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*Christopher David Absell and Antonio Tena-Junguito*

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**JEL Classification:** F14, N76

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'The great *desideratum* of every student of national finance and economy must be a thorough and trustworthy compilation of the respective statistics, that, embracing a long period, will afford a safe basis on which to found deductions, without which all conclusions are little better than mere speculations.' J. P. Wileman[3]

Brazil's export sector is the focal point of much of the country's economic historiography. It has been described as the motor of the Brazilian economy during the nineteenth century.[4] For better or for worse, the export sector was the principal source of the productivity growth of the Brazilian economy. It was the magnet for the first waves of foreign capital investment, the initiator of railway expansion, and an important contributor to the government's coffers.[5] Furthermore, it defined Brazil's role in the world economy as a member of the primary product producing periphery during the first globalisation. For these reasons, much of the economic history of the country has been dedicated to the export sector, covering almost every conceivable aspect of its development. The

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[3] J. P. Wileman, *Brazilian Exchange: the study of an inconvertible currency*, (Buenos Aires: Galli Bros., 1896), p. 129.
[4] See Nathaniel H. Leff, 'Tropical Trade and Development in the Nineteenth Century: The Brazilian Experience,' *Journal of Political Economy*, 81: 3 (May-June, 1973), p. 690.
[5] Marcelo de Paiva Abreu and Luiz Aranha Correa do Lago, 'Property rights and the fiscal and financial systems in Brazil: colonial heritage and the imperial period,' in Michael D. Bordo and Roberto Cortés-Conde (eds.), *Transferring Wealth and Power from the Old to the New World: Monetary and Fiscal Institutions in the 17th through the 19th centuries*, (Cambridge: Cambridge University Press, 2001), pp. 327-377; Nathaniel H. Leff, 'Economic Development in Brazil, 1821-1913,' in Stephen Haber (ed.), *How Latin America Fell Behind: Essays on the Economic Histories of Brazil and Mexico, 1800-1914*, (Stanford: Stanford University Press, 1997), p. 35.

country's export performance is a defining aspect of this history. Much of the historiography of this export performance has been based on an analysis of official Brazilian export statistics. Until now, however, the accuracy of these statistics has not been verified to a satisfactory extent. The objective of this paper is therefore to test the official Brazilian export statistics for their accuracy, utilising a methodology that has proven fruitful in other case studies. As we shall see, the official values of Brazilian export statistics demonstrate a bias that distorts our understanding of Brazil's export performance during the first half of the nineteenth century. When reappraised and put into comparative perspective, it becomes apparent that Brazilian export growth during the post-independence decades was more dynamic than any other period of the nineteenth century.

These conclusions do not sit well with the conventional narrative of this period. Traditionally, economic historians have focused on the second half of the century, when Brazil entered a 'novo equilíbrio econômico' in which coffee in the south-east was the principal protagonist in the growth of the quantum and value of the country's exports. During the period from independence to mid-century, according to the conventional narrative, Brazil remained a stagnant, 'sleeping giant.'[6] Although the process of independence was not overwhelmingly detrimental to export growth, the first few decades of independence were described as being anything but dynamic. As classic studies by Caio Prado Júnior and Celso Furtado both indicated, this was largely due to the demise of the eighteenth century gold rush and the stagnation and decadence of the previously dominant sugar and cotton export industries in the north-east of the country. Furthermore, according to this narrative, export growth was impeded by other factors including seemingly insurmountable internal trade costs, political and institutional instability, technological backwardness and the profound scarcity of factors of production.[7]

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[6] Teresa A. Meade, *A Brief History of Brazil, 2nd Edition*, (New York: Infobase, 2010), p. 89; Werner Baer, *The Brazilian Economy: Growth and Development, 5th Edition*, (Connecticut: Praeger, 2001), pp. 16-18; Albert Fishlow, 'Brazilian Development in Long-Term Perspective,' *The American Economic Review*, 70: 2 (May, 1980), p. 102; Paulo Nogueira Batista Jr., 'Política tarifária britânica e evolução das exportações brasileiras na primeira metade do século XIX,' *Revista Brasileira de Economia*, 34: 2 (1980), p. 204.

[7] Caio Prado Júnior, *História Econômica do Brasil, 38ª edição, (*São Paulo: Editora Brasiliense, 1990). pp. 192-204;

This traditional narrative has been taken to task by much of the empirical work on the Brazilian economy during this period. Amongst the first scholars to seriously '...check the relevance of the stylised facts...' was Nathaniel Leff, who argued that the second half of the century was not as dynamic as previous descriptive studies had claimed.[8] Furthermore, Leff's calculations revealed that export growth during the post-independence period was in fact more dynamic that the second half of the century.[9] Leff was primarily concerned with overall income growth, however, and his conclusions emphasised the importance of the regional disparity in export growth and its impact on the country's long-run income distribution.[10] What's more, his conclusions were based on the official trade statistics and, given Leff's recognition of the limitations of these statistics, were thus tentative. Leff's work has been complemented by a growing revisionist literature that, as we shall see in the following section, paints a more dynamic picture of the post-independence Brazilian economy.

Here we confront the conventional perception of Brazil through an analysis of the country's corrected export series. The paper is structured as follows. The next section outlines the revisionist narrative of early Brazilian economic dynamism. The second section concerns the accuracy and reconstruction of Brazil's export statistics. The third section reappraises the country's export performance. Concentrating on the post-independence period, we then place this performance in comparative perspective and provide an empirical basis for the revisionist narrative. Based on an examination of the empirical evidence regarding comparative growth rates and export market shares in the tropical Americas, we posit that the abolition of slavery in the British West Indies provided

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Celso Furtado, *Formación económica del Brasil, (*México D. F.: Fondo de Cultura Económica, 1962) pp. 113-123. On the decline of gold and the cotton and sugar industries in the eighteenth century, see Roberto Cockrane Simonsen, *Historia económica do Brasil: (1500-1820): curso professado na escola livre de sociología e politica de São Paulo*, (São Paulo: Companhia Editora Nacional, 1957).
[8] Nathaniel H. Leff, 'A Technique for Estimating Income Trends from Currency Data and an Application to Nineteenth-Century Brazil,' *Review of Income and Wealth*, 18: 4 (1972), p. 363. Leff used on data on the currency stock, together with official export statistics, to estimate the long-run trend of income growth. 2.7 percent from independence to 1869, 2.1 percent from 1869 to 1894, and 4.3 percent 1995 to 1913.
[9] Leff, 'Tropical Trade and Development in the Nineteenth Century,' Table 4, p. 683.
[10] Nathaniel H. Leff, Economic Development and Regional Inequality: Origins of the Brazilian Case,' *The Quarterly Journal of Economics*, 86: 2 (May, 1972), pp. 243-262.

Brazil a competitive advantage that incentivised producers to expand the country's factor endowment through the large scale importation of slaves and the expansion of the agricultural frontier. The final section concludes.

## *The revisionist narrative of early Brazilian economic dynamism*

Our results notwithstanding, there are other indications that Brazil's post-independence economy was much more dynamic than conventionally thought. Using alternative indicators of economic dynamism, an emerging revisionist strand of the literature has recast the Brazilian experience in a more dynamic and geographically disparate light. To begin with, being relatively free of the political and institutional instability conventionally associated with the process of independence, Brazil has served as an exception to the lost decades argument. As Leandro Prados de la Escosura noted, in the context of Latin American independence, Brazil provided '… a counterpoint of stability and gradual institutional transition while opening up to international commodity and factor markets.'[11] Unlike most of Spanish America, imperial collapse did not come with the baggage of balkanisation or anti-trade policy that characterised other countries of the region. Independence, in the Brazilian sense, was transition rather than revolution.[12] Furthermore, Brazil did not experience the institutional turmoil derived from slave abolition until much later in

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[11] Leandro Prados de la Escosura, 'Lost Decades? Economic Performance in Post-Independence Latin America,' *Journal of Latin American Studies*, 41 (2009), p. 281. Also see Robert H. Bates, John H. Coatsworth, and Jeffrey G. Williamson, 'Lost Decades: Postindependence Performance in Latin America and Africa,' *The Journal of Economic History*, 67: 4 (December 2007), p. 921; Alan Dye, 'The Institutional Framework,' in Victor Bulmer-Thomas, John Coatsworth, and Roberto Cortés Conde, eds., *The Cambridge Economic History of Latin America. Volume II: The Long Twentieth Century*. (Cambridge: Cambridge University Press, 2006). Although independence has been recognised as a costly process in terms of the temporary loss of fiscal sovereignty due to the payment of indemnities to Portugal and the continuation of a tariff agreement with Great Britain, this was offset by preferential access to the markets of its principal trading partners. On the fiscal impact of independence, see Paiva Abreu and Correa do Lago, 'Property rights and the fiscal and financial systems in Brazil,' pp. 338-340. For the case of Great Britain see Alan K. Manchester, *British Preeminence in Brazil, its Rise and Decline: A study in European Expansion,* (Chapel Hill: University of North Carolina Press, 1933), pp. 70-98. United States import duties for coffee also declined considerably during the decades following independence, dropping from five cents a pound in 1814 to exemption after 1832. See Steven Topik, 'The World Coffee Market in the Eighteenth And Nineteenth Centuries, from Colonial To National Regimes,' London School of Economics, Department of Economic History, Working Papers of the Global Economic History Network, No. 04/04, 2004, p. 23.

[12] However, Brazil was by no means immune from border disputes or secessionist revolts during the post-independence period. See Victor Bulmer-Thomas, *The Economic History of Latin America since Independence*, (Cambridge: Cambridge University Press, 2003), p. 20.

the century and only after suffering from a prolonged series of restrictions to its Atlantic slave trade.

While Brazil remained relatively free of the domestic institutional shocks associated with independence, institutional change plays an important role in the narrative of Brazil's early dynamism. As a number of scholars have argued, the external conditions for the expansion of Brazil's export economy were especially propitious during the post-independence decades. On the demand side, the consumption of Brazil's commodities in the industrialising core steadily expanded across the century. On the supply side, the hangover of the Haitian Revolution and the institutional shock of slave emancipation in the British West Indies in 1833 effectively opened room for more competitive tropical agricultural producers.[13] The export economies of those countries that remained slave plantation economies, such as Brazil, Cuba, Puerto Rico, and the Southern slave plantations of the United States expanded rapidly during the same period.[14]

Indications of this expansion and the accompanying economic dynamism are present in the revisionist literature. The work of numerous scholars on the slave trade has revealed the prodigious numbers of slave arrivals during the post-independence period. The Atlantic slave trade, in the words of Herbert Klein and Francisco Vidal Luna, '...reached its peak in the third decade of the nineteenth century.'[15] Brazil was at the centre of this trade, drawing the major part of slave importations during the period between independence and the abolition of the Brazilian slave trade in 1850.[16] During the period from 1821 to 1830, more slaves were imported into Brazilian ports than any other destination during any decade in the recorded history of the Atlantic slave trade.[17]

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[13] The slave trade was abolished by Great Britain in 1807. It wasn't until 1833 with the Slave Abolition Act that full emancipation occurred.

[14] Leff, 'Tropical trade and development in the nineteenth century,' pp. 684-686; Herbert S. Klein and Francisco Vidal Luna, *Slavery in Brazil*, (Cambridge: Cambridge University Press, 2010); Victor Bulmer-Thomas, *The Economic History of the Caribbean since the Napoleonic Wars*, (Cambridge: Cambridge University Press, 2012), pp. 41-45, 169-178; Batista Jr., ' Política tarifária britânica e evolução das exportações brasileiras,' pp. 215-223; On the British West Indies, see R. B. Sheridan, 'The West Indian sugar crisis and British slave emancipation, 1830-1833,' *Journal of Economic History*, 21 (1961), pp. 539-551; L. J. Ragatz, *The Fall of the Planter Class in the British Caribbean, 1763-1833*, (New York: Octagon Books, 1963); J. R. Ward, 'The Profitability of Sugar Planting in the British West Indies, 1650-1834,' *The Economic History Review*, 31: 2 (May, 1978), pp. 197-213.

[15] Klein and Vidal Luna, *Slavery in Brazil*, p. 74.

[16] *ibid.,* pp. 78-79; Luiz Aranha Corrêa do Lago, 'O surgimento da escravidão e a transição para o trabalho livre no Brasil: um modelo teórico simples e uma visão de longo prazo,' *Revista Brasiliera de Economia*, 42: 4 (1988), p. 329.

[17] See Herbert S. Klein, *The Atlantic slave trade*, (Cambridge: Cambridge University Press, 1999), pp. 210-211,

While the anti-slave trade law of 1831, the product of unyielding political pressure from the British, curtailed importations for a number of years, the illicit trade continued and expanded considerably after 1837 until final abolition in 1850.[18] Although the ports and, after 1831, clandestine disembarkation sites in the south-east received the largest share of imports, a similar trend is observed in the north-east, effectively feeding the expansion of sugar plantations.[19] The demand for labour was apparently so high that a considerable rise in slave prices – which began in the late 1820s, seemingly in anticipation of abolition – did not curtail importations.[20] After 1850 and the closure of the slave trade, an internal redistribution of the slave population from the north-east to the south-east took place, until eventual abolition and government subsidised immigration later in the century.[21]

The unprecedented demand for labour and its long-run appreciative price trend after 1830, coupled with the land-intensive nature of Brazil's export industries, implies a concurrent expansion of the agricultural frontier. To be sure, the country possessed a relatively superior endowment of fertile land in the south-east that – due to climatic conditions – favoured the cultivation of coffee.[22] In the north-eastern regions – particularly around the Recôncavo in Bahia but also in Pernambuco –

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appendix Table A.2, which gives the following figures for Brazil (in thousands of slaves):1801-1810: 241.3, 1811-1820: 327.7, 1821-1830: 431.4, 1831-1840: 334.3, 1841-1850: 378.4, 1851-1860: 6.4.

[18] Leslie Bethell, *The Abolition of the Brazilian Slave Trade: Britain, Brazil and the Slave Trade Question*, (Cambridge: Cambridge University Press, 1970), chapters 3, 12 and appendix.

[19] Klein and Vidal Luna, *Slavery in Brazil*, p. 153. For Bahia see Bert Jude Barickman, *A Bahian Counterpoint: Sugar, Tobacco, Cassava, and Slavery in the Recôncavo, 1780-1860*, (Stanford: Stanford University Press, 1998), p. 137; Stuart B. Schwartz, *Sugar Plantations in the Formation of Brazilian Society: Bahia, 1550-1835*, (Cambridge: Cambridge University Press, 1985), p. 343. For Pernambuco, see J. H. Galloway, 'The Sugar Industry of Pernambuco during the Nineteenth Century,' *Annals of the Association of American Geographers,* 58: 2 (June, 1968), pp. 285-303.

[20] On slave prices in Bahia, see Barickman, *A Bahian Counterpoint*, p. 139. For long-run slave price trends in Minas Gerais and Rio de Janeiro, see Klein and Vidal Luna, *Slavery in Brazil*, pp. 98-299. For a comparison with Cuba, see David Eltis, *Economic Growth and the Ending of the Transatlantic Slave Trade*, (Oxford: Oxford University Press, 1987), Appendix C.

[21] On the internal slave trade: Herbert S. Klein, 'The Internal Slave Trade in Nineteenth-Century Brazil: A Study of Slave Importations into Rio de Janeiro in 1852', *The Hispanic American Historical Review*, 51: 4 (Nov., 1971), pp. 567-585. On abolition see Robert Edgar Conrad, *The Destruction of Brazilian Slavery, 1850-1888,* (University of California Press: California, 1972); Bethell, *The Abolition of the Brazilian slave trade*; Klein and Vidal Luna, *Slavery in Brazil*, chapter 10. On immigration see Nathaniel H. Leff, 'Economic Retardation in Nineteenth-Century Brazil,' *The Economic History Review*, 25: 3 (Aug., 1972), p. 494.

