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ARTICLE

Globalization, welfare, and inequality: Evidence from transoceanic market integration, 1815–1913

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Abstract

This article contributes to the growing historical literature on the 'first globalization' (1815–1913) and income inequality in countries that exported agricultural products. International market integration is expected to increase the demand for exports and therefore their prices. We estimate the effects of increased prices from international market integration on national welfare and income inequality between and within regions in three major exporters of agricultural products—British India, Colonial Indonesia, and the United States—using the prices of eleven key primary commodities. Market integration significantly increased aggregate welfare, but the gains were unevenly distributed. Producing regions gained up to nearly 6% of their GDP. Since the regions that made most welfare gains were also the poorest in their countries, market integration mitigated inequality between regions. Within the southern United States and Java, plantation owners obtained most gains, causing a substantial increase in inequality between persons.

Keywords: globalization; market integration; welfare; income inequality

Introduction

Recently, global economic historians have shown a growing interest in the effects of trade globalization on income inequality in colonies and former colonies which produced agricultural commodities for the world market during the 'long nineteenth century' (1815–1913). The initial spurt of historical interest in globalization and the 'great divergence' that occurred around 2000 focused on the modern roots of inequality between rather than within nations.[1] Over the last decade, several works have examined the effects of the late-twentieth century growth of global markets on inequality,[2] but the topic is just as relevant for the nineteenth century. Historians have now begun to systematically ask: who were the winners and losers of the 'first globalization'? This issue is particularly controversial for regions producing agricultural exports, some of which became comparatively prosperous but also highly unequal. However, precise figures on the distributive effects of the 'first globalization' remain few and far between.

[1]Patrick Karl O'Brien, 'Intercontinental Trade and the Development of the Third World Since the Industrial Revolution', *Journal of World History* (1997): 75–133; Andre Gunder Frank, *ReOrient: Global Economy in the Asian Age* (Berkeley: University of California Press, 1998); Kenneth Pomeranz, *The Great Divergence: China, Europe, and the Making of the Modern World Economy* (Princeton: Princeton University Press, 2000); Kevin H. O'Rourke and Jeffrey G. Williamson, *Globalisation and History: The Evolution of a Nineteenth-Century Atlantic Economy* (Cambridge, MA: MIT Press, 2001); Christopher Alan Bayly, *The Birth of the Modern World, 1780–1914: Global Connections and Comparisons* (Malden and Oxford: Blackwell, 2004).

[2]Branko Milanovic, *Global Inequality: A New Approach for the Age of Globalisation* (Cambridge, MA: Harvard University Press, 2016); Francois Bourguignon, *The Globalization of Inequality* (Princeton: Princeton University Press, 2015); Martin Ravallion, 'Inequality and Globalization: A Review Essay'. *Journal of Economic Literature* 56, no. 2 (2018): 620–42.

In this article, we contribute to this evolving field of research by quantifying the distributional impact of globalization in some of the world's major agricultural exporters of this age. We develop a novel approach that bridges the gap between the economic history literature on inequality and the literature on price convergence. So far, the phenomenon of declining price gaps between exporting and importing countries has been neglected by scholars interested in the links between globalization and inequality. This is a missed opportunity: the analysis of price convergence allows us to precisely quantify the exposure of regional economies to globalization. The underlying idea is that when trade costs decline or when markets integrate, trade expands, causing export prices to rise and import prices to fall.[3] Price convergence gained prominence in the study of globalization thanks to a seminal article by O'Rourke and Williamson.[4] They argued that globalization began in the nineteenth century when intercontinental prices started to converge, implying that for the first time in history, local economies became fundamentally affected by global trade.[5] Following this lead, price convergence was labelled by de Vries as 'hard globalization', as opposed to the 'soft' concept of global interactions.[6] A large and still expanding body of literature has examined trends and causes of price convergence but, to date, only a handful of studies have measured the welfare effects of market integration.[7] Their focus has been on aggregate gains in Britain and the United States.[8] This article extends the analysis of price convergence to study the effects of globalization on income inequality between and within regions producing agricultural exports, including also two major European colonies.

We estimate the effects of market integration during the 'long nineteenth century' (1815–1913), the period of the 'first globalization', on income inequality in three major exporters of agricultural commodities that are blessed with comparatively abundant data on prices and income distribution: British India, Colonial Indonesia, and the United States. While we cover only three countries, the selected cases were important, in terms of their economic weight, as well as rather diverse. British India was the largest European colony of the nineteenth century, a sub-continent in its own right. Colonial Indonesia exported spices directly into Europe as early as the sixteenth century and became one of the most exploited areas when the Dutch consolidated their rule across

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[3]The key intuition here is that, as the costs of exporting a product from a producing to a consuming country decline, trade increases, pushing the prices of exports up. This effect is magnified in the presence of declines in costs with third importers and mitigated by those with third exporters. However, market integration is not the sole factor affecting export prices, which also depend on technology, which by increasing productivity pushes prices down, as well as other determinants of the demand and, possibly, changes in market power. For instance, as we are going to see below, in the middle of the nineteenth century, the export price of Java's sugar held on but did not rise thanks to market integration because the concomitant growth of the cultivation of a new crop, sugar beet, in Europe was pushing the 'world price' of sugar down.

[4]Kevin H. O'Rourke and Jeffrey G. Williamson, 'When Did Globalisation Begin?', *European Review of Economic History* 6, no. 1 (2002): 23–50.

[5]Recent research has qualified the idea that price convergence started in the nineteenth century and contested the argument that early modern global interactions had limited economic consequences, see Pim de Zwart and Jan Luiten van Zanden, *The Origins of Globalisation: World Trade in the Making of the Global Economy, 1500–1800* (Cambridge: Cambridge University Press, 2018). Nevertheless, other studies have confirmed that intercontinental price convergence witnessed a quantum leap forward during the 'long nineteenth century', e.g. see David Chilosi and Giovanni Federico, 'Early Globalizations: The Integration of Asia in the World Economy, 1800–1938', *Explorations in Economic History* 57 (2015): 1–18.

[6]Jan De Vries, 'The Limits of Globalisation in the Early Modern World', *Economic History Review* 63, no. 3 (2010): 710–33.

[7]Giovanni Federico, 'How Much Do We Know About Market Integration in Europe?', *Economic History Review* 65, no. 2 (2012): 470–97; Giovanni Federico, 'Commodity Market Integration', *Oxford Research Encyclopedia of Economics and Finance* (Oxford: Oxford University Press, 2021).

[8]Kevin H. O'Rourke and Jeffrey G. Williamson, 'Late Nineteenth-Century Anglo-American Factor-Price Convergence: Were Heckscher and Ohlin Right?', *Journal of Economic History* 54, no. 4 (1994): 892–916; Giovanni Federico and Paul Sharp, 'The Cost of Railroad Regulation: The Disintegration of American Agricultural Markets in the Interwar Period', *Economic History Review* 66, no. 4 (2013): 1017–38; David Chilosi and Giovanni Federico, 'The Effects of Market Integration during the First Globalisation: A Multimarket Approach', *European Review of Economic History* 25, no. 1 (2021): 20–58; Jonathan Hersh and Hans Joachim Voth, 'Sweet Diversity: Colonial Goods and the Welfare Gains from Global Trade after 1492', *Explorations in Economic History* 86 (2022): 101468, doi.org/10.1016/j.eeh.2022.101468.

the archipelago. The United States was a former colony with a vast open land frontier which was mainly inhabited by European settlers. Owing to its diversity, our sample lends itself to generalizations about the distributional consequences of market integration in agricultural exporting economies.

Our study covers eleven commodities imported by Europe from overseas producers. We examine the effects of price convergence on inequality among areas (between regions) and income groups (within regions). We start by estimating nationwide gains, the 'cakes' to be divided. Then we distribute their 'slices' among producing regions in all three countries, and between income groups within Java and the southern United States. We also estimate what inequality between and within regions would have looked like without global market integration and compare this counterfactual with the actual level of inequality.

We begin with a survey of the global economic history literature on globalization and inequality, with a focus on recent works on our three countries. We then explain our empirical strategy by providing a non-technical summary of our model and a presentation of our database (with details on the model and sources provided in Appendices A and C, in the Supplementary material to this article). The following three sections report our results. We first show that national gains for British India, Colonial Indonesia, and the United States were uneven but significant and were particularly large from cash crops such as American cotton and Java sugar. Next, we show that gains were concentrated in a few selected regions that were also particularly poor, with the result that market integration mitigated inequality between regions. Finally, we show that globalization substantially increased interpersonal income inequality within the southern United States and Java, where plantation owners were the main beneficiaries.

