rather than foreign industry,[39] news having reached them that engines were built there just as well and solidly as in other countries. However, when enquiries were made, the best they could come up with was a factory that boasted to be able to build any sugar mill, so long as they were given the details of the steam engine to be used – the implication being that they would be unable to supply this themselves.[40] The reality was that steam engines, and almost all other sugar machinery, had to be obtained from the industrial centres of Great Britain, the United States, and France. New York, Glasgow, Liverpool, and Le Havre – the port cities that

31 David J. Jeremy, *Transatlantic industrial revolution: the diffusion of textile technologies between Britain and America, 1790–1830s*, Cambridge, MA: MIT Press, 1981.

32 See, for example, Richard L. Hills, *Power from steam: a history of the stationary steam engine*, Cambridge: Cambridge University Press, 1993; and Joel Mokyr, *Lever of riches: technological creativity and economic progress*, New York: Oxford University Press, 1990.

33 On the general development of the sugar industry, see Noel Deerr, *The history of sugar*, 2 vols, London: Chapman & Hall, 1949–50; and J. H. Galloway, *The sugar cane industry: an historical geography from its origins to 1914*, Cambridge: Cambridge University Press, 1989.

34 'Proyecto sobre mejorar la máquina de exprimir caña', Biblioteca Nacional 'José Martí', Havana (henceforth BNJM), C.M. Sociedad Económica 15/21.

35 BNJM, C.M. Pérez Beato, legajo 12; Marrero, *Cuba*, vol. 10, pp.158–9.

36 Moreno Fraginals, *El ingenio*, vol. 1, p. 87.

37 Portell Vilá, *Historia de Cuba*, vol. 1, p. 199.

38 Jacobo de la Pezuela y Lobo, *Diccionario geográfico, estadístico, histórico de la isla de Cuba*, vol. 1, Madrid: Imprenta del Establecimiento de Mellado, 1863, p. 58.

39 *Anales de las Reales Junta de Fomento y Sociedad Económica de la Habana*, 4, 1851, p. 247.

40 Archivo Nacional de Cuba, Havana (henceforth ANC), Fondo Gobierno Superior Civil (henceforth GSC) 372/14200.

together formed the nexus for nineteenth-century Atlantic commerce – were also the principal centres for the engineering industry and the source of most of the steam engines and other machinery imported into Cuba.[41]

The first steam-powered mills to be introduced in Cuba came from such British engineering companies as Fawcett Preston of Liverpool;[42] even in the mid nineteenth century, despite growing competition from other countries, it could be boasted that 'we must still believe that English engineers are to carry out the majority of the great works of improvements in all countries where engineering talent is not indigenous'.[43] As late as the 1870s, over 90% of cane-crushing mills bought in Puerto Rico came from Britain, with just 15 of a total of 294 bought in the United States.[44] However, by the 1830s and 1840s, US engineering firms were making innovations in technology, taking it in different directions to that of the British, in particular through the development of higher pressure engines.[45] New York engineering firms such as the Novelty Iron Works and the Matteawan Works became important producers of stationary steam engines of the kind that might be applied to sugar mills,[46] and from the late 1830s the West Point Foundry established its reputation among those planters more inclined to look to the north than to Europe.[47] As a result, for all that British engineering continued to be influential in Cuba, by the 1840s the United States was becoming established as the principal provider of sugar machinery.[48]

Luis Martínez-Fernández argues that development in Cuba during this period was broadly defined by the pressures and influences exerted by the rival imperial powers that were vying for regional hegemony.[49] However, although the machinery that was acquired in the development of the Cuban sugar industry came from the factories of these competing powers, the initial impulse for its introduction in Cuba came not from attempts by these powers to challenge Spanish control over the island but from the Cuban planters themselves seeking to satisfy Cuba's developmental needs by accessing the latest technological advances. Prominent landowners became students of milling and refining technology, eagerly learning from all such developments and exploring how to apply them to their own industry – not in a slavish attempt to mimic the ideas and practices of Europeans

41 Paul Butel, *The Atlantic*, London & New York: Routledge, 1999, pp. 223–33.

42 A. A. Ramos Mattei, 'The role of Scottish sugar machinery manufacturers in the Puerto Rican plantation system, 1842–1909', *Scottish Industrial History*, 8, 1, 1985, p. 21; Moreno Fraginals, *El ingenio*, vol. 1, pp. 207–8.

43 *The Engineer*, 12 November 1858, p. 376.

44 Ramos Mattei, 'The role of Scottish sugar machinery', p. 20.

45 David J. Jeremy, 'Innovation in American textile technology during the early 19th century', *Technology and Culture*, 14, 1, 1973, pp. 40–76; David J. Jeremy and Darwin H. Stapleton, 'Transfers between culturally-related nations: the movement of textile and railroad technologies between Britain and the United States, 1780–1840', in David J. Jeremy, ed., *International technology transfer: Europe, Japan and the USA, 1700–1914*, Aldershot: Edward Elgar, 1991, pp. 31–48.

46 Carroll W. Pursell, *Early stationary steam-engines in America: a study in the migration of a technology*, Washington DC: Smithsonian Institution Press, 1969; Louis C. Hunter, *A history of industrial power in the United States, 1780–1930, Vol. 2: steam power*, Charlottesville, VA: University Press of Virginia, 1985.

47 Ramos Mattei, 'The role of Scottish sugar machinery', p. 21.

48 Martínez-Fernández, *Torn between empires*, p. 84.

49 Ibid.

and North Americans, but because they recognized in this both the potential to further their own individual interests and also the possibility of collectively pulling the island out of the feudal and protectionist past of Spanish dominion into the modern age of industrial production and globalizing trade. For example, in 1849, Joaquín de Ayesterán became the first planter to install centrifuges in a Cuban mill,[50] just five years after the first ever demonstration of the use of a centrifuge for separating sugar crystals, in Germany.[51] In 1850, he travelled to Europe, visiting Liverpool, Birmingham, and Paris, and returned to Cuba with the materials and machines that he needed to modernize his 'Amistad' estate.[52]

During the mid nineteenth century, the use of steam in Cuba's sugar mills became generalized, with 70% using steam engines by 1860, up from just 20% in 1846.[53] Advances were introduced in all aspects of sugar production, so enabling the improvements in quality for which Cuban sugar became renowned.[54] Accelerated sugar production also required improved transport, and this led to the development (again using mainly British and North American technology) of an extensive rail network – the sixth in the world to be constructed, several years before that in Spain itself – and steam-boat routes.[55] Although leading to the importation of large quantities of machinery, far from originating in a process of imperial penetration of the Cuban market by foreign producers, the initial impulse for this came from Cuba itself, through personally established networks. Not only did this enable the development of Cuba's sugar production and infrastructure through inclusion in the globalizing distribution of new technologies but it also enabled the engineering companies themselves to further extend the reach of their products, far beyond the bounds of their respective national empires. In the initial years, this occurred not through the unequal exchanges characteristic of economic imperialism but through the equal interchange between Cuban planters and foreign machine manufacturers, in a process that sidelined Spanish imperial control over the island.