[22] Stanley J. Stein, *Vassouras, a Brazilian Coffee County, 1850-1900: The Roles of Planter and Slave in a Plantation Society*, (Princeton: Princeton University Press, 1985); Antonio Delfim Netto, *O problema do café no Brasil,* (São Paulo: Instituto de Pesquisas Econômicas, 1981); Warren Dean, *With Broadax and Firebrand: The Destruction of the Brazilian Atlantic Forest*, (California: University of California Press, 1995).

large swathes of uncultivated land allowed for the gradual expansion of sugar, tobacco and cocoa plantations.[23] Moreover, there are clear indications of frontier expansion during the decades following independence. The years from 1830 to 1834 recorded the highest number of new sugar *engenho* registrations in Bahia during the nineteenth century.[24] There are also indications of a similar trend in the number of *fazendas* in the south-east.[25] From independence until 1850 there were effectively no institutional barriers to the definition of land rights. Besides the pre-existing land titles (*sesmarias)* granted by the Crown before independence, the definition of property rights during the first three decades of the independent Empire was achieved through informal occupation (*posse*). While the ambiguous nature of property rights frequently resulted in conflict, there were few institutional impediments to the expansion of cultivation, particularly by the more powerful 'large scale squatters.'[26] The Land Law (*Lei de Terras*) of 1850 recognised all previously claimed posses and sesmarias but prohibited the informal occupation of land, instead only allowing for acquisition through purchase.[27]

This frontier expansion, however, was hindered by a number of factors. The lack of institutionalisation that applied to property rights in land also applied to the financial system. There was a significant scarcity of private financial institutions before mid-century. In the absence of such institutions, planters were in large part beholden to the services of intermediaries (*comissarios*) for credit. [28] Inheritance, marriage and personal loans from non-bank lenders were other informal ways

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[23] For Bahia, see Barickman, *A Bahian Counterpoint*, chapter 5. For Pernambuco, Galloway, 'The Sugar Industry in Pernambuco.'

[24] Barickman, *A Bahian Counterpoint,* p. 36; for the number of mills in Pernambuco, see Peter L. Eisenberg, *The Sugar Industry in Pernambuco: Modernization without Change, 1840-1910*, (California: University of California Press, 1974), Appendix 3.

[25] For the case of São Paulo, see Francisco Vidal Luna and Herbert S. Klein, *Slavery and the Economy of São Paulo, 1750-1850*, (Stanford: Stanford University Press, 2003), pp. 56-57.

[26] Paiva Abreu and Correa do Lago, 'Property rights and the fiscal and financial systems in Brazil,' p. 327.

[27] Lee J. Alston, Gary D. Libecap, and Bernardo Mueller, *Titles, Conflict, and Land Use: The Development of Property Rights and Land Reform on the Brazilian Amazon Frontier*, (Michigan: University of Michigan Press, 1999), p. 35; Marcelo de Paiva Abreu and Luiz Aranha Correa do Lago, 'A economia brasileira no Império, 1822-1889,' in Marcelo de Paiva Abreu (ed.), *A Ordem do Progresso, Edição Atualizada: Dois Séculos De Política Econômica No Brasil*, (Rio de Janeiro: Elsevier, 2014); Warren Dean, 'Latifundia and Land Policy in Nineteenth-Century Brazil,' *The Hispanic American Historical Review*, 51: 4 (Nov., 1971), pp. 606-625.

[28] In the case of sugar, see Eisenberg, *Sugar Industry in Pernambuco*, pp. 63-67: for coffee see Stein, *Vassouras*, pp. 17-20.

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of obtaining credit. Given the speculative nature of much of this borrowing and the lack of a regulatory framework, the cost of borrowing during this period was generally quite high.[29] Despite the lack of financial institutionalisation, indicators of non-bank financial transactions show steady growth during the decades following independence.[30] Furthermore, Zephyr Frank's work on wealth holding in the south east has shown that, rather than remaining stagnant, mean wealth grew over the four decades after independence. Frank's examination of the credit market in São João del-Rei in the state of Minas Gerais during the post-independence period revealed a 'vast informal credit market' associated with the domestic and export economy.[31]

Another important factor was unfavourable geography and a high incidence of transport costs. Infrastructure was rudimentary at best; before the introduction of rail, the common mode of transport was the mule. Such costs affected not only the profit margin of producers but also the productivity of plantations. In the case of coffee, Herbert Klein estimated that one-third of a fazenda's slave labour force was dedicated to the transportation of coffee sacks to market.[32] Thus the expansion of the agricultural frontier was limited until the development of the rail network that took place after the 1860s.[33] In fact, like many economies in Latin America, investment in transport infrastructure was largely driven by the demands of the planters.[34] Construction did not begin until 1852 and continued during the final half of the nineteenth century, effectively generating large

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[29] Joseph Ryan, 'Credit where Credit is Due: Lending and Borrowing in Rio de Janeiro, 1802--1900,' unpubl. PhD diss., UCLA, 2007; Eisenberg, quoting 1875 report by the Commissões da Fazenda e Especial: 'The interest rate in some provinces ranges from 7 percent to 12 percent, and in other from 18 percent to 24 percent, and in still other from 48 percent to 72 percent.' Eisenberg, *Sugar Industry in Pernambuco*, p. 63.

[30] Ryan, 'Credit where credit is due,' p. 88.

[31] Zephyr Frank, 'Wealth Holding in Southeastern Brazil, 1815–60,' *Hispanic American Historical Review* 85: 2 (2005), pp. 242-246. For the case of Minas Gerais, see Amilcar Martins Filho and Roberto B. Martins, 'Slavery in a Nonexport Economy: Nineteenth-Century Minas Gerais Revisited,' *Hispanic American Historical Review*, 63: 3 (Aug., 1983), pp. 537-568; Laird W. Bergad, *Slavery and the Demographic and Economic History of Minas Gerais, Brazil, 1720-1888* (Cambridge: Cambridge University Press, 1999).

[32] Herbert S. Klein, 'The Supply of Mules to Central Brazil: The Sorocaba Market, 1825-1880,' A*gricultural History,* 64: 4 (Fall 1990), pp. 1-25.

[33] For the expansion of the railway and associated social savings costs see William R. Summerhill, 'Big Social Savings in a Small Laggard Economy: Railroad-Led Growth in Brazil,' *The Journal of Economic History*, 65: 1 (Mar., 2005), pp. 74-75.

[34] William R. Summerhill, 'The Development of Infrastructure,' in Victor Bulmer-Thomas, John Coatsworth and Roberto Cortes-Conde (eds.), *The Cambridge Economic History of Latin America: Volume 2, The Long Twentieth Century*, (Cambridge: Cambridge University Press, 2006), pp. 293-328. For the case of Cuba, see Oscar Zanetti and Alejandro García, *Sugar and Railroads: A Cuban History 1837-1959*, (Chapel Hill: University of North Carolina Press, 1998).

social savings for freight services and providing an impetus to the development of the domestic market.[35] Despite the lack of infrastructure and associated transport costs, however, it is evident that the supply of traditional modes of transportation increased alongside the expansion of export industries. According to Klein's estimates, the average arrival of mules to the Sorocaba market in the state of São Paulo doubled during the 1830s and showed a steadily increasing trend until the 1870s.[36] Aida Lavalle and Carlos Suprinyak observed similar tendencies in Rio Negro and Itapetininga, respectively.[37]

Here we seek to provide a solid empirical basis for the revisionist narrative of Brazilian export dynamism during the post-independence decades. Before doing so, however, a thorough analysis and reconstruction of the Brazilian export series is necessary.

### The reconstruction of Brazil's export statistics

Foreign trade statistics are perhaps unique in the statistical universe for being a useful case of double accounting: the quantity and value of imported and exported commodities appear in records of differing nationalities. This allows for a comparison of these records in order to ascertain the accuracy of origin or destination statistical sources. Unfortunately, at least for the period under examination, there existed no homogeneous international classification system regulating foreign trade statistics. The absence of such regulation engendered a debate regarding the reliability of these statistics.[38] Oskar Morgenstern's observation that 'Writers on all phases of foreign trade will have to assume the burden of proof that the figures on commodity movements are good enough...'[39] has

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[35] William R. Summerhill, *Order against progress: government, foreign investment and railroads in Brazil 1854-1913,* (Stanford: Stanford University Press, 2003).

[36] Klein, 'Supply of mules,' pp. 9-10.

[37] Aida Mansani Lavalle, *Análise quantitativa das tropas passadas no registro do Rio Negro* (*1830-1854*). 1974. Tese (Livre Docência) – UFPR, Curitiba; Carlos Eduardo Suprinyak, *Tropas em marcha: o mercado de animais de carga no centro-sul do Brasil imperial* (São Paulo: Annablume, 2008), Chapter 2.

[38] The pessimistic perspective is most eloquently articulated in Oskar Morgenstern, *On the Accuracy of Economic Observations,* (Princeton: Princeton University Press, 1963); for the optimistic perspective, see Giovanni Federico and Antonio Tena-Junguito. 'On the Accuracy of Foreign Trade Statistics (1909-1935): Morgenstern Revisited,' *Explorations in Economic History*, 28 (1991), pp. 259-273.

[39] Morgenstern, *On the Accuracy of Economic Observations,* p. 180.

since led to a substantial amount of quantitative soul-searching by economic historians and students of international trade. Although D. C. M. Platt was slightly less pessimistic about Latin American trade statistics, his conclusions were still disheartening.[40] Over the last few years the countries of Latin America and the Caribbean have been subjected to an audit of their historical foreign trade statistics.[41] Much of this work has contradicted Morgenstern and Platt's pessimistic view of the reliability of these statistics.

The accuracy of Brazil's historical foreign trade statistics, while being included in a number of these studies, has not been conclusively evaluated. Certainly a number of scholars have recognised and attempted to correct the limitations of these statistics. This work includes the correction of the inclusion of bullion in the official series of exports and imports[42] and the examination of the accuracy of the official value of exports.[43] These studies, however, have only focused on certain periods, and have not definitively addressed problems involving the value and destination of official export statistics. Here we focus primarily on the accuracy of the official values.

During the period under study, the official values of exports were fixed by the *pauta semanal*, a price schedule issued on a weekly basis by a government committee in consultation with local commodity brokers and commercial associations. The average weekly market prices of each commodity included in the nomenclature of the pauta were 'verified' in the market before being

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[40] D. C. M. Platt, 'Problems in the Interpretation of Foreign Trade Statistics before 1914,' *Journal of Latin American Studies,* 3: 2 (1971), pp. 119-130.

[41] For example, see Sandra Kuntz Ficker, 'Nuevas series del comercio exterior de México, 1870–1929,' R*evista de Historia Económica/Journal of Iberian and Latin American Economic History*, 20 (2002), pp. 213-270; Maria del Mar Rubio and Mauricio Folchi, 'On the Accuracy of Latin American Trade Statistics: a Nonparametric Test for 1925,' Universitat Pompeu Fabra. Departament d'Economia i Empresa Working Paper, 2005; Anna Carreras-Marín and Marc Badia-Miró, 'La fiabilidad de la asignación geográfica en las estadísticas de comercio exterior: América Latina y el Caribe (1908–1930),' *Revista de Historia Económica/Journal of Iberian and Latin American Economic History*, 26: 3 (2008), pp. 355-373; Antonio Tena-Junguito and Henry Willebald, 'On the accuracy of export growth in Argentina, 1870-1913,' *Economic History of Developing Regions*, 28: 1 (2013), pp. 28-68; Nicolás Bonino-Gayoso, Antonio Tena-Junguito and Henry Willebald, 'Uruguay and the First Globalization. On the accuracy of export performance, 1870-1913,' Working Papers in Economic History, WP 15-01, Carlos III University of Madrid. Figuerola Institute of Social Sciences History, 2015.

[42] Luiz Aranha Correa do Lago, 'Balança comercial, balanço de pagamentos e meio circulante no Brasil no Segundo Império: uma nota para uma revisão,' *Revista Brasileira de Economia*, 36: 4 (1982), pp. 489-508; *O comércio exterior do Brasil no Segundo Império: uma reavaliação* (Rio de Janeiro: Fundação Getulio Vargas, 1986); Gustavo Henrique Barroso Franco, 'O balanço de pagamentos do Brasil, 1870-1896: novas estimativas,' Texto para Discussão No. 201. Departamento de Economia PUC-Rio, 1988.

published and sent to the Ministry of Finance, provincial customs houses and major periodicals.[44]

Export duties were collected at the port of shipment by applying the values listed in the pauta to the quantities given in the manifests of the ocean going vessels.[45] Until the end of the nineteenth century the values used to calculate export statistics were those fixed by the pauta.[46] Any bias in the official price schedule would thus be reflected in the statistics. In 1900, after publishing his landmark study of 1896, *Brazilian Exchange: The Study of an Inconvertible Currency*, the British civil engineer J. P. Wileman was contracted by the Brazilian Ministry of Finance to assist in the modernisation of the state's statistical apparatus and the creation of the *Serviço de Estatística Comercial*.[47] From 1901 onwards, the official trade statistics were published annually by the *Serviço* in a publication that would assume the title *Comércio Exterior do Brasil*. The values listed in this publication were calculated using the market price given at the port of departure.[48] These values included export duties and other transaction costs (such as the cost of cartage, packing and loading) but not freight, insurance or landing costs.[49]

Due to the reliance upon official values for the calculation of export statistics during the nineteenth century, the veracity of these values was sensitive to the fiscal exigencies of the government, the influence of the brokers and commercial associations and the competencies of the statistical apparatus of the state.[50] Apart from the recognition of the possible inaccuracy of the

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[44] Brazil, *Regulamento das Alfandegas e Mesas de Rendas,* (Rio de Janeiro: Typographia Nacional, 1866), p. 242.
[45] Brazil, *Commercio Exterior do Brasil, 1910 a 1914, Vol. 1,* (Rio de Janeiro: Directoria de Estatistica Commercial, 1915), p. XXI.
[46] Wileman, *Brazilian Exchange,* p. 83.
[47] Franco, 'O balanço de pagamentos do Brasil,' p. 2.
[48] Although occasionally reference was made to the *pauta*. For example see Brazil, *Importação e Exportação, Movimento maritimo, cambial e do café da Republica dos Estados Unidos do Brazil,* (Rio de Janeiro: Imprensa Nacional, 1905), pp. 208-209.
[49] Brazil, *Commercio Exterior do Brasil, 1910 a 1914, Vol. 1,* p. XXI.
[50] While it is outside the purview of this paper to provide a comprehensive explanation for the bias shown in the official statistics, it is possible to offer a number of conjectures. One reason for the bias may be the influence of commercial associations. As Eugene Ridings observed, it was in the interest of export lobbies to reduce as much as possible the elasticity of the official price schedule with relation to ascending price movements in order to avoid an increased tax burden. If prices were descending, however, they would lobby for the frequent adjustment of official prices in order to avoid paying more taxes. See Eugene Ridings, *Business interest groups in nineteenth-century Brazil.* (Cambridge: Cambridge University Press), 1994, p. 199. Another possibility might be associated with exchange rate movements. Here we assess the accuracy of the official series in sterling prices, principally due to its use in the literature for comparative purposes. The *pauta*, however, was defined in terms of mil-réis prices. The sterling value depended on the

official values of Brazilian export statistics,[51] however, the veracity of these values has been the subject of little attention in the literature. Wileman included in *Brazilian Exchange* an examination of the accuracy of official valuations for the period 1861 to 1888. He concluded that the official statistics were marginally under-valued.[52] Wileman assumed somewhat arbitrarily that trade and transaction costs accounted for 15 per cent of the official value which included '...all expenditure from date of purchase to delivery on board...' but excluded the cost of freight rates.[53] This assumption is difficult to sustain for the periods preceding (when freights weighed heavily on total export value) and succeeding (when export duties for certain commodities sometimes exceeded 15 per cent) Wileman's study.

Here we confirm and extend Wileman's findings by way of the construction of a price accuracy index for Brazilian exports during the period 1821 to 1913. Following the methodology commonly employed in the literature to test for price accuracy,[54] we collect the prices[55] of a representative sample of export commodities including cacao, coffee, cotton, hides, rubber and sugar. These prices are then contrasted with their corresponding international prices.[56]

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trend of the mil-réis values of the official series and the réis-sterling exchange rate. Any observed covariance between the mil-réis and sterling values of the official series would thus be explained by movements in the exchange rate. Effectively, the periods that demonstrate the greatest degree of under-valuation (such as the 1830s and 1890s) are those that also demonstrate the greatest covariance between the mil-réis and sterling values of the official series. These exchange rate movements were principally driven by variations in the income derived from coffee export revenues. For an analysis of the determinants of the exchange rate in Brazil during the nineteenth century, see Eliana A. Cardoso, 'Exchange rates in nineteenth century Brazil: An econometric model,' *The Journal of Development Studies*, 19: 2 (1983), pp. 170-178; Gustavo Henrique Barroso Franco, *Reforma Monetária e Instabilidade Durante a Transição Republicana*. (Rio de Janeiro: BNDES, 1987).

[51] Franco, 'O balanço de pagamentos do Brasil,' p. 2; 'Setor Externo,' in *Estatísticas Históricas do Brasil, Series Econômicas, Demográficas e Sociais de 1550 a 1988, 2ª edição*. (Rio de Janeiro: IBGE, 1990), p. 561.

