European
Historical
Economics
Society

EHES Working Paper | No. 175 | January 2020

The rise of coffee in the Brazilian southeast: tariffs and foreign market potential, 1827-40

Christopher David Absell,
Departamento de Ciencias Sociales, Universidad Carlos III de Madrid

EHES Working Paper | No. 175 | January 2020

The rise of coffee in the Brazilian southeast: tariffs and foreign market potential, 1827-40

Christopher David Absell,
Departamento de Ciencias Sociales, Universidad Carlos III de Madrid*

Abstract

During the period spanning independence in 1822 to mid-century, Brazil's southeast shifted from specialising in the export of cane sugar to coffee. This paper explores the mechanism underlying this shift by exploiting a wealth of new monthly data on the Brazilian and international coffee and cane sugar markets during the period 1827-40. I argue that the timing of the coffee boom was driven by a rapid increase in foreign market potential associated with the abolition of the tariff on coffee in the United States. I estimate that American tariff reform served to increase coffee exports and African slave imports by around one-fifth. American firms, with indirect links to the slave trade, rapidly became major players in the export market in Rio de Janeiro, while non-American firms, traditionally specialised in Continental European destinations, turned their sights on the American market.

JEL Codes: N56, N76

Keywords: Coffee, Brazil, slavery, tariffs, market potential

Shorter version forthcoming in the Economic History Review

*The author thanks Antonio Tena-Junguito, Herbert Klein, Thales Zamberlan Pereira, Justin Bucciferro, Marc Morgan, Noel Maurer, Leticia Arroyo Abad, Pablo Martinelli, Leonard Kukic, Jordi Domenech, Carlos Santiago Caballero, Alejandro Ayuso Diaz, Victor Gomez Blanco, Colin Lewis, Gareth Austin, Kaoru Sugihara and participants at the LSE Workshop on Brazilian Economic History, the WEHC Boston, WIPS-UC3M, and ASSA Atlanta for comments on previous drafts of this paper, as well as the anonymous referees of the Economic History Review and editor Giovanni Federico. I would particularly like to thank one of the referees for kindly supplying me with the data on Zollverein tariffs.

Coffee's role in determining long-run paths of development in the Americas has long been a complicated one. Like other colonial cash crops, coffee is considered a 'bad' commodity in the sense that its rise in the nineteenth century is associated with the intense exploitation of African slave labour.[3] In comparison with the experiences of other tropical commodities, notably cane sugar, however, coffee has also been associated with 'good' long-run outcomes. Historically, regions specialising in coffee have followed radically different pathways of development to those specialising in other tropical commodities. While sugar producers have generally suffered from higher degrees of land concentration and inequality,[4] the experience of coffee regions has been more heterogenous.[5] Not only has coffee production been associated with more equitable tenure systems. Through fiscal and foreign investment channels, coffee has also been linked with increased investment in infrastructure, the emergence of industrial centres and urbanisation, and the increased provision of public goods.[6]

There is no better example of the ambiguous relationship between coffee and long-run development than that of the world's premier nineteenth century coffee producer: Brazil. By the final decade of the nineteenth century, Brazilian coffee occupied 70 per cent of the country's composition of exports and over half of the world export market share. While plantations during the latter half of the nineteenth century until the abolition of slavery in 1888 would come to resemble the size of sugar plantations in the northeast and Spanish Caribbean, early coffee growing was a somewhat more egalitarian affair.[7] What's more, despite attracting the lion's share of slave imports prior to the

[3] Bruhn and Gallego, 'Good, bad and ugly.'
[4] Sokoloff and Engerman, 'Institutions;' Easterly, 'Inequality.'
[5] Ocampo and Colmenares Guerra, 'Export and economic development;' Nugent and Robinson, 'Are endowments fate;' Bates, *Open Economy*.
[6] Cárdenas and Yanovich, 'Café y desarrollo económico.' An exception is Puerto Rico. See Bubonis, 'Bitter coffee.'
[7] Klein and Luna, *Slavery and the economy*, p. 53; Stein, *Vassouras*; Salles, *Vale*, pp. 155-69. For classic treatments of the sugar plantations of the northeast, see Eisenberg, *Sugar Industry*; Barickman, *Bahian*

closure of the Brazilian slave trade in 1850, and bidding away a large proportion of the northeast's slave labour thereafter, the emergence and consolidation of the coffee economy in the southeast has been linked to the better long-run economic performance of the region with respect to the rest of the country. Over the nineteenth century, coffee stimulated investment in the railroads, attracted hundreds of thousands of Southern European immigrants, and provided the Brazilian southeast increased purchasing power to obtain imported goods, including inputs for nascent industrial activity.[8] Coffee generated fiscal revenue that was channelled into the provision of public goods, notably education expenditures.[9] On the other hand, sugar created important inequalities in the distribution of land, public goods, and access to justice.[10] Consequentially, by 1950 per capita incomes in the northeast were half of that of Rio de Janeiro and around a third of that of Sâo Paulo, a distribution that persists to the present day.[11]

By the end of the nineteenth century, coffee was the third most traded commodity in the world by value, and Brazil its most important supplier.[12] Given the importance that coffee played in the international economy and Brazil's long-run economic development, there is remarkably little empirical literature on the timing of its rise in the Brazilian southeast. Although it is well known that coffee overtook sugar as Brazil's principal export commodity in terms of value during the 1830s, there is virtually no explanation of why this occurred when it did. Supply-side explanations of the rise of coffee – and they are abundant – are essentially static, focusing on the relative agricultural efficiency of

Counterpoint; Schwartz, *Sugar Plantations*. On Cuba and Puerto Rico, see Bergad, *Cuban rural society*; Figueroa, *Sugar*.

[8] Leff, *Underdevelopment*; Summerhill, *Order*; Corrêa do Lago, *Escravidâo*; Dean, *Industrialization*; Silva, *Expansão*.

[9] Musacchio et al., 'Colonial institutions.'

[10] Naritomi et al., 'Institutional development.'

[11] Baer, 'Regional inequality;' Monasterio, 'Brazilian spatial dynamics.' Moreover, by the twentieth century real wages in the southeast were around 50 per cent higher than those in the northeast. Pereira, 'North-South.'

[12] Topik, 'World Coffee Market,' p. 1. The other two commodities were wheat and oil. Guimarães and Greenhill, 'Trading,' p. 3.

coffee.[13] Although cane sugar enjoyed a geographical advantage in the fact that it could be grown along the littoral areas facing the Atlantic Ocean and did not have to traverse the rugged hinterland terrain where coffee prospered, the latter was characterised by lower unit labour requirements. Additionally, coffee required a lower initial investment, permitting entry for those who could not afford the fixed costs of establishing a sugar mill.[14] Other characteristics of production and distribution, such as fuel requirements, mixed cropping, transport costs and perishability, favoured coffee over sugar.

On the demand side, certain authors have observed that prices shifted in favour of coffee in the Brazilian southeast during the early nineteenth century, affecting relative rates of profitability.[15] This apparently had much to do with external conditions: that Brazilian coffee emerged at a time when world demand, especially in the United States and Central Europe, was expanding, and that the composition of world supply, from Haiti, the British and Spanish West Indies, was undergoing profound changes.[16] Conditions in the United States were particularly propitious. During this period, according to Steven Topik, 'Coffee became truly a mass product for the first time in the United States.'[17] This was the result of several factors, including favourable tariff policy, temperance movements, northern European immigration, and marketing campaigns that fed on American nationalism.[18] Topik argued that 'supply-induced demand,' whereby 'Cheap fertile land and slave labor allowed coffee prices to plummet after 1820 and remain low

[13] Furtado, *Formación*, p. 121; Medeiros Lima, 'Cafeicultores;'; Klein and Luna, *Slavery*; Viotti da Costa, *Senzala*, p. 67; Marcondes, *Arte*.
[14] As the British pro-consul in Rio de Janeiro observed in 1848, 'This article of produce [coffee] is found to be much more productive to the planters than any other, is easier cultivated, and does not require so much capital and labour as sugar; besides which the climate of this province and vicinity is particularly adapted to the cultivation of coffee, while on the other hand the flat land in the provinces of Bahia and Pernambuco suit the growth of sugar…' *Copies* (P.P. 1847-48, XLVI), p. 443.
[15] Petrone, *Lavoura*; 'Comerciante;' Dean, *Rio Claro*; Leff, 'Economic development,' p. 252.
[16] Topik, 'World coffee market;' Klein and Luna, *Slavery*; Corrêa do Lago, *Escravidâo*, pp. 110-11; Marquese, 'Origens;' Marquese and Tomich, 'Vale.'
[17] Topik, 'Integration,' p. 37.
[18] McDonald and Topik, 'Americanizing,' p. 121; Rorabaugh, *Alcoholic Republic*, pp. 100-1.

until the last quarter of the century…', was a key aspect of expanding American consumption.[19] For other scholars, shifts in American tariff policy, particularly the abolition of the coffee duty in 1832, were decisive, as they '…permitted the reduction by half of the price of coffee...'[20] '…a rate that brought the price of a cup of coffee down to the price of a glass of whiskey punch…'[21] For sugar, prices and, thus, profitability, were lower, due to intense competition from Caribbean, Asian, and domestic cane and beet producers.[22]

By exploiting a new database of monthly exports, imports and prices for the period 1827-40, I show that the growth of coffee exports from the port of Rio de Janeiro during the first half of the nineteenth century accorded with the reduction and abolition of the duty on coffee in the United States, and the subsequent expansion of American coffee market potential. Like the case of many peripheral economies during the first globalisation, reduced transaction costs and increased access to core consumer markets led to a shift in the Brazilian export economy towards the cultivation of the more efficient agricultural commodity (coffee) and a rapid concentration in the geographical distribution of its exports (to the United States).[23] American tariff reform led to the expansion of the contraband slave trade, outlawed by the Brazilian government in 1831. It also resulted in the radical alteration of the composition and behaviour of export firms operating in Rio de Janeiro. The potential of the sugar market in the United States, and in other important markets, such as the United Kingdom and Germany, was lower, due to higher barriers

[19] Topik, 'Integration,' p. 31.
[20] Marquese, 'Estados Unidos,' p. 55.
[21] Rorabaugh, *Alcoholic Republic*, p. 100.
[22] Federico and Tena-Junguito, 'Lewis revisited;' Galloway, 'Sugar industry;' Denslow Jr., 'Sugar production;' Deerr, *History*.
[23] On the performance of peripheral countries during the first globalisation, Federico and Tena-Junguito, 'Tale of two globalizations.' While there exists a voluminous descriptive literature on the integration of peripheral economies into the world market during the nineteenth century, cliometric approaches using detailed commodity-level data are thin on the ground. Recent exceptions include Lampe and Sharp, 'How the Danes' and Pinilla and Ayuda, 'Taking advantage.'

produced by tariffs, geography, and market distortions derived from monopolistic forms of competition.

The structure of the paper is as follows. Using a new series of monthly exports of coffee and sugar from the port of Rio de Janeiro, the next section establishes the timing of the southeast's export specialisation. The following section examines conditions in the American market for coffee and constructs a measure of market potential for coffee and sugar for the United States, Germany and the United Kingdom using new series of imports and trade costs. I then establish a correlation between American tariff reform and the Brazilian coffee boom using standard intervention analysis methodology, and present counterfactual estimates of coffee exports and slave imports in the absence of American tariff reform. The composition and behaviour of the principal firms exporting coffee from Rio de Janeiro is briefly explored. The final section concludes.

THE TIMING OF THE COFFEE BOOM

Table 1 provides a rough periodisation of the rise of coffee, including benchmark estimates of coffee and sugar exports from Rio de Janeiro, São Paulo, Bahia and Pernambuco during the first half of the nineteenth century. Coffee was a minor export commodity during the period 1796-1811, occupying around two per cent of Brazil's total export value. Sugar and cotton remained the most important exports of the late-colonial period, holding shares of 35 and 24 per cent of the composition of exports, respectively.[24] Rio de Janeiro occupied one-third of Brazil's total exports, followed by Bahia (22 per cent) and Pernambuco (19 per cent). The leading exporter of sugar was Bahia, followed

[24] Data taken from the *Jornal do Commercio* shows that as early as 1828, cotton exports accounted for less than one per cent of the value of Rio de Janeiro's exports. Thus, cotton did not compete with coffee and sugar for resources in the southeast during the period under analysis. During the first half of the century, the principal exporters of cotton were the northeastern provinces of Maranhão and Pernambuco. Pereira, 'Rise.'

Table 1. *Exports (in metric tons) of coffee and sugar from Rio de Janeiro, São Paulo, Bahia and Pernambuco, selected years*

	Rio de Janeiro		São Paulo		Bahia		Pernambuco
	Coffee	Sugar	Coffee	Sugar	Coffee	Sugar	Sugar
Av. 1796-1811	642	7,809	-	-	72	9,577	6,791
1817	4,672	-	-	4,323	-	14,838	7,369
1825	13,447	22,939	2,081	5,046	-	20,401	7,099
1836	52,582	17,989	8,640	8,272	757	18,693	26,539
1848	95,569	8,814	19,547	4,096	1,280	49,165	61,286

Notes: The 1817 figure for sugar from São Paulo is the export volume for the year 1818. The 1836 figure for sugar from Rio de Janeiro is an upper bound estimate; estimates by Soares and Maxwell, Wright & Co. being 16,312 and 17,175 metric tons, respectively. Figures for coffee for São Paulo include exports from Rio de Janeiro, as most of the exports from the Paraíba Valley were not shipped from Santos. Figures for Bahian sugar are production, not export, estimates. The same can be said for the 1836 figure for coffee and sugar from São Paulo. *Sources*: Arruda, *Brasil*, pp. 359, 374, 417; Soares, *Notas*, pp. 208, 216, 228, 241, 254-55; Corrêa do Lago, *Escravidâo*, pp. 156, 460, 483-585; Maxwell, Wright & Co., *Commercial Formalities*, p. 87; *Jornal do Commercio*, 1840, ed. 3; Petrone, *Lavoura*, p. 156; *Abstracts* (P.P. 1841, XXIV), p. 606.

by Rio de Janeiro and Pernambuco.[25] Evidence for the period from the liberalisation of Brazil's ports in 1808 to political independence in 1822 is fragmentary, but allow for a descriptive sketch. Coffee exports seem to have grown rapidly in Rio de Janeiro with the end of the Napoleonic Wars: the exports of 1,574 metric tons in 1807, the highest for the period 1796-1811, rose to 7,885 on the eve of independence.[26] Sugar, however, also followed similar growth tendencies, and the quantum of exports in Rio de Janeiro, Bahia and Pernambuco remained around twice that of coffee.

The definitive shift in the southeast's export composition occurred during the period 1825-36. Between these years, coffee exports from both Rio de Janeiro and São Paulo quadrupled. Exports of sugar from these regions, however, declined to pre-independence levels by mid-century. In Bahia and Pernambuco, on the other hand, sugar

[25] Arruda, *Brasil*, pp. 292, 353-54, 359, 374, 417.
[26] Corrêa do Lago, *Escravidâo*, p. 460.

exports increased. In the Bahian case, coffee exports also showed a rapid increase from late-colonial levels, although the volume shipped remained dwarfed by that of sugar.

Rio de Janeiro was the centre of the export boom. As Table 1 shows, the port exported the lion's share of coffee to the world market and, until the 1830s, closely trailed the northeast in the export of cane sugar. Thus, the analysis of the mechanisms underlying the shift in specialisation from sugar to coffee must focus on what was occurring in the Rio de Janeiro export market. To capture the subtleties of this shift, high frequency data are necessary. Here I introduce a new database of monthly exports of coffee and sugar from Rio de Janeiro to foreign ports spanning the period from July 1826 to December 1840.

The series is taken from contemporary periodicals widely read by the mercantile community in Rio de Janeiro, the principal source being the *Jornal do Commercio*. These newspapers reported the daily movements of the port, including imports and exports within and outside of the Empire, as well as the nationality and destination of the ships. Although never explicitly stated, this information was presumably gleaned from the *Mesa do Consulado*, which reported the volume of commodities entered for export, and used these volumes, along with a list of official prices, to collect export taxes. The fact that these volumes were the basis of the calculation of the government's fiscal revenue derived from exports, and that the movement of commodities was so widely disseminated in the press, lends confidence to the quality of the data. For much of the period under analysis, the *Jornal* conveniently published monthly summaries of foreign trade, from which much of the series is taken. In some years, these reviews were not published, and instead the daily data has been collected.[27]

[27] Volumes have been converted to metric tons. For a detailed list of weights and measurement conversions, see appendix 1.