Migrant engineers and transnational development

This new machinery required specialized labour for its installation, operation, and maintenance, and Cuba lacked workers with the necessary skills.[56] As a result, 'with steam engines came mechanics, who were mostly foreigners':[57] 'every mill, every steam boat, every train

50 Manuel Moreno Fraginals, *The sugarmill: the socio-economic complex of sugar in Cuba, 1760–1860*, New York: Monthly Review Press, 1976, p. 117.

51 Geoffrey Fairrie, *Sugar*, Liverpool: Fairrie & Co., 1925, p. 168.

52 BNJM, Lobo 108, vol. 3, file 2.

53 Martínez-Fernández, *Torn between empires*, p. 98; Bergad, *Cuban rural society*, p. 90; Marrero, *Cuba*, vol. 10, p. 159.

54 Moreno Fraginals, *El ingenio*; Dye, *Cuban sugar*; Curry-Machado, 'Indispensable aliens'.

55 Oscar Zanetti and Alejandro García, *Caminos para el azúcar*, Havana: Editorial de Ciencias Sociales, 1987.

56 Bergad, *Cuban rural society*, pp. 121–2.

57 Fé Iglesias García, 'The development of capitalism in Cuban sugar production, 1860–1900', in Manuel Moreno Fraginals, Frank Moya Pons, and Stanley L. Engerman, eds., *Between slavery and free labor: the Spanish-speaking Caribbean in the nineteenth century*, Baltimore, MD: The Johns Hopkins University Press, 1985, p. 58.

locomotive has to have with it an intelligent foreigner to direct and inspect the engine'.[58] Such skilled workers were generally looked for in the same countries that produced the machinery. Often orders included a condition that appropriate technicians be sent at the same time 'to put together that machinery and remain in charge of it'.[59] For example, when two steam boats to be used in Matanzas Bay were bought in New York from the Novelty Iron Works, it was stipulated that the factory should provide two trustworthy engineers skilled in their operation.[60] Likewise, when locomotives were acquired from Philadelphia for the Cárdenas to Bemba railway in 1839, it was requested that they should come with 'a man who knows how to direct them'.[61]

Even when there were engineering workers available locally, there was often a preference shown by planters to engage those recommended by the manufacturers, who had proven experience with the specific machines that they were installing. They would also be recruited on behalf of planters and other employers through agents placed in countries such as Britain and the United States. In 1838, the chief engineer of the Havana–Güines line ordered four locomotives from Britain. He requested that Alexander Robertson, who was acting as both the chief investor and British agent of the rail company, also find, along 'with duplicates of machinery', four engineers 'and as many machinists or men who understand the repair and construction of Locomotives'.[62]

The number of engineering workers in these countries increased greatly during the nineteenth century;[63] and, although such workers were among the better paid, lived in less cramped conditions, and had least recourse to the workhouse, for many, poverty and job insecurity continued to be a threatening presence.[64] With the exportation of machinery around the world came an extension of the well-established tramping tendencies of engineering workers.[65] While there were those who travelled to Cuba intentionally, often with pre-arranged jobs, others arrived almost by accident, as they pursued journeys from one job and place to another. For example, William Bisby had passed through a wide selection of jobs in the United States, before accepting a position on a steam ship. This opened up to him the possibility of travelling overseas in search of work, prompted by the unstable prospects that he had experienced back home, eventually leading him into employment in Cuba.[66]

58 Francisco de Paula Serrano, in *Memorias de la Sociedad Económica de la Habana*, 11, 1840, p. 240.

59 British Parliamentary Papers 1841, I, vii, pp. 88–9.

60 Archivo Histórico Nacional, Madrid (henceforth AHN), Ultramar, Cuba/Fomento (henceforth UCF) 35/2, no. 35.

61 *Diario de la Habana*, 24 November 1839.

62 ANC, Real Consulado y Junta de Fomento (henceforth RCJF) 131/6412.

63 Eric Hobsbawm, *Industry and empire*, London: Penguin, 1969, p. 117.

64 Geoffrey Crossick, *An artisan elite in Victorian society: Kentish London, 1840–1880*, London: Croom Helm, 1978, pp. 110–3; John Belchem, *Industrialization and working class: the English experience, 1750–1900*, Aldershot: Scolar Press, 1990, p. 156.

65 Eric Hobsbawm, *Labouring Men: Studies in the History of Labour*, London: Weidenfeld & Nicolson, 1986.

66 ANC, Comisión Militar (henceforth CM) 51/1, pp. 416–29.

A lively internal labour market for engineering workers quickly developed in Cuba, as burgeoning sales of steam engines and steam machinery brought a rapid increase in their demand – ranging from the more highly skilled, capable of constructing the machinery and even contributing to its further development, through those who operated and maintained it, to those with less specialized skills, employed in urban workshops and foundries. Those already established in the island provided a route in for others eager to work there, often seeking out opportunities for them. It was in this way that William Whitehorn left Britain 'in order to fit up machinery in Cuba', contracted by the veteran engineer Edward Beanes.[67] Joel Watts travelled to Cuba having been assured by Henry Elkins, who was already established on a sugar estate, that he would have secure employment there. On his arrival, this job proved not to exist, but he nevertheless found work in the foundry in Havana. Between 1843 and 1852, 622 migrant engineers are recorded as having settled in the island[68] – or 22% of all migrants so applying –and their numbers were likely to have been increased to a certain extent by those who only travelled to the island seasonally.[69] With at least 943 sugar mills using steam by 1860,[70] along with the spreading rail network, mines, and urban foundries and workshops, although there were a growing number of Cuban and Spanish engineers employed, it is probable that the number of migrant engineers continued to expand.