Globalization and inequality in agricultural exporters: debates and evidence

Relations between globalization and the welfare of agricultural exporters have been highly controversial since at least the nineteenth century, when Marx, quoting the Governor General's report of 1834–1835, wrote that the bones of local weavers were 'bleaching the plains of India'.[9] This image was as provocative then as it is today. Standard economic theory, grounded in Ricardo's concept of comparative advantage, posits that international trade was mutually beneficial, as it delivered an optimal allocation of resources.[10] Each country would specialize according to its factor endowment: land-abundant countries had a comparative advantage in the production of primary commodities to be exchanged with industrial products from places with abundant human and physical capital. Economists hold that a fall in trade costs would cause trade to grow, increasing prices in producing countries, due to additional external demand—and decreasing prices in consuming countries, due to increased supply – thus benefitting both producers and consumers. Economic models can be used to precisely measure these static gains (assuming constant factor endowments and technology).[11] However, this opportunity has thus far been barely exploited. Chilosi and Federico's study of the aggregate effects of intercontinental price convergence on agricultural producers such as Egypt and eastern Europe, as well as on western European and Japanese consumers, remains an isolated example. This article demonstrates that the global integration of cotton and wheat markets during the 'long nineteenth century' substantially contributed to the welfare of both producing and consuming nations.[12]

Past and present critics of globalization challenged economic orthodoxy by stressing that specialization in the export of primary products implied dynamic losses, as it negatively affected

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[9]Karl Marx, *Capital: A Critique of Political Economy, Volume 1, Book One: The Process of Production of Capital* [1867] (Champaign: Modern Barbarian Press, 2018), 188.

[10]David Ricardo, *Principles of Political Economy and Taxation* (London: John Murray, 1817).

[11]Dave Donaldson, 'The Gains from Market Integration', *Annual Review of Economics* 7, no. 1 (2015): 619–47.

[12]Chilosi and Federico, 'The Effects of Market Integration'.

investments and productivity growth. Losses from de-industrialization have long been a major issue in India's 'nationalist historiography'. At the turn of the twentieth century, Dutt[13] claimed that Britain forced her newly acquired colony to maintain free trade exposing her to competition with Lancashire cotton goods, thus destroying the once-thriving Indian textile industry.[14] In an updated version of this view, Parthasarathi influentially argued that textile imports prevented India from developing a labour-intensive technology suited to its own factor endowment.[15] Free trade thus consigned the British colony to a lower developmental path than its metropole.[16] Several India specialists disputed the idea that de-industrialization is to be blamed for the country's impoverishment.[17] However, the de-industrialization hypothesis was reframed by Clingingsmith and Williamson and then extended to the whole periphery by Williamson.[18] He argued that improvements in terms of trade pushed countries in the periphery to specialize in primary exports.[19] In Williamson's view, short-term gains from trade were obtained at the cost of jeopardizing long-term growth prospects.[20] Skills were lost when traditional domestic manufactured products were substituted with imports. Landowners were the main winners and increased inequality weakened incentives to invest in human capital.

The two conflicting views—gains from trade versus dynamic losses from primary specialization—are echoed in emerging debates on globalization's impact on inequality between regions. As early as 2012, Roy called for global historians to move beyond the 'great divergence' debate on north–south comparisons and to shift the focus to exploring how uneven relations with the global economy before 1913 led to relative affluence in exporting regions within the periphery.[21] True to his word, Roy went on to explore regional differences within British India in 1907.[22] Using fiscal revenues per square mile as a proxy for income,[23] Roy argued that coastal regions well-endowed with water, such as Bengal and Bombay, successfully cultivated export crops and thus became better off than upland

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[13]Romesh Chunder Dutt, *The Economic History of India under Early British Rule: From the Rise of the British Power in 1757, to the Accession of Queen Victoria in 1837* (London: K. Paul, Trench, Trübner & Co.).

[14]See also Bipan Chandra, 'The Colonial Legacy', in *The Indian Economy: Problems and Prospects*, ed. Bimal Jalan (New York: Viking, 1992), 1–31; Irfan Habib, 'Colonialization of the Indian Economy, 1757–1900', *Social Scientist* 3, no. 8 (1975): 23–53; Irfan Habib, 'Studying a Colonial Economy—Without Perceiving Colonialism', *Modern Asian Studies* 19, no. 3 (1985): 355–81.

[15]Prasannan Parthasarathi, *Why Europe Grew Rich and Asia Did Not: Global Economic Divergence, 1600–1850* (Cambridge: Cambridge University Press, 2011).

[16]See also Frank, *ReOrient*.

[17]Kirti Narayan Chaudhuri, 'European Trade with India', *The Cambridge Economic History of India*, 1, *c. 1200– c. 1750*, ed. Tapan Raychaudhuri and Irfan Habib (Cambridge: Cambridge University Press, 1982), 382–407; Bishnupriya Gupta, 'Falling Behind and Catching Up: India's Transition from a Colonial Economy', *Economic History Review* 72, no. 3 (2019): 803–27; Tirthankar Roy, *The Economic History of India, 1857–2010*, 4th ed. (Oxford: Oxford University Press, 2020).

[18]David Clingingsmith and Jeffrey Williamson, 'Deindustrialization in 18th and 19th Century India: Mughal Decline, Climate Shocks and British Industrial Ascent', *Explorations in Economic History* 45, no. 3 (2008): 209–34; Jeffrey G. Williamson, *Trade and Poverty: When the Third World Fell Behind* (Cambridge, MA: MIT Press, 2011).

[19]However, a recent paper challenged the claim that there was a generalized boom of terms of trade in the periphery during the nineteenth century, see David Chilosi, Giovanni Federico, and Antonio Tena-Junguito, 'Terms of Trade during the first Globalisation: New Evidence, New Results', *European Review of Economic History* 27, no. 1 (2023): 91–122. Its evidence on export composition also raised questions on the significance of de-industrialization outside British India.

[20]Williamson, *Trade and Poverty*.

[21]Tirthankar Roy, 'Beyond Divergence: Rethinking the Economic History of India', *Economic History of Developing Regions* 27, sup-1 (2012): 57–65; Pomeranz, *The Great Divergence*. For the related argument that international trade in the past led to the development of indigenous institutions making it possible for selected Indian and African regions to be prosperous today, see Christopher Alan Bayly, 'Indigenous and Colonial Origins of Comparative Economic Development: The Case of Colonial India and Africa', in *History, Historians and Development Policy*, ed. Vijayendra Rao and C.A. Bayly (Manchester: Manchester University Press, 2020), 37–62.

[22]Tirthankar Roy, 'Geography or Politics? Regional Inequality in Colonial India', *European Review of Economic History* 18, no. 3 (2014): 324–48.

[23]One drawback of this proxy that can potentially account for the discrepancy with the GDP pc's figures presented below is that it increases with land scarcity.

and low-rainfall interior zones.[24] Commercial gains were reinvested: Bombay and Bengal were also among the leading regions in the development of modern industry in the periphery during the second half of the nineteenth century.[25] New evidence from social tables in colonial Africa painted a similar picture. In colonial Ghana, Aboagye and Bolt detected an increase in inequality between the relatively more prosperous south and the poorer northern regions after the growth of cocoa exports.[26] Similarly, de Haas found that in colonial Uganda cash-crop cultivating districts were better off than those engaged in the cultivation of subsistence crops.[27]

However, questions remain as to whether gains from trade were sufficiently large to offset possible dynamic losses for exporting regions. Thus, in Bengal, on the one hand, land scarcity constrained agricultural productivity and therefore gains from globalization.[28] On the other hand, Bengal saw a particularly marked and precocious de-industrialization of its exports in the early nineteenth century.[29] Regional GDP per capita estimates show that between 1875 (the earliest available figure) and 1911, Bengal went from being the third poorest to becoming the least developed province of British India.[30] Bengal was not an isolated case. For Lindert and Williamson, the American south was much richer than New England in 1774 because it was much more involved in international trade, thanks to its high land productivity of cash crops such as tobacco and indigo.[31] However, commercial gains turned out to be fleeting. The growth of cotton exports in the nineteenth century coincided with a reversal of fortunes for the southern states, which increasingly fell behind their northern counterparts.[32] A comparatively small industrial sector, Crafts and Klein showed, accounts for the relative decline of southern states in the postbellum decades.[33] In turn, slow industrialization in the American south has long been linked to institutions associated with cotton plantation slavery, which, according to recent econometric analyses, led to reduced investments in human and physical capital.[34] Within the Indonesian archipelago, Java was the poorest island in terms of GDP per capita, as well as other developmental indicators, such as schooling and stature, in

[24]Roy, 'Geography or Politics?'.

[25]Roy, *The Economic History of India*, 161.