There are several problems with the data. Firstly, there are gaps in the series, including months in 1828, 1829, 1832, 1829, the first seven months of 1830 and all but March 1831. While the nationality and destination of the ships leaving port were listed during these years, the commodities and volume exported were not included. To calculate a continuous monthly time series, I have interpolated the missing months using a multiplicative seasonal factor derived from regressing the natural log of each country series on a full set of month dummies.[28] Another important problem is the source of exports. Being the southeast's principal port, Rio de Janeiro exported coffee and sugar from other provinces, including Minas Gerais and São Paulo. Given the nature of the data, it is impossible to confirm the true origin of the export data presented here.[29] Thus, the data should be interpreted as representing regional (southeastern) exports, rather than exports strictly from Rio de Janeiro. Additionally, the sources do not specify the quality of commodity exported, especially a problem for sugar, which might have arrived in the muscovado, yellow, or white forms. We know, however, that American and European importers preferred muscovado, as subsequent refining was undertaken by national industry.[30] Thus, it is likely that most of the sugar exported was of the lower quality.[31] Furthermore, the destinations listed may have been merely entrepôts, such as Cowes, the Cape of Good Hope, Açores or Madeira. This is particularly a problem for the British

[28] See appendix 1 for a full explanation.
[29] Corrêa do Lago, *Escravidâo*, p. 518. Data quoted in the *Jornal do Commercio* in 1831 indicate that exports from Rio de Janeiro occupied 93 per cent of the total volume, while those from Minas Gerais and Sâo Paulo constituted four and three per cent, respectively. See *Jornal do Commercio*, 1832, ed. 101, p. 2. See also Soares, *Notas*, p. 212, for figures for mid-century. While Minas Gerais remained Brazil's largest slaveholder during the nineteenth century, by mid-century the province still only exported around one-tenth the volume of coffee of neighbouring Rio de Janeiro, and slightly less than the Paulista portion of the Paraíba Valley. Filho and Martins, 'Slavery,' p. 545. The province remained, however, an important supplier of agricultural, animal products, and textiles to Rio de Janeiro. Bergad, *Slavery*, Chap. 2. São Paulo would become the country's premier coffee exporter during the final quarter of the century. Dean, *Rio Claro*; Klein and Luna, *Slavery*, pp. 92-5.
[30] On the British case, Curtain, 'British sugar duties,' p. 158; Sturz, *Review*, pp. 120-36; Barickman, *Bahian Counterpoint*, Chap. 7.
[31] Unfortunately, the official sources that are available for the 1840s do not differentiate between qualities of sugar. *Collecção* (1848-55).

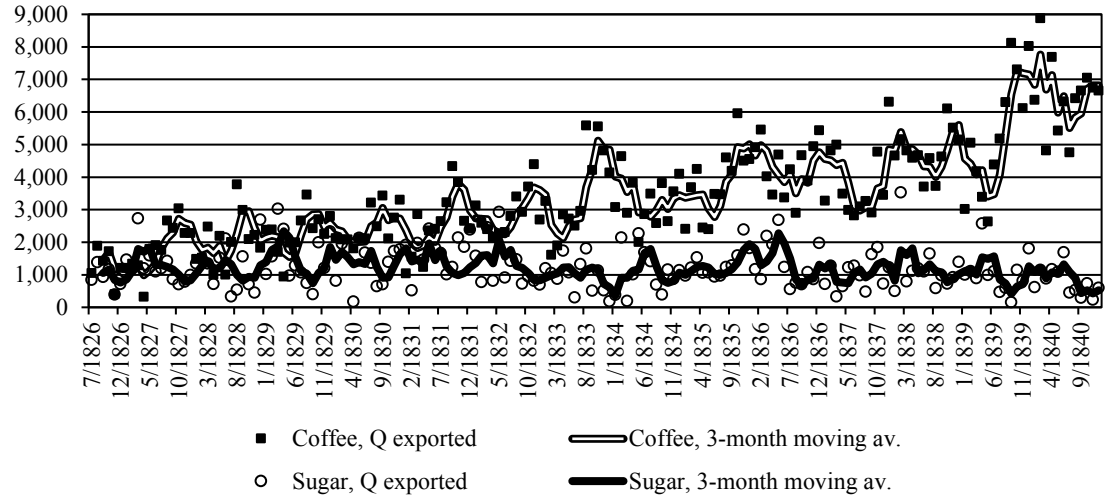

Figure 1. *Volume (in metric tons) of coffee and sugar exported from Rio de Janeiro, 6/1826-12/1840*

Sources: 1826: *Diario Mercantil*; 1827-6/1840 *Jornal do Commercio*; 7-12/1840: *O Despertador*.

series. On paper, the United Kingdom received an average of 23 per cent of coffee and 19 per cent of sugar exports over the period. Brazilian exports that did arrive to mainland British ports (London or Liverpool) were subjected to prohibitive tariffs and re-exported to the Continent. This seriously distorts the geographical distribution of exports and warrants correction. [32]

Figure 1 displays the resulting series of the total volume of coffee and sugar exported outside of the Empire from the port of Rio de Janeiro from July 1826 to December 1840. The figure shows both the monthly observations of total volumes and a three-month moving average. In terms of total volume, coffee overtook sugar from mid-1827 onwards. This accords with the series by Robert Walsh published in 1830, and reproduced by Luiz Aranha Corrêa do Lago, which showed that coffee had already overtaken sugar by 1828.[33] The divergence in export performances, however, did not

[32] See appendix 2 for a discussion of the correction of the series for British re-exports.
[33] Corrêa do Lago, *Escravidâo*, pp. 459-60; Walsh, *Notices*, pp. 535-36.

become sustained until around 1833, when the ratio of coffee to sugar exports began to climb steadily higher. The volume of coffee exported during the period grew by an average of 12 per cent, while that of sugar contracted by two per cent. Average growth was extremely rapid for coffee during the late-1820s, dropping off and picking up again in the mid-1830s. While the first half of the 1830s was good to sugar, growth declined from 1835 onwards. The 1830s were years of rapid growth for coffee (at an average of nine per cent) and moderate contraction for sugar (at three per cent). It is evident that the shift from sugar to coffee in the southeast was in full swing by the mid-1830s.

Figure 2 provides the series of the geographical distribution of coffee and sugar exports, corrected for the presence of British re-exports. During the late-1820s, around 60 per cent of Rio de Janeiro's coffee was shipped to ports in the United States, Belgium (via Antwerp), and Germany (via Hamburg). The remainder was shipped to destinations in Europe, the most important being the Austrian Empire (Trieste). Minor shipments were also made to ports in Africa (principally Angola) and the Rio de la Plata. The 1830s witnessed a considerable shift in the composition of coffee exports in favour of the United States. In the early-1830s, the share of the United States rocketed from around 15 per cent to occupy almost half of total exports. In fact, from 1831 onwards, the United States and Germany (Hamburg) alone occupied over half of all coffee exports. The geographical profile of sugar exports was considerably distinct. Exports to the United States were unimportant. The Austrian Empire, Portugal, and Germany (Hamburg) imported most of Rio de Janeiro's sugar, while the Rio de la Plata became an important destination after 1832.[34]

[34] Connections to the regional market in the Rio de la Plata went deeper than the trade in sugar. Apart from an important (legitimate and contraband) flow of commodities between Argentina, Uruguay and Brazil (Pereira, 'Was it Uruguay;' Flores, 'Contrabando'), the port of Montevideo served as an important entry point for imported slaves destined to Rio de Janeiro disguised as 'colonists' during the period of the contraband slave trade. Borucki, 'The "African Colonists" of Montevideo.' Additionally, due to the

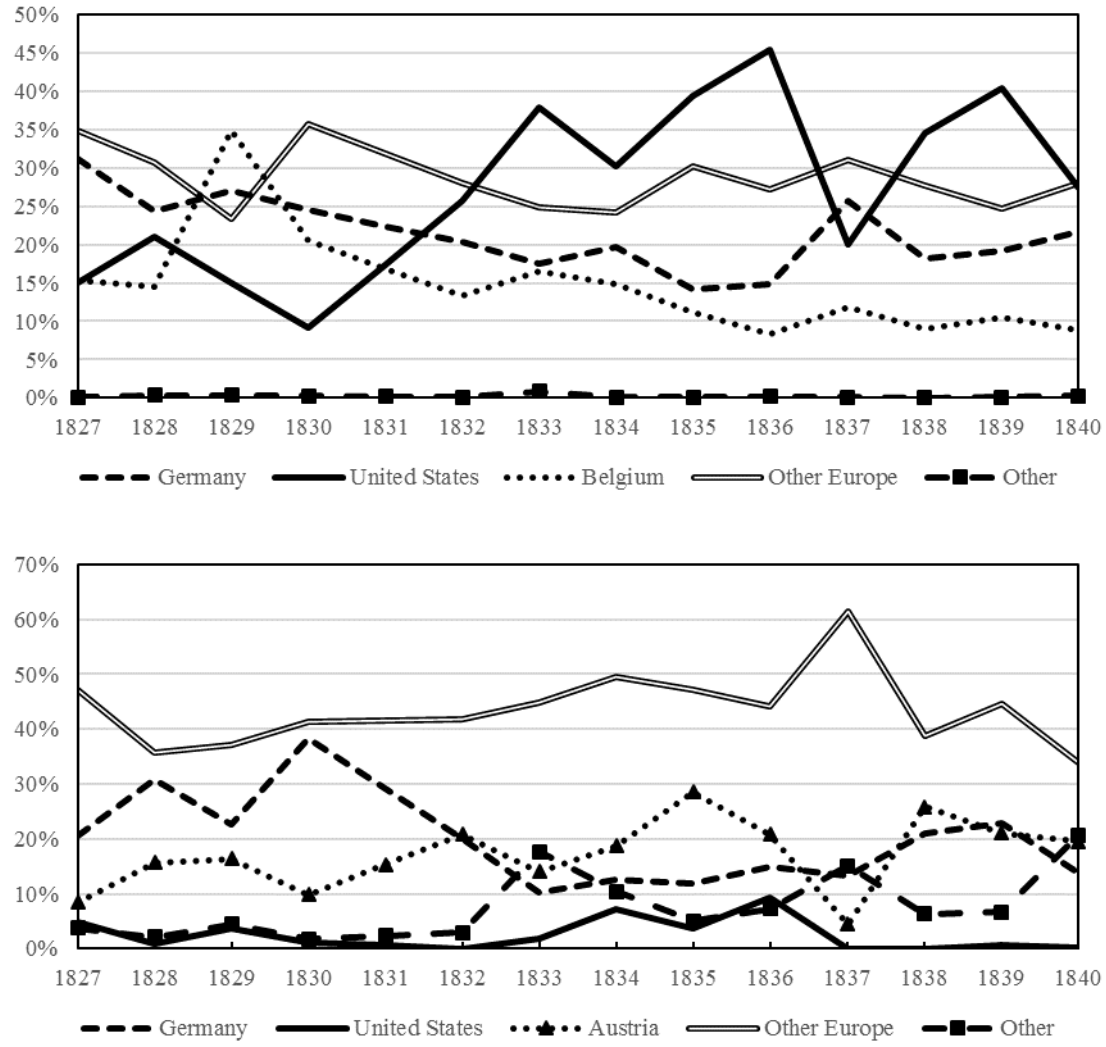

Figure 2. *Shares (%) in total exports of coffee (above) and sugar (below) from Rio de Janeiro, 1827-40*

Notes: These shares are corrected for missing observations and the presence of British re-exports. See appendix 2 for full explanation, and appendix 3 for port composition of destinations. *Sources*: same as figure 1.

TARIFFS AND MARKET POTENTIAL

The timing of the abolition of tariffs on coffee in the United States is fundamental for understanding the subsequent export boom that took place in Rio de Janeiro. American tariffs on coffee were gradually reduced from five cents per pound (an ad-valorem

continuous commercial deficit between the two countries, Argentina (via the port of Buenos Aires) exported significant quantities of foreign (Spanish) specie to Rio de Janeiro over the period. Barreto, 'O fluxo de moedas.'

equivalent of 34 per cent in 1827) to duty-free status during the period 1828 to 1832. Imports of coffee into the United States doubled between 1830 and 1835, while the geographical distribution of imports rapidly skewed in favour of Rio de Janeiro. The expansion of American coffee consumption provided a lucrative incentive for southeastern producers to cultivate. No such event occurred for cane sugar. Until the British Sugar Act of 1846, the virtual exclusion of southeastern sugar from all but a few markets remained business as usual.[35]

American society in the 1830s was ripe for the acceptance of coffee as an object of mass consumption. Lobbying from temperance groups aggressively discouraged the use of whiskey and encouraged the use of tea and coffee as substitutes.[36] The consumption habits of recently arrived European immigrants, particularly from Germany where the culture of coffee-drinking was firmly ingrained, ensured a ready market for the product.[37] Unlike cane sugar, the cultivation of which constituted an important part of the Southern slave-based economy in Louisiana, Americans were dependent on foreign countries for their supply of coffee.[38] This combination of factors undoubtedly served to place pressure on legislators to abolish the tariff on coffee. During a Congressional hearing regarding the tariff in January 1833, a representative of Massachusetts pointed to these factors as prime motivators of abolition, arguing that 'The great and glorious temperance reformation … will greatly increase the use of tea and coffee as a substitute for ardent

[35] On the effects of British slave emancipation and the Sugar Act, Batista Jr., 'Política tarifária;' Curtain, 'British Sugar Duties;' Federico and Tena-Junguito, 'American divergence.'
[36] Rorabaugh, *Alcoholic Republic*, p. 100.
[37] McDonald and Topik, 'Americanizing,' pp. 121-22. German immigration to the United States increased rapidly during the period surrounding the reduction and abolition of the coffee duty, from 10 thousand in the 1820s to 255 thousand in the period 1832-45. In terms of nationality, German immigration during this period was surpassed only by the Irish, at 388 thousand. Cohn, *Mass Migration under Sail*, p. 24.
[38] On the antebellum Louisiana sugar industry, see Follett, *Sugar Masters*; Schmitz, 'Economies of scale.'