[52] Summarising his conclusions over three periods, Wileman estimated the ratio of local to foreign valuations as 97 per cent for the period 1865 to 1878, 88.3 per cent for the period 1879 to 1886, and 98 per cent for the period 1886 to 1888. Wileman's sample of trading partners included Great Britain, France, Belgium, Germany (Hamburg), the United States, Portugal, Austria, Uruguay and Argentina. To the total valuation of imports from Brazil to these countries was added 10 per cent for 'unspecified countries' and 15 per cent was subtracted to cover the freight factor. See Wileman, *Brazilian Exchange*, pp. 122-123.

[53] *ibid*. p. 124.

[54] Federico and Tena-Junguito, 'On the Accuracy of Foreign Trade Statistics;' Tena-Junguito and Willebald, 'On the accuracy of export growth in Argentina;' Antonio Tena-Junguito, *Las estadísticas históricas del comercio internacional (1890-1960): fiabilidad y comparabilidad,* (Madrid: Banco de España, Estudios de Historia Económica, no. 24, 1992).

[55] This 'price,' as well as those derived from the U.K. import statistics, is effectively the computed unit value; that is, total value over total quantity. We take the official prices of these commodities from Brazil, *Anuário Estatístico do Brasil de 1939/1940,* (Rio de Janeiro: IBGE, 1941), pp. 1374-1378.

[56] Tobacco and herva mate, while also occupying lesser but still important portions of Brazil's exports, have been dropped due to the absence of data on international prices. Even in the absence of these commodities, the sample covers

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As a proxy for the average level of international prices, we have used two sources. For the period 1850 to 1913, we use the prices derived from the United Kingdom's import statistics. We assume that the latter reflect the international price of these commodities, an assumption that is supported by a comparison of the U.K. data with Augustus Sauerbeck's series of international prices of selected commodities.[57] The period before 1850 is more problematic due to the absence of a common point of reference such as the Sauerbeck series.[58] In order to confirm the accuracy of this period and achieve the most representative series possible, we have constructed a weighted average of prices from different origins to the U.K. and Philadelphia for the commodities in the sample.[59] An important consideration when choosing which price series to include in the weighted average is the quality of the commodity in question. Coffee is a particularly difficult commodity in this regard as quality is largely dependent upon the singular characteristics of each producer.[60] To account for this somewhat heterogeneous nature, we have included a wide range of series. Sugar, however, is a different story. The majority of Brazilian exports of cane sugar during this period were of the muscovado variety.[61] We have thus excluded other qualities, such as white or beet varieties, from the sugar series. While it is impossible to perfectly homogenise each weighted average by quality given the limited information available, we have taken the utmost care to include only the price

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an average of 88 per cent of the value of exports during the period in question, ranging from a minimum of 66.6 per cent in 1844/45 and a maximum of 93.9 per cent in 1895 according to official statistics.

[57] The correlation coefficients of the selected commodities during the period 1854-1912 are as follows: coffee = 0.91, sugar =0.98, cotton = 0.99, hides = 0.84.

[58] Import price data records of UK, France, and Belgium were valued at fixed prices respectively until 1854, 1847 and 1846 respectively. This implies that the use of these records to revaluate Brazil's official valuation are not useful and justifies the use of the international price series used here.

[59] As weights we use the distribution of each origin in the sum of the quantum of exports of all origin countries for each commodity. For this period we are obliged to drop rubber from the sample due to the lack of international price data. This is not such a problem, however, as rubber occupied a marginal portion of Brazil's total exports.

[60] See Steven Topik, 'The World Coffee Market in the Eighteenth and Nineteenth Centuries,' pp. 5-6. An additional consideration is the quality of Brazilian coffee included in the export statistics. These statistics do not disaggregate by quality. Prior to the 1890s, the nomenclature ranged from "*superior*" to "*segunda ordinaria.*" The prices of the qualities ranged from 6$950 to 2$200 per 10 kilograms in 1878. The official mil-réis unit value for 10 kilograms quoted in the *Anuario Estatistico* of 1939/40 is 4$555. In the early 1890s, the nomenclature used to classify Brazilian exports of coffee changed to reflect those qualities listed in the New York market. This nomenclature ranged from N. 4 to N. 9 in descending order of quality. The prices ranged from 8$6 to 15$1 per 10 kilograms in 1891, while the official statistic for this year is 8$814. The official unit values for 1878 and 1891 thus correspond with the quality "segunda boa" and its equivalent in the revised nomenclature, N. 6. See *Retrospecto Commercial*, various years.

[61] For the period 1910 to 1913 it accounted for 57.73 per cent of total sugar exports. Brazil, *Commercio Exterior do Brasil, 1910 a 1914, Vol. 1,* pp. 72-75.

series of certain qualities that, where possible, reflect those qualities exported from Brazil.

*Fig.1. Price Accuracy Index, Brazil, 1821-1913*
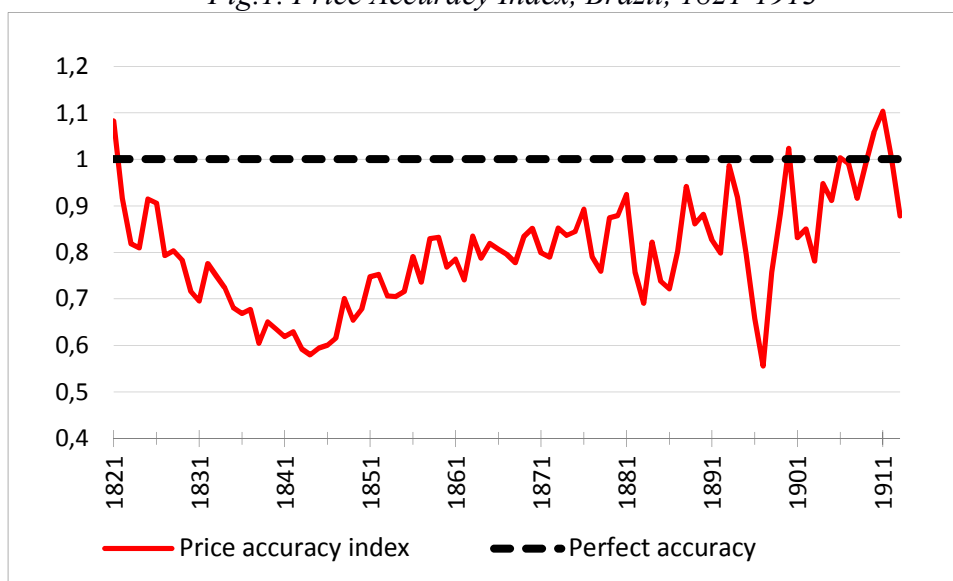
The international series represents the c.i.f. (cost, insurance and freight) values of Brazilian exports or their value at the Brazilian border plus insurance, freight and other associated trade costs. From 1821 to 1900 official Brazilian statistics are presented as f.o.b. (free on board) values, representing the value of exports at the Brazilian border and not including trade costs. As mentioned previously, from 1901 onwards these statistics include the value of export taxes but not freight or insurance costs. In order to make any meaningful comparison with the Brazilian data, the international series must therefore be converted to f.o.b. values. With this in mind, we have constructed a new series of freight rates and export taxes and we have used these costs, together with data on the insurance cost, to adjust the international series from the c.i.f. values to the f.o.b. values reflected in the Brazilian statistics.[62]

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[62] The weight of trade costs depends largely on the commodity in question. Generally, this factor ranged between 4.37 per cent (sugar, 1857) to 23.46 per cent (rubber, 1898) of the c.i.f. value. Such variability was due not to freight rates, which generally tended to decline during the period, nor to insurance costs, but rather to export taxes which differed quite drastically between commodities, particularly during the Republican period. Unlike other Latin American countries, Brazilian export taxes did not decline during the latter half of the century. Instead, provincial governments took advantage of the opportunity to define export taxes awarded to them by the Republican Constitution of 1891. This resulted in a sharp increase in the weight of taxation during the last decade of the nineteenth century which, in the case of the taxation of rubber exports in the state of Pará, saw ad valorem taxes rise as high as 22 per cent. For the case of Amazonia, see Felipe Tâmega Fernandes, 'Stretching the Inelastic Rubber: Taxation, Welfare and Lobbies in Amazonia,

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Figure 1 shows the general price accuracy index of the commodity sample for the years 1821 to 1913. If perfectly accurate, the adjusted international series should reflect the official Brazilian f.o.b. export values. However the index clearly confirms Wileman's findings of under-valuation. This under-valuation is particularly acute during the first half of the century. Furthermore, as predicted, the series tends towards perfect accuracy after the institution of the *Serviço de Estatística Comercial* in the early 1900s. Disaggregation by commodity reveals the drivers of this general under-valuation. As Figure 2 shows, each commodity was consistently under-valued with the exception of a few notable periods. Most notably, cotton and sugar tended towards over-valuation immediately after the founding of the Republic in 1889, a tendency that continued into the twentieth century. Given the weight of coffee in the export economy, however, this over-valuation is not reflected in the general price accuracy index.

*Fig. 2. Price accuracy indices by commodity, Brazil, 1821-1913*
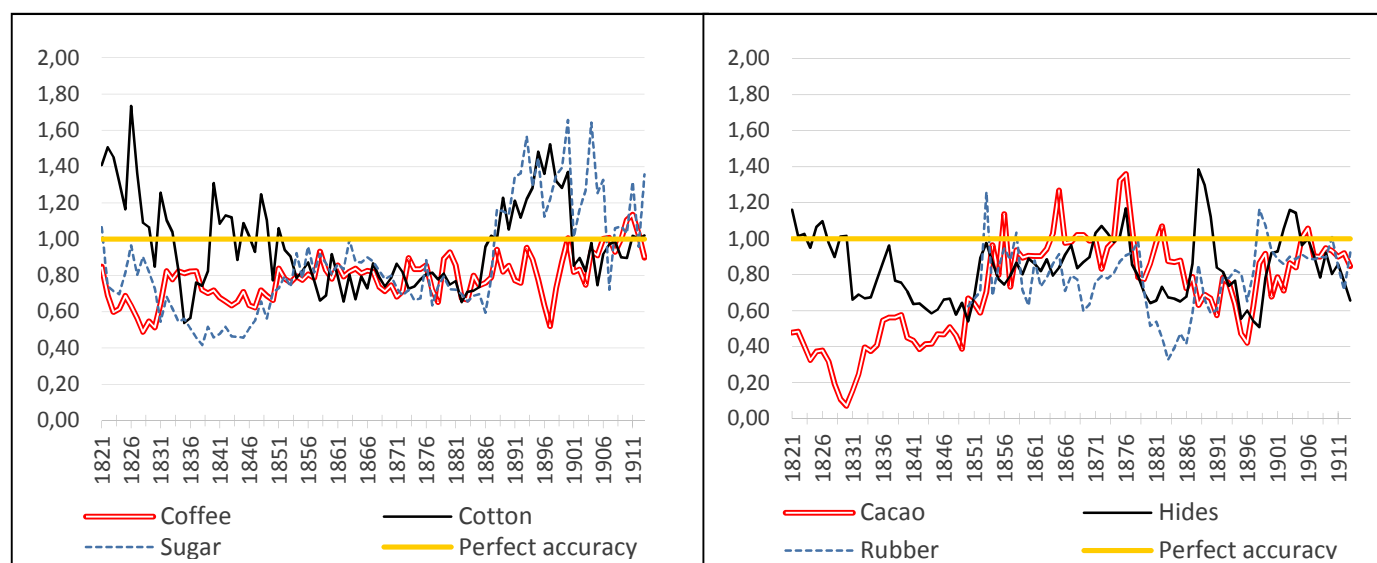


*Sources: see Appendix 1.*

### *A reappraisal of Brazilian export growth*

In sum, an examination of the accuracy of the values of Brazil's export statistics reveals a clear bias towards under-valuation. In order to correct this bias, we reconstruct the series using

international prices. During the period under consideration the commodity structure of Brazil's exports changed considerably. Although coffee played a leading role in the export sector from 1831 onwards, four other commodities also maintained substantial shares during different periods: cotton (1821-1837, 1862-1874), hides (1821-1832, 1844-1846), sugar (1821-1885) and rubber (1886-1913).[63] Given the long-run nature of the study and the changes in Brazil's composition of exports it is important to utilise a methodology that provides a balanced representation of the historical trend. We thus elaborate a Fisher export price index using the corrected prices of the commodities in the sample. This index is used to deflate the series from current to constant prices, from which the growth rates are calculated. We compare the new growth rates to those calculated using a number of other export price indices based on the official unit values. The first is a Fisher export price index for the period from 1850 to 1913 which was elaborated by Reinaldo Gonçalves using the unit values given in the official Brazilian statistics.[64] Furthermore, we compare the reconstructed series to a second export price index commonly used in the literature on export growth constructed by Christopher Blattman, Jason Hwang and Jeffrey Williamson (hereinafter BHW) using the same commodity sample and spanning the period from 1860 to 1913.[65]

*Table 1. Export growth rates, Brazil, 1821-1913.*

|  | Corrected | Gonçalves | BHW |
|---|---|---|---|
| 1821-1850 | 5,9% | | |
| 1821-1870 | 4,6% | | |
| 1821-1890 | 3,7% | | |

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[63] See Appendix 4.

[64] Reinaldo Gonçalves, ́Índices de Comércio Exterior do Brasil,' *Revista Brasileira de Estatística,* 42: 168 (1981), pp. 331-362. This index uses a sample of eight commodities (cacao, coffee, cotton, herva mate, hides, rubber, sugar and tobacco) with 1880 as the base year, the unit values of which are taken from the *Anuário Estatístico* of 1939/40. This index was later reproduced in *Estatísticas Históricas do Brasil, Séries Econômicas, Demográficas e Sociais de 1550 a 1988, second edition* (Rio de Janiero: IBGE, 1990), p. 597.

[65] Christopher Blattman, Jason Hwang and Jeffrey G. Williamson, 'Winners and losers in the commodity lottery: The impact of terms of trade growth and volatility in the Periphery 1870–1939,' *Journal of Development Economics,* 82 (2004), pp. 156-179. The BHW index is a chained Laspeyres index that uses the British c.i.f. unit values.

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| | | | |
|---|---|---|---|
| 1821-1913 | 3,7% | | |
| 1850-1870 | 2,8% | 2,4% | |
| 1850-1890 | 2,3% | 2,3% | |
| 1850-1913 | 2,8% | 2,9% | |
| 1870-1890 | 1,3% | 1,9% | 0,9% |
| 1870-1913 | 2,8% | 3,1% | 3,2% |
| 1890-1913 | 4,3% | 4,2% | 5,3% |

*Sources: see Appendices 1 and 2.*

Table 1 displays the growth rates of exports derived from the new series at constant prices alongside the official, Gonçalves and BHW series. We present both medium- and long-time periods beginning from 1821, 1850 and 1870 in order to capture the changes in the composition of exports. The two decades prior to the series represented here were characterised by considerable price volatility, due in large part to the effect of the Napoleonic Wars. After 1818, however, the prices of Brazil's principal export commodities began a gradual descent that ended in the 1830s.[66] Although quantum data for Brazilian exports after the end of the Portuguese trade monopoly in 1808 are difficult to come by, descriptive evidence suggests that liberalisation had a positive impact on Brazil's export industries during the decade prior to independence despite falling international prices.[67] As can be seen in Table 1, the period from 1821 to 1913 is not particularly exceptional, with growth rates of the corrected series for the period from mid-century onwards lying between the official and Gonçalves series and the dynamism of the BHW series. The period from 1821 to 1849, however, reveals a much more dynamic panorama. Exports grew faster than any other period of the nineteenth century at a rate of 5.9 per cent per annum. Further disaggregation of this period into decades is even more revealing. The export growth of this period to a large degree took place during

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[66] Based on the elaboration of a chained Laspeyres-Fisher export price index, adjusted for trade costs, calculated from data on sugar, coffee, cotton, hides, and tobacco prices from Bezanson and Gayer et al. Prices rose rapidly from the beginning of hostilities until the French loss in the Battle of Trafalgar in 1805, fell consistently before rising again during the hostilities between the United Kingdom and the United States. For the economic impact of the Napoleonic Wars, see Bulmer Thomas, *Economic History of the Caribbean*, p. 78; Kevin O'Rourke, 'The worldwide economic impact of the French Revolutionary and Napoleonic Wars, 1793-1815,' *Journal of Global History*, 1, (2006), pp. 123-149.