[26]Prince Young Aboagye and Jutta Bolt, 'Long-Term Trends in Income Inequality: Winners and Losers of Economic Change in Ghana, 1891–1960', *Explorations in Economic History* 82 (2021), 101405.

[27]Michiel De Haas, 'Reconstructing Income Inequality in a Colonial Cash Crop Economy: Five Social Tables for Uganda, 1925–1965', *European Review of Economic History* 26, no. 2 (2022): 255–83.

[28]Roy, *The Economic History of India*.

[29]Atsushi Kobayashi, 'Trade Development in British India and Three Presidencies, 1800–74', Paper presented at the History & Political Economy Seminar, King's College London, 2022.

[30]Paul Caruana-Galizia, 'Indian Regional Income Inequality: Estimates of Provincial GDP, 1875–1911', *Economic History of Developing Regions* 28, no. 1 (2013): 1–27.

[31]Peter H. Lindert and Jeffrey G. Williamson, *Unequal Gains: American Growth and Inequality Since 1700* (Princeton: Princeton University Press, 2016).

[32]Lindert and Williamson *Unequal Gains*; Alexander Klein, 'Regional Inequality in the United States: Long-Term Patterns, 1880–2010', in *The Economic Development of Europe's Regions*, ed. Joan Ramon Rosés and Nikolaus Wolf (London: Routledge, 2018), 363–86.

[33]Nicholas Crafts and Alexander Klein, 'Unconditional Convergence in Manufacturing Productivity across US States: What the Long-Run Data Show', CAGE Online Working Paper Series 660 (2023).

[34]Klein, *Regional inequality*, 381. Others, however, begged to differ. Thus, slave plantations were seen as efficient and not holding back the southern states in the pioneering cliometric analysis by Robert Fogel and Stanley Engerman, *Time on the Cross: The Economics of American Negro Slavery* (Boston: Little Brown and Company, 1974). Later work confirmed that cotton plantations achieved significant labour productivity gains, see Alan L. Olmstead and Paul W. Rhode, 'Biological Innovation and Productivity Growth in the Antebellum Cotton Economy', *Journal of Economic History* 68, no. 4 (2008): 1123–71. More recently, from a 'history of capitalism' perspective, Beckert went as far as arguing that it is thanks to cotton exports that the United States became a world-leading economy, see Sven Beckert, *Empire of Cotton: A New History of Global Capitalism* (London: Penguin, 2014), 119. This claim is nevertheless at odds with the small share of cotton in American GDP, see Alan L. Olmstead and Paul W. Rhode, 'Cotton, Slavery, and the New History of Capitalism', *Explorations in Economic History* 67 (2018): 12, as well as Beckert's own computations of the contribution of slaves to the growth of the American economy, see Mark Stelzner and Sven Beckert, 'The Contribution of Enslaved Workers to Output and Growth in the Antebellum United States', *Economic History Review* 77, no. 1 (2023): 137–159.

the decades around 1900.[35] Bosma and van Leeuwen speculated that Java was so poor because of, rather than despite, its integration with the world economy.[36] Sugar, its main staple export, turned out to be an 'unlucky ticket' in the 'commodity lottery': its price sharply declined in the closing decades of the nineteenth century. The dominance of plantations in Java's economy led to particularly high inequality, with few gains for local peasants.[37]

Increased inequality within regions is routinely stressed as one of the key mechanisms behind dynamic losses for agricultural exporters. Global historians have long argued that peasants in countries exporting agricultural products did not gain much because others—colonial powers, European expatriates, or local capitalists—creamed off most profits.[38] Recent research added details and nuance, stressing how the impact of globalization on income inequality was uneven. One key determining factor was access to land. Plantation agriculture, in particular, has been associated with high inequality in several places.[39] For instance, de Zwart found that the growth of plantations, rather than exports per se, explained rising inequality within colonial Java.[40] Recent research also stressed the role of indigenous institutions in determining patterns of land use, thus questioning geographical determinism: the growth of coffee exports in the 1920s was associated with high inequality in Java, where plantation land was owned by former aristocrats, while it was correlated with low inequality in western Sumatra, where small landholdings were controlled by communities of peasants.[41]

Another crucial factor in determining the consequences of globalization for inequality within regions was the extent to which market imperfections allowed powerful actors to extract rents from peasants. The infamous Dutch Cultivation System in Colonial Indonesia was surely one of the most extractive institutions of the nineteenth century. At its peak, in the 1850s, it accounted for more than half of the Netherlands' state revenue and 3.8% of its GDP.[42] The Cultivation System very effectively exploited its monopsonistic power against peasants, who were paid a fraction of the market price for the cash crops they were forced to cultivate; as little as 7% for

[35]Ulbe Bosma and Bas van Leeuwen, 'Regional Variation in the GDP Per Capita of Colonial Indonesia, 1870–1930, *Cliometrica* 17 (2023): 367.

[36]Bosma and van Leeuwen, 'Regional Variation'.

[37]Related to this point, negative consequences of Java's plantations for human capital were highlighted by Pim de Zwart, Daniel Gallardo-Albarrán, and Auke Rijpma, 'The Demographic Effects of Colonialism: Forced Labour and Mortality in Java, 1834–1879', *Journal of Economic History* 82, no.1 (2022): 211–49. They found that working conditions in the plantations of the Cultivation System were so harsh that they increased mortality rates by about a fifth. In contrast, persistent positive effects were stressed by Melissa Dell and Benjamin A. Olken, 'The Development Effects of the Extractive Colonial Economy: The Dutch Cultivation System in Java', *Review of Economic Studies* 87, no. 1 (2020): 164–203. For them growth of sugar production stimulated development of schooling, leading to economic growth in Java near the plantations.

[38]O'Brien, 'Intercontinental Trade', 92–5; Bayly, *The Birth*, 52, 135.

[39]These places include Java, on which see Jeroen Touwen, 'Regional Inequalities in Indonesia in the Late Colonial Period', *Lembaran Sejarah* 3 (2000); Andrew Leigh and Pierre van der Eng, 'Inequality in Indonesia: What Can We Learn From Top Incomes?', *Journal of Public Economics* 93, nos. 1–2 (2009): 209–12; Pim de Zwart, 'Globalisation, Inequality and Institutions in West Sumatra and West Java, 1800–1940', *Journal of Contemporary Asia* 51, no.4 (2021): 564–90; Pim de Zwart, 'Inequality in Late Colonial Indonesia: New Evidence on Regional Differences', *Cliometrica* 16, no. 2 (2022): 175–211). On the southern United States see Lindert and Williamson, *Unequal Gains*; on the Caribbean see Kenneth L. Sokoloff and Stanley L. Engerman, 'History Lessons: Institutions, Factor Endowments, and Paths of Development in the New World', *Journal of Economic Perspectives* 14, no. 3 (2000): 217–32; Trevor Burnard, Laura Panza and Jeffrey Williamson, 'Living Costs, Real Incomes and Inequality in Colonial Jamaica', *Explorations in Economic History* 71 (2019): 55–71. On colonial Africa see Ewout Frankema, Michiel de Haas, and Marlous van Waijenburg, 'Inequality Regimes in Africa from Pre-Colonial Times to the Present', *African Affairs* 122, no. 486 (2023): 57–94; Ellen Hillbom, Michiel De Haas, Jutta Bolt, and Federico Tadei, 'Income Inequality and Export-Oriented Commercialisation in Colonial Africa: Evidence from Six Countries', *Economic History Review* (2023), doi.org/10.1111/ehr.13304. Although the emphasis in the literature of Africa is on capital-intensive rather than plantation agriculture, the two are clearly closely related.

[40]de Zwart, 'Inequality in Late Colonial Indonesia'.

[41]de Zwart, 'Globalisation, Inequality and Institutions'.

[42]Jan Luiten van Zanden and Arthur van Riel, *The Strictures of Inheritance: The Dutch Economy in the Nineteenth Century* (Princeton: Princeton University Press, 2004), 179–80.

coffee, for instance.[43] Similarly, Tadei found that European farmers in East Africa obtained a fair price (i.e. world price less freights and other trade costs) from colonial trading companies, while native producers in West Africa were paid less—66% of the market price in French colonies and 84% in British territories.[44] Such colonial institutions are perhaps the best documented cases of extraction but were hardly unique. There is widespread, if less than uncontroversial, evidence that, regardless of their nationality, traders and large landowners, as well as providers of credit and transport, used their market power to squeeze rents out of labourers and small-scale producers.[45] This is not to say that market imperfections were always the rule. The Shanghai raw silk trade offers a counterexample: competition was strong at all stages of trade and production. In consequence, profit margins were low.[46] The indigo export market in British India, too, was quite competitive: there were 32 exporting houses and the top six managed approximately two-thirds of total trade.[47]

In summary, an expanding body of literature in global history has cast new light on the nexus between globalization and inequality in countries exporting agricultural products during the 'long nineteenth century'. However, the relationship between globalization and the welfare of these countries remains controversial, not least because questions remain as to how large the effects of globalization were. This article provides new estimates of the static effects of global market integration on welfare and inequality.