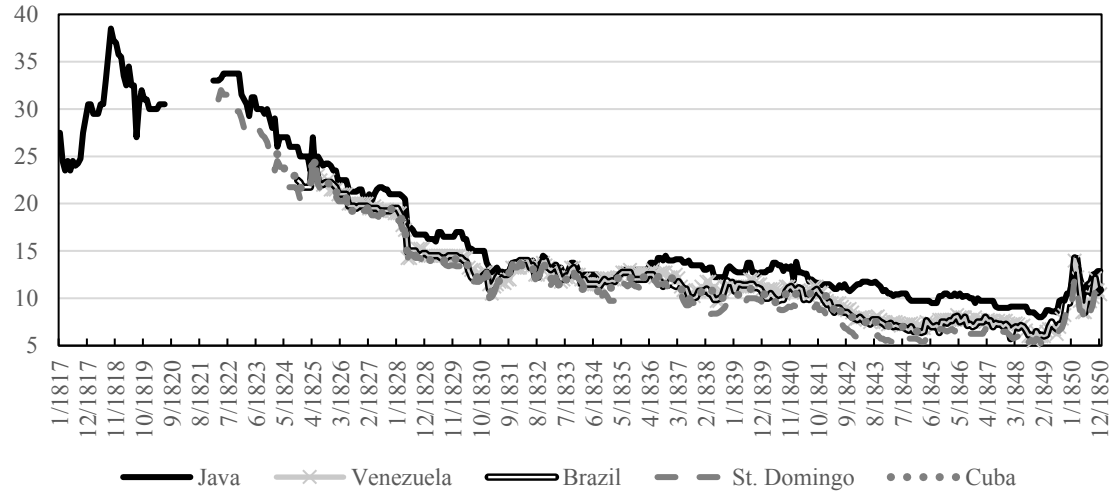

Figure 3. *Prices (c/lb) of coffee in New York, duty-paid, monthly, 1/1817-12/1850*

Source: *Shipping and Commercial List and New York Price Current*.

spirits … I hope that we may not … check a reformation essential to national honor, character, and salvation.' Furthermore, he observed that '…coffee and tea do not come in competition with any production of our country… They are of great value; may be safely kept for a long time; and coffee improves by age.'[39] Tellingly, foreign (raw and refined) sugar received no such treatment. Although tariffs on foreign muscovado sugar were reduced from three to two and a half cents during the same period, falling prices ensured that the ad-valorem equivalent remained steady (at around 37 per cent).[40]

The gradual reduction of the tariff from five cents per pound to two in May 1828, to one cent per pound in May 1830, and its final abolition in July 1832, together with coffee's declining price in the United States, which continued until mid-century, meant that for the first time coffee was affordable for the general population. The average duty-paid price of coffee declined from a peak of 38 cents per pound in September 1818 to 18 cents in April 1825 (Figure 3). Prices were then almost halved between the first and

[39] *Register* (1833), p. 1184. There is no evidence from the sources consulted that those who lobbied for the reduction and abolition of the duty were actively involved with the coffee trade.
[40] *The existing tariff* (1884), pp. 136-37, 156-57.

second reduction of duties in 1825 and 1830. Demand pressure seemingly slowed the pace of decline thereafter, although the trend of average prices continued its downward drift, reaching a half-century low of six cents per pound in October 1848. Price competition was fierce, and the price of Brazilian coffee lay between the expensive Javanese and the cheaper Haitian varieties.[41]

The rapid decline of prices and consequent expansion of consumption generated a social reaction that was equally as caffeinated:

> Coffee is all the gow now. The first thing that fixes the eye in the price current is coffee! And the last object it lingers upon is coffee! If you listen to a group of conspirators, why the only word that becomes audible is coffee! If you hear any man's having made a good speculation, why 'tis in coffee! If any one thinks of getting married in this cold and extravagant time, it is upon the strength of coffee! If any one preaches against intemperance, his text is coffee! The substitute is coffee! The antidote coffee! The means of salvation coffee! … While we 'calculate the value of the Union,' let us ever bear in mind how deeply we are indebted to the eloquence of coffee![42]

The immediate effect was the doubling of per capita consumption, from three to six pounds per year between 1830 and 1835. This increase translated into an additional hundred cups of coffee a year, raising per capita consumption to an average of around half a cup a day.[43] The American share of world imports rocketed from around seven per cent in 1823 to 24 per cent in 1835 and hovered around one-fifth until mid-century,[44] quickly converting the United States into 'the world's greatest coffee market.'[45] The main supplier of this vertiginous rise in consumption was the port of Rio de Janeiro. On the

---

[41] Except for West Indian product, which ceased to be quoted in the 1830s, the *Shipping and Commercial List* did not quote prices by grades. Furthermore, St. Domingo quotations include the annotation 'in cash,' which may indicate some form of exchange discount.
[42] *Boston Gazette and Daily Advertiser*, 27/12/1831, p. 3.
[43] See appendix 4 for estimates of coffee consumption.
[44] Calculated as the share of United States' imports in total world exports of coffee. World exports taken from Absell and Tena-Junguito, 'Brazilian export growth,' online appendix 1. For estimates of world import market shares and per capita consumption for the second half of the century, see McDonald and Topik, 'Americanizing,' p. 118.
[45] Topik, 'Coffee,' p. 95; Marquese, 'Estados Unidos,' p. 55.

national level, Brazil rose from occupying six per cent of the volume of total imports around the time of its political independence, to 70 per cent by mid-century.[46] Import data for the port of New York, which, besides Baltimore, was the leading destination for American coffee imports, show that Rio de Janeiro's share more than doubled during the period 1825-30 to 1836-40, from 14 to 41 per cent. This came at the expense of Cuba, which all but disappeared from the market and, to a lesser extent, Santo Domingo.[47]

In comparative terms, the United States was exceptional in its progressive attitude towards the coffee tariff. Indeed, for producers in southeastern Brazil on the eve of the first globalisation, tariffs on non-colonial coffee and sugar were the principal barriers to entry in several of the most important European markets. Table 2 shows the ad-valorem equivalent of tariffs on non-colonial coffee and brown sugar in 1841 for Brazil's principal trading partners. For both coffee and brown sugar, the tariffs in core Imperial Europe (the United Kingdom, Spain and France) were truly prohibitive. However, both within and outside of Imperial Europe, there was considerable heterogeneity of tariff levels. The tariff on coffee in the Netherlands was seven per cent, while that for non-Imperial Austria was 69 per cent. In terms of observable entry costs, the freest market in the world for coffee in 1841 was the United States, followed by Hamburg for both coffee and sugar. The latter, however, was a hub for re-exports to what had then become the German Customs Union (Zollverein), which placed a tariff of 35 per cent on coffee.[48] Generally, with a few exceptions (Belgium, 'Italy', and the Austrian Empire) tariffs for brown sugar were higher than those for coffee.

[46] *Commerce and Navigation* (1822-51).
[47] Data taken from the *Shipping and Commercial List and New-York Price Current*.
[48] In the mid-1830s, imports from the Hanse Towns accounted for 87 and 76 per cent of the volume of total coffee imports to the Prussian ports of Memel and Dantzig, respectively. *Tables* (P.P. 1836, XLVI), p. 475; *Tables* (P.P. 1837, XLIX), p. 300. Hamburg was also a gateway to Southern Prussia and the Scandinavian countries.

Table 2. *Tariffs on non-colonial imports of coffee and brown sugar, percentage of price, 1841*

	Coffee	Sugar
	Europe	
Hamburg	0.5	0.5
Zollverein	35.1	95.2 (52.9)
Belgium	16.7	2.9
'Italy'	46.8	27.7
Austrian Empire	68.5	95.9 (48.0)
Portugal	17.7	21.7
	Imperial Europe	
Netherlands	6.7	37.3
Spain	84.3	191.6
United Kingdom	264.3	233.2
Denmark	14.2	23.3
Sweden	21.0	46.1
France	68.3	91.7
	Americas	
United States	0.0	41.2
Uruguay	24.5	24.5
Chile	35.0	35.0

Notes: As most tariffs were given as specific duties (that is, duty per weight), I convert all duties to British shillings per hundredweight and apply this to the unweighted average of monthly prices for 1841 for Amsterdam, Hamburg, Liverpool, New York, and Philadelphia in 1841. Figures in parenthesis are for unrefined sugar imported for the purposes of refining. In some cases, different tariffs were given for national and foreign vessels. I have taken the average of these. 'Italy' is the average of Sardinia, the Papal States, and Tuscany. The Chilean tariff on sugar was not given by MacGregor, so I assume that it was the same as coffee. *Sources*: Prices: Amsterdam: *Börsen-Halle*, *Handelsblad*, *Nieuw Rotterdamsche Courant*; Hamburg: *Börsen-Halle*; Liverpool: *Liverpool Mercury*, *The Manchester Times and Gazette*, *North Wales Chronicle*; New York: *Shipping and Commercial List and New-York Price Current*; Philadelphia: Bezanson et al., *Wholesale prices*, pp. 48-52, 222-23. Exchange rates: Denzel, *Handbook*. Specific and ad-valorem tariffs: MacGregor, *Commercial Statistics*.

In the American case, however, it was the dynamic interplay between the tariff, other trade costs, and consumption – the market potential of coffee – that provided the demand-side impetus to the expansion of cultivation in the Brazilian southeast. To ascertain the comparative size of American market potential, I estimate the market potential for both coffee and cane sugar for the United States, Germany and the United Kingdom. The market potential measure used here is a version of Chauncy Harris' seminal formulation, which calculated the potential of a market as economic size divided by trade costs.[49] While Harris, and much of the literature that followed, weighted

[49] Harris, 'Market.'

economic size by distance as a proxy for trade costs, the empirical reality is that trade costs were neither time-invariant nor directly related to distance.[50] I prefer a more empirically-founded (albeit data intensive) approach to measuring trade costs. Thus, I assemble data on freight rates, insurance costs, and tariffs for coffee and sugar exports from Rio de Janeiro during the period and combine these with the total import of coffee and brown sugar as a proxy for commodity-specific market size in destination markets.[51]

The market potential measure takes the form:

$$MP_{cjt} = \frac{lnY_{cjt}}{ln(1+t_{cjt}+I_{cjt}+T_{cjt})} \quad (1)$$

where the market potential of commodity *c* in country *j* at time *t* is calculated as the total demand for commodity *c* in country *j* at time *t* (Y_{cjt}), discounted by the previously mentioned trade costs: freight rates (t_{cjt}), insurance rates (I_{cjt}), and import tariffs (T_{cjt}). As a proxy for Y_{cjt}, I gather new monthly data on coffee and sugar imports to the ports of New York and Liverpool for the period 1/1827 to 12/1840. Given that a monthly series of imports has not yet been gleaned for Hamburg, I present annual estimates from 1829 onwards taken from official trade statistics.[52]

Figure 4 presents the results for coffee (above) and sugar (below) for New York, Liverpool and Hamburg together with aggregate estimates for the United States and United Kingdom. I also include a rough estimate of the Zollverein's market potential, using the Hamburg import series and Zollverein tariffs on coffee and raw sugar retained for refining purposes.[53] The effect of the abolition of American tariffs on the market

[50] On the theory behind and calculation of market potential, see Redding and Venables, 'Geography;' Liu and Meissner, 'Market potential;' Jacks and Novy, 'Market potential.'
[51] See appendix 5 for a description of the data and sources.
[52] The Hamburg series includes re-exports from Great Britain and other European ports.
[53] For the period 1829-33, I use the Prussian tariff, which, with minor alterations, was adopted by the Zollverein from 1834.

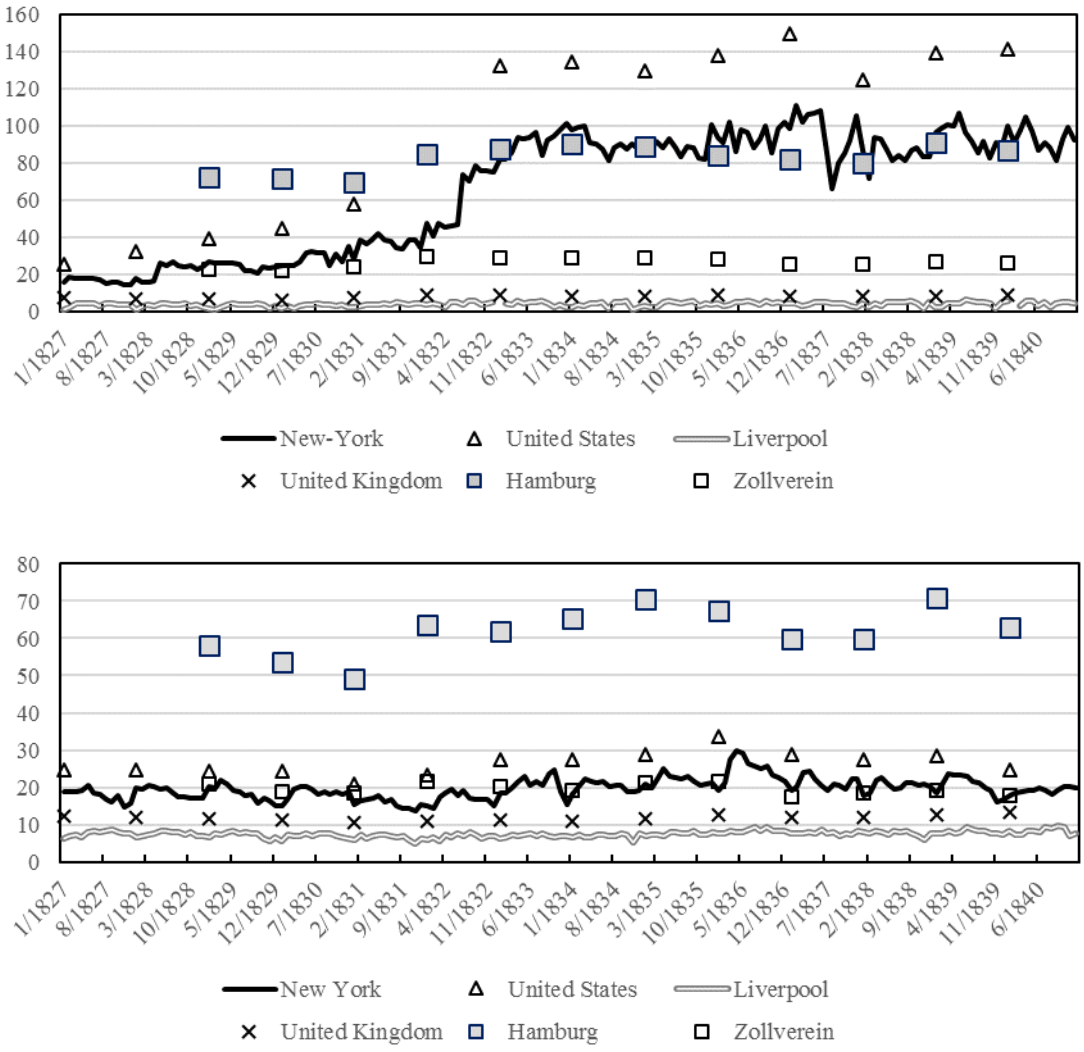

Figure 4. *Market potential of Brazilian coffee (above) and sugar (below) in the United States, Germany and the United Kingdom, 1/1827-12/1840*

Sources: Imports: New York: *Shipping and Commercial List and New York Price Current*. Liverpool: 1/1827-11/1834, 3/1835-8/1835, 10/1835-12/1835, 1837-40: *Liverpool Mercury*; 12/1834, 1/1835-2/1835, 9/1835, 1836: *Gore's Liverpool General Advertiser*. Hamburg: 1829-30: *Tables* (P.P. 1835, XLIX), pp. 572; 1831-40: *Tabellarische* (1850). United States: *Commerce and Navigation* (1822-51). United Kingdom: *Tables* (P.P. 1833-50, XLI-LIV). Freight rates: Absell and Tena-Junguito, 'Reconstruction,' p. 104. Insurance rates: Schöller, 'L'évolution'. Tariffs: *The existing tariff* (1884), pp. 136-37, 156-57; *Coffee.-Cocoa.-Cheese and butter* (P.P. 1843, LII); *Sugar* (P.P. 1846, XLIV)*;* Gaemmerer, *Sammlung*, pp. 110-11; *Prussian Commercial Treaty* (P.P. 1837-38, XLV), pp. 18-9; MacGregor, *Commercial Tariffs*, pp. 46-7.

potential for coffee is evident: in a period of 12 months, spanning abolition in July 1832 to the summer of 1833, market potential doubled. A new equilibrium was subsequently reached, and market potential fluctuated around a constant trend (except for the negative

shock associated with the financial crisis of 1837)[54] for the rest of the period. The New York market alone attained market potential levels comparable to Hamburg after the abolition of tariffs. New York, however, only accounted for around 35 per cent of total American imports during the 1830s.[55] Thus, as figure 4 demonstrates, total American coffee market potential rose to become the highest in the sample, and most likely the highest in the world. While Hamburg remained the leading market for southeastern sugar, the potential of the Zollverein was considerably lower, being comparable to the American market. The latter, however, was dwarfed by the market potential of coffee after the abolition of the tariff. Finally, the effect of colonial preferences on the British market potential for Brazilian coffee and sugar is clear: the market potential for both commodities in Liverpool and the United Kingdom is negligible when compared to American and German levels.

THE AMERICAN COFFEE TARIFF AND BRAZILIAN EXPORTS

Quantifying the precise effect of the abolition of the American coffee tariff on Brazilian exports is a difficult task for several reasons. Firstly, as mentioned above, the reduction of the tariff took place over the period of five years, although, judging from the change in consumption trends, the expansion of mass consumption in the United States most likely began after 1830. Secondly, the nature of coffee cultivation in southeastern Brazil at the time meant that any exogenous demand shock would generate a lagged

[54] In a retrospective of 1837, the *Jornal do Commercio* observed that the effects of the crisis '…will not be easily erased from the memory of the merchant, the capitalist, the farmer, and the statesman.' However, 'The Rio de Janeiro market suffered less than was expected… trade continued as usual here, and with few exceptions… merchants fulfilled their obligations with the greatest promptitude.' *Jornal do Commercio*, 1848, ed. 2, p. 2. Indeed, while coffee imports to the United States, following the general trend of total imports, almost halved in value over the period 1836 to 1843 and stagnated until mid-century, the value of coffee imports from Brazil, despite a rapid decline in the years 1837 and 1838, continued its upward trajectory. *Commerce and Navigation* (1822-51). On the general economic consequences of the crisis, Temin, 'Economic consequences;' Rousseau, 'Jacksonian.'