By the 1860s, this job market was well established, with migrant engineering workers often passing from one job to another by word-of-mouth recommendations,[71] by placing adverts in the local press, or by directly approaching potential employers. As more and more gained experience of Cuba, their presence made the necessity for the engine manufacturers to provide artisans less pressing. As early as 1838, the planter Pedro Diago told William Kemble of the West Point Foundry that he would not need him to send out anybody with his new machinery, since he was already in agreement with the man who had mounted the machinery of a neighbouring mill, 'and this one has the advantage for me that he speaks Spanish, and has experience of this country'.[72] Although Baring Brothers intended to send a favourite engineer of theirs to oversee the installation of the new steam engine and mill on the 'Arroyo' estate,[73] he himself declined the position, recommending that they should simply employ the engineer already working there, 'saying he knew he was as competent as any man we could find'. Besides, he had no need to accept, since he had more than sufficient engagements to keep him occupied.[74]

Far from all being members of a clearly defined trade, mid nineteenth century migrant engineers came from an industrial milieu that brought together 'Engineers, Machinists,

67 National Archives, London (henceforth NA), FO 72/830, no. 6; NA, FO 72/830, no. 24.

68 ANC, Miscelénea de Libros (henceforth ML) 11080 and 11910; also AHN, UCF 30/2, no. 2.

69 Curry-Machado, 'Indispensable aliens'.

70 Carlos Rebello, *Estados relativos a la producción azucarera de la Isla de Cuba*, Havana: publisher unknown, 1860.

71 BNJM, Sociedad T.34, no. 1a.

72 BNJM, Lobo 111, vol. 3.

73 Barings Archive, London (henceforth BA), LB 22, no. 231.

74 BA, HC 4.6.10, no. 65.

Millwrights, Smiths, and Pattern Makers', the boundaries between which were far from clear.[75] Unfortunately, Cuban and Spanish records from the mid nineteenth century tended to use fairly indiscriminately and interchangeably the terms *maquinista* (machinist), *ingeniero* (engineer), and *mecánico* (mechanic) to describe foreign artisans who may have ranged greatly in the level of skill that they possessed. Nevertheless, it is probable that the majority of those who worked in the sugar mills necessarily demonstrated sufficient skill not only to be left in sole charge of expensive machinery and ensure its smooth operation but also to maintain it and have the wherewithal to carry out, or otherwise guarantee, the necessary repairs.

So long as the machinery was running smoothly, the job of a sugar-mill engineer was a relatively relaxed one. Even during the grinding season, when they supposedly had little free time because their full attention was required – and even more so during the other six months of the year when there was relatively little work to be done at the mill, beyond routine maintenance – such workers had much opportunity to turn their attention to more than merely keeping existing engines in operation. Manuel Moreno Fraginals – who, from the 1960s, set the scene for the study of the Cuban sugar industry – asserted that 'the slave had no contact with the engine'.[76] However, even when there was only one engineer employed by a sugar estate, he would not be expected to do all the machine-related work. For all that most slaves were employed in the unskilled manual labour of the fields and mills, there was nevertheless an important elite of slaves trained and skilled in artisan trades. For example, on the 'Palma' estate, of the seventy-five adult male slaves, eleven had trades and two of these were engaged in engineering duties.[77] Such slaves were considered to have a market value considerably higher than that of others. In 1844, when troops killed seven slaves and arrested three others on Theodore Phinney's estate, accusing them of involvement in a conspiracy for an uprising, one of these was listed as an engineer/blacksmith, worth $5000 – twenty times the average price for a male slave.[78] On the 'Flor de Cuba' estate, the slave Juan was known by all as '*el maquinista*' and had a close working relationship with the foreign engineer.[79] Just as the migrant engineers were privileged among free workers, so too were the slave engineers among their fellow slaves, with the foreign engineers often showing them a level of trust that was highly unusual on slave plantations. For example, whenever Henry Elkins left the estate on which he worked, he always felt confident in leaving the engine in charge of the slave Juan Lucumí;[80] and there were many cases in which the engineers would encourage the slaves appointed to work under them to learn the trade well, so that one day they would be able to practise it in their own right.[81]

75 Modern Records Centre, Warwick, MSS 259/2/1/1, Amalgamated Society of Engineers, Quarterly reports, September 1853, and Annual branch reports, 1853.

76 Fraginals, *El ingenio*, vol. 1, p. 213.

77 Bodleian Library, Oxford, Henry E. Emerson Papers (henceforth BL, HEE), MSS Span c. 3, 'La Palma' Estate Book 3.

78 NA, FO 72/664, no. 19, letter from Theodore Phinney to British Consul, Joseph Crawford, Havana, 29 June 1844; Bergad, *Cuban rural society*, p. 203.

79 ANC, CM 63/9.

80 ANC, CM 51/1, pp. 260–2.

81 Ibid., pp. 84–5.

This situation meant that many of the migrant engineers on the sugar estates were able to accrue not just their own capital, thanks to their high income, but also time to engage in other activities. The experience that they acquired in Cuba provided them with the knowledge and skills necessary to make contributions themselves to further technological development. For example, Ezra Dod invented, while working on Cuban sugar estates, a 'tubular juice heater', which 'worked with the exhaust steam of the mill engine as the estate had no multiple effect'; an 'upright tube vacuum pan'; and a new housing for the mill, successfully demonstrating the advantages to be gained by placing the cane carrier in such a way as to ensure that the cane entered at right angles to the mill rollers.[82]

Seasonal employment also enabled engineers to divide their time between work in Cuba and leisure in the United States or Europe. It was very common for planters to take advantage of such trips to use them as agents charged with placing orders with factories for new machinery and parts.[83] Although most planters had commercial agents representing them, it was felt that these skilled workers were most effective in such a role, since they could give very precise specifications to the manufacturers.[84] Thus, when Henry Elkins travelled back to Britain in 1843 to spend the summer, he placed orders directly with the leading Liverpool firm of sugar-machine manufacturers, Fawcett Preston.[85] In June 1840, Frederick Shuck, who worked on Francisco Diago's 'Caunabaco' estate, left for the United States carrying a letter of introduction from his employer to the latter's commercial representative in New York, requesting him to place an order at the West Point Foundry according to the specifications given by Shuck, who was to return to Cuba in September.[86]

The initial stimulation for Cuba's involvement in the technology-driven globalization that was underway in the nineteenth century might have come from the desire of Cuban planters to develop sugar production, thus increasing their own fortunes. However, the migrant engineering workers that this required quickly became the agents through whom such networks became strengthened and extended, motivated primarily by considerations of technological and commercial advantage, rather than furthering economic imperialist interests. They assisted Cuba's entrepreneurs in their break from Spanish monopoly to the free selection of where best to take their business, apparently liberated from commitment to any particular national or imperial interests.

Transnational merchants and commercial networks

An important role was played in both importing machinery and contracting the necessary skilled workers by merchant houses based in the island, generally foreign-born merchants who did much to improve Cuba's place within the international commercial networks.

82 *Louisiana Planter and Sugar Manufacturer*, 7 February 1914 and 11 September 1915.