[67] Leslie Bethell, *Brazil: empire and republic, 1822-1930*, (Cambridge: Cambridge University Press, 1989), p. 6-7; Jose Luis Cardoso, *1808: o ano zero d autonoma economica do Brasil*, in Pedro de Avillez (ed.), *Rio de Janeiro, Capital do Imperio Portugues (1808-1821)*, (Parede: Tribuna a Historia, 2010), p. 120; Bergad, *Slavery and the demographic and economic history of Minas Gerais*, Chapter 2.

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the decade immediately following independence.

*Table 2. Volume and prices commodity growth rates. Brazil, 1821-1913*

|         | 1821-50 | 1850-70 | 1870-90 | 1890-1913 | 1870-1913 | 1821-1913 | 1850-1913 |
|---------|---------|---------|---------|-----------|-----------|-----------|-----------|
| **volume** | | | | | | | |
| **Cacao** | 5.00% | 0.66% | 1.69% | 7.10% | 4.48% | 3.71% | 3.24% |
| **Coffee** | 9.72% | 2.98% | 2.03% | 4.34% | 3.19% | 5.09% | 3.08% |
| **Cotton** | 1.26% | 5.60% | -6.52% | 4.90% | -0.38% | 1.38% | 1.46% |
| **Hides** | 2.37% | 1.62% | -0.24% | 3.36% | 1.65% | 1.83% | 1.61% |
| **Rubber** | -- | 7.70% | 6.02% | 3.88% | 4.76% | -- | 5.58% |
| **Sugar** | 4.57% | 0.13% | 0.28% | -14.62% | -7.53% | -2.06% | -5.06% |
| **prices** | | | | | | | |
| **Cacao** | -1.48% | 1.43% | 2.93% | 0.24% | 1.45% | -0.01% | 1.42% |
| **Coffee** | -4.48% | 0.46% | 2.26% | -0.81% | 0.60% | -0.69% | 0.55% |
| **Cotton** | -2.67% | 2.06% | -2.89% | 1.10% | -0.73% | -0.02% | 0.14% |
| **Hides** | -1.64% | -0.39% | -1.05% | 4.80% | 2.04% | 0.71% | 1.26% |
| **Rubber** | -- | 3.75% | 0.94% | 0.41% | 0.64% | -- | 1.58% |
| **Sugar** | -0.73% | -0.13% | -3.11% | -0.79% | -1.82% | -1.29% | -1.27% |

*Sources: see Appendices 1 and 2.*

Disaggregation by commodity reveals the drivers of this initial dynamism. Table 2 displays the growth rates of the value of Brazil's principal export commodities in constant prices. Coffee was the principal protagonist of this period, exhibiting a growth rate in its sterling value of 9.7 per cent per annum. Sugar, although showing considerably less dynamism at 4.6 per cent per annum, was far from the stagnation and decadence that would characterise its experience in the latter half of the century. On the other hand, cotton, which had occupied such a central role in the export growth of the north-east during the late eighteenth century, was clearly showing signs of stagnation at 1.3 per cent per annum. It must be noted that the unparalleled growth of sugar and coffee occurred during a period in which international prices were generally declining.

*Fig. 3. Exports/GDP, Brazil, 1821-1913*
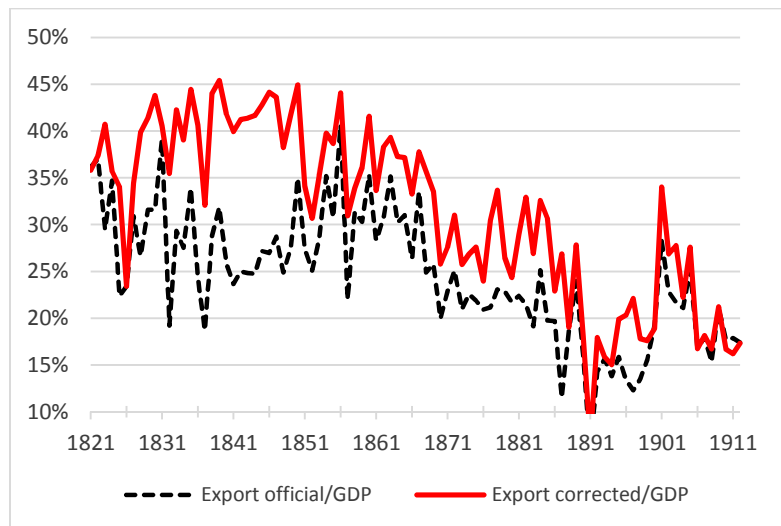
*Sources: Exports: see appendix 5. GDP: PIB - R$ (milhões), Instituto Brasileiro de Geografia e Estatística, Sistema de Contas Nacionais Referência (IBGE/SCN, 2000).*

The corrected series allows for the calculation of the exports/GDP ratio. As can be seen in figure 3, Brazil's degree of openness to the international economy was higher during the earlier period than previously thought.[68] In terms of income growth, however, Brazil's relatively positive export performance must be qualified. As can be seen by the commodity-level data, export growth was largely confined to a single sector: coffee. What's more, coffee production was highly concentrated in the south-eastern regions of the country, gradually diffusing from Rio de Janeiro to São Paulo.[69] So while export growth following independence and during the 1890s was more dynamic than previously appreciated, this growth was unequally distributed both in sectoral and geographic terms.[70]

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[68] Leff estimated an export-to-GDP ratio of 16 percent for 1911-13. Given that the export sector was the fastest growing sector of the Brazilian economy, Leff argued that such a figure would suggest a much lower portion during most of the nineteenth century. This led Leff to the conclusion that the internal market was the principal driving force behind Brazil's economic growth, employing the majority of the country's economically active population. As can be seen in the figure, however, the export sector accounted for a much larger portion of the economy during the post-independence period, falling to Leff's predicted levels only after 1870. See Leff, 'Tropical Trade and Development in the Nineteenth Century,' p. 690; 'Economic Development in Brazil, 1821-1913,' p. 41.

[69] Prado Júnior, *História Econômica do* Brasil, pp. 159-167.

*Demand and supply conditions during the post-independence decades*

The corrected series effectively permits us to reappraise the conventional narrative of Brazilian export growth and to lend support to the revisionist narrative of early Brazilian economic dynamism. Here we explore the conditions surrounding Brazil's dynamic export growth experience during the post-independence decades. The first step is to ascertain how much of this growth was attributable to factors related to Brazil's international competitiveness, and how much was due to the shift in world demand for Brazil's commodities. In order to untangle the effects of these determinants, we undertake a constant market share analysis of Brazilian export growth. The underlying assumption of constant market share analysis is essentially counter-factual; we assume that Brazil's export share in the world market remains unchanged over time. Any differentials that arise between our constant-share assumption and observed export performance are attributable to a residual factor, commonly interpreted as a competitiveness effect.[71] Here we perform a simple disaggregation of Brazil's export growth into two factors.[72] The first, the demand effect, uses the growth of world exports as a proxy for world demand, and reports how much of Brazil's market share is explained by the increase (or decrease) of this demand. The second, the competitiveness effect, reveals how much is explained by the increase (or decrease) of a country's competitiveness vis-à-vis other suppliers. We present an aggregate (which includes 55 countries) and disaggregate (which includes France, the Netherlands, Portugal, Sweden, the United Kingdom and the United States) world in order to control for the growth of world demand unrelated to Brazil's principal export markets. Table 3 displays the results.

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[72] Although it is customary to further disaggregate export growth into market distribution and commodity composition effects, we are restricted by the questionable quality and paucity of official bilateral data. A test of the accuracy of the geographical distribution of bilateral statistics by value and quantity highlights a number of serious problems. To begin with, the series is incomplete. Data are only available for the years 1842/43, 1852/53, 1862/63, 1872/73, and the period from 1901 onwards. Furthermore, the Brazilian export records are found to be considerably and consistently overvalued when compared to trading partner import records. This incorrect geographic assignment of exports might have been driven by differing conceptions of origin and destination and in some cases by smuggling or fraudulent practices by government officials in customs houses. See Platt, 'Problems in the Interpretation of Foreign Trade Statistics before 1914,' p. 121; Brazil, *Relatorio do Ministerio da Fazenda,* (Rio de Janeiro: Typographia Nacional, 1876), pp. 66-67; Mariana Flores da Cunha Thompson Flores, 'Contrabando na fronteira meridional do Brasil – por fora e por dentro da Alfândega (1845-1889),' *Revista Brasileira de História & Ciências Sociais*, 4: 7 (2012), pp. 122-142.

*Table 3. Constant market share analysis, 1821-1913*
[Millions of 1913 pounds sterling]

| | | | 1821-1850 | 1850-1870 | 1870-1890 | 1890-1913 | 1821-1913 |
|---|---|---|---|---|---|---|---|
| **World** | Brazil Export Increase | **ΔXB** | 10,8 | 9,5 | 6,2 | 45,4 | 72,0 |
| | World Demand | **rV** | 7,3 | 19,2 | 21,8 | 31,2 | 94,3 |
| | Competitiveness Effect | **V'-V-rV** | 3,5 | -9,7 | -15,5 | 14,2 | -22,4 |
| **Partners** | Brazil Export Increase | **rV** | 7,0 | 17,4 | 23,0 | 25,6 | 80,7 |
| | World Demand | **V'-V-rV** | 3,8 | -7,9 | -16,8 | 19,8 | -8,7 |
| **Cacao** | Brazil Export Increase | **Δ** | 3,0 | 0,5 | 1,7 | 23,5 | 28,7 |
| | World Demand | **rV** | 1,1 | 2,2 | 6,5 | 20,6 | 40,4 |
| | Competitiveness Effect | **V'-V-rV** | 1,9 | -1,7 | -4,8 | 2,9 | -34,9 |
| **Coffee** | Brazil Export Increase | **Δ** | 114,8 | 80,3 | 53,4 | 564,0 | 812,4 |
| | World Demand | **rV** | 21,9 | 83,8 | 68,0 | 256,5 | 142,5 |
| | Competitiveness Effect | **V'-V-rV** | 92,8 | -3,5 | -14,6 | 307,6 | 669,9 |
| **Cotton** | Brazil Export Increase | **Δ** | 4,3 | 28,8 | -31,2 | 8,0 | 10,1 |
| | World Demand | **rV** | 15,2 | 19,2 | 31,4 | 3,7 | 118,5 |
| | Competitiveness Effect | **V'-V-rV** | -10,6 | 9,6 | -62,7 | 4,3 | -108,4 |
| **Sugar** | Brazil Export Increase | **Δ** | 85,5 | 3,0 | 6,8 | 36,1 | 134,8 |
| | World Demand | **rV** | 66,9 | 143,5 | 179,8 | 94,2 | 854,6 |
| | Competitiveness Effect | **V'-V-rV** | 18,6 | -140,5 | -173,0 | -58,1 | -719,7 |

*Sources: see Appendix 3.*

Constant market share analysis reveals that world demand was the principal determinant of Brazil's export growth during the post-independence decades and the first globalisation. The negative sign of the competitiveness effect indicates that Brazil's response to the expansion of world demand was negatively affected by the loss of competitiveness. This does not change when the world is reduced to its principal trading partners. The implication of these results is that, at least on an aggregate level, Brazil consistently lost market share for its exports across the nineteenth century. As we have seen, however, the nuances of Brazil's long-run export performance were commodity-specific and thus will only be detected by way of a disaggregated analysis.

Indeed, such an analysis confirms our revision of Brazil's export growth performance. The

initial dynamism was driven principally by the relative gains of competitiveness of the coffee sector. From mid-century this competitiveness disappeared only to return during the period 1890-1913, perhaps due to the influence of government intervention. In the case of Brazil's other principal export commodities, we observe a different tendency. Sugar expanded faster than world demand in the initial period, due in part to increased competitiveness. After 1850, however, Brazil's sugar export sector lost competitiveness and growing international demand for the commodity buoyed the observed export growth. Cacao evinced a similar tendency. While cotton gained a competitive advantage due to the institutional shock of the American Civil War and its effect on Southern Big Cotton, this advantage was largely ephemeral, and in the long-run the sector lost competitiveness over the century. In short, the rapid expansion of world demand for Brazil's products, coupled with an increase in competitiveness for coffee and, initially, for sugar and cacao, determined the observed export growth pattern.

### *Brazilian dynamism and divergence in the tropics*

As the various indicators of the revisionist narrative tell us, the circumstances afforded Brazil by the turmoil of other tropical agricultural producers in the region stimulated a voracious appetite for slave labour which, when combined with the expansion of the agricultural frontier, drove the observed initial dynamism of export growth. Here we explore Brazil's export performance from a comparative perspective and examine the empirical evidence supporting this narrative.

Such a comparison is offered in Table 4, showing the export growth rates for the Americas during the nineteenth century based on the World Trade series constructed by Giovanni Federico and Antonio Tena-Junguito.[73] These export growth figures confirm Brazil's dynamic export performance during the post-independence years. Brazilian export growth from independence to mid-century more than doubled the South American average and was comparable to that of the

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[73] Giovanni Federico and Antonio Tena-Junguito, 'A New World Trade Series 1800-1938, (2015 unpublished document) and 'The American Divergence. Independence versus Emancipation in Latin American and the Caribbean 1820-1870,' Paper presented in CLADHE IV July 23th- 25th 2014, Bogotá.

United States. Despite the regional disparities in export growth derived from the success of coffee in the south-east and the relative failure of cotton and, to a lesser extent, sugar in the north-east, it is clear that the country's overall rate of export growth was comparatively quite high. The table includes the British and French colonies of the West Indies and the Guianas, as well as the Spanish Caribbean (Santo Domingo, Puerto Rico and Cuba), Spanish Central America (Guatemala, Honduras, Costa Rica, Nicaragua y Panama) and, of course, Brazil. Amongst this group can be found most of Brazil's principal coffee- and sugar-producing competitors.[74] While the export growth of this region generally stagnated over the century, disaggregation by country reveals the effects of the institutional shock of slave emancipation. During the first half of the nineteenth century these tropical agricultural producers would be torn between countervailing tendencies. On the one hand, Cuba (which became increasingly specialised in sugar production), Puerto Rico and Brazil showed high export growth rates, comparable only to North America on a continental level. On the other hand, the other tropical agricultural producing countries experienced a (in some cases violent) contraction of exports. The British tropical colonies experienced the most severe contraction, Jamaica being the extreme case. The export economies of the French tropical colonies, particularly French Guyana, also contracted. It is clear, therefore, that there was considerable divergence in the export performance of the tropical agricultural producers during the post-independence decades and that this divergence corresponded with the profound institutional changes taking place in the labour markets of the British West Indies.

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[74] Another Asian competitor and Dutch colony, Java, would also occupy a leading role in the international coffee (and later, rubber) market, although it is not included here for geographical reasons.