[55] Calculated by dividing total imports of the New York series by total national imports taken from *Commerce and Navigation* (1822-51).

supply response of at least three years.[56] Furthermore, the limitations of the monthly export data restrict the pre-treatment starting point of the series to January 1827, leaving little room to estimate pre-trends for the first duty reduction that occurred in 1828. Here I take a first step in estimating the impact of the reduction and abolition of the coffee tariff using standard intervention analysis methodology. The strategy employed involves comparing the pre- and post-trends of exports to the United States with a series of control groups for the 1830 and 1832 tariff changes. If the post-trend of exports to the United States is larger than both the pre-trend and the post-trends of the control groups, then it is evidence of the positive effect of tariff reduction.[57]

To begin with, I undertake a controlled interrupted time series (CITS) analysis of the monthly export data. CITS is an extension of the differences-in-differences (DID) design that, in a panel setting, estimates the effect of a policy intervention or event (treatment) on a treated group relative to an untreated control. CITS differs from DID in the respect that it measures deviations from a pre-treatment (or baseline) trend rather than a pre-treatment mean. In this sense, CITS is more flexible than DID, allowing for the control of time varying confounders, the inclusion of multiple treatments, and the testing of the parallel trends assumption.[58] It is, however, more data intensive, requiring a greater frequency of pre- and post-treatment observations for both treatment and control groups.[59] Here, I undertake a univariate CITS analysis that takes the form:

[56] Although coffee is a perennial crop with a lifespan of up to 20 years, it yields its first crop three to four years after the seedlings have been planted. Ferreira de Aguiar, *Pequena*; Dean, *Rio Claro*.
[57] This methodology is preferred over a fixed effects panel estimation of trade and tariff elasticities for the simple reason that it exploits the complete export series. The latter would require a full cross-section of ad-valorem equivalent tariffs for coffee and brown sugar over the period 1827-40, which is currently only available for a handful of countries. By using the dummy approach, I thus cede a certain degree of precision in favour of representativeness.
[58] The parallel trends assumption is tested in CITS by examining the statistical significance of the differences in the intercept and pre-treatment trends between treated and control groups.
[59] For examples of applications, see Linden, 'Conducting;' Lopez Bernal et al., 'Effect.' For a concise explanation of the difference between CITS and DID, Bernal et al., 'Difference in difference.'

$$Y_{it} = \gamma_0 + \beta_1 T_{pre} + \gamma_1 Z_{pre} + \beta_2 ZT_{pre} + \gamma_2 X_{1830/1832} + \beta_3 XT_{1830/1832} +$$

$$\gamma_3 ZX_{1830/1832} + \beta_4 ZXT_{1830/1832} + \gamma_4 D_{1837} + \varepsilon_{it} \quad (2)$$

where Y_t is export volume (in metric tons) to country *i* in month *t*, γ_0 the initial intercept (of the control group), T_{pre} the (control) pre-treatment slope, $X_{1830/1832}$ a dummy that captures the (control) level change following the immediate introduction of the treatment, $XT_{1830/1832}$ the difference between the (control) pre- and post-treatment slope, Z_{pre} the difference between the intercepts of the control and treated group prior to treatment, ZT_{pre} the difference between control and treated pre-treatment trends, $ZX_{1830/1832}$ the difference in level change between control and treated following the immediate introduction of the treatment, and $ZXT_{1830/1832}$ the difference between control and treated of the difference in the pre-post trend. D_{1837} is a dummy that takes the value of one during 1837 for the United States, to control for the negative effect of the banking crisis on import demand. The coefficients of interest are β_1 for the pre-trend, γ_1 and β_2 for testing the parallel trends assumption, and the sum of β_1 and β_3 for the calculation of the post-trend. The Z coefficients can be used to calculate the size and statistical significance of the pre- and post-trends for the treated group (the United States). Given the detection of significant levels of serial correlation at both the 12- and 24-month lags, I seasonally adjust the data and estimate an AR1 model (prais) with robust standard errors.[60] I define four control groups: World, which includes 10 countries from Europe, Africa and the Americas; Non-Imperial Europe, which includes those countries that did not possess colonial suppliers of coffee; Imperial Europe, which includes those that did; and Core, which includes the principal consumers of the southeast´s coffee (outside of

[60] Estimated in STATA using the itsa and actest user-written commands. Linden, 'Conducting;' 'Comprehensive.' To seasonally adjust the data, I regress the series on a constant and set of monthly dummies and add the residuals to the original mean. For a detailed explanation of this technique, Baum, *Introduction*, pp. 174-78.

Table 3. *Pre- and post-trends of controlled interrupted time series analysis on monthly coffee exports from Rio de Janeiro, in metric tons, 1/1827-12/1840*

	To				
	USA	World	Europe, Non-Imperial	Europe, Imperial	Core
			Treatment: 7/1832		
Pre	2.8	1.1	1.1	1.1	2.8
	(0.5)	(0.7)	(0.7)	(0.3)	(1.2)
Post	11.3	2.3	2.9	0.1	3.9
	(4.1)***	(2.7)***	(3.6)***	(0.1)	(3.1)***
			Treatment: 5/1830		
Pre	1.4	0.7	0.6	1.5	2.6
	(0.1)	(0.2)	(0.2)	(0.2)	(0.5)
Post	14.7	1.7	1.6	1.9	2.9
	(7.0)***	(2.7)***	(2.8)***	(1.2)	(3.2)***
Adj. R^2	0.4	0.1	0.2	0.2	0.2
Obs.	168	1,680	1,344	504	840

Notes: *** p< 0.01, ** p<0.05, *p<0.10. *Sources*: same as figure 1.

the United States): Germany, Belgium, Austria, and the United Kingdom.[61] (2) is run separately on the 5/1830 and 7/1832 treatment points, in order to gauge the differential effect of each.

Table 3 reports the coefficients of the pre- and post-trends for the United States, and each control group. γ_1 and β_2 (unreported) are not statistically significant in all cases, indicating the validity of the parallel trends assumption. There is a large (and statistically significant) change in the pre- and post-trends of exports to the United States, from three to 11 metric tons per month, following the 1832 abolition of the coffee duty. The post-trend is larger than that of any of the control groups. The comparable size of the American pre-trend (although not statistically significant, it is comparable to the Core and larger than the other control pre-trends), however, indicates that the skew towards the United

[61] The world sample constitutes 96 per cent of total export volume over the whole period, Non-Imperial Europe 39 per cent, Imperial Europe 26 per cent and Core 58 per cent. The estimation is undertaken on the uncorrected data, given that British re-exports were not presented monthly. This might bias downwards the coefficient of the Non-Imperial Europe control group.

States had begun prior to the abolition of the tariff. This is confirmed by the coefficient of the post-trend following the 1830 reduction of the tariff, which is larger than that of the 1832 post-trend. Prior to the 1830 treatment, exports to the Core countries increased faster than those to the United States. This trend was reversed after the treatment, however, and exports to the American market increased faster than those to any of the control groups. Significantly, the change from pre- to post-trend for the control groups (apart from Imperial Europe in 1832) was positive, suggesting that the reduction and abolition of the American tariff on coffee served to increase the absolute volume of exports across the board.

However, there are two issues that may bias these trend estimates. Firstly, it is possible that unobserved cross-sectional heterogeneity might serve to confound the tariff effect. Furthermore, the monthly series is characterised by a substantial number of zeros, a ubiquitous characteristic of high frequency trade data, the presence of which might bias the size of the coefficients. As a robustness check, I run a simple differences-in-differences estimation for the treatment points that takes the form:

$$Y_{it} = \alpha + \gamma_1 T_i + \gamma_2 t_i + \gamma_3 (T_i * t_i) + \varepsilon_{it} \quad (3)$$

where Y_{it} is again the export volume (in metric tons) to country *i* in month *t*, T_i is a dummy that takes the value of one for the treatment period (5/1830 to 12/1840; 7/1832 to 12/1840), t_i is a dummy that takes the value of one for the treated country (the United States), $T_i * t_i$ is the differences-in-differences term and ε_{it} is the error term. I include both country and year fixed effects. To control for the presence of zeros in the monthly data, I present results using the Poisson pseudo-maximum likelihood (PPML) estimator.[62]

[62] On the performance of PPML relative to OLS in the presence of many zeros, Santos Silva and Tenreyro, 'Log;' 'Further simulation evidence.' Of the 1,680 observation in the 10-country sample, 319, or 5.3 per

Table 4. *Differences between treated (USA) and control means of monthly exports from Rio de Janeiro, pre- and post-treatment, Poisson pseudo-maximum likelihood, country and year fixed effects, 1/1827-12/1840*

	Control			
	World	Europe, Non-Imperial	Europe, Imperial	Core
		Treatment: 7/1832		
Pre	1.7	1.6	0.2	-0.6
	(10.4)***	(9.8)***	(1.2)	(-4.3)***
Post	2.7	2.8	0.9	0.5
	(21.7)***	(22.1)***	(10.5)***	(6.0)***
		Treatment: 5/1830		
Pre	1.7	1.7	-0.5	-0.5
	(9.5)***	(9.3)***	(-2.9)***	(-3.5)***
Post	2.6	2.6	0.3	0.4
	(20.9)***	(21.0)***	(4.6)***	(4.8)***
Adj. R^2	0.6	0.6	0.4	0.4
Obs.	1,680	1,344	504	840

Notes: *** p< 0.01, ** p<0.05, *p<0.10. *Sources*: same as Figure 1.

γ_1 provides an estimate of the difference of the means between the treated and control groups in the pre-treatment period, while the sum of γ_1 and γ_3 gives the post-treatment difference. These coefficients are displayed in Table 4 for the four control groups. Although the results are not directly comparable to those of (2) as they reflect expected means rather than trends, they do support the pre- and post-treatment dynamics shown in Table 3. The differences between the treated and control means increased following both treatments, confirming that exports to the United States rose relative to the control groups. What's more, the coefficients on the 1830 treatment show that this dynamic was present before the abolition of the tariff in 1832.

The results of the intercept and pre-trend obtained from (2) permit the speculative exercise of calculating counterfactual exports in the absence of the 1830 and 1832 tariff changes. To provide a range of counterfactual estimates, I present two scenarios for each

cent, are zeros. Appendix 6 displays the results of (2) run on the truncated series. The inclusion of zeros most notably serves to reduce the estimate of the pre-trend for the 1830 treatment.

treatment. First, I assume that the shift in American tariff policy only affected exports to the United States. Estimates A (no 1832: the duty continued to be one cent per pound) and C (no 1830: the duty continued to be two cents per pound) in Figure 5 are calculated by extrapolating the monthly series of exports to the United States using the intercept and pre-trend coefficients for the 1832 and 1830 treatment points, respectively, as well as the dummy coefficient for 1837, and adding this to the total export series (minus actual exports to the United States). Secondly, I assume that the effect of the American tariff policy shift was dynamic, and so also affected exports to the principal consumers of Brazil's coffee in Europe. Estimates B and C are calculated in the same way but using the intercept and pre-trend for 'Core' and adding this to the counterfactual United States series. The difference between the counterfactual and the original series is interpreted as an estimate of the effect of the treatments, with A and C providing a lower- and B and D an upper-bound estimate. I estimate that in the absence of the 1830 treatment, the volume of total exports would have been between 29 (estimate B) and 41 (estimate D) per cent lower than the actual total during the period 1830-40. In the case of the 1832 treatment, the figures for 1832-40 are 19 (estimate A) and 28 (estimate C) per cent. In the case of the dynamic ('Core') estimates, almost all the growth that occurred during the 1830s would have disappeared in the absence of the tariff changes.

The most important consequence of the expansion of the coffee economy in southeastern Brazil was the increased demand for and supply of African slave labour. During the period under analysis, over half a million African slaves were imported into the southeast of Brazil, many of them destined for the coffee plantations.[63] Over 300

[63] Eltis, *Economic Growth*, pp. 243-44.

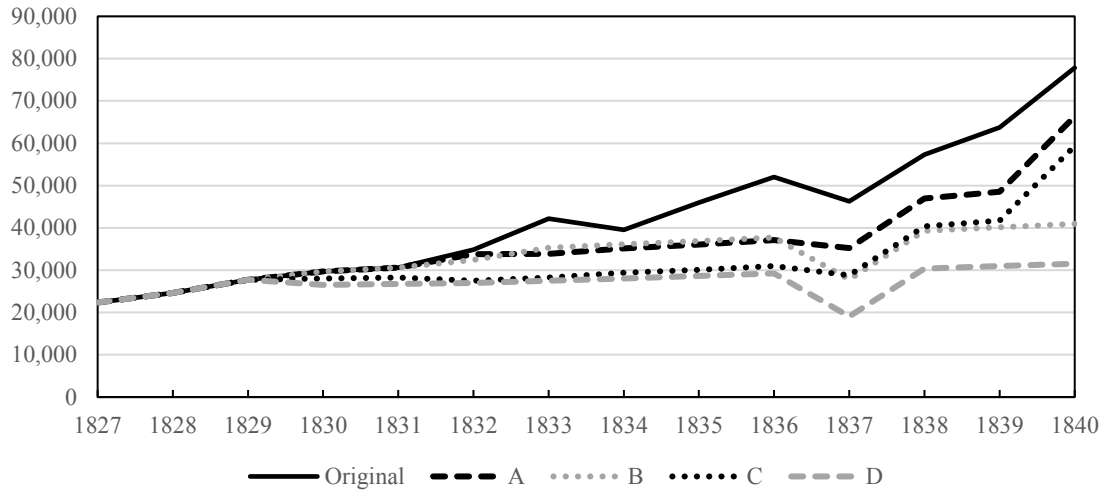

Figure 5. *Total exports (in metric tons) of coffee from the port of Rio de Janeiro, original and counterfactual estimates, 1827-40*

Notes: A is pre-1832 trend counterfactual USA plus no counterfactual rest. B is pre-1832 trend counterfactual USA plus pre-1832 trend counterfactual 'Core.' C is pre-1830 trend counterfactual USA plus no counterfactual rest. D is pre-1830 trend counterfactual USA plus pre-1830 trend counterfactual 'Core.' *Sources*: same as Figure 1.

thousand of these slaves were imported after the Brazilian government outlawed the trade in 1831. How might this trade have looked in the absence of American tariff reform? Using estimates of output per slave from Rio de Janeiro in 1827 and the counterfactual estimates shown in figure 5, I calculate the number of slaves required to produce the observed and counterfactual export volumes for the two dynamic 'Core' counterfactuals: no reduction in 1830 and no abolition in 1832. I include two estimates of output per slave: a lower (A; 23.5 *arrobas* or 0.35 metric tons per slave) and upper (B; 40 *arrobas* or 0.59 metric tons per slave) bound.[64] Underlying this exercise are two important assumptions:

[64] Corrêa do Lago, *Escravidão*, p. 461, note 12. Corrêa do Lago notes that these estimates most likely include slaves not directly involved in the cultivation of coffee. The author (p. 468, note 38) also cites estimates given in Tschudi, *Viagem*, pp. 39, 46, ranging between 135 and 182 *arrobas* (1.98 and 2.67 metric tons), but these are from the period 1847-54, thus including the rapid increases in productivity achieved through increased economies of scale during the consolidation of the coffee economy in the 1840s. Estimates presented by Klein and Luna for Areias, São Paulo, are actually lower than those for Rio de Janeiro - 0.19 (1825) and 0.8 (1854) metric tons – perhaps unsurprisingly, given that Rio de Janeiro was the epicentre of the initial phase of the nineteenth century coffee boom, and the first to experience concentration and associated productivity enhancements. Klein and Luna, *Slavery and the economy*, pp. 60, 65-7, 71.

Table 5. *Estimates of total slave labour requirements (thousands), actual and counterfactual, 1827-40*

Slaves needed:	A	B
Actual	222	132
Counterfactual:		
1830	90	53
1832	117	69
Difference:		
1830	132	78
1832	105	63
% of slave imports:		
1830	26	15
1832	21	12

Notes: A is based on an output per slave figure of 0.35 metric tons. B is based on an output per slave figure of 0.59 metric tons. *Sources*: Output per slave: Corrêa do Lago, *Escravidão*, p. 461, note 12. Actual and counterfactual export volume: figures 1 and 5.

a) that productivity did not rise above 40 *arrobas* per slave and b) that slave mortality was zero during the period 1827-40. In the absence of a major pecuniary incentive to export, such as the expansion of American coffee market potential described above, the former assumption is not completely farfetched. Rates of slave mortality, however, were evidently greater than zero.[65] The violation of the second assumption would serve to increase the slave requirement, biasing downwards the estimates. Thus, the figures shown in Table 5 should be interpreted as a lower-bound threshold. The estimates show that between 132 and 222 thousand slaves were required to produce the volume of coffee exported during the period 1827-40. The counterfactual estimates suggest that between 78 and 132 thousand less slaves would have been required if the United States had not reduced the tariff in 1830, and between 63 and 105 if the tariff had not been abolished in 1832. These estimates correspond with between 12 and 26 per cent of slaves imported during 1827-40. Would the law of 1831 have been more effective in the absence of the demand shock generated by the shift in American tariff policy? The answer to such a

[65] For a discussion of mortality trends and the life expectancy of slaves in Brazil, Klein and Luna, *Slavery*, pp. 163-72; Carvalho de Mello, *The Economics of Labor*, pp. 104-25. See appendix 7 for estimates incorporating productivity and mortality increases.

question is difficult, given the central role that slavery played in the Brazilian economy at the time, the absence of any immediate substitute for African slaves, and the increased demand for labour generated by the sugar boom in the northeast during the 1840s. What is clear, however, is the central role that American tariff policy played in the expansion of both the coffee economy and the contraband slave trade in the southeast during the 1830s.