83 BNJM, Lobo 111/1.

84 Glasgow University Archives and Business Records Centre, UGD 118/1/2/3.

85 ANC, CM 51/1.

86 BNJM, Lobo 109/3.

While the majority of merchants operating in Cuba were from Spain,[87] there was an important core of non-Spanish traders who dominated much of the island's import and export business (although Spanish law required them to operate in formal partnership at least with a Spanish merchant) and were highly influential in the development of the island's connections with Europe and North America.[88] These non-Spanish merchants do not appear to have been particularly committed to the national/imperial interests of the countries from which they came. Although founded by James Drake, who emigrated from Britain to Cuba in the 1790s, Drake Brothers & Co. traded more heavily with Spain, France, Russia, and Germany than with Britain;[89] among its partners it came to include, alongside Drake's sons, a Spaniard, a North American, and a Swiss.[90]

In the nineteenth century, the Spanish who dominated Cuban commerce appear to have lacked the spirit of speculation necessary for pushing the island into the transnational commercial networks through which trade was becoming globalized.[91] The non-Spanish merchants, on the other hand, were able to take advantage of their relationships with European and North American merchants and manufacturers to 'execute orders more advantageously'[92] or to otherwise use their superior knowledge of modern commercial methods.[93] Hence, although Adot, Spalding & Co. had 'no property outside of their business capital which is supposed not to be large', they were much sought after, and had a very good credit rating both in Cuba and the United States, where they had 'many good friends'.[94] Thus it was through such merchants that the transnational commercial networks reached into Cuba; and partnerships were frequently formed that included one merchant in Cuba and the other in another country. For example, the dry goods business of Tennant & Clark was made up of Tennant in Havana and Clark in England;[95] and the Matanzas-based merchant Florentio Huertas teamed up with James Baring (British-born) in Wiesbaden in Germany.[96] Even if they had no formal partner, merchants would often form close alliances with the foreign-based agents, such as Henry Coit in the United States, who represented the interests of many of the Cuban-based merchants and planters in North America and Europe, acting as a go-between with metropolitan merchant bankers such as Moses Taylor of New York or Baring Brothers of London, through whom they encouraged the consigning of sugar shipments, and who assisted in ensuring that Cuban products penetrated into more distant markets.[97]

87 Roland T. Ely, *Cuando reinaba su majestad el azúcar*, Havana: Imágen Contemporánea, 2001 [1963], p. 317.

88 Ibid.

89 MC, MF 235/1/24.

90 Ely, *Comerciantes cubanos*, pp. 83–140.

91 BA, HC 4.6.1, nos. 4–5.

92 BA, HC 4.6.12, no. 141.

93 BA, HC 4.6.1, no. 1.

94 BA, HC 4.6.8 (part 3), no. 307.

95 BNJM, Lobo 113/1.

96 BA, HC 4.6.12.

97 BNJM, Lobo 113; BA, HC 4.6.8 (part 1), no. 19; BA, HC 4.6.2 (part 2), nos. 216–8.

Considerable resources came to be expended by Cuban planters in their attempt to maintain themselves ahead of the technological game, and such costs continued to increase as the century progressed and more advances were made. By 1873, the British Consul at Havana was reporting that 'The machinery and engines on the Cuban estates are generally of an expensive and superior character … [I]mmense capital is invested solely in the "manufacture"; and sugar, far superior in quality to the "muscavado" of Jamaica and Demerara, is made here on the estates themselves … [E]verything has been done, at vast cost, to supersede or supplement manual labour.'[98]

Such outlays required finance and, since initially there were no banks operating directly in the island and no system of government securities, both planters and the Cuban economy in general quickly became highly dependent upon the foreign-led commercial networks and in debt to metropolitan bankers.[99] Although the Cuban financial system did gradually develop through the mid nineteenth century, such that by 1857 there was one principal bank with deposit and discount facilities and empowered to issue bank notes, and several other banks in operation,[100] these were themselves often underwritten by foreign bankers.[101]

Susan Fernández has shown how 'encumbered' the late nineteenth-century Cuban economy was by debt and financial dependency, and how strongly the foundations for the twentieth-century neo-colonial domination of the island by the United States had been laid during the final decades of Spanish dominion.[102] However, her analysis, beginning as it does following the end of the Ten Years' War (the first war for Cuban independence) in 1878, falls short of fully comprehending the origins of Cuban economic indebtedness and dependency – not exclusively to US capital, but to a range of transnational investors – which can be traced back into the first half of the nineteenth century, and which was closely related to the development of the Cuban sugar industry and related infrastructure. Metropolitan bankers were increasingly underpinning most of Cuba's commerce and economy, and the door was opened to them by the non-Spanish merchant community (albeit in partnership with Spanish-born merchants). In 1832, George Knight proposed that Baring Brothers become his sleeping partners.[103] Though he was keen for them to leave him to manage his own affairs in the island, this enabled the merchant bankers to gain a foothold in Cuba, which would gradually turn into a stranglehold. When Knight ran into financial difficulties a few years later, he was forced into bankruptcy by Barings, who readily extended their credit facilities to Knight's successor,[104] drawing the latter deeper into debt through the granting of additional credits.[105]

98 *Greenock Sugar Trade Review*, 2 April 1873.

99 Ely, *Cuando reinaba*, p. 300; Susan J. Fernández, *Encumbered Cuba: capital markets and revolt, 1878–1895*, Gainesville, FL: University Press of Florida, 2002.

100 BA, HC 4.6.8 (part 2), no. 185.

101 BA, HC 4.6.8 (part 3), no. 333.

102 Fernández, *Encumbered Cuba*.

103 BA, HC 4.6.2 (part 1), no. 26.

104 BA, HC 4.6.2 (part 2), no. 213a.

105 Ibid., no. 239.

Such credits were soon also being made to Cuban planters. As Roland Ely notes, 'Credit was the life blood of the island's system for the commercialization of sugar. Without improvements in production and without long-term loans, few planters would have been in a condition to feed and clothe their workers, buy agricultural implements and necessary machines, cultivate new land or satisfy their personal pleasures.'[106]

The same merchants who had initially been the channel bringing external investment into Cuba came to act as the conduits through which control by the metropolitan bankers was applied. Mortgages became more and more common, 'often in the form of loans secured against the earnings of future crops'.[107] Economic crises, or simply a poor crop, would lead to defaults in payments, as a result of which ownership of Cuban plantations began to fall into the hands of foreign bankers. Two-thirds of Cuba's sugar industry had become mortgaged in this way by the 1860s, with some 95% of estates at least partially so.[108] Their policy was 'that of a usurer,' commented the Cuban planter Betancourt Cisneros, 'who little by little provides means to a youthful fool until he places him on an unrepayable debt, and then proceeds to embargo his real estate'.[109] Planters, particularly those of small to middle-sized estates, would thus lose control over their plantations, administration of which was turned over by the bank to merchant companies resident in Cuba,[110] in a manner somewhat similar to that affecting other sectors of the Cuban economy, such as the railways, most of which had, by the late nineteenth century, 'lost nearly all of their national character', with foreign capital moving from a 'role of mortgage-holding creditor' to assume direct control.[111]

Anton Allahar has argued that, by the mid nineteenth century, merchants in Cuba had displaced the old Creole landowning class 'from the pinnacle of Cuban prosperity'.[112] However, even the foreign-born merchants who played such an important part in opening up Cuba to the wider commercial networks had themselves fallen under the control of the increasingly powerful metropolitan merchant bankers. As with the planters, they were dependent upon the success of the sugar harvest, and its trade, for their own survival.[113] Having started as innovators, they quickly took on the role of debt collectors. This ensured that not just Cuban trade but increasingly land ownership and production fell under foreign control. This would be exacerbated after 1868, when the Cuban wars of independence led to a far greater weakening of the position of the Cuban landowners and a far greater penetration of foreign capital and ownership.