*Table 4. Export growth rates, the Americas, 1821-1913*

| | 1821/25 - 1851/55 | 1831/35-1851-55 | 1851/55- 1871/75 | 1871/75- 1891/95 | 1891/95- 1911/14 | 1831/35- 1871/75 | 1821/25- 1871/75 | 1871/75- 1911/13 |
|---|---|---|---|---|---|---|---|---|
| North America | 4,5 | 4,7 | 3,5 | 3,7 | 4,0 | 4,1 | 4,1 | 3,7 |
| United States | 5,2 | 5,3 | 3,4 | 4,0 | 3,9 | 4,4 | 4,5 | 3,8 |
| Southern USA | 5,5 | 5,1 | 1,2 | 3,8 | 2,6 | 3,1 | 3,8 | 3,1 |
| Northern USA | 4,9 | 5,5 | 5,2 | 4,1 | 4,4 | 5,4 | 5,0 | 4,2 |
| Tropical Agricultural | 2,8 | 2,1 | 2,3 | 1,9 | 3,3 | 2,2 | 2,6 | 2,5 |
| Brazil | 5,5 | 4,4 | 2,0 | 1,9 | 3,5 | 3,2 | 4,1 | 2,6 |
| Cuba | 4,6 | 5,2 | 4,0 | 0,8 | 5,6 | 4,6 | 4,4 | 3,0 |
| Puerto Rico | 5,8 | 3,3 | 1,7 | 0,8 | | 2,5 | 4,1 | |
| Jamaica | -3,4 | -5,6 | 0,9 | 3,1 | 2,2 | -2,4 | -1,7 | 2,6 |
| Leeward Island | 2,9 | -0,2 | -0,8 | 0,4 | 1,6 | -0,5 | 1,4 | 1,0 |
| French Guyana | 0,9 | -3,3 | -4,1 | 9,1 | 1,3 | -3,7 | -1,2 | 5,1 |
| Martinica | 0,2 | -0,2 | 3,1 | 0,4 | 1,6 | 1,4 | 1,3 | 1,0 |
| Iberian Tropical | 5,2 | 4,3 | 2,4 | 1,8 | 3,7 | 3,3 | 4,1 | 2,6 |
| British Tropical | -1,3 | -2,3 | 1,8 | 2,3 | 1,3 | -0,3 | 0,0 | 1,8 |
| French Tropical | 0,8 | -0,4 | 0,9 | 1,0 | 1,0 | 0,3 | 0,8 | 1,0 |
| South America | 2,6 | 1,4 | 3,0 | 2,6 | 3,8 | 2,2 | 2,8 | 3,1 |
| TOTAL AMERICAS | 3,5 | 2,9 | 3,3 | 3,2 | 3,9 | 3,1 | 3,4 | 3,5 |

*Sources: Federico and Tena-Junguito, 'A New World Trade Series 1800-1938.'*

The effect of the slave emancipation shock is also discernible in the evolution of the relative export market shares of the tropical agricultural producers. Specifically, we examine the effect of this shock on Brazil's market share of coffee and sugar.[75] To ascertain the nature of the evolution of

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[75] According to Bulmer-Thomas, sugar accounted for over 50 per cent of the commodity exports in constant prices of the Caribbean in 1820. This would rise to close to 70 per cent in 1880 and fall thereafter. Coffee was the second most important export of the region, maintaining its share throughout the century. See Bulmer-Thomas, *The Economic*

Brazil's market share of world coffee exports, we take a sample of the principal coffee exporting countries for which there are data available from around the time of Brazil's independence, and calculate their relative shares of the world market.[76] The results can be seen in figure 4. It is clear that Brazil's market share of coffee gradually widened over the nineteenth century at the expense of all of its major competitors. Furthermore, it is evident that most of this market share was gained before 1850. The effect of the slave abolition shock of the 1830s on the British colonies impacted considerably on their market shares. British Jamaica moved from being the fourth largest exporter to holding a relatively minuscule share by the end of the 1830s. After the Napoleonic Wars many French Caribbean coffee-exporting colonies suffered an involution. Indeed, many of the French colonies all but disappeared from the market by the 1850s. The only competitor that did not experience a considerable reduction of its market share during the post-independence decades was Java. Like certain Spanish colonies of the Caribbean, Java was not subjected to the institutional shocks associated with independence or slave abolition.[77] Thus it also responded to the competitive advantage afforded by the slave abolition shock by expanding its market share of coffee during the post-independence decades. Javanese expansion was brought to a halt, however, by the spread of *Hemileia vastatrix*, a coffee-leaf blight that would devastate Javanese and other Asian and African producers late in the century, effectively permitting Brazil to consolidate its world market share.[78]

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*History of the Caribbean,* Figures 5.2 and 5.2.

[76] This sample includes Cuba, Guadalupe, Haiti, Indonesia (Java), Jamaica, Martinique, and Suriname. Together with Brazil this sample represented 81.63 per cent of the quantum of world exports in the period 1851-1855. Unfortunately, data for total world exports is only available from 1851-1855 onwards, calculated by five-year averages. To provide estimates for the decades up until mid-century, we assume that our sample represents 80 per cent of world exports during the period 1823-1850, and estimate world exports based on the sum of the sample countries. This is by no means an unrealistic assumption. At the beginning of the nineteenth century nearly all coffee exported to the world market was apparently produced by European colonies, including, most notably, the ex-colony of Haiti (previously Saint Domingue), the world's leading coffee exporter at the turn of the nineteenth century, followed by other French colonies such as Martinique, Dominica, Guadalupe, the Dutch and British colonies in the Guianas and Jamaica. Once estimated, we use the world exports estimate to calculate five-year average country shares. On the world market for coffee, see Topik, 'The World Coffee Market in the Eighteenth and Nineteenth Centuries,' p. 16.

[77] In fact, Java was not a slave plantation economy, although coffee cultivation was imposed upon the peasantry by a strict system of state control. See M. R. Fernando, 'Coffee cultivation in Java, 1830-1917,' in William Gervase Clarence-Smith and Steven Topik (eds.), *The Global Coffee Economy in Africa, Asia, and Latin America, 1500–1989.* (Cambridge: Cambridge University Press, 2003), pp. 157-158.

[78] William Gervase Clarence-Smith, 'The Coffee Crisis in Asia, Africa, and the Pacific, 1870–1914,' in William Gervase Clarence-Smith and Steven Topik (eds.), *The Global Coffee Economy in Africa, Asia, and Latin America, 1500–1989,*

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*Fig. 4. Coffee export market shares, 1823-1910.*
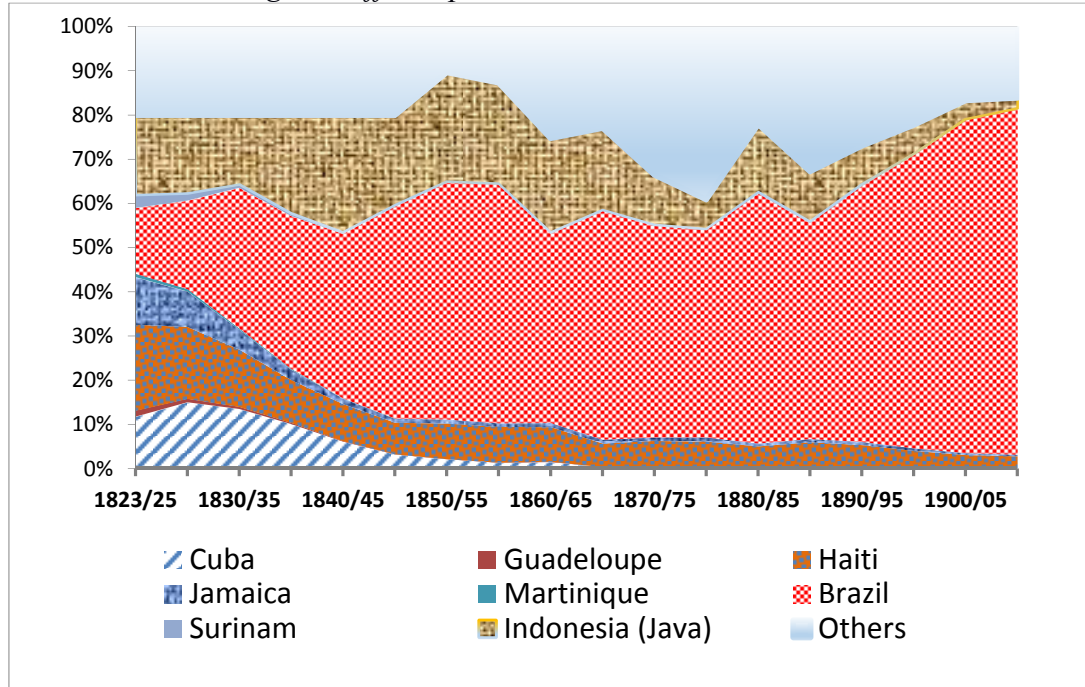


*Sources: see Appendix 1.*

In the case of sugar, we obtain data on the world production of both cane and beet sugar and examine the market share of a sample of tropical agricultural countries for the period 1820-1900.[79] Figure 5 displays the results. It is clear that Cuba's market share of sugar expanded substantially during the first half of the nineteenth century. This expansion came at the expense of the British colonies and, to a lesser extent, Brazil. Unlike Brazil's hold over the international coffee market, however, the sugar market would remain sufficiently diversified to prevent Cuban supply from dictating the price trend of the market. Furthermore, the substitution of cane for beet sugar in Western Europe would serve to undermine the market power of tropical agricultural producers.[80]

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(Cambridge: Cambridge University Press, 2004), pp. 101-105.

[79] This sample includes the British (Trinidad and Tobago, St. Lucia, St. Kitts, Nevis, Monserrat, Jamaica, Guyana, Grenada, Dominica, Barbados and Antigua), French (French Guyana, Guadeloupe, Martinique), Danish (Danish Virgin Islands), Dutch (Dutch Antilles, Suriname) and Spanish (Dominican Republic, Puerto Rico, Cuba) colonies of the Caribbean, as well as a number of African and Asian producers (Mauritius, Rèunion, Indonesia).

[80] J.H. Galloway, *The sugar cane industry: an historical geography from its origins to 1914,* (Cambridge: Cambridge University Press, 1989), pp. 130-134.

Still, as the export growth rates indicate, the export performance of both Brazil and Cuba diverged quite considerably from that of the other tropical agricultural producers.

*Fig. 5. Sugar export market shares, 1820-1900.*
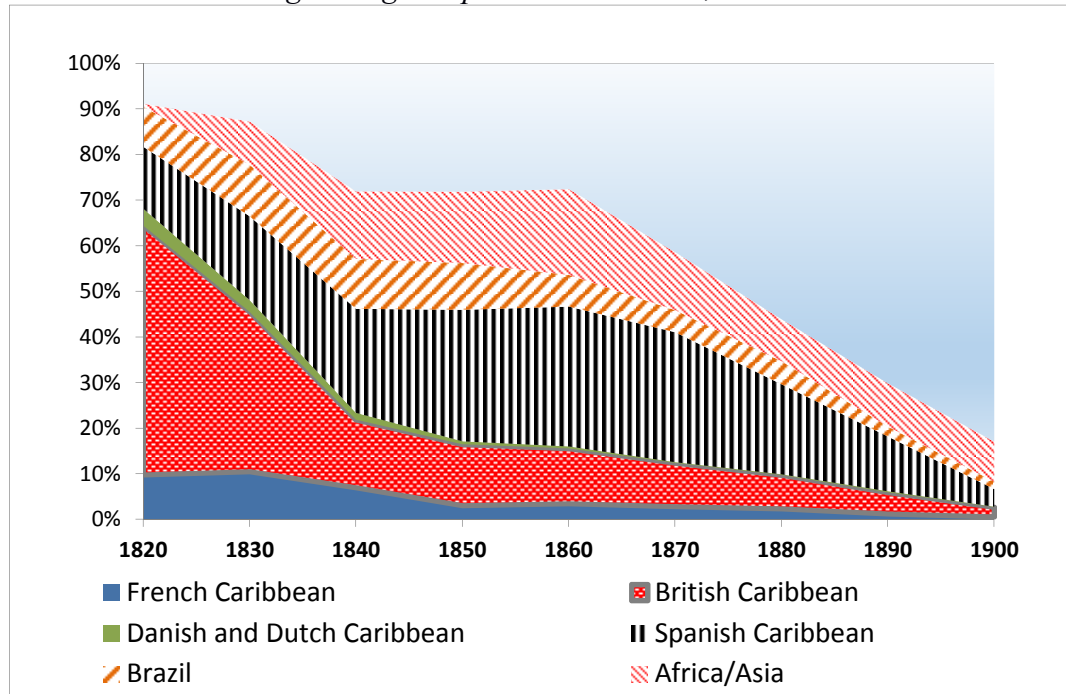


Sources: see Appendix 1.

Further empirical evidence of the effect of the slave abolition shock is provided in figure 6. We compare the world export shares of the Southern United States (separated from the North for comparative purposes), Brazil, Cuba and the British West Indies. The trend of the world export shares of Brazil and the Southern United States[81] is positive until mid-century, when the abolition of the slave trade would affect Brazil's export industries and the Southern United States would be torn asunder by the effect of the Civil War. Cuba did not respond so positively, due principally to increased European beet sugar production, although it managed to maintain its share across the period. The world export share of the British West Indies, however, declined steadily after abolition. The shock affected the British colonies in a number of ways. Those colonies with

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[81] We proxy exports from the Southern United States with the sum of exports of tobacco and thus our estimate might undervalue their total share.

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relatively small land to labour ratios were affected by the cost of the transition between labour regimes, but did not suffer the loss of much of the work force. Those countries with a greater and unexploited endowment of land suffered not only from an increase in the cost of labour, but also a reduction of supply as many former slaves moved to subsistence farming. A good example of the latter case is British Jamaica that, as we have seen, suffered a violent contraction of exports after abolition. Faced with an exodus of former slaves, the government was forced to source indentured labour from Asia.[82]



*Fig. 6. World export market share, 1820-1870.*
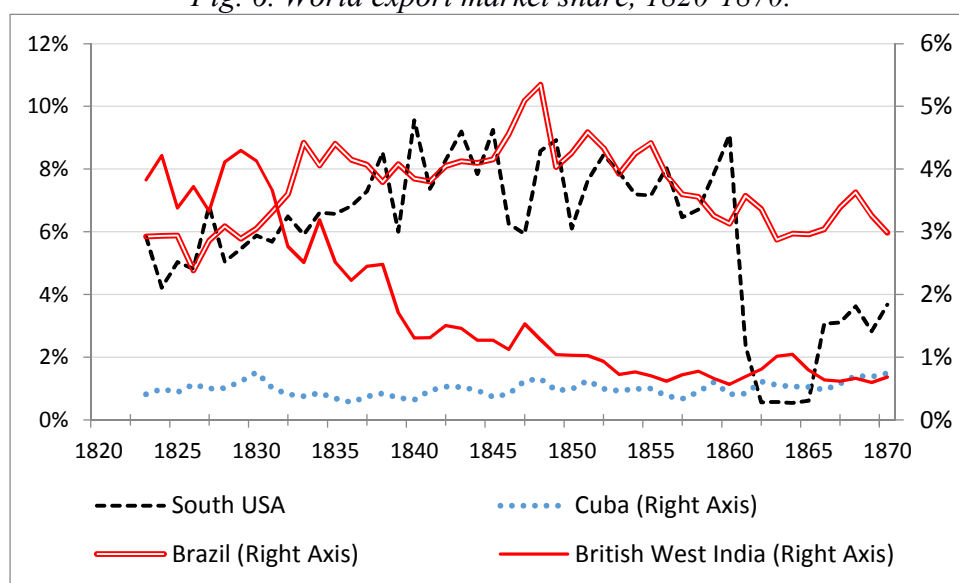
*Sources: Federico and Tena-Junguito, 'A New World Trade Series 1800-1938.'*

The effect of the shock is also discernible in the trends of the international prices of these commodities as shown in figure 7. It is evident that the commodity prices of all of the tropical agricultural producers included responded to the shock of emancipation. The degree of this shock, however, differed across producers. Thus, while British colonial exports (in this case Jamaican

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[82] The effect of slave abolition on the sugar plantations of the British and French colonies of the Caribbean is described in Galloway, *The sugar cane industry*, pp. 123-130. For an overview of the British West Indies, including the consequences of different land/labour ratios, see Stanley L. Engerman, 'Economic adjustments to emancipation in the United States and British West Indies,' *The Journal of Interdisciplinary History*, 13: 2 (Autumn 1982), p. 196. For Jamaica, Gisela Eisner, *Jamaica 1830-1930*, (Manchester: Manchester University Press, 1961). For British Guiana, Michael Moohr, 'The Economic Impact of Slave Emancipation in British Guiana, 1832-1852,' *The Economic History Review*, 25: 4 (Nov., 1972), pp. 588-607.