Modelling a counterfactual world economy without market integration

This article estimates the effects of transoceanic price convergence on inequality between and within regions in three major primary products' exporters: British India, Colonial Indonesia, and the United States. In the first step, we rely on a microeconomic model to compute new estimates of how different prices and therefore aggregate welfare in our three countries would have been without market integration. Moving beyond our earlier study, we add a new set of bilateral trade estimates to that study's multilateral estimates.[48] While the multilateral model developed in that study considers interactions between all major exporters and importers, our bilateral model considers interactions between only one producing country and one consuming country, which

[43]de Zwart, 'Globalisation, Inequality and Institutions'; de Zwart, 'Inequality in Late Colonial Indonesia'.

[44]Federico Tadei, 'Measuring Extractive Institutions: Colonial Trade and Price Gaps in French Africa', *European Review of Economic History* 24, no. 1 (2020): 1–23; Federico Tadei, 'Colonizer Identity and Trade in Africa: Were the British More Favourable to Free Trade?', *Economic History Review* 75, no. 2 (2022): 561–78.

[45]On British India see Amiya Kumar Bagchi, *The Political Economy of Underdevelopment* (Cambridge: Cambridge University Press, 1982), 20; Beckert, *Empire of Cotton*, 286–90; Tirthankar Roy, 'Inequality in Colonial India', LSE Economic History Working Paper 286 (2018); Roy, *The Economic History of India*, 136–8. On the United States see Roger L. Ransom and Richard Sutch, *One Kind of Freedom: The Economic Consequences of Emancipation* (Cambridge: Cambridge University Press, 1988); Roger L. Ransom and Richard Sutch, 'One Kind of Freedom Reconsidered (and Turbo Charged)', *Explorations in Economic History* 38 (2001): 6–39; Beckert, *Empire of Cotton*, 286–90; Alexander Klein, Karl Gunnar Persson, and Paul Sharp, 'Populism and the First Wave of Globalisation: Evidence from the 1892 US Presidential Election', *Rivista di Storia Economica* (2020): 1–40. On Brazil see Giovanni Federico and Ricardo Paixao, 'Market Power on the Colonial Frontier? Evidence from São Paulo 1800–1840', *Revista de Historia Economica-Journal of Iberian and Latin American Economic History* 27, no. 1 (2009): 17–26. On southern Italy see Pablo Martinelli, 'Latifundia Revisited: Market Power, Land Inequality and Agricultural Efficiency: Evidence from Interwar Italian Agriculture', *Explorations in Economic History* 54 (2014): 79–106. Information asymmetries mattered, too, for the identity of the winners. Thus, within British India, production, and to a lesser extent trade of cotton, which was often cultivated in the interior, was mainly in the hands of Indian agents, who exploited their local knowledge and networks; see Christopher Alan Bayly, *Rulers, Townsmen and Bazaars: North Indian Society in the Age of British Expansion, 1770–1870* (Cambridge: Cambridge University Press, 1983), 527; Beckert, *Empire of Cotton*, 129–30. Conversely, better access to information about European markets, as well as capital, meant that the majority and the largest tea plantations in Assam—a province relatively easy to access from the coast—were controlled by Calcutta-based British corporations, with Indian family firms specializing in low quality tea for domestic consumption, see Roy, *The Economic History of India*, 191–2.

[46]Giovanni Federico, *An Economic History of the Silk Industry, 1830–1930* (Cambridge: Cambridge University Press, 1997).

[47]Personal communication by M. Aldous.

[48]Chilosi and Federico, 'The Effects of Market Integration'.

allows us to expand the coverage from two to eleven commodities. In the second step, these aggregate gains are distributed between and within regions, enabling comparisons between actual and counterfactual (without market integration) measures of inequality. Technical details on the model are provided in Appendix A, and details on the sources are provided in Appendix C. Here, we provide a non-technical summary of the model and present the key features of our database.

British India, Colonial Indonesia, and the United States all shared in the rapid growth in world trade in the 'long nineteenth century', although there were substantial differences in extent and timing (see also Figures A3 and A4 and Table A3 in Appendix B). The Unites States stood out for the rapid growth of its trade: it nearly doubled its share of world trade in the ninety years before 1912, from 6.5% to nearly 13%. By the end of our period, the United States exported more than the whole of the Asian continent, whose overall share of global trade remained roughly stable. British India increased its share up to almost 7% in the late 1880s, but experienced a steep fall to below 4% in the wake of the collapse of exports of wheat and the stagnation of those of jute and cotton cloths.[49] Total Indian exports did recover and by the eve of the First World War they were about a tenth higher than in the 1880s, but India's share of world trade never returned to the pre-crisis peak. Colonial Indonesia's share more than doubled in the 1830s when peasants were forced to provide growing quantities of coffee, sugar, and spices under the Cultivation System.[50] Colonial Indonesia's share of world exports peaked at 1.8% of world trade in the early 1840s but declined in the 1850s and 1860s and fluctuated around 1% thereafter. Part of the increase in world trade was determined by the growth of trading economies, but market integration was also a key driver. Thus, market integration accounted for about two thirds of the increase of Indian and American cotton exports and one fifth of American wheat exports.[51]

Unfortunately, we have not been able to include any industrial products. The prices of manufactured commodities are scarce and hard to compare: their quality, unlike those of our primary products, typically differs significantly across places and over time. Anyway, as seen in Figure A5 in Appendix B, industrial products were likely a negligible share of exports from Colonial Indonesia. Despite British India's de-industrialization and eventual re-industrialization, manufactured products never accounted for more than 20% of its exports. The only country in our sample where manufactured products mattered more than primary products was the United States, but even there the transition occurred rather late: after the Civil War when, in the space of two decades, the share of manufacturing in exports went from c. 20% to c. 60%. Moreover, even in the postbellum decades, exports of cotton grew nearly fourfold.[52] The agricultural products upon which our analysis concentrates thus continued to dominate the exports of the southern United States.

Our sample of commodities can be regarded as quite representative of the export mix of our three producers: they accounted for half or more of total exports from the United States before the Civil War and from British India and Colonial Indonesia for nearly the whole period (Table A2 in Appendix B). It includes an interesting mix of different production structures, mostly plantations (sugar and coffee from Java; indigo, jute and tea from India; and cotton from the antebellum United States and from British India), quite a few cases in which small-scale farm production played a significant role (wheat and, after the Civil War, cotton from the United States, coffee from Sumatra, cotton and wheat from British India), as well as the odd mineral (tin from Colonial Indonesia).

Columns 4 and 5 of Table 1 report estimates of the change in trade costs between ports in producing countries (e.g., Calcutta or Batavia) and in Europe (mostly London).[53] In our model,

[49]Kirti Narayan Chaudhuri, 'Foreign Trade and the Balance of Payments (1757–1947)', in *The Cambridge Economic History of India*, vol. 2, ed. Kumar Dharma and Meghnad Desai (Cambridge: Cambridge University Press, 1982b), 804–902.

[50]Jan Luiten van Zanden and Daan Marks, *An Economic History of Indonesia: 1800–2010* (London: Routledge, 2012).

[51]Chilosi and Federico, 'The Effects of Market Integration', 35.

[52]Chilosi and Federico, 'The Effects of Market Integration', 24.

[53]Our source, Chilosi and Federico, 'Early Globalizations', measures price convergence for 26 commodities for five countries, including silk from China and Japan, but some series are too short or are missing other necessary data. For Colonial Indonesia, we have dropped rice because the country was a net importer in 1913, rubber because exports started in the early

Table 1. Summary of the database (figures in %)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
			Change in trade costs/export price in 1913		Production-Consumption/GDP	Regional concentration production
Countries & goods	Period	Model	1815[‡]-1913	1870[‡]-1913	1913	(Herfindahl index) 1913[§]
British India						
Cotton	1816–1913	Multilateral	−109	−25	1.79	17.1
Indigo	1823–1913	Bilateral	−228	−16	0.01	31.4
Jute	1845–1913	Bilateral	−50	−35	1.45	79.3
Linseed	1847–1913	Bilateral	−67	−22	0.34	24.1
Rapeseed	1872–1913	Bilateral	−43	−43	0.19	25.6
Rice	1871–1913	Bilateral	−56	−56	1.01	20.0
Tea	1894–1913	Bilateral	−21	−21	0.60	50.4
Wheat	1862–1913	Bilateral	−84	−31	0.62	23.3
Colonial Indonesia						
Coffee	1834–1913	Bilateral	−30	−11	0.37	33.6
Sugar	1823–1913	Bilateral	−71	−38	2.72	46.4
Tin	1864–1913	Bilateral	−9	−12	2.29	100.0
United States						
Cotton	1816–1913	Multilateral	−82	−1	1.11	14.6
Wheat	1815–1913	Multilateral	−56	−25	0.02	6.6

Note: to facilitate comparison, we also report changes in trade costs with Britain for estimates based on the multilateral model, neglecting, e.g., trade costs from British India to Japan.