FIRM-LEVEL DYNAMICS

An additional consequence of the abolition of the American tariff and subsequent export boom was the radical alteration of the composition and behaviour of export firms operating in the port city. Here I present disaggregated data on firm-level exports for three benchmark years including that prior to the reduction of coffee duties in the United States, 1827, three years after the abolition of duties, 1835, and the end of the export series, 1840.[66] The data indicate that, in just over a decade, a handful of firms rose to occupy around half of all coffee shipments. Of these firms, American and German firms rapidly eroded British pre-eminence in the export market, while non-American firms increased their participation in the American coffee market.

The export firm played a vital role in the distribution leg of the coffee commodity chain.[67] Once the coffee beans were harvested, the coffee was consigned to a factor (*comissário*/*correspondente*), who was responsible for the intermediate stage of the

[66] The sources of these data are the same as the aggregate series presented above. The firm-level data, however, was presented daily, and indicated the destination, the name and nationality of the ship, the name of the captain, *consignatorio*, and the volume exported. The daily data were collected and summed to obtain yearly estimates for each firm for each benchmark. In the case of 1827, the *consignatorio* was not given in the daily listing for exports, so I matched the ship's name and nationality with previous lists of incoming vessels that did include the consigning firm. The data for 1835 and 1840 show that in all cases importing and exporting firms were the same, so this shouldn't bias the assignment of *consignatorios*. The identification of the nationality of the principal *consignatorios* was performed using information provided by the secondary literature on export firms, principally Jarnagin, *Confluence*; Marques, 'Contraband;' Kuniochi, 'Crédito;' Ribeiro, 'Leading.'

[67] For a model of the Brazilian coffee commodity chain, Topik and Samper, 'Latin American,' p. 134.

distribution chain from the interior to port.[68] Before the coming of the railroads, coffee was transported to the port by muleteers (*tropeiros*), where it was entered into factor warehousing, sacked according to commercial standards, and stored until a transaction with an export firm could be brokered.[69] Export firms acted as consignment officers (*consignatorios*), connecting the supply of Brazilian planters with the demand of foreign clientele overseas, occasionally mediated by ship brokers (*corretores de navios*). Both during the rise of the coffee economy in Rio de Janeiro and its *apogee* in São Paulo later in the century, the final stage of the commodity chain was dominated by foreign capital.[70]

Table 6 displays descriptive statistics of the principal firms exporting coffee from Rio de Janeiro in 1827, 1835, and 1840. Prior to the initial reduction of the American coffee duty in 1828, the export of coffee was principally a British affair: the top four British firms together accounted for around a third of all exports (Columns B and C). These firms covered the principal export destinations (Column F: the Austrian Empire, Belgium, the British re-export market and Hamburg) in Continental Europe before the rise of the United States in the 1830s.[71] The exception was the American firm James (Diogo) Birckhead and Co., which occupied 11 per cent of total exports, and 80 per cent of the exports to the United States in 1827. Birckhead and Co. was an outlier in the sense that it exported almost five times the volume of its principal American competitors of the

[68] Sweigart, *Coffee factorage*; Taunay, *Historia,* pp. 43-51.
[69] Stein, *Vassouras*, p. 81; Maxwell, Wright and Co., *Commercial Formalities*, p. 79. On transport and *tropeiros* before railways, Schmidt, 'Tropas;' Klein, 'Supply;' Suprinyak, *Tropas*.
[70] Pereira da Silva, 'Predomínio.'
[71] Many of these firms were long-established import-export enterprises with primary interests outside of the coffee trade, firmly enmeshed in wider mercantile networks. Thus, Francis Le Breton and Co. played an important role in the salted codfish trade between Newfoundland and Brazil, while Henry Miller and Co. was involved in the British textile and coastal trade in the Southern Cone. On these two cases, see Herold, 'Nineteenth-Century Bahia's Passion,' and Reber, 'Speculation' and Llorca-Jaña, *British Textile Trade*, respectively. For a concise overview of British merchant banking during the first half of the nineteenth century, Llorca-Jaña, 'Shaping Globalization.'

Table 6. *Top five firms exporting coffee from Rio de Janeiro, 1827-40*

A	B	C	D	E	F	G
Name	Nationality	% of total exports	% USA of firm exports	Principal ship nationality (count)	Principal destination (weight)	% of total exports
			1827			
James Birckhead & Co.	American	11	98	American (25/25)	Baltimore	42
Priaulx Tupper & Co.	British	10	0	British (18/18)	Trieste	
Henry Miller & Co.	British	8	0	British (15/19)	Guernsey	
F. Le Breton & C.	British	7	0	British (23/25)	Antwerp	
Heyworth Brothers	British	6	0	British (9/13)	Hamburg	
			1835			
James Birckhead & Co.	American	18	78	American (32/32)	New York	65
Maxwell Wright & Co.	American	14	95	American (22/25)	New York	
F. Schott	German	13	15	Hamburg (15/30)	Hamburg	
George Hudson & Co.	British	12	0	British (20/47)	Trieste	
Henry Miller & Co.	British	9	23	British (13/23)	Trieste	
			1840			
George Hudson & Co.	British	13	0	British (22/75)	Trieste	49
F. Schott	German	12	8	Danish (24/45)	Trieste	
Maxwell Wright & Co.	American	10	99	American (34/35)	Baltimore	
Schröder & Co.	British/German	9	43	American (13/27)	Hamburg	
Miller Le Coq & Co.	British	5	13	British (9/18)	Trieste	

Sources: 1/1827-6/1827: *Diario Mercantil*; 7/1827-12/1827, 1835, 1840: *Jornal do Commercio*

time (Maxwell Wright and Co. and Samuel Clapp and Co.) and outdid its British competition in terms of the number of coffee consignments (25, Column E). The firm's early position was driven not by the demand for coffee in the American market, however, but by the early monopolisation of the Baltimore flour trade, which counted among the principal exports from the United States to Brazil.[72]

By 1835, the top five firms exported 65 per cent of the coffee from the port of Rio de Janeiro. The two principal American firms, Birckhead and Co. and Maxwell Wright and Co., together held 32 per cent of the total, with most of this coffee travelling on American ships to New York or Baltimore. The latter would become the leading exporter of coffee during the consolidation of the trade in the 1840s.[73] The degree of concentration in the top five, however, declined during the late-1830s to around half of all exports. By 1840, the leading firms were distributed between American, British and German interests. Apart from the British firm George Hudson and Co., however, all the top firms began to export to American ports in the 1830s (Column D).[74] The share of non-American firms in exports to the United States rose from five per cent in 1827 to 25 per cent in 1840. Much of this increase was due to the emergence of an Anglo-German firm, Schröder and Co., a multinational merchant banking and commission house, which possessed offices in London, Hamburg and, Liverpool, and active participation in the American cotton and Cuban sugar trades to Great Britain and Continental Europe.[75]

---

[72] Jarnagin, *Confluence*, pp. 121-25. Exports of flour averaged 57 per cent of the value of total exports to Brazil over the period 1822-40. *Commerce and Navigation* (1822-51). See appendix 8 for the principal export firms for sugar. Birckhead and Co. also accounted for eight per cent of total exports of sugar from Rio de Janeiro in 1827.

[73] Ribeiro, 'Leading;' Jarnagin, *Confluence*, Chap. 7.

[74] It is not clear from the sources whether Hudson and Co. was a commission house, a ship broker, or both. Frequently, adverts for shipping in 1827 listed 'Hudson & Weguelin' as the *corrector*, and the *Almanach do Rio de Janeiro* of 1827 lists Hudson as one of eight *corretores*. In 1835 and 1840, however, Hudson was listed as a *consignatorio* in the shipping lists. It's possible that George Hudson began as a ship broker and later moved into consigning.

[75] Roberts, *Schroders*, Chap. 2. In the early twentieth century, the firm would play an important role in financing the coffee valorisation plans in the state of São Paulo. Hutchinson, 'Coffee,' p. 530.

All the firms listed here were indirectly involved in the slave trade.[76] Thus, these firms not only facilitated the distribution of coffee from Rio de Janeiro overseas, but also reduced slave labour and credit constraints for planters in the interior. The firms' indirect participation in the slave trade took several forms. In the case of the three most important American firms, Maxwell Wright and Co., James Birckhead and Co, and Forbes Valentin and Co., it involved selling (or chartering) ships to slave traders. During the period spanning the *de jure* abolition of the Brazilian slave trade in 1831 to its *de facto* closure in 1850, American-made vessels transported almost 430 thousand slaves to Brazil, accounting for over half of all slave disembarkations during this period.[77] The above-mentioned firms, two of which played fundamental roles in the expansion of coffee exports to the United States, were identified by the United States' Consul in Rio de Janeiro as playing a major role in providing the vessels, as well as the flag, required for the expansion of the contraband slave trade.[78]

Export firms, particularly the British, also reduced credit constraints for slave traders by loosening maturity terms on bills of exchange related to commodities used in the slave trade, mainly cotton textiles.[79] After 1831, British firms reportedly extended maturity terms from the standard 60 days to up to four years, a practice emulated by non-British firms.[80] Pressure from the British government in the 1840s forced British firms to

[76] With the notable exceptions of Hudson and Schott, virtually all the firms exporting coffee in 1840 appeared as signees on a petition supporting the reinstatement of Manoel Pinto da Fonseca, the leading slave trader of the period, as '*assignante'* in the customs house. *Jornal do Commercio*, 1840, ed. 13, p. 2.
[77] Marques, 'Contraband,' p. 665. The classic work on the abolition of the Brazilian slave trade remains Bethell, *Abolition*.
[78] Marques, 'Contraband,' pp. 669-75; *United States*, Chap. 5; Wright, *Desafio*, pp. 242-45; Topik, *Gunboats*, p. 53. See the discussion between the Consul, George W. Slacum, and the Secretary of State, Daniel Webster, in 'Message' (1844), pp. 10-27. The United States flag provided protection from detention by British patrols. Eltis, 'U. S. Transatlantic slave trade,' p. 373-74.
[79] David Eltis estimated that British manufactured goods constituted around 80 per cent of the trade goods shipped from Rio de Janeiro to ports in Africa during the period 1821-43. Eltis, 'British contribution,' p. 219.
[80] Kuniochi, 'Crédito,' pp. 38-41; Tavares, *Comércio*, pp. 125-34. The source of this information is the 'Alcoforado report' from 1853, written by an informant of the Brazilian government. Tavares, *Comércio*, pp. 123-25; Marques, 'Contraband,' p. 670 and fn. 19.

limit maturity terms to 12 months in 1848, and non-British firms to follow suit in 1851.[81] Furthermore, it is also likely that these firms indirectly extended credit to planters by opening accounts with the *comissários*, crediting the cost of imported goods forwarded to the plantations in the interior as well as for services rendered and debiting the value of coffee purchased for export.[82]

CONCLUDING REMARKS

While the argument presented in this paper reifies the role of demand-side factors in the rise of coffee in the southeast, it is by no means conflictive with the conventional supply-side explanations. There is no doubt that coffee's relative efficiency as a cash crop determined the direction of the southeast's export specialisation. As I have shown here, however, the timing of this specialisation warrants a demand-side explanation. Together, agricultural efficiency and the expansion of coffee's foreign market potential provide a coherent account of why and when coffee emerged as the southeast's principal export commodity. In a sense, the demand-side approach is a nuanced take on some of the claims that the dependency school were making during the last half of the twentieth century: that peripheral economies were structured by the mechanisms of international capitalism in such a way so that they would supply the raw materials necessary for core capitalist development.[83] However, it wasn't merely agricultural specialisation in the periphery that the institutions of the core countries fostered, but also the direction of that specialisation. In southeastern Brazil during the 1830s, market signals worked in such a way that over

[81] Kuniochi, 'Crédito,' pp. 41-5. See *Jornal do Commercio*, 1851, ed. 2, p. 3, for signees of the non-British resolution.
[82] Marquese, 'Estados Unidos,' p. 60; Marques, *United States*, p. 108; Guimarães and Greenhill, 'Trading.' For a list of the charges of commission services rendered by Maxwell Wright and Co. in 1841, Maxwell Wright and Co., *Commercial Formalities*, p. 24. Merchant houses, cooperating through business associations in the country's principal ports, were also active in the exchange market, continuously decrying the monetary policy of the Imperial government and lobbying for a convertible currency. Ridings, *Business interest groups*, pp. 138-44.
[83] Gunder Frank, *Capitalism*; Cardoso and Faletto, *Dependencia*.

time Brazilian producers were incentivised to quench a particular thirst in a particular market at a particular historical juncture. The dependency school's emphasis on demand-side conditions, however, is only one side of the story: Brazilian producers (and their commercial and political representatives) were the real agents of coffee's expansion. Brazilians, with the aid of foreign (principally British) capital and transport technology, created the supply-side conditions that led to the country's eventual domination of the world coffee market.[84]

Outside of the Brazilian historiography, the findings of this paper also feed into the literature on the determinants of specialisation during the first globalisation. The factor proportions approach, derived from Ricardo's classic theory of comparative advantage, argues that countries specialise in export activities that use their abundant factor of production. Advances in international trade theory, however, have shown that while factor proportions may define the commodity structure of production and trade, geography-specific trade costs, home market effects, and foreign demand define the intensity and direction of trade.[85] The reduction of trade costs may result in commodity- and destination-specific demand shifts, expanding the foreign market potential of exports and driving market integration in terms of commodity price convergence.[86] This paper affirms the importance of trade costs in the process of specialisation. During the post-independence decades, exogenous shifts in trade costs translated into local price signals in Brazil that provided differing incentives for producers of different commodities. Thus, factor endowments only go so far in explaining the peripheral pattern of agricultural specialisation during the nineteenth century. The southeast's rapid specialisation in coffee

[84] Summerhill, 'Market intervention;' *Inglorious Revolution*; Abreu, 'British business.'
[85] Romalis, 'Factor proportions;' Davis and Weinstein, 'Market access;' Krugman, 'Scale economies.'
[86] Redding and Venables, 'Geography,' pp. 97-100; Head and Mayer, 'Market potential;' O'Rourke and Williamson, *Globalization*, p. 65.

was not only the product of an abundant source of land, the quality of which was ideal for the its cultivation. Specialisation was also driven by the expansion of foreign market potential, fuelled by the reduction of tariffs and subsequent expansion of demand for Brazilian coffee.

Footnote references

Abreu, M. De. P., 'British business in Brazil: Maturity and demise,' *Revista Brasileira de Economia*, 54 (2000), pp. 383-413.

Absell, C., and Tena-Junguito, A., 'Brazilian export growth and divergence in the tropics during the nineteenth century,' *Journal of Latin American Studies*, 48 (2016), pp. 677-706.

Absell, C., and Tena-Junguito, A., 'The reconstruction of Brazil's foreign trade series, 1821-1913,' *Revista de Historia Económica-Journal of Iberian and Latin American Economic History*, 36 (2018), pp. 87-115.

Arruda, J. J. de A., *O Brasil no Comércio Colonial* (São Paulo, 1980).

Baer, W., 'Regional inequality and economic growth in Brazil,' *Economic Development and Cultural Change*, 12 (1964), pp. 268-85.

Barickman, B. J., *A Bahian Counterpoint: Sugar, Tobacco, Cassava, and Slavery in the Recôncavo*, *1780-1860* (Stanford, 1998).

Barreto, A. E. M., 'O fluxo de moedas entre o Rio da Prata e o Brasil – (1800-1850),' *Revista de História*, 51 (1975), pp. 207-27.