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coffee and Guyanese cotton) clearly responded to the slave abolition shock, Brazilian and Cuban exports were buffered by the resilience of slavery. In the case of coffee, Jamaican exports were subjected to a threefold increase from 24.9 in 1830 to 72.1 and 80.6 in 1833 and 1839 respectively, while Brazilian exports demonstrated a more moderate increase from 46.9 to 51.9 and 40.9 in the same years. Similarly, the price of Jamaican sugar exports increased twofold from 18.8 in 1830 to 40.2 in 1840, whereas Cuban sugar prices showed a comparatively modest increase of 34.5 in 1831 and 48.2 in 1836. British Guyanese cotton prices also show a similar reaction to emancipation. Despite the convergence of trends in coffee and sugar prices during this decade, over the long-run these prices displayed very different tendencies. Unlike coffee, sugar prices showed a decreasing secular trend at least from the 1840s onwards, the result of increased competition in the international market and the expansion of European sugar beet production.[83] Coffee prices, on the other hand, after experiencing rather dramatic fluctuations following the Napoleonic Wars and the slave abolition shock, generally responded to Brazil's supply schedule until the crisis and government intervention of the 1890s, due largely to the strength of Brazil's market power.[84]

*Fig. 7. Price of coffee, cotton and sugar, pounds sterling per ton, 1821-1912*

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[83] Galloway, *The sugar cane industry,* pp. 130-134.
[84] On the coffee crisis and subsequent intervention see Delfim Netto, *O problema do café no Brasil*; Lincoln Hutchinson, 'Coffee "Valorization" in Brazil,' *The Quarterly Journal of Economics*, 23: 3 (May, 1909), pp. 528-535. For a study on the extent of Brazil's market power, see Marcelo de Paiva Abreu and Felipe Tâmega Fernandes, 'Market power and commodity prices: Brazil, Chile and the United States, 1820s-1930,' Texto para Discussão No. 511. Departamento de Economia PUC-Rio, (2005), p. 8.
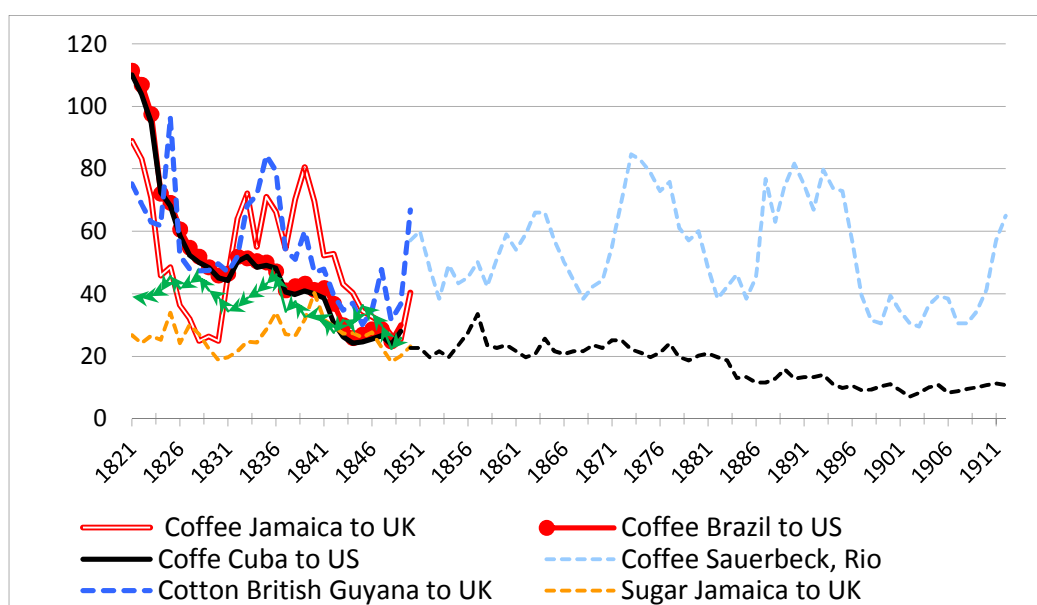
*Sources: see Appendix 1.*

### *Concluding remarks*

The objective of this article has been to re-evaluate both the statistical basis and conventional narrative of Brazil's export performance during the nineteenth century. Our conclusions lend empirical support not only to the revisionist narrative of Brazilian economic dynamism during the post-independence period, but also to the comparative study of the export performance of the tropical agricultural producing periphery as a whole. The implications of our findings transcend the pessimistic perspective of the conventional narrative and reveal a region rift by countervailing tendencies. As we have seen, the basis for this pessimism laid in the interpretation of official statistics that were largely inaccurate. These statistics were in fact undervalued, thus misrepresenting both the relative share of exports in GDP and the true dynamism of Brazil's export growth during the post-independence decades. A cross-country comparison shows that Brazil was one of the most dynamic countries in the region. Furthermore, there is clear evidence of divergence within the tropical agricultural producers of the Americas. The catalyst for this divergence was an institutional shock in the form of British West Indies slave emancipation that gave Brazil an initial competitive advantage vis-à-vis other producers of the region. Brazilian producers, both in the

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north-east and south-east, responded to the incentives provided by the shock by expanding both the agricultural frontier and imported slave labour. Output expanded rapidly and Brazil increased its market share.

The implications of our findings also suggest a reappraisal of the arguments propounded by the lost decades literature. Emphasis must be placed not only on the importance and relevance of a comparative perspective, but also upon the ways in which divergent economic experiences were interrelated. In the case of Brazil, the focus on the exceptional nature of independence has overlooked the importance of the impact of exogenous institutional shocks on the country's export performance. Only by adopting a regional comparative perspective do we comprehend that the story of Brazil's exceptional post-independence export performance *was* a story of institutional shocks.

Together these conclusions indicate a direction for future research. To begin with, the divergence that took place in the tropics during the post-independence decades is deserving of more attention. Further study of the mechanisms underlying this divergence will surely help to understand not only the diversity of short-run economic outcomes but also the long-run development trends of these countries. In respect to Brazilian economic historiography, greater attention should be paid to the post-independence decades in order to further elucidate the drivers and subtleties of the country's dynamic export performance. Finally, an examination of the long-run impact of this period on both export performance and regional income growth would provide a greater understanding of Brazil's economic development during the nineteenth century.

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*Appendices*

*Appendix 1: Price accuracy index*

The price accuracy index for Brazilian exports takes the form

$$PAI_{it} = \sum_{j=1}^{n} \left( \frac{P_{ij} * Q_{ij}}{P_{mj} * Q_{ij}} \right)$$

where $PAI_{it}$ is the price accuracy index of country $i$ at time $t$, $P_{ij}$ the unit value of commodity $j$ in country $i$ at time $t$, $P_{mj}$ the unit value of commodity $j$ in country $m$ at time $t$, and $Q_{ij}$ the quantity in metric tons of commodity $j$ in country $i$ at time $t$. The results are given in the text. Data for $P_{ij}$ and $Q_{ij}$ come from Brazil, *Anuário Estatístico do Brasil de 1939/1940*, pp. 1374-1378. Data sources for $P_{mj}$ are listed as follows:

1821-1849: We have computed a weighted average of the monthly prices from different origins to the United Kingdom and Philadelphia. As weights we use the distribution of each origin in a sample of total quantum exports. Price data for the United Kingdom comes from A. D. Gayer, W. W. Rostow, and A. J. Schwartz, *Microfilmed Supplement to Volumes I and II of The Growth and Fluctuation of the British Economy 1790-1850*, (Oxford: Clarendon Press, 1953). Data from Philadelphia from Anne Bezanson, Robert D. Gray and Miriam Hussey, *Wholesale prices in Philadelphia, 1784-1861,* (Philadelphia: University of Pennsylvania Press, 1936-37).

Coffee: Prices: Cuba, St. Domingo, Brazil Rio 7 and Java to Philadelphia and Jamaica Ordinary to the United Kingdom. Quantities: exports, Mario Samper and Radin Fernando, 'Appendix: Historical Statistics of Coffee Production and Trade from 1700 to 1960,' in William Gervase Clarence-Smith and Steven Topik (eds.), *The Global Coffee Economy in Africa, Asia, and Latin America, 1500–1989*. (Cambridge: Cambridge University Press, 2004), pp. 411-463, Tables A12,

A13, A14, A15.

Sugar: Prices: Jamaica Brown to the United Kingdom, Cuba Brown and Muscovado to Philadelphia. Quantities: exports, Victor Bulmer-Thomas, *The Economic History of the Caribbean*, Table A10; world production, Manuel Moreno Fraginals, *El ingenio: Complejo económico social cubano del azúcar*, (Havana: Editorial de Ciencias Sociales, 1978).

Hides: Prices: Buenos Aires to the United Kingdom, Buenos Aires Ox hides to Philadelphia. We have taken the arithmetic average of the two series.

Cotton: Prices: Guyana Raw (Berbice or Demerara) to the United Kingdom, Middling Uplands from the United States to the United Kingdom, from M. B. Hammond, *The cotton industry; an essay in American economic history*, (New York: Macmillan, 1897), p. 898. Quantities: exports, Bulmer-Thomas, *The Economic History of the Caribbean*, Table A10; exports, Hammond, T*he cotton industry,* p. 898; world production, Harry Hammond, 'Production and Consumption of Cotton in bales of 400 lb. weight by the countries contributing to the world's supply and demand for a series of years from 1790 to 1895,' in *The Cotton Plant: its history, botany, chemistry, culture, enemies and uses*, (Washington: Government Printing Office, 1896), p. 42, Plate II.

Cocoa: Prices: Granada to the United Kingdom, Caracas to Philadelphia, "Island" (includes Guayaquil, St. Domingo, Caracas and Trinidad) to Philadelphia. Quantities: William Gervase Clarence-Smith, *Cocoa & Chocolate, 1765-1914*, (London: Routledge, 2000), Appendix 2.

1850-1853: As computed values are not listed in the official British statistics for this period, we have taken the prices for four commodities (sugar, hides, coffee, cotton) from Augustus Sauerbeck, 'Prices of Commodities and the Precious Metals,' *Journal of the Statistical Society of London*, 49: 3, (1886), pp. 581-648, and multiplied them by the quantities from the British series. 1850 quantities come from United Kingdom, *British produce and manufactures. Accounts of exports to and imports from the British West India colonies, the East Indies, Ceylon, China, & c., for the seven years ending 5 January 1853; also the number of ships that have entered and cleared for the above places during each year of the period*, (House of Commons Parliamentary Papers, 1854), pp. 20-21. Cacao and rubber prices for the period 1850-1853 are taken as the average cacao price during the period 1847-1851 and the average price for Caoutchouc in 1850, respectively. These figures are taken from B. Poole, *Statistics of British Commerce: Being a Compendium of the Productions, Manufactures, Imports, and Exports, of the United Kingdom*, (London: McCorquodale and Co, 1852), pp. 52, 75.

1854-1913: Imports from Brazil to the United Kingdom, taken from United Kingdom, *Annual statement of the trade of the United Kingdom with foreign countries and British possessions*, (House of Commons Parliamentary Papers, various years).

As mentioned in the text, from these international prices we deduct export duties, freight rates, and insurance costs. The data sources for these trade costs are as follows:

Export duties:
Given the diverse nature of the origins of the international price series for the period 1821-1849, we have deducted an "additional" trade cost - which does not include freight or insurance costs - equivalent to the Brazilian export tax. This additional cost falls in the range of 1 to 7 per cent of the value of exports. For the Imperial period, we have used the effective duty on exports (the ratio between the total quantity of export duties collected and the total value of exports) in an attempt to

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obviate the problems associated with the application of the official ad valorem rates to the *pauta*. During the Republican period the issue is somewhat more complicated. The Republican Constitution devolved the right to earn export duties to the regional governments. The size of the export duty on a single commodity could thus differ across regions; for example, the export duty on cacao from Bahia in 1913 was 14 per cent while that from Pará was 6 per cent. Where possible, we use the duties applied by the principal exporting regions, as these duties would have fallen heaviest on the values of exports. Thus it must be kept in mind that the rate used for the calculation of the price accuracy index is most likely under-valued by a number of percentage points.

Cacao: 1821-1869: Brazil, *Finanças, Quadros synopticos da receita e despeza do Brasil, Periodo de 1822 a 1913*, (Rio de Janeiro: Typographia do Ministerio da Agricultura, 1914), pp. 14-17; 1870-1871: Brazil, *Estatistica do Commercio Maritimo do Brazil do Exercicio de 1871-1872, 2.ª Parte, Commercio Geral*, (Rio de Janeiro: Typographia Nacional, 1878), pp. 220-221; 1881-1913: Pará, *Mensagem dirigida em 1 de agosto de 1915 ao Congreso Legislativo do Pará pelo Dr. Enéas Martins*, (Belém: Imprensa Official do Estado do Pará, 1915) p. 91. The years 1872 to 1880 have been assumed using the general trend of national duties.

Coffee: 1821-1849: Brazil, *Finanças,* pp. 14-17; 1850-1890: Annex 'Impostos de exportação, 1850-1930' from Abreu and Fernandes, 'Market power and commodity prices,' available from http://www.economia.puc-rio.br/mpabreu/projeto%20cnpq.html; 1891-1913: São Paulo, *Annuario Estatistico de São Paulo 1913*, (São Paulo: Typographia do Diario Official, 1915), p. 124.

Cotton: 1821-1869: Brazil, *Finanças,* pp. 14-17; 1870-1881: Pernambuco, *Projecto de receita provincial organisado por ordem do exm. sr. desembargador José Manoel de Freitas, dignissimo presidente desta provincia, pelo administrador do Consulado Provincial, bacharel Francisco Amynthas de Carvalho Moura*, (Pernambuco: Typographia de Manoel Figueiroa de Faria and Filhos, 1884), Mapa 5; 1881-1886: Rio de Janeiro, *Mappas estatisticos do commercio e navegação do Porto do Rio de Janeiro*, (Rio de Janeiro: Typographia da Alfandega, various years); 1891-1899: Rio Grande do Norte, *Mensagem dirigida ao Congresso Constituinte do Estado do Rio Grande do Norte*, (Typographia do Rio Grande do Norte, various years); 1902-1913: Pernambuco, *Mensagem do Governador do Estado*, (Recife: Typgraphia do Diario de Pernambuco, various years). The years 1883, 1887 to 1890, 1899 to 1901, 1905 to 1907 have been assumed using the general trend of national and regional duties.

Hides: 1821-1869: Brazil, *Finanças,* pp. 14-17; 1870-1882: Pernambuco, *Projecto de receita,* Mapa 5; 1884-1888: Rio de Janeiro, *Mappas estatisticos*; 1900-1906: Pará, *Mensagem dirigida em 7 de Setembro de 1911 ao Congresso Legislativo do Pará pelo Dr. João Antonio Luiz Coelho*, (Belém: Imprensa Official do Estado do Pará, 1911), pp. 233-234; 1890-1891, 1907-1913: Bahia, *Mensagem apresentada a Assembléa Geral Legislativa do Estado da Bahia*, (Bahia: Typographia do Diario da Bahia, various years). The years 1883, 1889, 1892 to 1899 have been assumed using the general trend of national and regional duties.

Rubber: 1850-1869: Brazil, *Finanças,* pp. 14-17; 1870-1871: Brazil, *Estatistica do Commercio Maritimo,* pp. 234-235; 1878-1884: Rio de Janeiro, *Mappas estatisticos*; 1885-1913: Pará, *Mensagem dirigida em 1 de agosto,* p. 91. The years 1875 to 1877, 1883 have been assumed using the general trend of national duties.

Sugar: 1821-1869: Brazil, *Finanças,* pp. 14-17; 1870-1871: Brazil, *Estatistica do Commercio Maritimo,* pp. 218-219; 1884-1887: Rio de Janeiro, *Mappas estatisticos*; 1870-1882, 1902-1904, 1908-1913: Pernambuco, *Mensagem do Governador do Estado*. The years 1883, 1888 to 1901,

1905 to 1907 have been assumed using the general trend of national and regional duties.

Freight rates:
Cacao: We use the freight rates for coffee.

Coffee: 1821-1847: Paul Schöller, 'L'évolution séculaire des taux de fret et d'assurance maritimes 1819-1940,' *Bulletin de l'Institut de Recherches Économiques et Sociales*, 17: 5 (1951), pp. 519-557. Rio de Janeiro to Antwerp, "bulky" freight index, interpolated for the periods 1831-1841 and 1843-1848 to extend backwards Klovland's 1848 figure.
1848-1856: J. T. Klovland, 'A Repeat Sailings Index of Ocean Freight Rates for the 1850s,' Discussion paper SAM 40 2006, Department of Economics, Norwegian School of Economics and Business Administration, 2006. Rio de Janeiro to the British Channel.
1857-1875, 1877-1878: C. Knick Harley, 'Coal Exports and British Shipping, 1850-1913,' *Explorations in Economic History*, 26 (1989), pp. 311-338. Rio to Britain.
1876: we take the arithmetic mean of monthly rates from Rio de Janeiro to the British Channel as found in the *Retrospectivo Commercial* (various years) of the *Jornal do Commercio* (various years).
1879-1892: we take the arithmetic mean of monthly freight rates from Rio de Janeiro to London as found in the *Retrospectivo Commercial* of the *Jornal do Commercio.*
1893-1897: we extend the series using the East Latin American nominal freight index for grain from Saif I. Shah Mohammed and Jeffrey G. Williamson, 'Freight rates and productivity gains in British tramp shipping 1869–1950,' *Explorations in Economic History,* 41 (2004), pp. 172–203.
1898-1913: we take the arithmetic mean of monthly freight rates from Rio de Janeiro and Santos to London as found in *Wileman's Brazilian Review* (various years).