106 Ely, *Cuando reinaba*, p. 301.

107 Louis A. Pérez Jr, *Winds of change: hurricanes and the transformation of nineteenth-century Cuba*, Chapel Hill, NC: University of North Carolina Press, 2001, p. 96.

108 Martínez-Fernández, *Torn between empires*, p. 106, citing Moreno Fraginals.

109 Cited by Martínez-Fernández, *Torn between empires*, p. 128.

110 Guerra y Sánchez, *Azúcar y población*.

111 Oscar Zanetti and Alejandro García, *Sugar and railroads: a Cuban history, 1837–1959*, Chapel Hill, NC: University of North Carolina Press, 1998, p. 193.

112 Anton L. Allahar, 'Slaves, slave merchants and slave owners in 19th century Cuba', *Caribbean Studies* 21, 1–2, 1988, p. 174.

113 Ely, *Cuando reinaba*.

Migrant engineers, privileged scapegoats and frustrated nationalism

With the migrant engineering workers playing such an important part in the technological development of Cuba's sugar industry, it might be expected that their presence would have been seen to have a positive influence upon the island. However, the increasing debts that were leading to the island falling inexorably into foreign hands were so firmly connected to the introduction of steam engines and other machinery that the engineers themselves came to be seen as symbolizing the new foreign economic domination of Cuba. Having begun as contributors to the process by which, through new globalizing technologies, Cuba was gradually shaking off imperial Spanish control, the migrant engineers became representatives of the flip side of this liberation, through which new forms of imperial subjection were being imposed.

When migrant engineering workers first began to arrive, their presence was seen as beneficial. In 1838, Francisco Diago commented that it 'suited all of them that there should be abundant engineering workers in the Island';[114] and Francisco de Paula Serrano declared in 1839: 'Small matter that they be foreigners who at present direct the machines; my principles are not founded on such absurd nationalism'.[115] Such support was not simply because of their technological contributions but also because, in a culture in which manual labour was looked down upon by many whites, who felt that it was racially demeaning, the migrant engineers helped to make it acceptable to get your hands dirty. They were also exceptionally well paid, and this more than anything demonstrated just how respectable this was as a career for a young white Cuban. It became a valued prize to secure an apprenticeship in a North American foundry. In the late 1850s, it cost between $20 and $30 a month for a Cuban to be placed with a North American engineering firm,[116] and hence those who sought advancement in this way had either to be from reasonably well-off families or to have a wealthy sponsor.

Mid nineteenth century sugar mills did not offer an opportunity for the engagement of free apprentices, since – with the exception of the largest – they generally only required a single engineer, who would be assisted by slaves trained in the necessary skills under his guidance.[117] There was therefore a shortage of appropriate placements in the island to meet the growing demand, and the *Sociedad Económica* (which oversaw many of the economic and infrastructural improvements of the period) felt that foreigners opening workshops in Cuba should be obliged to take on local apprentices, to teach them their trade. There was growing resentment that many of them declined so to do.[118] Engineering was a trade with a long tradition of craft exclusiveness, access to which was often closely guarded. Juan Angel Echerri discovered this on being apprenticed to the machine workshop of the foreign engineers Keen and Lochkurd in Cienfuegos. During his four years there, his foreign

114 BNJM, Lobo 109/3.

115 *Memorias de la Sociedad Económica*, 9, 1840, p. 240.

116 BNJM, Lobo 135/2.

117 Curry-Machado, 'Indispensable aliens'.

118 *Memorias de la Sociedad Económica*, 1843 (2), pp. 7–9.

masters paid little attention to his education in the trade, using him and others as little more than cheap labour. They finally refused to qualify him because he 'was a blockhead incapable of learning'; though it would seem that, in fact, they had simply not bothered to train him in the necessary skills.[119]

Such intransigence fed a growing opposition to their presence in Cuba, augmented by jealousy of the privileges extended to them and paranoia at the possibly detrimental political and cultural role that they were thought to be playing. These engineers commanded wage levels far in excess of those of other workers at the time, which generated resentment as well as helping to mark them as different. For example, in the 'Angelita' sugar mill, the foreign engineer received $153 a month – a great deal more than the estate's carpenter and mason, who only earned $60 and $40 respectively.[120] It was not only on the sugar plantations that migrant engineers could expect to be very well paid: the engineer on the Havana Bay dredger was earning $300 a month, compared to the $95 that the most senior crew member (other than the captain) was taking home (and the $23 earned by the common sailors).[121] Not only were they paid more, but the engineering workers (in particular those located on sugar plantations) generally received housing and sustenance free of charge. They could also on occasion aspire to promotion into positions of greater responsibility, as did the North American Ezra Dod, who began his time in Cuba working on the construction of the Havana–Güines railway before becoming an engineer in the 'Amistad' sugar mill. Here he was eventually named as administrator;[122] indeed, other estates also appointed their migrant engineers as temporary, or on occasions permanent, administrators.[123] Some were able to accumulate sufficient capital to become land owners, establish workshops, or become merchants themselves – with a potential for upward social mobility unmatched by others in the plantation economy. This was a source of jealousy among Cuban workers – and, while one of the first trade unions to be established on the island, in 1850, organized engineering workers, it overtly excluded non-Spanish migrants from joining.[124]

The migrant engineers may have been much sought after by the sugar-mill owners, but their presence was so tied to the machinery (the cost of which was, more than anything else, leading to the indebtedness of these same planters) that even among the planters they came to be regarded with distrust. Although it was commonplace for mill owners to make use of their engineers as agents in their dealings with metropolitan engineering companies,[125] these same engineers often at the same time came to represent the interests of the engineering companies. This would lead to them occupying a rather contradictory position, since disputes often occurred between the two parties, as when O. J. Reynolds – engineer for the Diago family – became employed by the West Point Foundry, while still working for the

119 ANC, GSC 1608/81938.

120 ANC, ML 10789.

121 AHM, UCF 16/1.

122 James H. Dod, 'Reminiscences of Cuban engineering', *Louisiana Planter and Sugar Manufacturer*, 7 February 1914.

123 BL, HEE, MSS Span c.5, 'La Palma' Estate Book 4.

124 Joan Casanovas, *Bread, or bullets! Urban labor and Spanish colonialism in Cuba, 1850–1898*, Pittsburgh, PA: University of Pittsburgh Press, 1998, p. 67.