Bates, R. H., *Open-Economy Politics: The Political Economy of the World Coffee Trade* (New Jersey, 1999).

Batista Jr., P. N., 'Política tarifária britânica e evolução das exportações brasileiras na primeira metade do século XIX,' *Revista Brasileira de Economia*, 34 (1980), pp. 203-39.

Baum, C. F., *An Introduction to Modern Econometrics Using Stata* (Texas, 2006).

Bergad, L. W., *Cuban Rural Society in the Nineteenth Century: The Social and Economic History of Monoculture in Matanzas* (New Jersey, 1990).

Bergad, L. W., *Slavery and the demographic and economic history of Minas Gerais, Brazil, 1720-1888* (Cambridge, 1999).

Bernal, J. L., Cummins, S., and Gasparrini, A., 'Difference in difference, controlled interrupted time series and synthetic controls,' *International Journal of Epidemiology*, 2019, pp. 1-2.

Bethell, L., *The Abolition of the Brazilian Slave Trade: Britain, Brazil and the Slave Trade Question* (Cambridge, 1970).

Bezanson, A., Gray, R. D., and Hussey, M., *Wholesale prices in Philadelphia, 1784-1861* (Philadelphia, 1936-37).

Borucki, A., 'The "African Colonists" of Montevideo: new light on the illegal slave trade to Rio de Janeiro and the Río de la Plata (1830-42),' *Slavery and Abolition*, 30 (2009), pp. 427-44.

Bruhn, M. and Gallego, F. A., 'Good, bad and ugly colonial activities: do they matter for economic development?' *Review of Economics and Statistics*, 94 (2012), pp. 433-61.

Bubonis, G., 'Bitter coffee: Trade Winds, the 19th Century Coffee Boom, and Historical Development' (unpub. manuscript, Univ. of Toronto, 2007).

Cárdenas, M. and Yanovich, D., 'Café y desarrollo económico: un análisis departamental,' *Coyuntura Social*, 5 (1997), pp. 137-81.

Cardoso, F. H. and Faletto, E., *Dependencia y Desarrollo en América Latina* (México, D.F., 1969).

Carter, S. B., Gartner, S. S., Haines, M. R., Olmstead, A. L., Sutch, R. and Wright, G., *Historical Statistics of the United States, Millennial Edition Online*, https://hsus.cambridge.org/HSUSWeb/toc/showPart.do?id=A, (accessed 23 Jul. 2017).

Carvalho de Mello, P., 'The Economics of Labor in Brazilian Coffee Plantations, 1850-1888' (unpub. Ph.D. thesis, Univ. of Chicago, 1977).

Cohn, R. L., *Mass Migration under Sail: European Immigration to the Antebellum United States* (Cambridge, 2009).

Corrêa do Lago, L. A., *Da Escravidão ao Trabalho Livre. Brasil, 1550-1900* (São Paulo, 2014).

Curtin, P. D., 'The British Sugar Duties and West Indian Prosperity,' *Journal of Economic History*, 14 (1954), pp. 157-64.

Davis, D. R. and Weinstein, D. E., 'Market access, economic geography and comparative advantage: an empirical test,' *Journal of International Economics*, 59 (2003), pp. 1-23.

Dean, W., *The Industrialization of São Paulo, 1880-1945* (Austin, 1969).

Dean, W., *Rio Claro: A Brazilian Plantation System, 1820-1920* (Stanford, 1976).

Deerr, N., *The History of Sugar,* Vol. 1 (1949).

Denslow, D. A., 'Sugar Production in Northeastern Brazil and Cuba, 1858-1908,' *Journal of Economic History*, 35 (1975), pp. 260-63.

Denzel, M. A., *Handbook of World Exchange Rates, 1590-1914* (Surrey, 2010).

Easterly, W., 'Inequality does cause underdevelopment: insights from a new instrument,' *Journal of Development Economics*, 84 (2007), pp. 755-76.

Eden, T., *Cooking in America, 1590-1840* (Westport, 2006).

Eisenberg, P., *The Sugar Industry in Pernambuco, 1840-1910: Modernization without Change* (Berkeley, 1974).

Eltis, D., 'The British Contribution to the Nineteenth-Century Transatlantic Slave Trade,' *Economic History Review*, 2nd ser., XXXII (1979), pp. 211-27.

Eltis, D., *Economic Growth and the Ending of the Transatlantic Slave Trade* (Oxford, 1987).

Eltis, D., 'The U.S. Transatlantic Slave Trade, 1644-1867: An Assessment,' *Civil War History*, 54 (2008), pp. 347-78.

Federico, G. and Tena-Junguito, A., 'Lewis revisited: tropical polities competing on the world market, 1830-1938,' *Economic History Review*, 70 (2017), pp. 1244-67.

Federico, G. and Tena-Junguito, A., 'A tale of two globalizations: gains from trade and openness 1800-2010,' *Review of World Economics*, 153 (2017), pp. 601-26.

Federico, G. and Tena-Junguito, A., 'American divergence: lost decades and emancipation collapse in Latin America and the Caribbean 1820-1870,' *European Review of Economic History*, 22 (2017), pp. 185-209.

Ferreira de Aguiar, J. J.., *Pequena Memoria sobre a Plantação, Cultura e Colheita do Café* (Rio de Janeiro, 1836).

Figueroa, L. A., *Sugar, Slavery, and Freedom in Nineteenth-Century Puerto Rico* (Chapel Hill, 2005).

Filho, A. M., and Martins, R. B., 'Slavery in a Nonexport Economy: Nineteenth-Century Minas Gerais Revisited,' *Hispanic American Historical Review*, 63 (1983), pp. 537-68.

Flores, M. F. da C. T., 'Contrabando na fronteira meridional do Brasil – por fora e por dentro da Alfândega (1845-1889),' *Revista Brasileira de História and Ciências Sociais*, 4 (2012), pp. 122-42.

Follett, R. J., *The Sugar Masters: Planters and Slaves in Louisiana's Cane World, 1820-1860* (Baton Rouge, 2005).

Furtado, C., *Formación económica del Brasil* (México D. F., 1962).

Gaemmerer, F., *Sammlung der jetzt bestehenden Königlich Preußischen Steuer-Gesetze* (Köln am Rhein, 1825).

Galloway, J. H., 'The Sugar Industry of Pernambuco during the nineteenth century,' *Annals of the Association of American Geographers*, 58 (1968), pp. 285-303.

Guimarães, C. G., and Greenhill, R., 'Trading in an emerging market: E. Johnston & Co and the Brazilian coffee trade 1840-1880,' *Revista de Historia Económica-Journal of Iberian and Latin American Economic History*, First View (2019), pp. 1-34.

Gunder Frank, A., *Capitalism and Underdevelopment in Latin America: historical studies of Chile and Brazil* (New York, 1967).

Harris, C. C., 'The market as a factor in the localization of industry in the United States,' *Annals of the Association of American Geographer,* 44 (1954), pp. 126-42.

Head, K. and Mayer, T., 'Market potential and the location of Japanese Investment in the European Union,' *Review of Economics and Statistics*, 86 (2011), pp. 959-72.

Herold, M. W., 'Nineteenth-Century Bahia's Passion for British Salted Cod: From the Seas of Newfoundland to the Portuguese Shops of Salvador's Cidade Baixa, 1822-1914' (Commodities of Empire Working Paper No. 23, London, 2015).

Hutchinson, L., 'Coffee "Valorization" in Brazil,' *Quarterly Journal of Economics*, 23 (1909), pp. 528-35.

Klein, H. S., 'The Supply of Mules to Central Brazil: The Sorocaba Market, 1825-1880,' *Agricultural History*, 64 (1990), pp. 1-25.

Klein, H. S. and Luna, F. V., *Slavery and the economy of São Paulo, 1750-1850* (Stanford, 2003).

Klein, H. S. and Luna, F. V., *Slavery in Brazil* (Cambridge, 2009).

Krugman, P., 'Scale Economies, Product Differentiation, and the Pattern of Trade,' *American Economic Review*, 70 (1980), pp. 950-59.

Kuniochi, M. N., 'Crédito e privilégios de comerciantes estrangeiros no Rio de Janeiro, na finalização do tráfico de escravos, na década de 1840,' *História e Economia*, 6 (2010), pp. 27-50.

Jacks, D. S. and Novy, D., 'Market Potential and Global Growth over the Long Twentieth Century,' *Journal of International Economics*, 114 (2018), pp. 221-37.

Jarnagin, L., *A Confluence of Transatlantic Networks: Elites, Capitalism, and Confederate Migration to Brazil* (Tuscaloosa, 2008).

Lampe, M. and Sharp, P., 'How the Danes discovered Britain: the international integration of the Danish dairy industry before 1880,' *European Review of Economic History*, 19 (2015), pp. 432–53.

Leff, N. H., 'Economic Development and Regional Inequality: Origins of the Brazilian Case,' *Quarterly Journal of Economics,* 86 (1972), pp. 243-62.

Leff, N. H., *Underdevelopment and Development in Brazil. Volume 1: Economic Structure and Change, 1822-1947* (1982).

Linden, A., 'Conducting Interrupted Time-series Analysis for Single- and Multiple-group Comparisons,' *Stata Journal*, 15 (2015), pp. 480-500.

Linden, A., 'A comprehensive set of postestimation measures to enrich interrupted time-series analysis,' *Stata Journal*, 17 (2017), pp. 73-88.

Liu, D. and Meissner, C., 'Market Potential and the rise of US productivity leadership,' *Journal of International Economics*, 96 (2015), pp. 72-87.

Llorca-Jaña, M., *The British Textile Trade in South America in the Nineteenth Century* (Cambridge, 2012).

Llorca-Jaña, M., 'Shaping Globalization: London's Merchant Bankers in the Early Nineteenth Century,' *Business History Review*, 88 (2014), pp. 469-95.

Lopez Bernal, J. A., Gasparrini, A., Artundo, C. M., and McKee, M., 'The effect of the late 2000s financial crisis on suicides in Spain: an interrupted time-series analysis,' *European Journal of Public Health*, 23 (2013), pp. 732-36.

MacGregor, J., *Commercial tariffs and regulations of the several states of Europe and America, together with the commercial treaties between England and foreign countries. Part the fifth. States of the Germanic Union of Customs; also, the Hanse Towns, Holstein, Hanover, Oldenburg, and Mecklenburg* (1842)

MacGregor, J., *Commercial Statistics: A Digest of the Productive Resources, Commercial Legislation, Customs Tariffs, of All Nations. Including British Commercial Treaties with Foreign States*, 5 Vols. (1850).

Marcondes, R. L., *A arte de acumular na economia cafeeira: Vale do Paraíba, século XIX* (São Paulo, 1998).

Marques, L., 'The Contraband Slave Trade to Brazil and the Dynamics of US Participation, 1831-1856,' *Journal of Latin American Studies*, 47 (2015), pp. 659-84.

Marques, L., *The United States and the Transatlantic Slave Trade to the Americas, 1776-1867* (New Haven, 2016).

Marquese, R. de B., 'Estados Unidos, Segunda Escravidão e a Economia Cafeeira do Império do Brasil,' *Almanack. Guarulhos*, 5 (2013), pp. 51-60.

Marquese, R. de B., 'As origens de Brasil e Java: trabalho compulsório e a reconfiguração da economia mundial do café na Era das Revoluções, c.1760-1840,' *História,* 34 (2015), pp. 108-27.

Marquese, R. de B. and Tomich, D., 'O Vale do Paraíba escravista e a formação do mercado mundial do café no século XIX,' in K. Grinberg and R. Salles, eds., *O Brasil Imperial: 1831-1870* (Rio de Janeiro, 2009), pp. 339-83.

Maxwell, Wright & Co., *Commercial Formalities of Rio de Janeiro* (Baltimore, 1841).

McDonald, M. C. and Topik, S., 'Americanizing coffee: the refashioning of a consumer culture,' in A. Nützenadel and F. Trentmann, eds., *Food and Globalization: Consumption, Markets and Politics in the Modern World* (Oxford, 2008), pp. 109-128.

Medeiros Lima, C. A., 'Cafeicultores, productores de açucar e tráfico de escravos na província de Sao Paulo (1825-1850),' *Revista de História Comparada*, 6 (2012), pp. 168-99.

Monasterio, L. M., 'Brazilian spatial dynamics in the long term (1872-2000): "path dependency" or "reversal of fortune"? *Journal of Geographical Systems*, 12 (2010), pp. 51-67.

Musacchio, A., Martínez Fritscher, A. and Viarengo, M., 'Colonial institutions, trade shocks, and the diffusion of elementary education in Brazil, 1889-1930,' *Journal of Economic History*, 74 (2014), pp. 730-66.

Naritomi, J., Soares, R. R. and Assunção, J. J., 'Institutional development and colonial heritage within Brazil,' *Journal of Economic History*, 72 (2012), pp. 393-422.

Nugent, J. B. and Robinson, J. A., 'Are endowments fate?' *Revista de Historia Económica-Journal of Iberian and Latin American Economic History*, 28 (2010), pp. 45-82.

Ocampo, J. A. and Colmenares Guerra, S., 'Exports and economic development in Colombia: a regional perspective, 1830-1929,' in S. Kuntz-Ficker, ed., *The First Export Era Revisited: Reassessing its Contribution to Latin American Economies* (Cham, 2017), pp. 191-234.

O'Rourke, K. H., and Williamson, J. G., *Globalization and History: The Evolution of a Nineteenth-Century Atlantic Economy* (Cambridge, 1999).

Pereira, T. A. Z., 'Was it Uruguay or coffee? The causes of the beef jerky industry's decline in southern Brazil (1850-1889),' *Nova Economia*, 26 (2016), pp. 7-42.

Pereira, T. A. Z., 'The rise of the Brazilian cotton trade in Britain during the Industrial Revolution,' *Journal of Latin American Studies*, 50 (2018), pp. 919-49.

Pereira, T. A. Z., 'The North-South Divide: real wages and welfare in Brazil during the early 20th century,' *Revista de Historia Económica-Journal of Iberian and Latin American Economic History*, (First View, 2019).

Pereira da Silva, G. 'O predomínio das casas estrangeiras sobre a exportação cafeeira em Santos no século XIX,' *América Latina en la Historia Económica*, 22 (2015), pp. 213-46.

Petrone, M. T. S., *A Lavoura Canavieira em São Paulo* (São Paulo, 1968).

Petrone, M. T. S., 'Um comerciante do ciclo do açúcar paulista: Antônio da Silva Prado (1817-1829),' *Revista de História,* 36 (1968), pp. 115-38.

Pinilla, V. and Ayuda, M. I., 'Taking advantage of globalization? Spain and the building of the international market in Mediterranean horticultural products, 1850–1935,' *European Review of Economic History*, 14 (2010), pp. 239–74.

Reber, V. B., 'Speculation and Commerce in Buenos Aires-The Hugh Dallas House, 1816-1822, *Business History*, 20 (1978), pp. 19-36.

Redding, S. and Venables, A., 'Geography and Export Performance: External Market Access and Internal Supply Capacity,' in R. E. Baldwin and L. A. Winters, eds., *Challenges to Globalization: Analyzing the Economics* (Chicago, 2004), pp. 95-130.

Ribeiro, A. dos S., '"The Leading Commission-House of Rio de Janeiro": A firma Maxwell, Wright & Co. no comércio do Império do Brasil' (unpub. Masters thesis, Univ. Federal Fluminense, 2014).

Ridings, E., *Business interest groups in nineteenth-century Brazil* (Cambridge, 1994).

Roberts, R., *Schroders: Merchants and Bankers* (1992).

Romalis, J., 'Factor Proportions and the Structure of Commodity Trade,' *American Economic Review*, 94 (2004), pp. 67-97.

Rorabaugh, W. J., *The Alcoholic Republic: An American Tradition* (Oxford, 1981).

Rousseau, P. L., 'Jacksonian Monetary Policy, Specie Flows, and the Panic of 1837,' *Journal of Economic History*, 62 (2002), pp. 457-88.

Salles, R., *E* o *Vale era o Escravo. Vassouras, Século XIX. Senhores e escravos no coração do Império* (Rio de Janeiro, 2008).

Santos Silva, J. M. C. and Tenreyro, S., 'The Log of Gravity,' *Review of Economics and Statistics*, 88 (2006), pp. 641-58.

Santos Silva, J. M. C. and Tenreyro, S., 'Further simulation evidence on the performance of the Poisson pseudo-maximum likelihood estimator,' *Economic Letters*, 112 (2011), pp. 220-22.