Cotton: 1821-1849: C. Knick Harley, 'Ocean Freight Rates and Productivity, 1740-1913: The Primacy of Mechanical Invention Reaffirmed,' *The Journal of Economic History*, 48: 4 (1988), pp. 851-876. New Orleans to Liverpool. The period 1821-1824 has been interpolated using the 1820 and 1825 values.
1850-1868: Schöller, 'L'évolution séculaire.' Rio de Janeiro to Antwerp, "light" freight index.
1869-1877: we extend the series backwards using the East North American nominal freight index of grain from Mohammed and Williamson, 'Freight rates and productivity gains.'
1878-1897: we extend the series backwards using the North American Gulf Coast cotton nominal freight index of cotton from Mohammed and Williamson, 'Freight rates and productivity gains.'
1885: we cover this year using the East Latin American nominal freight index of grain from Mohammed and Williamson, 'Freight rates and productivity gains.'
1898-1913: we take the arithmetic mean of monthly freight rates from Pernambuco to Liverpool as found in *Wileman's Brazilian Review*.

Hides: 1821-1847: Schöller, 'L'évolution séculaire.' Rio de Janeiro to Antwerp, "bulky" freight index, interpolated for the periods 1831-1841 and 1843-1848 to match Klovland's 1848 figure.
1848-1861: Klovland, 'A Repeat Sailings Index.' Rio-Grande to the United Kingdom.
1862-1868: we have extended Klovland's series using Schöller's Rio de Janeiro to Antwerp, "bulky" freight index.
1869: we take the arithmetic mean of 1868 and 1870.
1870-1872: we take the arithmetic mean of the minimum and maximum rates from Rio Grande do Sul to the United Kingdom from E. A. V. Angier, *Fifty year' freights*, (London: Fairplay, 1920).
1874, 1876-1892: we take the arithmetic mean of monthly rates from Rio de Janeiro to the British Channel as found in the *Retrospectivo Commercial* of the *Jornal do Commercio.* These rates are not explicitly denoted as Hides (Couros) until 1891.
1875: Harley, 'Coal Exports and British Shipping,' coffee, Rio to Britain.

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1893-1897: we extend the series using the East Latin American nominal freight index of grain from Mohammed and Williamson, 'Freight rates and productivity gains.'

1898-1900, 1902-1903: we take the arithmetic mean of monthly freight rates from Rio de Janeiro to the British Channel as found in *Wileman's Brazilian Review*.

1901: we take the arithmetic mean of 1900 and 1902.

1904-1913: we extend using the East Latin American nominal freight index of grain from Mohammed and Williamson, 'Freight rates and productivity gains.'

Rubber: We use the freight rates for coffee.

Sugar: 1821-1868: Schöller, 'L'évolution séculaire.' Rio de Janeiro to Antwerp, "bulky" freight index, interpolated for the periods 1831-1841 and 1843-1850.

1869-1897: we extend the series backwards using the East Latin American nominal freight index of grain from Mohammed and Williamson, 'Freight rates and productivity gains.'

1898-1913: we take the arithmetic mean of monthly freight rates from Pernambuco to Liverpool as found in *Wileman's Brazilian Review*.

*Insurance*:

Schöller, 'L'évolution séculaire,' Statistical appendix. We use the insurance quotes for Brazil from 1821-1867 and for Rio de la Plata from 1880-1910. The intervening period, 1868-1879, has been interpolated.

| Year | Cacao official Quantity, tonnes | Cacao estimated fob prices, pounds sterling | Coffee official Quantity, tonnes | Coffee estimated fob prices, pounds sterling | Cotton official Quantity, tonnes | Cotton estimated fob prices, pounds sterling | Hides official Quantity, tonnes | Hides estimated fob prices, pounds sterling | Rubber official Quantity, tonnes | Rubber estimated fob prices, pounds sterling | Sugar official Quantity, tonnes | Sugar estimated fob prices, pounds sterling | Other corrected Current prices | Other official Current prices |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1821 | 1016 | 63.79 | 7740 | 107.24 | 10631 | 61.52 | 8535 | 60.20 | | | 35168 | 29,25174 | 901071 | 976000 |
| 1822 | 684 | 54.42 | 11160 | 102.50 | 12989 | 50.64 | 9431 | 68.39 | | | 36694 | 27.25 | 913275 | 837000 |
| 1823 | 714 | 55.36 | 13560 | 108.24 | 12593 | 51.45 | 6343 | 70.65 | | | 53549 | 29.28 | 1153343 | 944000 |
| 1824 | 1251 | 61.38 | 16440 | 69.54 | 12006 | 57.18 | 6128 | 67.75 | | | 44976 | 28.82 | 1138784 | 922000 |
| 1825 | 1545 | 62.54 | 13440 | 67.29 | 15441 | 79.02 | 7650 | 71.57 | | | 35485 | 36.58 | 984685 | 901000 |
| 1826 | 1614 | 54.11 | 19080 | 57.33 | 5123 | 40.87 | 8916 | 65.60 | | | 35410 | 28.77 | 670126 | 607000 |
| 1827 | 1996 | 44.08 | 25800 | 53.18 | 10101 | 42.41 | 7112 | 72.47 | | | 50483 | 33.64 | 512957 | 407000 |
| 1828 | 667 | 46.91 | 27120 | 49.63 | 13549 | 46.26 | 5415 | 78.32 | | | 67641 | 32.52 | 527777 | 424000 |
| 1829 | 1221 | 44.96 | 27540 | 46.74 | 13544 | 40.10 | 9629 | 60.60 | | | 55059 | 28.45 | 356029 | 279000 |
| 1830 | 654 | 43.25 | 28800 | 44.83 | 16196 | 49.75 | 8460 | 59.42 | | | 65386 | 25.76 | 364573 | 261000 |
| 1831 | 858 | 29.99 | 32940 | 45.28 | 15703 | 39.22 | 10416 | 63.79 | | | 62996 | 24.84 | 487374 | 339000 |
| 1832 | 1599 | 35.55 | 43020 | 51.69 | 10409 | 48.29 | 10575 | 60.94 | | | 75873 | 26.66 | 577408 | 448000 |
| 1833 | 1396.5 | 37.09 | 67230 | 52.90 | 13519 | 63.23 | 10709 | 61.25 | | | 73394.5 | 29.71 | 818681 | 613000 |
| 1834 | 1020 | 34.03 | 62730 | 50.39 | 11834 | 65.48 | 9775 | 58.79 | | | 63997.5 | 30.56 | 1061215 | 769000 |
| 1835 | 1090.5 | 41.60 | 60660 | 50.64 | 12374 | 75.12 | 12395.5 | 51.96 | | | 77263 | 34.36 | 1540183 | 1049000 |
| 1836 | 1279 | 35.86 | 58860 | 49.47 | 13022.5 | 68.77 | 12921.5 | 51.50 | | | 77854.5 | 38.77 | 1623181 | 1085500 |
| 1837 | 1998 | 36.52 | 61770 | 43.53 | 11819 | 43.89 | 7443.5 | 49.46 | | | 81526 | 30.00 | 993224 | 673000 |
| 1838 | 2870.5 | 36.55 | 74460 | 43.79 | 10212 | 44.11 | 5218.5 | 52.07 | | | 78973.5 | 31.92 | 826932 | 500000 |
| 1839 | 2963.5 | 33.94 | 81480 | 45.06 | 9825 | 54.51 | 8543 | 55.74 | | | 74688 | 31.98 | 932506 | 607000 |
| 1840 | 2955.5 | 39.19 | 78660 | 43.86 | 10208.5 | 38.57 | 8595.5 | 61.39 | | | 89897.5 | 36.02 | 994709 | 631500 |
| 1841 | 2811 | 44.70 | 78060 | 43.63 | 9779.5 | 43.00 | 9943.5 | 57.07 | | | 85084.5 | 31.86 | 1108597 | 686000 |
| 1842 | 2451.5 | 52.87 | 84210 | 38.21 | 9725 | 36.05 | 11879 | 51.23 | | | 74150.5 | 28.39 | 1154902 | 726500 |
| 1843 | 2506.5 | 42.37 | 89550 | 33.83 | 10873 | 31.95 | 15041 | 49.30 | | | 79957 | 29.95 | 1223880 | 725000 |
| 1844 | 2368.5 | 42.67 | 91980 | 31.31 | 11915 | 34.86 | 18249 | 49.32 | | | 96597.5 | 29.22 | 1200006 | 696000 |
| 1845 | 2442.5 | 40.96 | 97440 | 29.65 | 10809 | 27.74 | 19879 | 48.21 | | | 107127.5 | 32.59 | 1207153 | 717000 |
| 1846 | 2978.5 | 42.43 | 123300 | 30.19 | 9211 | 35.41 | 20465.5 | 45.61 | | | 104355.5 | 31.46 | 1241281 | 745500 |
| 1847 | 2693.5 | 42.37 | 141810 | 30.58 | 9166.5 | 45.38 | 19281 | 42.07 | | | 109184.5 | 27.48 | 1598505 | 983500 |
| 1848 | 3031 | 40.89 | 133380 | 27.05 | 10973 | 28.60 | 18174 | 41.32 | | | 119516 | 21.05 | 1697126 | 1189000 |
| 1849 | 3917 | 42.72 | 106770 | 32.03 | 14927.5 | 29.90 | 16199.5 | 38.62 | | | 120668 | 24.02 | 1457208 | 953500 |
| 1850 | 3993.5 | 26.24 | 118140 | 40.68 | 15181.5 | 55.55 | 16534.5 | 52.33 | 1137 | 116.40 | 124067 | 19.92 | 1208959 | 821000 |
| 1851 | 4061 | 26.34 | 144660 | 32.62 | 13173.5 | 43.01 | 16977 | 47.21 | 1483.5 | 116.65 | 121266.5 | 19.95 | 1285931 | 1058500 |
| 1852 | 3825 | 27.30 | 143010 | 35.20 | 14020 | 41.79 | 16201 | 38.21 | 1591 | 118.32 | 134380 | 17.39 | 1420257 | 1157000 |
| 1853 | 4012 | 26.36 | 136800 | 38.83 | 13945.5 | 46.06 | 17203 | 37.18 | 1961 | 118.43 | 138248 | 19.44 | 1654283 | 1175000 |
| 1854 | 3407 | 21.46 | 159600 | 38.52 | 13009 | 54.73 | 17380 | 45.05 | 2590 | 212.20 | 119440.5 | 17.23 | 1471220 | 1300500 |
| 1855 | 2290.5 | 32.57 | 181290 | 39.49 | 13968 | 51.46 | 16682.5 | 54.24 | 2496.5 | 139.96 | 114873 | 22.68 | 1820290 | 1399500 |
| 1856 | 2972.5 | 35.56 | 181260 | 40.12 | 15516.5 | 53.56 | 17027.5 | 71.85 | 1884.5 | 124.72 | 111034 | 24.10 | 1915948 | 1587000 |
| 1857 | 3575.5 | 67.43 | 167070 | 41.98 | 15441.5 | 64.69 | 16121.5 | 73.09 | 1625 | 112.06 | 109633.5 | 30.65 | 2047147 | 1607000 |
| 1858 | 3876 | 44.80 | 153450 | 35.55 | 15844.5 | 63.24 | 15151 | 58.96 | 1663 | 98.69 | 131511.5 | 22.66 | 1628436 | 1437000 |
| 1859 | 3657 | 42.07 | 157770 | 44.56 | 14095.5 | 64.78 | 15436.5 | 70.91 | 2125.5 | 184.09 | 123328 | 21.40 | 1838138 | 1557500 |
| 1860 | 3331 | 48.65 | 182850 | 51.92 | 10188 | 62.84 | 16398.5 | 67.62 | 2505.5 | 213.31 | 77764 | 22.23 | 1923972 | 1638500 |
| 1861 | 3233 | 50.37 | 179730 | 48.19 | 10891.5 | 77.16 | 18689.5 | 59.09 | 2379 | 137.20 | 110286 | 19.02 | 2091020 | 1777500 |
| 1862 | 3429 | 46.02 | 136680 | 57.38 | 14374.5 | 141.74 | 19414.5 | 54.04 | 2670.5 | 158.03 | 149945 | 17.99 | 2538263 | 2013500 |
| 1863 | 3659 | 40.31 | 124200 | 60.54 | 17869 | 181.93 | 20504 | 46.75 | 3237.5 | 153.20 | 119828.5 | 17.89 | 2143784 | 1854500 |
| 1864 | 3320 | 37.94 | 139470 | 56.82 | 22576 | 228.94 | 21662 | 49.63 | 3377.5 | 141.51 | 101288 | 22.84 | 2318114 | 1795000 |
| 1865 | 2899.5 | 34.82 | 152430 | 54.64 | 33966.5 | 156.01 | 22203.5 | 43.17 | 3407.5 | 142.37 | 119439.5 | 18.35 | 2257438 | 1800500 |
| 1866 | 2746 | 49.98 | 167790 | 48.39 | 41029.5 | 138.18 | 22522.5 | 42.76 | 4096.5 | 184.47 | 108956.5 | 16.75 | 2442153 | 2046000 |
| 1867 | 3386 | 44.56 | 201540 | 44.94 | 40572 | 90.76 | 21312.5 | 45.78 | 4838.5 | 169.04 | 105239.5 | 18.13 | 2924422 | 2524000 |
| 1868 | 3343 | 36.92 | 220890 | 43.62 | 40491.5 | 85.83 | 22020.5 | 50.11 | 4808.5 | 170.09 | 94487 | 19.30 | 3640051 | 2791500 |
| 1869 | 3690 | 35.08 | 207510 | 42.12 | 41170.5 | 97.79 | 23487.5 | 45.89 | 4720.5 | 196.35 | 101587.5 | 20.43 | 3145693 | 2460500 |
| 1870 | 4524.5 | 34.42 | 208260 | 44.39 | 43980 | 82.21 | 22476 | 48.60 | 4912 | 237.39 | 127079 | 19.44 | 2181765 | 1854000 |
| 1871 | 5009 | 33.57 | 236610 | 46.23 | 61726.5 | 64.42 | 21635.5 | 48.84 | 5368.5 | 242.16 | 144611.5 | 21.16 | 2521042 | 1877500 |
| 1872 | 4937 | 42.26 | 226710 | 59.33 | 62235.5 | 73.28 | 23632 | 53.91 | 5380.5 | 246.37 | 184354.5 | 22.45 | 2709636 | 1975500 |
| 1873 | 4469.5 | 35.88 | 188130 | 71.10 | 51091 | 73.23 | 23595 | 57.80 | 5882 | 239.94 | 175389.5 | 19.05 | 1918211 | 1730000 |
| 1874 | 4976 | 41.11 | 198810 | 76.73 | 49894 | 64.59 | 22102 | 60.11 | 6265.5 | 222.38 | 180967.5 | 18.34 | 1917120 | 1547000 |
| 1875 | 5252.5 | 40.80 | 217800 | 74.09 | 35668.5 | 60.78 | 22762 | 58.73 | 5785 | 222.55 | 164375.5 | 18.38 | 2096900 | 1660000 |
| 1876 | 5496 | 45.06 | 208800 | 70.40 | 29322 | 53.03 | 22167 | 46.49 | 5955.5 | 213.69 | 152473 | 17.62 | 2081726 | 1791000 |
| 1877 | 5233.5 | 58.10 | 221880 | 71.97 | 24310.5 | 49.74 | 18805 | 55.00 | 6409 | 199.77 | 176700 | 23.66 | 3492758 | 2262500 |
| 1878 | 4853 | 76.46 | 262410 | 70.34 | 21620.5 | 48.99 | 19673.5 | 50.05 | 6549 | 176.60 | 158698.5 | 18.02 | 3594272 | 2075000 |
| 1879 | 5019 | 75.33 | 225660 | 59.75 | 18421.5 | 47.19 | 24170.5 | 48.60 | 6668 | 231.21 | 181659.5 | 16.91 | 2381288 | 2280000 |
| 1880 | 5888.5 | 61.57 | 188340 | 65.38 | 12037.5 | 51.70 | 23400.5 | 51.93 | 6801.5 | 310.75 | 188859.5 | 18.94 | 3642310 | 3862000 |
| 1881 | 7153 | 51.50 | 232230 | 53.08 | 17317.5 | 50.69 | 20891 | 54.01 | 6781.5 | 298.86 | 204013.5 | 19.37 | 4084661 | 3890500 |
| 1882 | 7132 | 50.85 | 323040 | 46.78 | 27740.5 | 54.43 | 15727.5 | 47.98 | 7170 | 364.23 | 212712 | 18.14 | 2440464 | 2288000 |
| 1883 | 6860 | 62.28 | 360090 | 46.85 | 33125 | 47.52 | 11250 | 51.42 | 8326 | 385.27 | 254015 | 16.67 | 548986 | 1474000 |
| 1884 | 6585.5 | 65.28 | 346620 | 44.83 | 28495 | 51.09 | 12225 | 51.40 | 8528 | 265.00 | 301843 | 13.16 | 1003278 | 1634000 |
| 1885 | 5213 | 68.82 | 350220 | 43.70 | 19679.5 | 49.93 | 16295 | 48.50 | 8044.5 | 236.79 | 193355 | 11.31 | 1923919 | 1924500 |
| 1886 | 5576 | 68.76 | 345330 | 46.25 | 19167 | 45.66 | 16570 | 44.73 | 8413.5 | 268.80 | 169204.5 | 11.68 | 1629647 | 1965500 |
| 1887 | 6320 | 58.48 | 283890 | 63.62 | 27487 | 43.51 | 14017 | 45.07 | 11016 | 258.30 | 207660 | 9.97 | 2207503 | 2389500 |
| 1888 | 10107 | 63.46 | 206640 | 55.78 | 22094 | 44.11 | 18755 | 37.84 | 17062 | 276.47 | 158496 | 11.48 | 1796509 | 2350477 |
| 1889 | 9042 | 61.91 | 335160 | 69.02 | 13575 | 46.03 | 22175 | 41.12 | 15990 | 263.45 | 105558 | 12.99 | 2350905 | 2862022 |
| 1890 | 6236 | 60.04 | 306540 | 68.21 | 12738 | 47.49 | 21464 | 39.83 | 15355 | 283.84 | 133908 | 10.76 | 1367371 | 2499754 |
| 1891 | 10094 | 62.99 | 322380 | 70.52 | 20143 | 44.87 | 23847 | 37.92 | 16650 | 266.74 | 184902 | 10.75 | 1222348 | 1995838 |
| 1892 | 6478 | 54.60 | 426540 | 68.10 | 11914 | 41.13 | 24750 | 32.59 | 18250 | 211.03 | 161872 | 10.98 | 2309612 | 1908745 |
| 1893 | 10059 | 62.44 | 318420 | 71.57 | 38937 | 40.14 | 18516 | 35.61 | 19050 | 228.64 | 103962 | 11.95 | 1201484 | 2081025 |
| 1894 | 8461 | 63.23 | 334920 | 70.15 | 27261 | 34.52 | 19165 | 32.52 | 19710 | 218.80 | 152398 | 10.36 | 1724115 | 1988592 |
| 1895 | 10509 | 64.62 | 403200 | 71.56 | 9510 | 33.85 | 21292 | 44.53 | 27794 | 225.91 | 163530 | 7.75 | 2565106 | 1988432 |
| 1896 | 8966 | 69.79 | 404640 | 76.47 | 7209 | 36.22 | 24642 | 42.64 | 24370 | 237.35 | 172886 | 8.68 | 2939861 | 1959248 |
| 1897 | 10467 | 55.27 | 567780 | 55.75 | 11500 | 34.15 | 27533 | 42.66 | 21621 | 240.62 | 127712 | 7.93 | 6587220 | 2342638 |
| 1898 | 11270 | 56.91 | 556020 | 34.01 | 8070 | 29.55 | 29146 | 47.72 | 21218 | 215.72 | 126484 | 8.49 | 6199376 | 2839069 |
| 1899 | 12792 | 50.34 | 586260 | 28.23 | 3738 | 30.71 | 31396 | 44.33 | 20790 | 274.49 | 50268 | 9.17 | 4048361 | 2490757 |
| 1900 | 15364 | 70.35 | 549300 | 34.22 | 20720 | 40.39 | 26452 | 41.84 | 24302 | 285.99 | 92188 | 9.37 | 2763989 | 3445492 |
| 1901 | 15682 | 68.72 | 885600 | 33.04 | 11765 | 44.96 | 23835 | 48.40 | 30241 | 321.53 | 187166 | 8.19 | 5577223 | 4095447 |
| 1902 | 20642 | 61.14 | 789420 | 30.95 | 32138 | 41.83 | 28792 | 50.36 | 28632 | 296.74 | 136757 | 5.88 | 5083639 | 4246609 |
| 1903 | 20900 | 55.97 | 775620 | 32.85 | 28236 | 56.92 | 30676 | 51.23 | 31717 | 341.44 | 21889 | 7.17 | 6380829 | 3716070 |
| 1904 | 23160 | 56.38 | 601500 | 35.57 | 13263 | 63.65 | 35959 | 58.02 | 31866 | 397.90 | 7861 | 7.20 | 3218315 | 3853147 |
| 1905 | 21090 | 49.12 | 649260 | 36.27 | 24082 | 64.37 | 29041 | 66.20 | 35393 | 446.74 | 37747 | 8.59 | 4769227 | 4349534 |
| 1906 | 25135 | 52.26 | 837960 | 32.89 | 31668 | 57.01 | 35053 | 70.69 | 34960 | 452.17 | 84948 | 5.37 | 3439804 | 5261154 |
| 1907 | 24397 | 91.50 | 940800 | 30.11 | 28036 | 63.64 | 34405 | 76.44 | 36490 | 423.50 | 12858 | 14.65 | 4090613 | 5665386 |
| 1908 | 32956 | 66.71 | 759480 | 32.65 | 3565 | 58.68 | 33975 | 75.84 | 38206 | 343.82 | 31577 | 9.14 | 4987180 | 4817807 |
| 1909 | 33818 | 49.96 | 1012860 | 33.04 | 9968 | 65.95 | 39680 | 76.46 | 39027 | 541.61 | 68483 | 9.15 | 3666568 | 5668645 |
| 1910 | 29158 | 50.81 | 583440 | 41.34 | 11160 | 89.21 | 36755 | 82.28 | 38547 | 634.20 | 58824 | 11.18 | 4825089 | 6365654 |
| 1911 | 34994 | 52.19 | 675480 | 52.74 | 14647 | 65.73 | 34630 | 82.37 | 36547 | 487.02 | 36208 | 8.58 | 1195810 | 5905847 |
| 1912 | 30492 | 54.66 | 724800 | 62.63 | 16774 | 61.66 | 39444 | 92.21 | 42286 | 432.05 | 4772 | 12.26 | 4360625 | 9649240 |
| 1913 | 29759 | 63.29 | 796080 | 57.09 | 37424 | 60.52 | 44969 | 114.61 | 36232 | 310.35 | 5371 | 9.05 | 8482492 | 6947840 |