[‡]Or the earliest available date.

[§]1902–03 for British India and 1926 for Colonial Indonesia. Computations of the Herfindahl index (equal to the sum of the squared production shares) are based on 15 regions in British India, 10 regions in Colonial Indonesia, and 47 regions in the United States.

Sources: columns 3 and 4: Chilosi and Federico, 'Early Globalizations' (see Appendix C for details on computations). The figures in column 5 are computed with statistics drawn from a wide range of secondary sources and period statistics, as detailed in Appendix C. The figures in column 6 are computed from statistics drawn from India Statistics Department, *Area and Yield of Rice, Wheat, Cotton, Oilseeds, Jute, Indigo, Sugar Cane for Various Periods from 1891–92 to 1902–03* (Calcutta: Office of the Superintendent of Government Printing, 1903), 30–38 for British India; Centraal Kantoor voor de Statistiek, *Mededeelingen van het Centraal Kantoor voor de Statistiek: De Landbouwexportgewassen van Nederlandsch-Indie* (The Export crops of the Netherlands East Indies in 1926) (Batavia: G. Kolff & Co, 1926), 90 and Amarjit Kaur and Frits Diehl, 'Tin Miners and Tin Mining in Indonesia, 1850–1950', *Asian Studies Review* 20, no. 2 (1996): 95–120, for Colonial Indonesia; and the ATICS database in Federico and Sharp, 'The Cost of Railroad Regulation', 1017–38, for the United States.

trade costs are expected to be equal to price gaps: if they are higher, traders will lose money; if they are lower, trade will generate abnormally high profits, attracting new traders. In both cases, equilibrium would be restored by changes in traded quantities. The price series show an impressive process of convergence over the 'long nineteenth century', with different timing between different components of trade costs. Trade costs declined faster in the early phase of globalization, from Waterloo to 1870, than in the alleged 'heyday of globalization' from 1870 to the First World War.[54] Early price convergence was determined mostly by policy changes.[55] Thus, England abolished the trade monopoly of the East India Company with India in 1813 and the Corn Laws in 1843, which protected domestic production from overseas wheat. Some years later, the Netherlands liberalized the market for the transport of exports from Colonial Indonesia, which as part of the Cultivation System had been previously managed by the Netherlands Trading Society (*De Nederlandsche Handel-Maatschappij N.V.*, or NHM). The existence of a trading monopoly meant that contracts were awarded to well-connected shipowners who charged freights up to four times higher than the world market rates.[56] Transoceanic trade was broadly free of barriers by 1870; thus, further convergence was driven by technological gains in transport (the steamship) and communication (the telegraph).

Our model assumes that producers received the full amount of prices at the country border. This is clearly an oversimplification. Producers had to pay transport costs from farms to the port of embarkation and possibly also fees to intermediaries who might have extracted some monopsony rents.[57] The existence of these costs would not affect our aggregate estimate of gains if transport costs and intermediaries' fees were paid to residents. However, if the residence and income group of the intermediaries differed from those of the producers, commercial costs could affect the distributions of gains across space and income groups. Domestic transport costs and, arguably, associated rents declined thanks to the building of railways in Colonial Indonesia, British India, and the United States.[58] Similarly, the demise of the Cultivation System reduced gaps between export prices and payments to farmers in Colonial Indonesia. It is possible that market imperfections also declined in other countries. Thus, domestic market integration might have increased the 'share of the cake' going to producers, but lack of series of farm prices prevents any estimation of the size of these effects. Nevertheless, we can be confident that biases are unlikely to be sufficiently large to alter our conclusions. In both British India and Colonial Indonesia, producing areas that benefited the most, Java and Bengal, were also major export hubs. Wealthy merchants and plantation owners both belonged to top income groups; hence, our computations of the effects of market integration on inequality within regions would be hardly affected by violations of our assumption that wealthy merchants did not share in the gains. Besides, as stressed in the previous section, the literature has shown that 'size' mattered. It is therefore unlikely that intermediaries could squeeze large rents from crops cultivated on plantations, which were very large economic players. As plantations accounted for the lion's share of our estimated gains, their

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twentieth century (the price series starts in 1913), tea and pepper for lack of output data in 1913. Their exclusion is expected to have an only negligible impact on the results: spices only accounted for 1.94% of exports in 1913 (0.87% in 1870) and the same figure for tea is 3.18% (0% in 1870), as compared, e.g., with 22.54% (29.42% in 1870) for sugar, see Tables 6A and 6B in W.L. Korthals Altes, *Changing Economy in Indonesia: A Selection of Statistical Source Material from the early 19th Century up to 1940, Volume 12a: General Trade Statistics, 1822–1940* (The Hague: Royal Tropical Institute, 1991).

[54]Chilosi and Federico, 'Early Globalizations', 8.

[55]Chilosi and Federico, 'Early Globalizations', 16.

[56]Chilosi and Federico, 'Early Globalizations', 11.

[57]See footnote 45 for references.

[58]G. Roger Knight, *Commodities and Colonialism: The Story of Big Sugar in Indonesia, 1880–1942* (Leiden: Brill, 2013); Van Zanden and Marks, *An Economic History*; Dan Bogart and Latika Chaudhary, 'Railways in Colonial India', in *A New Economic History of Colonial India*, ed. Latika Chaudary, Bishnupriya Gupta, Tirthankar Roy, and Anand Swamy (London: Routledge, 2016), 140–60; Dave Donaldson, 'Railroads of the Raj: Estimating the Impact of Transportation Infrastructure', *American Economic Review* 108 (2018): 899–934; Dave Donaldson and Richard Hornbeck, 'Railroads and American Economic Growth: A 'Market Access' Approach', *Quarterly Journal of Economics* 131, no. 2 (2016): 799–858.

distribution is unlikely to be sensitive to violations of our assumption that producers rather than intermediaries benefitted from market integration.

Our bilateral trade model is a modified version of a standard neoclassical partial equilibrium analysis of the negative welfare effect of protectionism—the so called 'Harberger triangles' (for details and formulas, see Appendix A). These triangles measure welfare gains from the abolition of positive duties on a particular good. Our model, following Hufbauer, more realistically examines the effects of a change between positive levels of trade costs.[59] Total welfare gains for producing countries are determined by increased production and exports, as well as higher prices. Higher prices benefitted producers but also harmed local consumers. The upshot was that aggregate gains increased with the shares of each product in total GDP and of exports in production. In other words, gains depend on the share of net exports in GDP (Table 1, column 6). This share was, for example, particularly low for American wheat, large quantities of which were consumed domestically, while it was comparatively high for Indonesian sugar, which accounted for a sizeable share of GDP and was nearly all exported.

We estimate gains relative to GDP in 1913 rather than in any other year for two reasons. First, price ratios between producing and consuming countries in 1913 were close to one: trade costs were low and thus there was no room for rents from imperfections in the international transport market (see Table A10 in Appendix C). Second, our estimation requires data on agricultural output and consumption, which are available for all countries as of 1900. In our counterfactual setting we ask how different prices and the aggregate welfare of exporting countries would have been in 1913, with the technology and factor endowment of that year, if the trade costs had been as high as those in 1815, or in 1870. The first comparison estimates the gains over the whole 'long nineteenth century'; the second, the gains during 'late globalization' (1870–1913); the difference between the two is a crude estimate of gains during 'early globalization' (1815–1870). Our estimates of aggregate welfare effects need a set of elasticities that measure how responsive demand and supply were to changes in prices. We draw these parameters from an extensive survey of the literature, matching as closely as possible the period, place, and commodity. We thus obtain separate estimates of gains by product, which we sum to obtain total gains for the country. As with all estimates of static gains, they neglect the long-term dynamic effects of globalization: in all likelihood, factor endowment and technology in 1913 would have been different if trade costs had been much higher and thus exports had been much lower. However, the implicit counterfactual is too complex to be manageable with available economic models and data.