125 BNJM, Lobo 111/1.

Diagos, and given the task of both extending the Foundry's sales in Cuba and of ensuring that the Diagos continued to purchase their machines from them.[126]

The combination of these elements led them to become 'privileged scapegoats',[127] their presence manipulated by the Spanish authorities – themselves highly nervous of the increasing non-Spanish involvement in the Cuban economy, of rival imperial involvement in anti-slavery and separatist movements, and even (in the case of the United States) of open attempts to assume control over the island.[128] Partly through the scapegoating of these migrants – symbols though they were, alongside the machines that they operated, of the modernity that the Creole elite was seeking to bring to the island – the colonial authorities were able to 'portray the spread of Cuban nationalism or ideas of slave trade abolition and emancipation as serving foreign, not local, interests'.[129] This contributed to the finger of suspicion being pointed at several foreign engineers in 1844, accused of complicity in the revolutionary conspiracies and slave uprisings that subsequently became known as *La Escalera*.[130] Although the evidence presented against them was highly questionable, a number were arrested and imprisoned for several months – apparently victims of the reprisals against the role played by British abolitionists in stirring up rebellion. The activity of the British Consul at Havana, David Turnbull, in actively seeking out British subjects who had been kidnapped into slavery in Cuba – and in acting as an intermediary between the two, racially segregated, committees attempting to organize an uprising – helped to generate an atmosphere in which the migrant engineers (most of whom were British or North American) could readily be placed under suspicion.[131] Although they were finally released, the cases against them having become quite untenable, they had already served the purpose of helping the Spanish authorities tarnish the conspiracies as foreign-inspired.

By the 1850s, not only had the numbers of privileged migrant engineers working in Cuba increased but so to too had both the planters' indebtedness and the control by foreign capital. At the same time, the Spanish hold over the colony was becoming shakier, with opposition to them growing among the Cuban population. This created an atmosphere of paranoia surrounding the migrant engineering workers, which resulted in an official order being sent out by the island's governor to his officials in the provinces to keep a careful watch and account of all such non-Spanish migrant engineers, their absences and movements, with the clear implication that this group should be especially suspected of subversive involvement.[132] Nevertheless, no evidence has been found that any of these engineers were at all involved politically – beyond the individual expression of views that may have been

126 BNJM, Lobo 109/3.

127 Curry-Machado, 'Privileged scapegoats'.

128 Martínez-Fernández, *Torn between empires*.

129 Curry-Machado, 'Privileged scapegoats', p. 237.

130 Jonathan Curry-Machado, 'Catalysts in the crucible: kidnapped Caribbeans, free black British subjects and migrant British machinists in the failed Cuban revolution of 1843', in Nancy Naro, ed., *Blacks and national identity in nineteenth-century Latin America*, London: ILAS, 2003.

131 Rodolfo Sarracino, *Inglaterra: las dos caras en la lucha cubana por la abolición*, Havana: Editorial Letras Cubanas, 1989; Robert L. Paquette, *Sugar is made with blood: the conspiracy of La Escalera and the conflict between empires over slavery in Cuba*. Middletown, CN: Wesleyan University Press, 1988.

132 ANC, GSC 1285/50277.

considered anathema by the colonial authorities. At the same time, the authorities decreed that all residents (regardless of national origin) should register their trade, and pay a duty in order to exercise this. Visible by their absence from the long list of occupations stipulated for such a tariff are the sugar-mill engineers – despite their privileged position and despite the policy of reporting upon their movements.[133] The Spanish authorities might not have been able to prevent their employment (the sugar industry would have collapsed without them), but they could certainly ensure that they would continue to be marked as undesirable, albeit indispensable, aliens.

Another reaction to the presence of and dependency upon migrant engineers was the attempt to establish specialist schools in the island to train indigenous engineering workers. By so doing, it was hoped to end the skills shortage that had made the immigration necessary in the first place. The establishment of such a school was first suggested in the late 1830s, shortly after the extensive immigration of engineering workers had begun. It was an increasing concern for the authorities in Havana that, as more and more steam engines, mills and other high-tech equipment poured into the country's plantations, the country was finding itself dependent not only upon foreign capital but also upon the physical presence in the island of many non-Spanish skilled workers. They were not so concerned about the carpenters, masons, or even boilermakers who arrived; from the start, they were disproportionately preoccupied with the migrant engineers. As Cubans travelled abroad to learn the necessary skills, and returned to the island, there were attempts locally to pass such knowledge on to their countrymen. In 1845, the following proposal to establish a school in Matanzas was advertised in the press:

> The desire to have schools of mechanics, as applied to the steam engines of the sugar mills and railways, is about to be satisfied. A native of Matanzas, educated abroad, where he has been a director of large establishments, and has constructed railroads, wishes to give to his homeland the precious gift of educating its sons and so free them from a foreign contribution.[134]

It was in Havana that most effort was made to establish an engineering school, and this was promoted by the *Sociedad Económica* as a part of its general campaign to improve urban, working-class education. The *Escuela de Maquinaria* (School of Machinery) was founded in 1845,[135] with fifty students matriculating in its first year – more not being possible, since the building with which they were provided lacked the space. By the end of this first year they were claiming success, with many landowners (for whom the students had worked during the year) contracting the students again for the coming grinding season: 'because they have not been able to avoid feeling heated by that holy patriotic fire that is always to be found in the breasts of the Spanish, when they so visibly perceive happy results'. [136]

133 ANC, Miscelánea de Expedientes, 75/Ai, Orden del Capitan General, 8 December 1851, *La Aurora de Matanzas*, 3 January 1852. The exclusion of foreign sugar-mill engineers from the matriculation of trades appears to have been maintained at least until the outbreak of the first war of Cuban independence in 1868.

134 *El Faro Industrial de la Habana*, 10 April 1845.

135 *Memorias de la Sociedad Económica*, 36, 1848 (1), pp. 31–4.

136 *Memorias de la Sociedad Económica*, 33, 1846 (2), p. 359.