## Appendix 2: Export Price Index

We construct a Fisher index of Brazilian export prices, calculated as the geometric mean of the product of the Paasche and Laspeyres indices:

$$EPI_{it}\sqrt{\frac{\sum P_{jt} * Q_{jt}}{\sum P_{j,1880-82} * Q_{jt}} * \frac{\sum P_{jt} * Q_{j,1880-82}}{\sum P_{j,1880-82} * Q_{j,1880-82}}}$$

where EPI$_{it}$ is the export price index of country $i$ at time $t$, P$_{jt}$ is the unit value of commodity $j$ at time $t$, and Q$_{jt}$ is the quantity in metric tons of commodity $j$ at time $t$. We have used the average of the years 1880-82 as a reference period because it represents the complete cross section of Brazil's export commodity structure. Data for prices in quantities are listed in appendix 1.

## Appendix 3: Constant market share analysis

The constant market share analysis for exports on the aggregate- and commodity-level takes the form

$$V_{j,t+1} - V_{j,t} = \left(R_{j,t-t+1} * V_{j,t}\right) + [V_{j,t+1} - V_{j,t} - \left(R_{j,t-t+1} * V_{j,t}\right)]$$

where V$_{j,t+1}$ is Brazil's exports of commodity $j$ in period $t+1$, V$_{j,t}$ is Brazil's exports of commodity $j$ in period $t$, and R$_{j,t-t+1}$ is the percentage increase of total world exports of commodity $j$ from period $t$ to period $t+1$. For the aggregate-level we use total export values in constant prices and for the commodity-level we use total quantities. Data sources are given in Appendix.

## Appendix 4: Commodity composition of exports, corrected series, 1821-1913

|         | Cacao | Coffee | Cotton | Hides | Rubber | Sugar | Other |
|---------|-------|--------|--------|-------|--------|-------|-------|
| 1821/29 | 1.3%  | 23.1%  | 12.2%  | 10.4% | 0.0%   | 27.4% | 15.6% |
| 1830/39 | 0.8%  | 37.4%  | 9.9%   | 8.0%  | 0.0%   | 31.5% | 12.3% |
| 1840/49 | 1.4%  | 38.7%  | 4.3%   | 8.5%  | 0.0%   | 32.4% | 14.7% |
| 1850/59 | 1.0%  | 48.6%  | 6.4%   | 7.3%  | 2.1%   | 21.5% | 13.2% |
| 1860/69 | 0.8%  | 47.0%  | 17.9%  | 5.7%  | 3.3%   | 11.5% | 13.8% |
| 1870/79 | 1.0%  | 55.8%  | 10.6%  | 4.7%  | 5.3%   | 12.8% | 9.9%  |
| 1880/89 | 1.7%  | 60.1%  | 4.2%   | 3.2%  | 10.9%  | 11.4% | 8.5%  |
| 1890/99 | 1.6%  | 68.0%  | 1.7%   | 2.8%  | 13.8%  | 3.8%  | 8.3%  |
| 1900/09 | 3.0%  | 53.6%  | 2.4%   | 4.1%  | 26.5%  | 1.2%  | 9.3%  |
| 1912/13 | 2.4%  | 61.0%  | 2.2%   | 5.9%  | 19.8%  | 0.1%  | 8.6%  |

### Appendix 5: Corrected series of Brazilian exports, 1821-1913

| Year | Corrected, current sterling prices | Corrected, constant sterling prices | Official series, current sterling | Export price index, (1913=1) | Year | Corrected, current sterling prices | Corrected, Constant sterling prices | Official series, current sterling | Export price index, (1913=1) |
|---|---|---|---|---|---|---|---|---|---|
| 1821 | 3992039 | 2571996 | 4324000 | 1.55 | 1868 | 20618179 | 24407775 | 15838500 | 0.84 |
| 1822 | 4397251 | 2960662 | 4030000 | 1.49 | 1869 | 20122427 | 23397767 | 14902000 | 0.86 |
| 1823 | 5324439 | 3356132 | 4358000 | 1.59 | 1870 | 19926969 | 22863653 | 15446000 | 0.87 |
| 1824 | 4756459 | 3758196 | 3851000 | 1.27 | 1871 | 23021259 | 26067247 | 17264000 | 0.88 |
| 1825 | 5051293 | 3612549 | 4622000 | 1.40 | 1872 | 27666967 | 26169680 | 20740500 | 1.06 |
| 1826 | 3664166 | 3270934 | 3319000 | 1.12 | 1873 | 25311086 | 22154730 | 21506000 | 1.14 |
| 1827 | 4615356 | 4058375 | 3662000 | 1.14 | 1874 | 26639788 | 22631582 | 21506000 | 1.18 |
| 1828 | 5155786 | 4617007 | 4142000 | 1.12 | 1875 | 26260275 | 22820144 | 21606000 | 1.15 |
| 1829 | 4391021 | 4442274 | 3441000 | 0.99 | 1876 | 23573242 | 21801150 | 20696500 | 1.08 |
| 1830 | 4676596 | 4868300 | 3348000 | 0.96 | 1877 | 27469958 | 23784391 | 19818000 | 1.15 |
| 1831 | 4849295 | 5218682 | 3373000 | 0.93 | 1878 | 28484990 | 26126549 | 19285500 | 1.09 |
| 1832 | 6027982 | 5842133 | 4677000 | 1.03 | 1879 | 22899803 | 23585779 | 19648500 | 0.97 |
| 1833 | 8118696 | 7505319 | 6079000 | 1.08 | 1880 | 23847624 | 22205906 | 20519000 | 1.07 |
| 1834 | 7562365 | 7143553 | 5480000 | 1.06 | 1881 | 24763859 | 26244530 | 20193500 | 0.94 |
| 1835 | 8885785 | 7927835 | 6052000 | 1.12 | 1882 | 26651016 | 30343600 | 18258000 | 0.88 |
| 1836 | 9160393 | 7980123 | 6126000 | 1.15 | 1883 | 27439695 | 31476802 | 18435500 | 0.87 |
| 1837 | 7087605 | 7470530 | 4802500 | 0.95 | 1884 | 25289079 | 32143811 | 19498500 | 0.79 |
| 1838 | 7435775 | 7728126 | 4496000 | 0.96 | 1885 | 23452261 | 31201317 | 17307000 | 0.75 |
| 1839 | 8104504 | 8243892 | 5275500 | 0.98 | 1886 | 23838395 | 30214965 | 17806000 | 0.79 |
| 1840 | 8720049 | 8561891 | 5536000 | 1.02 | 1887 | 27380770 | 28802983 | 21954000 | 0.95 |
| 1841 | 8338722 | 8596785 | 5160000 | 0.97 | 1888 | 22184701 | 25297684 | 21714000 | 0.88 |
| 1842 | 7566876 | 8933500 | 4760000 | 0.85 | 1889 | 33164431 | 31544900 | 28552000 | 1.05 |
| 1843 | 7842962 | 9773931 | 4646000 | 0.80 | 1890 | 29910918 | 29087741 | 26382000 | 1.03 |
| 1844 | 8318146 | 10639690 | 4824500 | 0.78 | 1891 | 32828939 | 31734352 | 27136000 | 1.03 |
| 1845 | 8945055 | 11271133 | 5313000 | 0.79 | 1892 | 38636345 | 38787310 | 30854000 | 1.00 |
| 1846 | 9632209 | 12484420 | 5785000 | 0.77 | 1893 | 32437691 | 31339668 | 32007000 | 1.04 |
| 1847 | 10276103 | 13993112 | 6322500 | 0.73 | 1894 | 33210631 | 33342186 | 30491000 | 1.00 |
| 1848 | 9010184 | 14501194 | 6312500 | 0.62 | 1895 | 40912773 | 40548375 | 32586000 | 1.01 |
| 1849 | 9014514 | 12555838 | 5898500 | 0.72 | 1896 | 43106203 | 39919055 | 28333000 | 1.08 |
| 1850 | 10431276 | 13387150 | 7026500 | 0.78 | 1897 | 46603278 | 54054558 | 25883000 | 0.86 |
| 1851 | 10073024 | 15142135 | 8102000 | 0.67 | 1898 | 33030315 | 54825915 | 25019000 | 0.60 |
| 1852 | 10287600 | 15540775 | 8250500 | 0.66 | 1899 | 28916534 | 51800346 | 25545000 | 0.56 |
| 1853 | 11273549 | 15586243 | 8769500 | 0.72 | 1900 | 32396501 | 49983358 | 33163000 | 0.65 |
| 1854 | 11795604 | 16166599 | 9780000 | 0.73 | 1901 | 48851166 | 76634759 | 40622000 | 0.64 |
| 1855 | 13631826 | 17576222 | 10640000 | 0.78 | 1902 | 42870088 | 72189257 | 36437000 | 0.59 |
| 1856 | 14259265 | 17531136 | 11995500 | 0.81 | 1903 | 47194129 | 71673085 | 36883000 | 0.66 |
| 1857 | 15020791 | 16503140 | 11909500 | 0.91 | 1904 | 41587285 | 56532801 | 39430000 | 0.74 |
| 1858 | 12296885 | 16280085 | 11020500 | 0.76 | 1905 | 48962164 | 63039769 | 44643000 | 0.78 |
| 1859 | 14060570 | 16177865 | 11582500 | 0.87 | 1906 | 52864478 | 74847836 | 53059000 | 0.71 |
| 1860 | 15592594 | 16390619 | 12517000 | 0.95 | 1907 | 54702252 | 75599280 | 54177000 | 0.72 |
| 1861 | 15283306 | 17492115 | 13049000 | 0.87 | 1908 | 48194210 | 69432796 | 44155000 | 0.69 |
| 1862 | 16745363 | 16301338 | 13140500 | 1.03 | 1909 | 64271161 | 83974015 | 63724000 | 0.77 |
| 1863 | 16658694 | 15113446 | 14158000 | 1.10 | 1910 | 59550095 | 60825940 | 63092000 | 0.98 |
| 1864 | 19403825 | 16446610 | 15312500 | 1.18 | 1911 | 60574413 | 60720225 | 66839000 | 1.00 |
| 1865 | 19622053 | 18643188 | 16051500 | 1.05 | 1912 | 74424514 | 66781320 | 74649000 | 1.11 |
| 1866 | 19912794 | 20497991 | 16078000 | 0.97 | 1913 | 74526798 | 74526798 | 65451000 | 1.00 |
| 1867 | 19517299 | 22731844 | 16556000 | 0.86 | | | | | |

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