We then distribute nationwide gains between areas and income groups, simply assuming that they were proportional to the share of each region or income group on each product's output. Particular gains therefore tended to increase with the concentration of production. For instance, the spatial concentration was much lower for American wheat, which was cultivated in more than two-thirds of the states of the union, than for American cotton, which was produced in less than one-third of the states, all located in the south (Table 1, column 7). Following standard approaches in the literature, we measure inequality between regions with the population-weighted coefficient of variation[60] of income per capita and inequality within regions with the (agricultural) labour income share or the Gini coefficient and the top 1% income share, depending on the data availability.[61] We compute counterfactual distributions by region and income group by deducting gains from market integration from 1913 GDP.

In our baseline, we rely on the textbook 'Marshallian' allocation across income groups and assign gains to profit-earners.[62] However, we subsequently relax this assumption in two ways. In a

[59]Gary Clyde Hufbauer, Erika Wada, and Tony Warren, *The Benefits of Price Convergence: Speculative Computations* (Washington: Institute for International Economics, 2002).

[60]The coefficient of variation is the standard deviation (the standard statistical measure of dispersion) divided by the mean.

[61]Joan Ramon Rosés and Nikolaus Wolf, 'Regional Growth and Inequality in the Long-Run: Europe, 1900–2015', *Oxford Review of Economic Policy* 37, no. 1 (2021): 17–48.

[62]Alfred Marshall, *Principles of Economics*, vol. 1 (London: Macmillan, 1890).

first 'Ricardian'[63] extension, we allow the reallocation of capital to erode incumbents' profits in the long run, with the consequence that at least part of the gains end up transferred to the owners of fixed factors of production, in our context of land and specialist engineering skills.[64] In a second 'Keynesian' extension, we allow for frictions in the labour market, which imply that some of the gains accrued to workers who would have been unemployed had there been no market integration.[65] Having discussed our empirical approach, we are now ready to present our results.

National gains

Figure 1 reports national gains for each producer by good and period, relying on multilateral estimates when available and on bilateral estimates otherwise, as explained in the previous section. We also report the results of a sensitivity analysis, assuming demand and supply elasticities to range between 66% and 150% of their baseline values. All estimates refer to GDP rather than GNP and thus include transfers to foreign owners. Such transfers were significant for sugar but not sufficiently large to substantially change our results.[66]

Almost all the gains for the United States and for Colonial Indonesia came from cotton and sugar. However, the causes behind this dominance were different for the two producers. Wheat and cotton accounted for roughly the same proportion of American GDP in 1913, but the share of domestic consumption was much greater for wheat than for cotton (85% vs. 30%). The extent to which gains for wheat producers offset losses for consumers is correspondingly lower than that for cotton. Colonial Indonesia gained almost exclusively from sugar because trade costs declined much less for coffee and remained almost constant for tin (Table 1, columns 4 and 5). Furthermore, in 1913, coffee accounted for a small share of GDP (0.45% vs. 2.96% for sugar) because production levels had not fully recovered from the destruction caused by the rust disease in the 1880s.[67] Nevertheless, a simple calculation confirms that the dominance of sugar is not simply driven by the use of 1913 as the baseline year: if we let coffee account for the same share of GDP as sugar in 1870, gains from coffee in 1815–1913 can be estimated as equivalent to 0.47% of Colonial Indonesia's GDP in 1913, compared with 1.87% gains from sugar in our baseline.[68] In contrast to the other two producers, British India gained from a wide range of goods. The most relevant products, cotton and wheat, accounted each for between one-third

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[63]David Ricardo, *An Essay on the Influence of a Low Price of Corn on the Profits of Stock, with Remarks on Mr. Malthus' Two Last Publications* (London: John Murray, 1815).

[64]Under perfect competition *all* gains would accrue to owners of fixed factors in the long run; see Ezra J. Mishan, 'What is Producer's Surplus?', *American Economic Review* 58, no. 5 (1968): 1269–82. However, as we are going to show, in Java land markets were clearly not competitive, as plantations acted as monopsonies.

[65]John Maynard Keynes, *The General Theory Employment, Interest and Money* (London: Macmillan, 1936).

[66]In 1912, out of approximately 190 sugar factories, 31 were fully owned and 27 partly owned by the six big Dutch banks; see Roger Wiseman, 'Three Crises: Management in the Colonial Java Sugar Industry 1880s–1930s' (PhD thesis, Department of History, University of Adelaide, 2001), 57). Thus, the GNP gains from sugar were 84% of the GDP gains if we include only fully owned factories or 70% if we add partly owned ones. Aggregate gains were between 1.53% and 1.80% over the long run and 0.85% and 0.98% since 1870 of the GNP of Colonial Indonesia, as compared to our corresponding baseline estimates of 2.10% and 1.13% of GDP. The difference includes both dividends paid to Dutch investors and re-invested profits, which accrued to shareholders as capital gains. Estimates of total transfers from Colonial Indonesia to the Dutch metropole are available in Alec Gordon, 'A Last Word: Amendments and Corrections to Indonesia's Colonial Surplus 1880–1938', *Journal of Contemporary Asia* 48, no. 3 (2018): 508–18.

[67]M.R. Fernando, 'Coffee Cultivation in Java, 1830–1917', in *The Global Coffee Economy in Africa, Asia, and Latin America*, ed. William Gervase Clarence-Smith and Steven Topik (Cambridge: Cambridge University Press, 2003), 157–82.

[68]Letting the added value of coffee production in 1913 be as high as that of sugar (as gross production figures suggest was the case in 1870), subtracting from the gains in 1815–1913 (0.67%) those in 1870–1913 (0.24%) and then adding back the baseline gains in 1870–1913 (0.04%) yields an estimate of 0.47% of Colonial Indonesia's GDP in 1913 (vs. a baseline result of 0.10% for coffee 1815–1913). The implications for our other baseline results are thus that the total gains for Colonial Indonesia would be increased somewhat. The results for inequality between regions are likely little affected, too, given that half of the Indonesian coffee was produced in Java (probably more before the 1880s crisis, see Fernando, 'Coffee Cultivation in Java'). Those for income inequality within the island would only be strengthened since all Javanese coffee was cultivated on plantations.
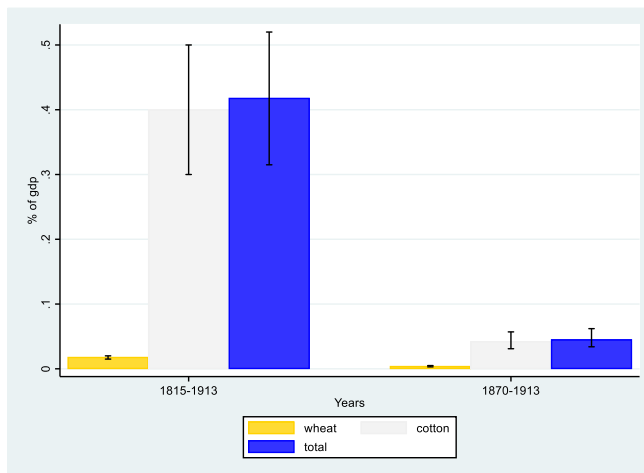
(a) British India
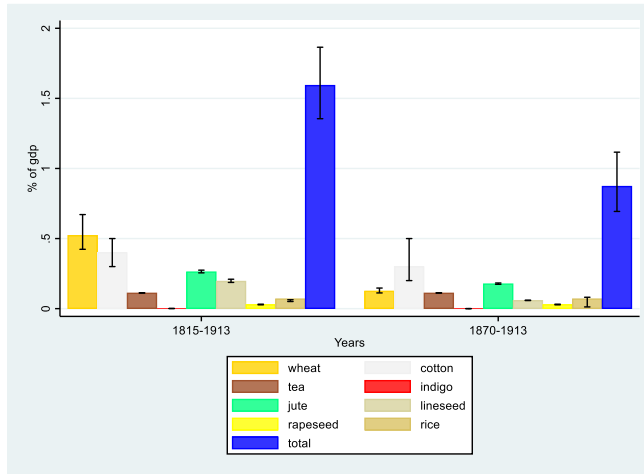
(b) Colonial Indonesia
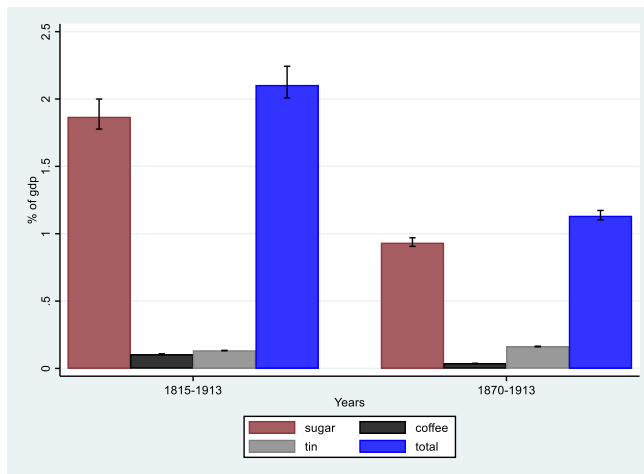
(c) United States

Figure 1. Welfare gains as a share of national GDP (%), 1815–1913.
Source: Table A4 in Appendix B.
Note: Figures a to c have different scales; thus, the heights of the bars are not directly comparable. The range plots use two-thirds and three halves of the elasticities in the baseline specifications.

and one-fourth of the total gains. Next came jute, accounting for a sixth of the total surplus. Both cotton and jute accounted for 2–3% of GDP and were mostly exported (60% cotton and 70% jute). The contribution of the two major food crops was relatively small, despite their high share of GDP (20% rice, 5% wheat) because 95% of the rice and 80% of the wheat were consumed domestically. Other goods accounted for less than 1% of the GDP in 1913.