This might have seemed encouraging by those who were patriotically minded, and certainly it was important as a first step towards the indigenous development of industrial skills in Cuba. However, the School made very little real impression on the country's need for foreign workers. The latter were quite scathing of the efforts of the School: 'One very grave [obstacle] has been that the opinion of the foreign engineers has constantly been opposed to [the School], and without knowing nor even visiting it, they have declared the impossibility that good operatives could be produced by an establishment that does not belong to them, and which is not in France or England but in Havana.'[137] They may have had a point. Since the numbers graduating from the School were hardly a threat to the job prospects of the migrant engineers, given the ever-increasing demand for such workers and the general shortage of them, it is unlikely that such criticism was motivated by selfish reasons. It seems that the sponsors and organizers of the School underestimated the degree of training needed to be able to take personal charge of the equipment of a sugar mill, dealing with all eventualities. In mid-nineteenth-century Britain and the United States, engineers generally began their education in the trade in early adolescence. Having served an apprenticeship lasting several years, they qualified to become journeymen. Their training did not stop there: if they aspired to become masters, they not only had to work their way up the workshop hierarchy but also had to obtain specialist technical education. Even though many of them may have travelled to Cuba in the hope of short-circuiting the craft exclusiveness that may have prevented them from advancement in their home countries, the average age on arrival of such engineers was thirty-one.[138] Supposing they had begun in the trade around the age of fourteen, they therefore already had an average of seventeen years' experience before being employed in Cuba.

This was something that does not seem to have been fully appreciated. Many of the Cubans who studied in the School of Machinery, and their families, seem to have believed that 'they could be, and that they are, complete engineers in a year'.[139] Often driven by the prospect of the high earnings that they dreamed of obtaining (and that they saw foreigners claiming), this failure to understand the slow, incremental path of formation needed, not just by aspiring engineers but by the country as a whole in its attempt to develop the skills needed by its economy, led to a high dropout rate from the School. Not surprisingly, this provoked considerable scepticism on the part of the migrant engineers. However, by seeking to protect the standards of their craft, which they saw being undercut by the School, while at the same time generally showing little interest in playing a positive role in the development of native engineers, they exacerbated the feelings of hostility shown towards them and fuelled the impulse that led to the establishment of the School in the first place.

At the time of the heightened official paranoia about the presence in Cuba of so many migrant engineers, in the early 1850s, the *Junta de Fomento* assumed control over the School, 'so that it may succeed in the important and primordial objective of satisfying our local necessities without the help of foreign hands'.[140] José Gutiérrez de la Concha, the

137 *Memorias de la Sociedad Económica*, 36, 1848 (1), pp. 31–4.

138 ANC, ML 11080, 11397, and 11910.

139 *Memorias de la Sociedad Económica*, 36, 1848 (1), pp. 31–4.

140 AHN, UCF 30/2, No.32.

Captain General and Governor of Cuba, considered this to be important more as a patriotic undertaking than one of economic necessity. The original motivation for the school had been to train the brightest of the urban working class. Under the new, Spanish-state-sponsored management, priority was given to 'the orphans of military families and servants of the State, and particularly those who lost their lives and fortunes in the defence of Spain in our old American possessions'. The intention was that these would form a bulwark against foreign engineers, 'who, spread about our sugar mills and on the railroads, are a seed for propaganda in the ideas of secession, and who are internal enemies that it is essential that we free ourselves from'.[141] The new directors of the School sought to make it a 'large industrial enterprise', so moving away from the original conception of it assisting in the gradual foundation and improvement of the skills upon which the island's economy could subsequently be developed. Previously, the School had provided subsidized training for young Cuban engineers who could then obtain employment in the mills and railways, providing them with the theoretical knowledge that they would later put into practice. But now they purchased expensive machinery from abroad, with the students becoming apprentices, attempting to learn the advanced applications of steam technology through construction. By so doing, the state hoped that it might acquire a workshop of which it could be proud, rivalling the great foundries of the metropolitan powers. But this attempt to turn an institution that had begun with the simple aim of enabling some native engineers to replace some of the foreigners into one that attempted both to train highly skilled technicians and to produce its own machines – virtually overnight, in conditions lacking the necessary pre-existing industrial infrastructure and skills base – was a disaster. As soon as the state realized this, they quickly returned it to its original management, slashing its budget in the process and virtually guaranteeing its failure.[142]

Although the aim had been to free Cuban planters and rail companies from the need to contract foreign engineers, the School may actually have accentuated this reliance on outsiders. By the 1850s there were, to be sure, a small but steadily growing number of suitably skilled Cubans and Spanish. However, they continued to be too few to meet the growing demand for engineers that resulted from the generalization and extension in the use of steam engines and mills, as the sugar frontier pushed eastwards. The failure of the school experiment inspired little confidence in the majority of planters, driven as they were more by economic than patriotic concerns; and they were more likely to show prejudice in favour of employing 'superior' foreign technicians to operate and maintain the foreign-built engines and mills that had cost them so much and towards which they felt such pride. Native engineers might have been cheaper, but both engineer and engine were seen almost as status symbols by those planters who could afford them, and an indication of their estate's modernity and the superiority of its product.[143]

But the island's reliance on non-Spanish migrant engineers continued to rankle. In 1857, the *Compañía Española de Fundición y Mecánica* (Spanish Foundry and Machine Company) was formed. Its founder argued that 'The establishment of this Society is evidently

141 AHN, Estado 8044/7.

142 *Memorias de la Sociedad Económica*, 46b, 1855–9.

143 Curry-Machado, 'Privileged scapegoats'.

useful and even necessary because in the material of Foundry and Mechanics we depend on foreigners imposing the law.'[144] The following year, Manuel Hernández Aranda invented a sugar train, which he advertised as being specifically 'Cuban'. His application for a patent and privilege for his invention reads more like a nationalist treatise, than a blueprint for a contribution to technology: 'Our emerging agriculture demands a great help so as to remove it from that rachitic state in which it finds itself, and to elevate it to its peak, given that, without the necessity of begging from foreigners, there exists in our country extraordinary elements with which to achieve this.'[145] Even though his invention seems to have been little more than an adaptation of the Jamaica trains widely used for the evaporation process of sugar production, Hernández Aranda showed the same excess of patriotic optimism that had doomed the School of Machinery to ineffectuality, believing it possible for Cuba not only to be on the same technological level as the industrial countries but even to rival and surpass them; all that was needed was the desire to do so.

Conclusion

Hernández Aranda and his Cuban sugar train are symbolic of the shift that had occurred during the nineteenth century. The same spirit for advancement that the early promoters of new technology in Cuba had shown, and which had represented a break with the Spanish imperial past and self-confident hopes for a more independent future, was also demonstrated by Hernández Aranda, only this time as something of a forlorn hope against the, by then, irrepressible forces of technological advancement that were being led and controlled by foreign powers, exerting ever-increasing control over the Cuban economy and production. The introduction of steam engines and related machinery, along with the skilled workers required to operate them, was not simply an example of this process but was central to it, along with the commercial networks with which they were so associated. Although this would be accentuated later in the century, through a combination of the devastating impact of the wars of independence and the ever more costly and complex steam and sugar-making machinery, the process was already well advanced by the 1850s.