Schmidt, C. B., 'Tropas e Tropeiros,' *Journal of Inter-American Studies*, 1 (1959), pp. 103-22.

Schmitz, M. D., 'Economies of Scale and Farm Size in the Antebellum Sugar Sector,' *Journal of Economic History*, 37 (1977), pp. 959-80.

Schöller, P., 'L'évolution séculaire des taux de fret et d'assurance maritimes 1819-1940,' *Bulletin de l'Institut de Recherches Économiques et Sociales,* 17 (1951), pp. 519-57.

Schwartz, S. B., *Sugar Plantations in the Formation of Brazilian Society: Bahia, 1550-1835* (Cambridge, 1985).

Silva, S. *Expansão Cafeeira e Origens da Indústria no Brasil* (São Paulo, 1976).

Soares, S. F., *Notas Estatisticas sobre a Producção Agricola e Carestia dos Generos Alimenticios no Imperio do Brazil* (Rio de Janeiro, 1860).

Sokoloff, K. L. and Engerman, S. L., 'Institutions, factor endowments, and paths of development in the New World,' *Journal of Economic Perspectives*, 14 (2000), pp. 217-32.

Stein, S. J. *Vassouras: A Brazilian Coffee County, 1850-1900: The Roles of Planter and Slave in a Plantation Society* (New Jersey, 1985).

Sturz, J. J., *A Review, Financial, Statistical, & Commercial, of the Empire of Brazil and its Resources: Together with a Suggestion of the Expediency and Mode of Admitting Brazilian and Other Foreign Sugars into Great Britain for Refining and Exportation* (1837).

Summerhill, W. R., 'Market intervention in a backward economy: Railway subsidy in Brazil, 1854-1913,' *Economic History Review*, LI (1998), pp. 542-68.

Summerhill, W. R., *Order Against Progress: Government, Foreign Investment, and Railroads in Brazil, 1854-1913* (Stanford, 2003).

Summerhill, W. R., *Inglorious Revolution: Political institutions, sovereign debt, and financial underdevelopment in Imperial Brazil* (New Haven, 2015).

Suprinyak, C. E., *Tropas em Marcha: O Mercado de Animais de Carga no Centro-Sul do Brasil Imperial* (São Paulo, 2008).

Sweigart, J. E., *Coffee Factorage and the Emergence of a Brazilian Capital Market, 1850-1888* (New York, 1987).

Taunay, A. de E., *História do café no Brasil,* Vol. 5 (Rio de Janeiro, 1939).

Tavares, L. H. D., *Comércio Proibido de Escravos* (São Paulo, 1988).

Temin, P., 'The Economic Consequences of the Bank War,' *Journal of Political Economy*, 76 (1968), pp. 257-74.

Topik, S., *Trade and Gunboats: The United States and Brazil in the Age of Empire* (Stanford, 1996).

Topik, S., 'The Integration of the World Coffee Market,' in W. G. Clarence-Smith and S. Topik, eds., *The Global Coffee Economy in Africa, Asia and Latin America, 1500-1989* (Cambridge, 2003), pp. 21-49.

Topik, S., 'The World Coffee Market in the Eighteenth and Nineteenth Centuries, from Colonial to National Regimes' (LSE Working Paper No. 04/04, London, 2004).

Topik, S. 'Coffee as a Social Drug,' *Cultural Critique*, 71 (2009), pp. 81-106.

Topik, D. and Samper, M., 'The Latin American Coffee Commodity Chain: Brazil and Costa Rica,' in S. Topik, C. Marichal and Z. Frank, eds., *From Silver to Cocaine: Latin American Commodity Chains and the Building of the World Economy, 1500-2000* (Durham, 2006), pp. 118-46.

Tschudi, J. J., *Viagem às províncias do Rio de Janeiro e São Paulo* (São Paulo, 1953).

Van Delden Laërne, C. F., *Brazil and Java: Report on Coffee-Culture in America, Asia, and Africa* (1885).

Viotti da Costa, E., *Da Senzala à Colônia* (São Paulo, 1998).

Walsh, R., *Notices of Brazil in 1828 and 1829* (1830).

Waterston, W., *A Manual of Commerce* (Edinburgh, 1840).

Wright, A. F. P. de A., *Desafio Americano à Preponderância Britânica no Brasil, 1808-1850* (São Paulo, 1978).

Official Publications

Abstracts of returns from various foreign countries, for the most part obtained through Her Majesty's consuls, (P.P. 1841, XXIV).

Chicory and coffee. Copies of Treasury minutes, &c., relative to the use and sale of chicory, as a substitute for or mixed with coffee; and account of coffee imported and entered for consumption, (P.P. 1849, L).

Coffee. Accounts of the quantity of coffee imported and exported into and from Great Britain and Ireland; and amount of duties received, (P.P. 1821-30, XXI- XXVII).

Coffee.—Cocoa.—Cheese and butter. Accounts of the quantities of coffee imported into the United Kingdom, entered for home consumption, &c., from 1820 to 1842;--of cocoa, from 1832 to 1842;--and, of cheese and butter, from 1830 to 1842, (P.P. 1843, LII).

Collecção de mappas estatísticos do commercio e navegação do Imperio do Brasil (Rio de Janeiro, 1848-55).

Commerce and Navigation of the United States (Washington, 1822-51).

Copies or Extracts of any recent Correspondence between the Secretary of State and the Governors of the Sugar Growing Colonies, as to the Distress now existing in those colonies, not already laid before the House, (P.P. 1847-48, XLVI).

'Message from the President of the United States communicating (in compliance with a resolution of the Senate) information in relation to the African slave trade, and the taking away of slaves the property of Portuguese subjects,' in *Public Documents printed by order of the Senate of the United States*, Vol. 4 (Washington, 1844, document no. 217).

Prussian Commercial Treaty. Copy of the Prussian Commercial Union Treaty; and return of the names of the several states which have joined that union, (P.P. 1837-38, XLV).

Register of Debates in Congress: Comprising the Leading Debates and Incidents of the Second Session of the Eighteenth Congress (Washington, 1833).

Sugar. Accounts of the quantity of sugar imported and exported into and from Great Britain and Ireland; and amount of duties received, (P.P. 1823-32, XX- XXXIV).

Sugar. An account of the quantities of sugar imported into the United Kingdom; the quantities retained for actual consumption; the rates of duty charged on the home consumption, and net revenue accruing therefrom; with a comparative statement of the average prices of British and foreign plantation sugar in each year from 1815 to 1840, (P.P. 1846, XLIV).

Tabellarische Übersichten des Hamburgischen Handels im Jahre (Hamburg, 1850).

Tables of the revenue, population, commerce, &c. of the United Kingdom, and its dependencies, (P.P. 1833-50, XLI-LIV).

Tables shewing the trade of the United Kingdom with different foreign countries and British possessions, in each of the ten years from 1831 to 1840, (P.P. 1842, XXXIX).

The existing tariff on imports into the United States, etc., and the free list, together with comparative tables of present and past tariffs, and other statistics relating thereto. Prepared by the Committee on finance, United States Senate. January 7, 1884. Reported by Mr. Morrill and ordered to be printed (Washington, 1884).

APPENDIX: THE RISE OF COFFEE IN THE BRAZILIAN SOUTHEAST

Please note: for the full series underlying this paper, please see the supplementary material of the online version of this article in the *Economic History Review*.

1. Weights and measures

An important issue regarding the comparability of the Brazilian data is the conversion of original weights and measurements. The volume of coffee and sugar was listed in units of bags (*saccos*) and boxes (*caixas*), respectively, standard units of measurement at the time that seemingly suffered little variation.[87] However, coffee was also given in barrels (*barritas*), boxes (*caixas* or *caixotes*), and bales (*feixes*), while sugar was listed in bags, barrels, bales, and tins or cans (*latas*). In some instances, several listings provided the *arroba* equivalent of a measure.[88] In other instances, assumptions had to be made. In 1840, the accountant William Waterston published a useful *Manual of Commerce* in which he included the customary weights for a variety of commodities imported into the United Kingdom. The weights given by Waterston have been adopted for those measurements not found in Brazilian sources.[89] All weights have then been converted to metric tons as follows:

Rio de Janeiro, in arrobas (14.69 kg, 0.015 metric tons):

	Sacca	Barrita	Caixa	Feixe/Feixo/Fecho	Lata
Coffee	5	3.5	6	2	-
Sugar	5.3	7	50	22.5	5.3

[87] As the commercial guide to Rio de Janeiro by American trading firm Maxwell, Wright & Co. observed with respect to coffee: 'It is purchased from the planters by a class of traders, who pack it in bags containing, without variation, five arrobes, or one hundred and sixty pounds Portuguese, and by whom it is sold to the shippers. Full confidence is placed in the weight, as frauds have scarce ever been detected; where however, any doubt may exist, some bags are reweighed upon delivery.' The same source observed that sugar was packed in boxes '…containing from 1200 to 2000 pounds.' Maxwell, Wright & Co., *Commercial Formalities*, pp. 79, 88.
[88] See, for instance, *Jornal do Commercio* 1832, eds. 5 and 71, in the cases of Gothenburg and Harlingen.
[89] Waterston, *Manual*, pp. 147-48

Liverpool conversion measures, in hundredweights (0.05 metric tons):

	Bdl (bundle)	Bg (bag)	Bl (bale)	Brl (barrel)	Bsk (basket)	Bx (box)	Cases	Ck (cask)	frazil
Coffee	6	1.375	2.25	1.25	-	6	6	6	0.26
Sugar	-	1.25	-	7	1.25	4.4	14.5	8	-

	H (hogshead)	Keg	Mat	Pch (puncheon)	Pkt (packet)	Robin	Tc (tierce)	Seron
Coffee	10	1.25	1.125	1.25	6	1.125	6	2.25
Sugar	14.5	7	1.125	7	4.4	1.125	8	-

New York conversion measures, in hundredweights (0.05 metric tons):

	Tierce/Cask	Barrel	Bag	Hhd (Hogshead)	Box
Coffee	6	1.25	1	-	-
Sugar	8	7	1.25	14.5	4.4

Interpolation technique

As mentioned in the text, the monthly series of exports is missing several observations, specifically: 6/1828, 11/1829-7/1830, 4/1831-12/1831, 4/1832-5/1832. In order to interpolate these values, I have applied a multiplicative seasonal factor by regressing the natural log of each truncated country series on a set of month dummies, with December as the base.[90] This yields a set of monthly effects (relative to December) that can be applied to the existing data in each broken year to fill in the blanks: $v_t^* = v_i \pm (v_i * \gamma_t)$, where v_t^* is the interpolated volume at month t, v_i is the baseline observation (i being December for 1828, 1830 and 1832, September or October for 1829,

[90] I drop the zeros from the series to estimate the monthly effects because I found that OLS was providing unrealistically low estimates when compared to previous and following year observations.

and January for 1831), and γ_t is the multiplicative factor for month *t*. In three cases for each commodity (coffee: 'Italy' 1831, Austria 1831, Sweden 1830; sugar: Austria, Belgium and Chile 1831), a baseline observation for that year is missing. In these cases, I resort to taking the arithmetic average of previous and following year observations for a single month (coffee: December 1830/1832 for Austria and 'Italy,' February 1829/1831 for Sweden; sugar: November 1830/1832 for Austria, December 1830/1832 for Belgium, August 1830/1832 for Chile) and applying the seasonal factor to this figure for the remaining missing months. The reliability of this approach relies on two assumptions: 1) that all countries traded in the missing months, and 2) that trade in these months followed the seasonal trend indicated by the dummies. Violation of either of these assumptions might serve to over- (if countries didn't trade in these months) or under- (if they did trade but the volume was higher than the seasonal effects) inflate the interpolation. This, of course, will affect the pre- and post-trends of the treatments estimated in section three of the paper and, subsequently, the counterfactual estimates. Luckily, for the case of coffee, I was able to recover the total volume of exports for the missing months. When compared to the sums of the individual interpolated country series, it is evident that the above assumptions were violated in most months (the sum of interpolated series is higher in 1830 and lower in 1831 than the actual total). To correct this bias, I take the distribution of the interpolated series (that is, the interpolated volume exported to each country over the sum of the interpolated series) and apply it to the actual total. This yields a set of corrected interpolations that, when summed, equal the actual total volume exported. In the case, of sugar, I have recovered total volumes only for the months 1/1830 to 7/1830 and 5/1832. For these months, I follow the same approach. For the remained missing months, I simply take the sum of the interpolations.

The seasonal factors (relative to December) for each country are as follows:

Coffee																
	USA	BEL	DEN	FRA	GER	ITA	AUS	RIO	CHI	NET	POR	SWE	UK	SPA	AFR	OTH
Jan.	-0.23	0.14	0.00	-1.19	-0.57	-1.64	-0.65	0.44	-1.51	0.00	-0.29	0.12	0.21	0.00	-1.19	1.60
Feb.	-0.15	0.33	-2.08	-0.62	-0.55	-1.75	-0.71	0.09	-1.12	1.26	0.41	0.37	0.08	-4.84	-1.63	0.11
Mar.	-0.28	0.01	0.00	-0.94	-0.24	-1.63	-1.04	-0.52	-1.20	1.78	0.59	-0.05	-0.45	0.00	-0.38	-2.12
Apr.	-0.30	0.32	0.00	-2.10	-0.39	-0.86	-0.45	1.36	1.75	-0.04	0.18	-1.62	-0.88	-2.95	0.23	-0.60
May	-0.39	0.88	0.00	-1.12	-0.45	-0.99	-1.22	0.66	0.00	0.38	0.31	-0.45	-0.61	0.00	-0.20	0.75
Jun.	-0.36	0.30	0.00	-0.51	-0.08	-0.18	-0.46	-0.03	-1.48	2.53	0.78	-0.61	-0.94	0.00	0.77	-1.57
Jul.	-0.22	0.60	0.00	-0.57	-0.59	-1.02	-0.33	0.36	0.00	1.56	0.83	-0.40	-0.52	0.00	-1.20	0.27
Aug.	0.02	0.91	-0.34	-0.60	-0.31	-0.49	0.10	0.81	-2.30	2.09	0.76	-0.54	-0.23	0.00	-0.87	1.41
Sep.	-0.05	1.13	0.27	-0.57	-0.03	-0.58	0.20	0.62	-1.10	1.20	0.08	-1.13	-0.26	-1.27	-2.02	-0.24
Oct.	0.39	0.78	0.00	-0.50	-0.35	-0.79	-0.02	0.42	0.75	1.70	0.45	-0.54	-0.29	0.00	-1.68	0.14
Nov.	0.24	0.42	0.00	-0.49	-0.56	-0.82	0.39	-0.12	-1.29	-0.42	0.29	-0.44	0.07	0.00	-1.20	0.88
Sugar																
	USA	BEL	DEN	FRA	GER	ITA	AUS	RIO	CHI	NET	POR	SWE	UK	SPA	AFR	OTH
Jan.	1.03	0.48	0.00	3.92	0.42	-0.26	-0.36	-0.14	-2.29	0.00	1.12	1.44	-0.32	0.00	-0.77	-0.37
Feb.	-0.25	-0.70	1.74	1.58	1.42	0.28	-0.81	-0.21	0.09	3.92	0.74	1.75	-0.80	0.84	-0.02	1.35
Mar.	-1.33	1.04	0.00	1.99	1.29	-0.12	-1.47	-1.00	0.19	2.10	1.09	1.44	-0.53	0.00	-0.28	2.58
Apr.	-0.21	0.09	0.00	0.68	1.32	0.09	-1.05	-0.65	1.05	3.63	0.89	0.96	-0.92	-0.59	-0.64	1.14
May	0.30	0.23	0.00	2.58	1.96	0.25	-0.29	0.04	0.36	3.46	0.85	1.00	-0.79	1.23	-0.64	0.39
Jun.	-1.13	-0.65	0.00	1.82	1.60	0.16	-0.62	-0.25	-0.88	0.00	0.76	1.26	-1.09	0.00	-0.32	1.13
Jul.	-1.62	1.23	0.00	0.50	1.39	-0.69	-1.79	-0.27	1.90	4.16	1.20	1.36	-1.76	0.00	-0.70	-0.91
Aug.	-1.62	-1.57	1.02	2.48	1.24	-0.88	-0.93	-0.75	-0.38	4.82	1.03	0.88	-1.21	0.00	0.06	-0.30
Sep.	-2.83	-0.13	0.00	3.47	0.04	0.20	-1.39	-0.35	0.90	2.18	0.20	1.50	-1.41	1.77	-0.34	-2.35
Oct.	-1.66	0.22	0.00	1.18	1.33	0.05	-0.35	-0.15	-0.46	3.99	0.97	-0.16	-0.51	1.06	-0.85	-0.55
Nov.	-2.11	0.55	0.00	1.74	0.82	0.08	-0.42	-0.21	-2.57	1.47	0.59	0.70	-0.66	0.00	-0.69	-1.70

Note: negative values greater than one were treated as zeros in the database.