Comparing gains in the long run and in 1870–1913 offers additional insights into the timing of globalization. Both are expressed as shares of 1913 GDP; thus, the ratio between 1870–1913 and 1815–1913 is a crude measure of the proportion of gains during late globalization. The evidence of faster price convergence before 1870 (Table 1, columns 4 and 5) would suggest that the ratio was low. This is indeed the case for American exports (15%), where the price series cover the whole period since 1815, but it is also the case for indigo (6%). The ratios were greater for some other commodities, such as coffee (33%) and jute (67%), partly because the price series started later (Table 1, column 2). We are not always sure why prices were not registered, but we speculate that trade was very small or non-existent because costs were too high to make it profitable. Sugar is somehow an outlier: gains divided almost perfectly between the two periods of globalization because trade costs included hefty tariffs from consuming countries, which were aimed at protecting European sugar beet production and thus were removed only gradually.

Bilateral estimates might overstate gains as they ignore competition from other producers, which also benefitted from a fall in trade costs. Nevertheless, they also fail to consider the benefits caused by exports to third consumers. A comparison of twenty results obtained with the two methods provides reassurance (Figure A2 in Appendix A). Bilateral estimates tend to be only slightly greater than and highly correlated with multilateral estimates, with only one clear exception: the long-run estimate for Indian cotton. This was a special case, as the United States' dominance of the world cotton market was not replicated for any other commodity. Moreover, it is likely that any positive bias in the bilateral estimates is compensated for by our neglect of general equilibrium effects arising from interactions with other products and factors' markets: these are expected to be positive, but not large.[69]

Welfare gains might at first sight look rather small. Yet the American figures for the long run compare rather favourably with Irwin's estimate of the total welfare cost of tariffs, which between 1870 and 1913 hovered around 0.2% of American GDP in 1913.[70] Moreover, our estimate covers only a part of trade. A rough estimate of total gains from market integration can be computed under the assumption that our products were representative, dividing gains from them by the share of trade they covered. Such estimates of total gains would have been equivalent to 3% of GDP in the United States, 12% in Colonial Indonesia, and 5% in British India or expressed as a ratio of per capita economic growth since 1815, 4%, 30% and 66%, respectively.[71]

A comparison with available estimates of gains from market integration in other places (Table A5 in Appendix B) shows that our countries were hardly exceptional. For instance, in the long run, the aggregate gains of Britain from goods in our sample were equivalent to 1.3% of its GDP;[72] on

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[69]Chilosi and Federico, 'The Effects of Market Integration', 38.

[70]Douglas A. Irwin, 'Trade Policy in American Economic History', *Annual Review of Economics*, 12 (2020): 35. This 0.2% figure considers that the United States economy grew about five times between 1870 and 1913, see Jutta Bolt and Jan Luiten van Zanden, 'Maddison Project Database, version 2020', (Groningen 2020), www.rug.nl/ggdc/historicaldevelopment/maddison/releases/maddison-project-database-2020?lang = en). Douglas A. Irwin and Maksym G. Chepeliev, 'The Economic Consequences of Sir Robert Peel: A Quantitative Assessment of the Repeal of the Corn Laws', *Economic Journal* 131, no. 640 (2021): 3322–37, find that aggregate gains from the abolition of British Corn Laws in 1846 were negligible, because the United Kingdom, as a big country, suffered a negative terms of trade effect.

[71]Figures obtained assuming that imports mattered as much as exports and using the export shares in Table 2 and the following growth rates between 1815 (1811 for India) and 1913, expressed as a proportion of 1913 GDP pc: 72% in the US, 40% in Colonial Indonesia, and 8% in British India (Jutta Bolt and Jan Luiten van Zanden, 'Maddison Project Database').

[72]This figure is computed assuming that the gains from cotton as a share of GDP were the same for Europe and Britain (0.5%).

this measure, they were close to the total Indian gains (1.6% of GDP). British per capita GDP, however, was about seven and a half times that of British India; thus, the absolute gains were much greater in Britain than in India. This comparison highlights how the absolute size of gains could steeply increase with openness: in 1913, Britain exported 22.4% of its GDP, nearly twice as much as India (11.7%).[73] Openness was still greater in Egypt (29.2%), which gained as much as 5% of its GDP thanks to the integration of the world market for cotton alone. This gain is more than ten times greater than the corresponding figure for the United States (0.4%), which had a large domestic market and was the least open country in our sample (7.5%).

In brief, aggregate welfare gains, while unevenly distributed across products and places, were significant. Who obtained them? The next two sections answer this question, starting by looking at the distribution of gains between regions.

Distribution of gains between regions

The production of goods for export was geographically concentrated in all three producing countries (Table 1, column 7). In the United States in 1913, seven states, all in the south, each produced more than 5% of the total cotton output; their joint contribution was 90%. Wheat was grown in 32 American states, but the top seven states by output accounted for 60% of the total supply.[74] Tin in Indonesia was extracted from mines in Bangka and Belitung and other small islands off Sumatra's eastern coast.[75] In 1926, central and eastern Java produced almost all sugar and approximately half of the coffee, while Sumatra produced nearly all the remainder.[76] The supply of export crops was also fairly concentrated in British India.[77] The share of the largest state by output ranged from one-third for wheat, rice and cotton to almost nine-tenths for jute (Bengal). The shares of the two top states ranged from one-half for cotton to 96% for jute. However, these regional pockets of specialization were scattered across the subcontinent. As a result, the overall concentration was low: eight states produced more than 5% of the total output of the export crops we cover, and the most important of them, Bengal, did not reach a quarter of the total.

Figure 2 plots the estimated gains separately for the long run and the 'late globalization' period (1870–1913) by geographical unit as a share of GDP in 1913.[78] Cotton-producing states in the southern United States gained handsomely from market integration, especially in the long run: without market integration, South Carolina's GDP would have been 5.9% lower over the long run and 0.60% lower since 1870. Long-run gains close to 4% were also enjoyed by Alabama,

[73]Although at constant prices India's openness in 1913 increases to 15.4% and is actually greater than that of Colonial Indonesia (11.8%), for which we lack an estimate at current prices. These as well as the subsequent measures of openness are from the database by Giovanni Federico and Antonio Tena-Junguito, 'World Trade, 1800–1938: A New Synthesis', *Revista de Historia Económica-Journal of Iberian and Latin American Economic History* 37, no.1 (2019): 9–41.

[74]Data from the ATICS data-base, see Federico and Sharp, 'The Cost of Railroad Regulation'.

[75]Amarjit Kaur and Frits Diehl, 'Tin Miners and Tin Mining in Indonesia, 1850–1950', *Asian Studies Review* 20, no. 2 (1996): 95–120.

[76]It is likely that Java's share of coffee production was higher in 1913: from 1913 to 1926 Indonesian coffee production more than doubled, but in Java production stagnated between 1922 and 1926, see Brian Mitchell, *International Historical Statistics* (London: Palgrave Macmillan, 2013), 479; Centraal Kantoor voor de Statistiek, *Mededeelingen van het Centraal Kantoor voor de Statistiek: De Landbouwexportgewassen van Nederlandsch-Indie* [The Export crops of the Netherlands East Indies in 1926] (Batavia: G. Kolff & Co., 1926), 90.

[77]India Statistics Department, *Area and Yield of Rice, Wheat, Cotton, Oilseeds, Jute, Indigo, Sugar Cane for Various Periods from 1891–92 to 1902–03* (Calcutta: Office of the Superintendent of Government Printing, 1903), 30–38.