David Jeremy has identified four stages of technological transfer: new technology introduced through migrants or the diffusion of plans and prototypes; establishment of pilot installations; modification of designs as a result of local conditions; and reverse transfer, back to where the technology had originated.[146] However, in the Cuban case, local protagonists were of fundamental importance in the initiation of the transfer process. Rather than it coming from the seeds sown by migrants (whether engineers or entrepreneurs), it was the Cuban planters themselves who went out into the world in search of solutions for what they perceived as being the necessities of their industry. Once they had brought back and introduced examples of new technology and scientific-industrial thinking, it would certainly seem that Jeremy's stages occurred, but his model is perhaps too linear. It might be more appropriate to think of the stages as ongoing, coexisting elements, once the initial

144 ANC, GSC 1594/81606.

145 ANC, RCJF 207/9310.

146 Jeremy, *Transatlantic industrial revolution*.

impulse had been given. In effect, a network of technological transfer and development became established, involving the introduction and spread of new advances not just from the metropolitan industrial centres but also from the sugar mills. This network linked a number of agents, from Creole planters to the engineering companies, through commercial agents, metropolitan banks, diasporic merchants, and migrant engineers. The relationship between these different groups resulted in a network that was dynamic, responsive to advances (wherever they occurred), and that had a gathering momentum that resulted in its ongoing extension, and with this the spread of the new technology to ever more plantations and mills. However, the need for external investment led to a financial situation in which local upsets – whether economically or politically inspired – resulted in those who controlled this capital (generally based in the metropolitan centres) gaining in influence and power over the local actors who had instigated the process.

Both the spread of steam technology in the nineteenth century and the related international trade networks are examples of how the processes of globalization that are seen to characterize our current period of late capitalism were historically founded. This has long been recognized – as seen in Immanuel Wallerstein's concept of the centrality of world systems in understanding the interconnected development of the planet's economy and society – as a necessity for tracing the history of the emergence of the global capitalist system, presided over by European hegemonic powers.[147] Similarly, Eric Hobsbawm has shown how the interdependence of every part of this world system reveals how individual nations come to emerge not just as historically contingent but within the constraints imposed by wider, transnational forces.[148] More recently, the 'global history' approach has developed on such perspectives, seeking 'to transcend the nation-state as the focus of history'.[149]

I would argue that this mid-nineteenth-century Cuban case demonstrates how the networks of capital, trade, skills, and technology through which key commodities, such as sugar, moved – along with the related human movement and settlement – were not directly tied to competing empires, related though they may have been to these. Rather, they were transnational, transimperial, even globalized in scope. What is also shown is that such networks were not simply imposed upon Cuba by imperial interests. As Robert Marks has written, 'however influential Europeans may have been in the making of this modern world, they did not make it themselves',[150] and much of the impetus for development in Cuba came from actors in the island itself and from the transnational relationships that they themselves established. Thus, although the machines that were increasingly revolutionizing production worldwide were mainly built in the core industrializing countries, the technological developments were the result of the interconnection between manufacturers and their

147 Immanuel Wallerstein, *The capitalist world economy*, Cambridge: Cambridge University Press, 1979; and *The modern world system*, 3 vols., New York: Academic Press, 1974–89. Also Terence K. Hopkins and Immanuel Wallerstein, *World systems analysis, theory and methodology*, Beverley Hills, CA: Sage, 1982.

148 Eric Hobsbawm, *Nations and nationalism since 1780: programme, myth, reality*, Cambridge: Cambridge University Press, 1990.

149 Bruce Mazlish, 'An introduction to global history', in Bruce Mazlish and Ralph Buultjens, eds., *Conceptualizing global history*, Boulder, CO: Westview Press, 1993, pp. 1–24.

150 Robert B. Marks, *The origins of the modern world: a global and ecological narrative*, Lanham, MD: Rowman & Littlefield, 2002, p. 155.

clients, such as Cuba's sugar planters. This would seem to confirm what Patrick O'Brien has shown: that 'for the Third World, the history of enforced (and/or unavoidable) dependence on "European middlemen" did not necessarily signify exploitation'.[151] The actors through which this was made possible were, alongside the Creole planters, the skilled migrant workers who, like Charles Edmonstone, were using their presence in the field to stimulate further developments, so as to better meet the needs of local production. As David Jeremy has argued, migrant engineering workers were 'by far the most important vehicle of technology transfer': 'they were able to interact with the technological system on the one hand, with the natural and cultural environment of the receptor society on the other hand, and so make the multitude of adjustments that were necessary in accommodating a new technological system to fresh, cross-cultural surroundings.'[152]

What this Cuban case shows is that the globalizing tendencies that were in motion were not initially brought about by the imperial designs of powerful nations, intent upon extending their global influence. At the outset, the impulse came from beneath the shadow of conflicting empires, inspired by the needs and aspirations of local actors, with the collaboration of migrant artisans and merchants who facilitated Cuba's entry into the transnational networks that were extending themselves globally during the nineteenth century. It is for this reason that I have characterized this as 'sub-imperial' globalization, and those involved – the Cuban sugar planters, and the migrant merchants and engineers – as being the 'sub-imperial' agents through whom this came about.

However, as Cuba's history shows, for all that it may be necessary to look beyond the political boundaries imposed by empires – so as to see the much more complex social interactions that lay beneath – this is not to deny the dominant role played by imperialism. The sub-imperial globalizing tendencies described here were instrumental in weakening the Spanish empire's hold over Cuba. Yet, with terrible ironic inevitability, out of the flames that consumed one empire, stepped – phoenix-like – the figure of empire reborn. The technological advances that so inspired the Cuban planters brought new forms of subjugation, which would lead, at the end of the nineteenth century, to freedom from Spain being replaced by domination by the United States; and the migrant engineers and merchants, for all their own sub-imperial identity and apparent freedom from imperial prejudice and concern, proved to be the agents through which this new imperial control came to be imposed. Thus, the compelling figure of Charles Edmonstone riding through all weathers to spread new machinery to Cuba's sugar plantations hides the story of how engineering advances, spreading independently of imperial projects, could at the same time be the cause both of the weakening of old imperialisms and the emergence of new ones.

Jonathan Curry-Machado is a Fellow of the Caribbean Studies Centre, London Metropolitan University, and Coordinator of the Commodities of Empire project. His research focuses on the importance of migrants in the spread during the nineteenth century of globalizing transnational networks of trade, capital, and technology, in particular in Cuba and the Hispanic Caribbean.

151 Patrick Karl O'Brien, 'Colonies in a globalizing economy, 1815–1948', in Barry K. Gills and William R. Thompson, eds., *Globalization and global history*, London: Routledge, 2006, p. 275.

152 David J. Jeremy, *Artisans, entrepreneurs and machines*, Aldershot: Ashgate, 1998, p. 19.