2. Corrections for British re-exports

As mentioned in the text, the geographical distribution of the original Brazilian series is distorted by the presence of British re-exports. An examination of the data on the distribution of British re-exports provides insight into how these might be redistributed across the sample. The Table below displays the average shares of the main destinations of southeastern exports (excepting Austria) in total British re-exports of foreign (non-colonial) coffee and sugar from 1827 to 1840. The estimate for the United Kingdom is the average share retained for consumption of total foreign coffee and sugar imports. Virtually all non-colonial produce imported was promptly re-exported. Re-exports were principally shipped to non-imperial Europe, apart from Holland after 1830, which possessed a notable share of both coffee and sugar re-exports. The main destinations were Belgium, 'Germany' and Prussia (most likely entering via Hamburg), 'Italy' (mainly Genova) and Holland for sugar. The shares of these markets in total southeastern coffee and sugar exports were undoubtedly higher than those gleaned from the original series. To correct the bias in the geographical distribution of the series, I take the portion of foreign exports to the United Kingdom not retained for consumption and distribute it across the sample according to the destination shares of British re-exports. This is then added to the Brazilian series. As the Table indicates, Holland and Belgium are aggregated as the United Netherlands until 1830. I derive a separate series for each by applying the share of British re-exports to Antwerp (the principal Belgian port) to the total United Netherlands figure. Since exports to Prussian ports are not present in the data, and were probably re-exported from Hamburg, I add the Prussian shares to Germany. British data on re-exports to the Austrian Empire did not exist at the time and re-exports probably arrived from other European ports, which might bias the geographical distribution of the

Continental European countries included in the sample.[91] Figure 2, should be interpreted with these caveats in mind.

Average percentage share of British re-exports of foreign coffee and raw sugar, 1827-40

	Coffee	Raw Sugar
	Europe	
Germany	14.7	10.1
Prussia	2.9	10.6
Belgium[a]	32.3	26.8
Italy	10.3	12.3
Portugal	0.1	0.3
	Imperial Europe	
United Netherlands[a]	36.3	29.7
Holland[a]	10.4	11.2
Spain	0.0	0.8
United Kingdom	0.2	0.1
Denmark	2.8	1.8
Sweden	1.1	1.5
France	0.7	0.8
	Americas	
United States	0.6	0.4
Rio de la Plata	0.0	0.0
Chile	0.0	0.0

Notes: [a] United Netherlands aggregates Belgium and Holland until 1830. 1832 and 1833 include total re-exports of coffee and raw sugar, thus include product from the British colonies. *Sources*: Imports and retained consumption: Sugar: *Sugar* (P.P. 1846, XLIV); Coffee: *Chicory* (P.P. 1849, L). Geographical distribution of re-exports: 1827-1831: *Sugar* (P.P. 1823-32, XX-XXXIV); *Coffee* (P.P. 1821-30, XXI-XXVII). 1832-1833: *Tables* (P.P. 1833-50, XLI-LIV).

[91] MacGregor, *Commercial Statistics*, p. 22.

3. Port composition of sample of export destinations

Note: Port names maintain spellings as they appear in primary sources.

Europe	
'Germany' (incl. Hanse Cities)	Altona, Bremen, Flensburg, Hamburg, Tonningen
Belgium	Antwerp, Ostende
"Italy"	Milazzo, Genova, Livorno, Palermo, Sicilia, Napoles
Austrian Empire	Veneza, Trieste, Vianna
Portugal	Açores, Madeira, Terceira, S. Miguel, Fayal, Lisboa, Porto, Setubal
Imperial Europe	
Netherlands	Amsterdam, Flessingue, Harlingen, Rotterdam
Spain	Bilbao, Malaga, Cadiz
United Kingdom	Bristol, Cork, Cowes, Falmouth, Gibraltar, Guernsey, Jersey, Leith, Liverpool, London, Norfolk, Plymouth
Denmark	Copenhagen
Sweden	Stockholmo, Gothenburgo, Nord Kuping, Sundswall, Gefle
France	Havre, Marselha, Nantes
Americas	
United States	Baltimore, Bedford, Boston, Charleston, Dartmouth, Georgetown, Halifax, Houston, Mobile, New Bedford, New Orleans, New York, Philadelphia, Portland, Portsmouth, Providence, Richmond, Salem
Rio da Prata	Buenos Ayres, Montevideo
Chile	Valparaiso
Other	
Africa	Africa, Angola, Benguela, Cabo de Boa Esperança, Cabo Verde, Costa d'Africa, Mozambique, Serra Leoa
Other	S. Petersburgo, Corfú, Riga, Baltico, Malta, Constantinople, Smyrna, Meditteraneo

4. The evolution of the American consumption of coffee, 1821-50

	Annual consumption per capita, lbs	Annual consumption, per capita, cups	Daily consumption, per capita, cups
1821	1.4	45.7	0.1
1826	2.7	88.8	0.2
1830	3.0	96.3	0.3
1835	6.1	198.1	0.5
1840	5.0	163.3	0.4
1845	4.7	151.5	0.4
1850	5.6	180.5	0.5

Notes: Annual and daily consumption by cup based on the assumption of 14.3 grams of coffee to a cup, found in historical recipes (Eden, *Cooking*, p. 129), which is close to the Golden Cup Standard (approximately 13 grams per cup) established by the Specialty Coffee Association of America. *Sources*: Imports retained for consumption, *Commerce and Navigation* (1822-51). Population: Carter et al., *Historical Statistics*.

5. Data for market potential measure (Figure 4)

As mentioned in the text, the market potential measure displayed in Figure 4 is calculated using data on freight and insurance rates, tariffs and total imports of coffee and sugar. The freight data, discussed in Absell and Tena-Junguito, 'Reconstruction,' p. 104 and taken from the same sources as the Brazilian export data presented in section I, consists of monthly observations (mostly quoted in British shillings per ton) from Rio de Janeiro to Liverpool, London and Hamburg. Freight quotations to the American East Coast are remarkably absent from the sources (the first quote to the United States appears in November 1843). Freights to the United States from the 1840s closely followed those to European destinations.[92] I create an American freight series by discounting 18 per cent from the Liverpool series: the average difference between American and British freights for all available observations between November 1843 and December 1850.[93] An additional complication of the freight data is that quotes did not differentiate between commodities. This is not the case for freight rates quoted for Pernambuco and Bahia, which provided separate rates for cotton, hides and sugar.[94] As the sources for Rio de Janeiro do not indicate otherwise, I assume that the freight rates were the same for both coffee and sugar. To my knowledge, a monthly series of maritime insurance rates does not exist for New York, Liverpool and Hamburg. Therefore, I resort to insurance rates taken from Paul Schöller, which represent outgoing rates from Antwerp to Brazil.[95] Schöller's series displays a decline in insurance rates from 2.9 to 1.7 per cent between 1827 and 1840, averaging two per cent over the period. While the use of an outgoing

[92] The correlation coefficient of American and British freights for the period from 7/1845 to 12/1850, when a continuous monthly series is available, is 0.89. American freights are quoted in cents per sack (of five arrobas). To permit direct comparability with the British series, I convert the American series to shillings per ton.
[93] The average ratio of American to British freights was 0.82, the standard deviation across the 72 available observations 0.16, the maximum ratio 1.21, and the minimum 0.46.
[94] See, for example, *Diário de Pernambuco*, 1829, ed. 123, p. 3.
[95] Schöller, 'L'évolution.'

series for a port not included in the sample may be questionable, partial evidence suggests that insurance rates were similar for other destinations and identical for both outgoing and incoming routes.[96] To calculate the market potential measure, I convert freights, insurance rates and specific tariffs (in the case of the United States, United Kingdom and Zollverein) to effective terms by dividing them over the average price of coffee and sugar in New York, Liverpool and Hamburg.[97]

The sources of the import data for New York and Liverpool are the same as the sources of the price data, except for the year 1836 for Liverpool, which comes from *Gore's Liverpool General Advertiser*. For New York, the *Shipping and Commercial List* published convenient monthly statements of the volume of imports by product and origin. In the case of Liverpool, both the *Liverpool Mercury* and the *General Advertiser* included weekly summaries of the volume of imports by product and origin. A monthly series has been assembled by collecting and summing the weekly observations. In both cases, the series represent gross imports, and do not account for re-exports. In the case of New York, this is not such a problem, as most re-exports were most likely domestic in character.[98] As discussed in section I and appendix 2, this was not the case for Great Britain, due to high tariffs on non-colonial product. Given that virtually all non-colonial product was re-exported during this period, I exclude imports of coffee and sugar from non-colonial origins from the total import sum to Liverpool. While a portion of colonial imports were also re-exported, it is impossible to gauge whether this came from imports to Liverpool,

[96] See *Jornal of Commercio*, 1827, ed. 7, p. 3 for Antwerp, ed. 22, p. 3 for London. Rates were also regularly quoted in the *Shipping and Commercial List* for New York to Brazil and are comparable to those quoted by Schöller. I am yet to come across sources featuring continuous quotations of insurance rates for Liverpool and Hamburg.

[97] The sources of the price data are the same as those given in Table 2.

[98] National statistics indicate that the percentage of coffee imports retained for consumption in the United States rose from 75 in 1830 to 91 percent in 1840. Imports of brown sugar retained for consumption in these years were 92 and 91 percent, respectively. *Commerce and Navigation* (1822-51).

and whether these re-exports were foreign or domestic in nature.[99] With these considerations in mind, readers should be aware that the inclusion of re-exports may marginally over- or under-value the market potential measure.

[99] Imports of colonial brown sugar and coffee averaged 111 and 144 per cent of the quantity retained for consumption over the period, respectively. *Tables* (P.P. 1833-50, XLI-LIV).

6. *Pre- and post-trends of controlled interrupted time series analysis on monthly coffee exports from Rio de Janeiro, truncated series, in metric tons, 1/1827-12/1840*

	To				
	USA	World	Europe, Non-Imperial	Europe, Imperial	Core
			Treatment: 7/1832		
Pre	2.9	1.3	1.2	1.7	3.2
	(0.5)	(0.8)	(0.8)	(0.4)	(1.4)
Post	11.2	2.4	2.8	0.8	3.7
	(3.9)***	(2.8)***	(3.3)***	(0.4)	(3.0)***
			Treatment: 5/1830		
Pre	2.2	1.5	1.2	4.9	3.8
	(0.2)	(0.5)	(0.4)	(0.6)	(0.8)
Post	14.7	1.8	1.7	2.1	3.1
	(6.7)***	(2.8)***	(2.7)***	(1.4)	(3.4)***
Adj. R^2	0.4	0.1	0.2	0.2	0.2
Obs.	168	1,680	1,344	504	840

Notes: *** p< 0.01, ** p<0.05, *p<0.10. *Sources*: same as figure 1.

7. *Estimates of total slave labour requirements (thousands), actual and counterfactual, various assumptions, 1827-40*

The table below tests the assumptions underlying the estimates of actual and counterfactual total slave labour requirements presented in the text. Firstly, I combine the original output per slave estimates with a six per cent slave death rate assumption. This is probably high – Carvalho de Mello cited estimates of between 2.4 and 5.0 per cent for 'Brazil' and Rio de Janeiro over the period 1847-78.[100] However, as columns C and D (that use the output per slave figures of 0.35 and 0.59 metric tons, respectively) show, the inclusion of a six per cent death rate does not alter the estimates of slave requirements by any significant amount. The estimates for the 1830 and 1832 treatments are between five and eight and seven and three thousand slaves higher than the original estimates, respectively. In terms of total southeastern slave imports over the period, the difference is a single percentage point. An increase in the volume of output per slave coupled with the six per cent death rate assumption, however, considerably reduces the estimate. Column E displays estimates of total slave labour requirements using the output per slave figure of 1.07 metric tons, cited by Van Delden Laërne for Rio de Janeiro in 1883.[101] The actual slave requirement estimate is reduced to 77 thousand, and the counterfactual 1830 and 1832 estimates to 31 and 41 thousand, respectively, representing between seven and nine per cent of slave imports. It is questionable, however, that output per slave during the initial expansion of coffee in the southeast would have been as high as it was in the final quarter of the century, following the closure of the Brazilian slave trade and consolidation of the coffee sector after mid-century.

[100] Carvalho de Mello, 'Economics of labor,' pp. 108-11.
[101] Van Delden Laërne, *Brazil and Java*, pp. 325-29. See Eltis, *Economic Growth*, p. 289 and Corrêa do Lago, *Escravidão*, p. 468, note 38, for other estimates.

	Original		Original productivity, 6% death rate		One metric ton productivity, 6% death rate
Slaves needed:	A	B	C	D	E
Actual	222	132	236	140	77
Counterfactual:					
1830	90	53	95	57	31
1832	117	69	124	74	41
Difference:					
1830	132	78	140	83	46
1832	105	63	112	66	37
% of slave imports:					
1830	26	15	27	16	9
1832	21	12	22	13	7

Notes: A is based on an output per slave figure of 0.35 metric tons. B is based on an output per slave figure of 0.59 metric tons. C is based on A output per slave and six per cent death rate. D is based on B output per slave and six per cent death rate. E is based on output per slave figure of one metric ton and six per cent death rate.

8. Top five firms exporting sugar from Rio de Janeiro, 1827-40

A	B	C	D	E	F	G
Name	Nationality	% of total exports	% USA of firm exports	Principal ship nationality (count)	Principal destination (weight)	% of total exports
			1827			
F. Le Breton & C.	British	13	0	British (30/34)	Cowes	
James Birckhead & C.	American	8	45	American (14/14)	Lima	
Heyworth Brothers	British	7	0	British (8/10)	London	37
Henry Miller & C.	British	6	0	British (12/16)	Trieste	
William Harrison & C.	British	4	0	British (6/6)	Trieste	
			1835			
George Hudson & C.	British	21	0	British (18/36)	Trieste	
F. Schott	German (?)	8	6	American (9/19)	Trieste	49
J. E. Vibert & C.	British	7	0	Sardo (5/13)	Hamburg	
Priaulx Tupper & C.	British	7	9	British (16/17)	Guernsey	
J. B. Folco	?	6	0	Sardo (29/31)	Genova	
			1840			
George Hudson & C.	British	23	0	British (18/42)	Trieste	
F. Le Breton & C.	British	7	0	Sardo (4/7)	Trieste	
Miller Le Coq & C.	British	5	0	Danish/American (3/7)	Trieste	41
Hoyle Hargreaves & C.	British	3	0	British (2/2)	Cowes	
Jose Ferreira Maia	Brazilian	3	0	Brazilian/Portuguese (3/6)	Lisboa	

Sources: 1/1827-6/1827: *Diario Mercantil*; 7/1827-12/1827, 1835, 1840: *Jornal do Commercio.*

European Historical Economics Society

EHES Working Paper Series

Recent EHES Working Papers

2019

EHES 174 American Precious Metals and their Consequences for Early Modern Europe,
Nuno Palma

EHES 173 The uneven transition towards universal literacy in Spain, 1860-1930,
Francisco J. Beltrán Tapia, Alfonso Díez-Minguela, Julio Martínez-Galarraga, Daniel A. Tirado

EHES 172 'All little girls, the bad luck!' Sex ratios and gender discrimination in 19th-century Greece
Francisco J. Beltrán Tapia, Michail Raftakis

EHES 171 Comparative European Institutions and the Little Divergence, 1385-1800
António Henriques, Nuno Palma

EHES 170 The vagaries of the sea: evidence on the real effects of money from maritime disasters in the Spanish Empire
Adam Brzezinski, Yao Chen, Nuno Palma, Felix Ward

EHES 169 From West to East: Bolivian Regional GDPs since the 1950s. A story of Natural Resources and Infrastructure
José A Peres-Cajías

EHES 168 Reconstruction of regional and national population using intermittent census-type data: the case of Portugal, 1527-1864
Nuno Palma, Jaime Reis, Mengtian Zhang

EHES 167 "Cholera Forcing" and the Urban Water Infrastructure: Lessons from Historical Berlin
Kalle Kappner

EHES 166 The impact of border changes and protectionism on real wages in early modern Scania
Kathryn E. Gary, Cristina Victoria Radu,