[78]Data on regional GDP for the United States in 1910 from Alexander Klein, 'New State-Level Estimates of Personal Income in the United States, 1880–1910', in *Research in Economic History* 29 (2013): 229–30; for India in 1910 from Caruana-Galizia, 'Indian Regional Income Inequality', 12; and for Colonial Indonesia in 1905 from Bosma and van Leeuwen, 'Regional Variation', 380. The regional distribution of Colonial Indonesia's GDP in 1920 was almost identical (the correlation coefficient is 0.995). British India's provinces and Colonial Indonesia's residencies have been aggregated into the smallest feasible regions to address discrepancies with the borders of the GDP figures.

(a) British India, 1815-1913
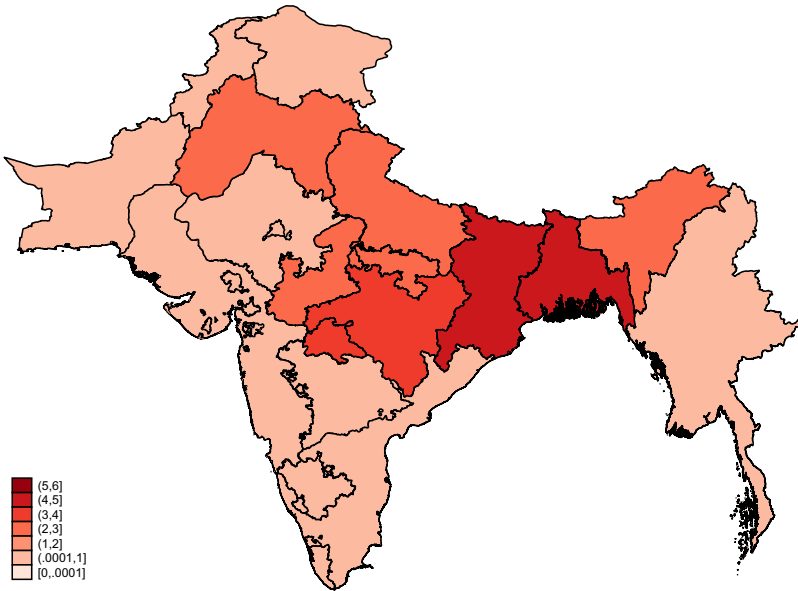
(b) British India, 1870-1913
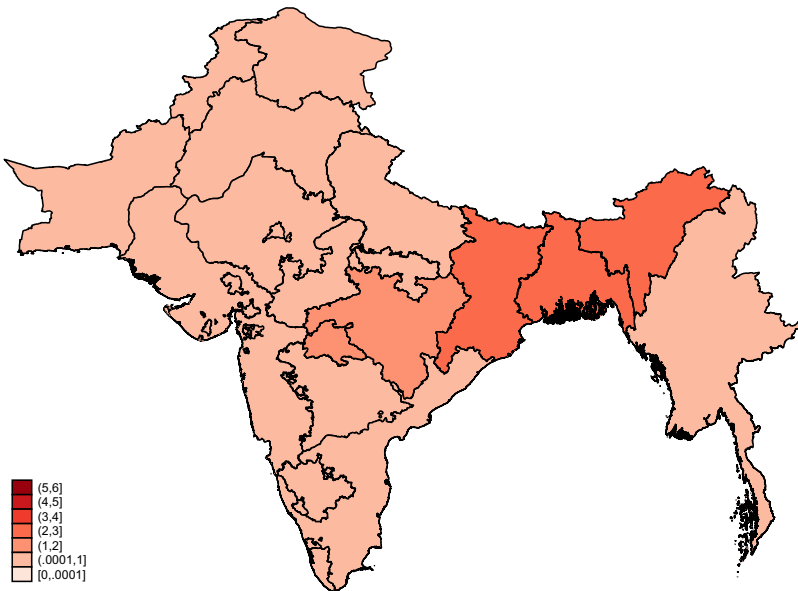
Figure 2. Welfare gains as share of regional GDP (%), 1815–1913.
*Source*: Table A6 in Appendix B.
Notes: all the figures have the same scale; thus, the results are directly comparable.

Mississippi, and Georgia. Such large profits are consistent with stable export cotton prices in the antebellum decades, given that productivity gains imply declining cotton production costs.[79]
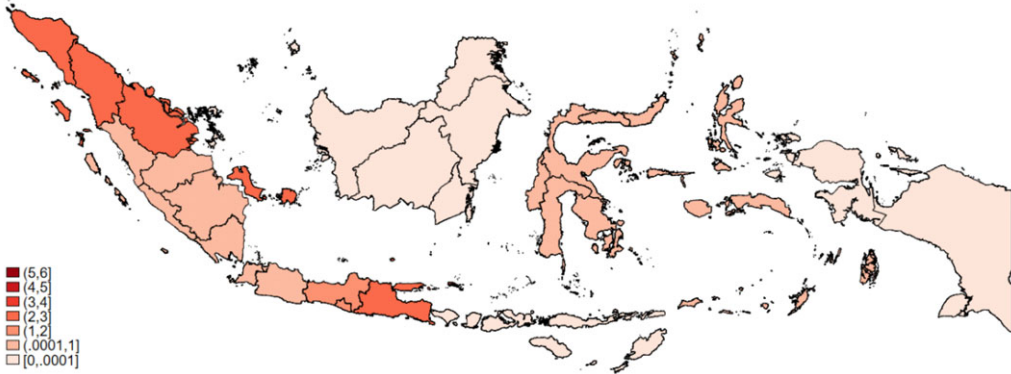
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[79]Olmstead and Rhode, 'Biological Innovation'.

(c) Colonial Indonesia, 1815-1913
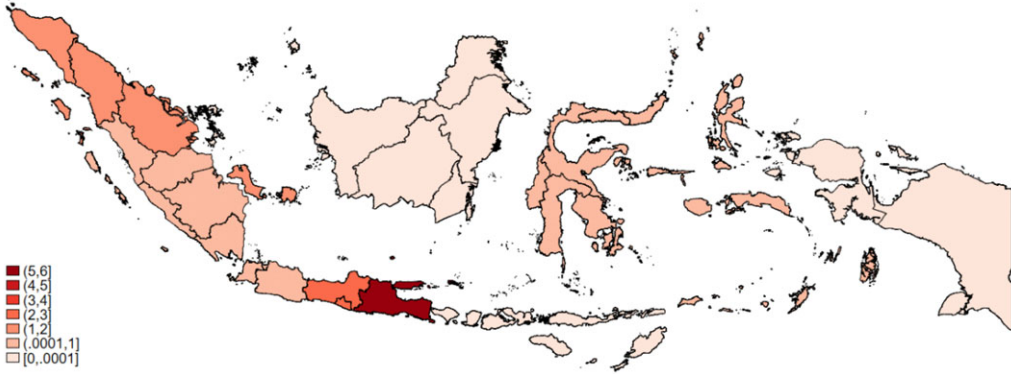
(d) Colonial Indonesia, 1870-1913

(e) United States, 1815-1913
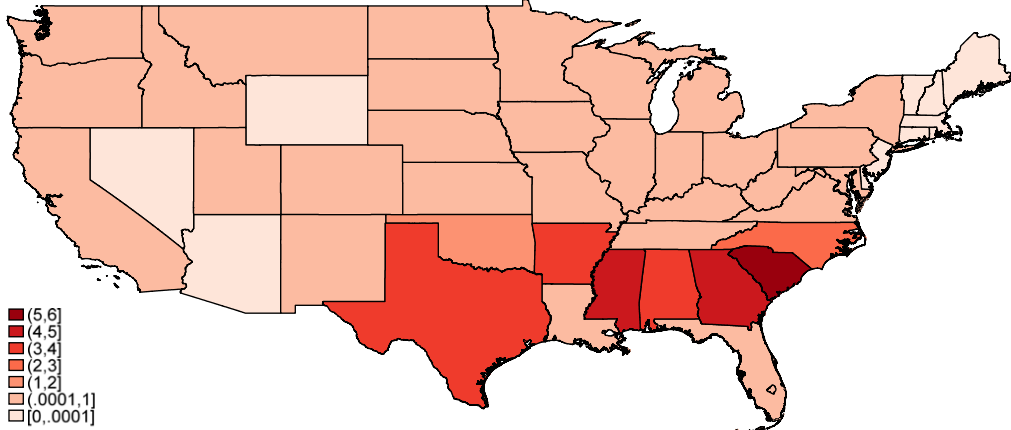
Figure 2. (Continued).

In contrast, the gains from wheat were rather small. The maximum was 0.2% in the long run for the Dakotas in the Midwest, which accounted for an unusually large share (13%) of American wheat production in 1913.

Turning to Colonial Indonesia, the outer islands gained little, except for north Sumatra, which included the tin-producing islands (with gains of 2.3% since 1870). Within Java, too, gains were very unbalanced, ranging from 0.8% in the west to 5.6% in the east. As stated in the previous
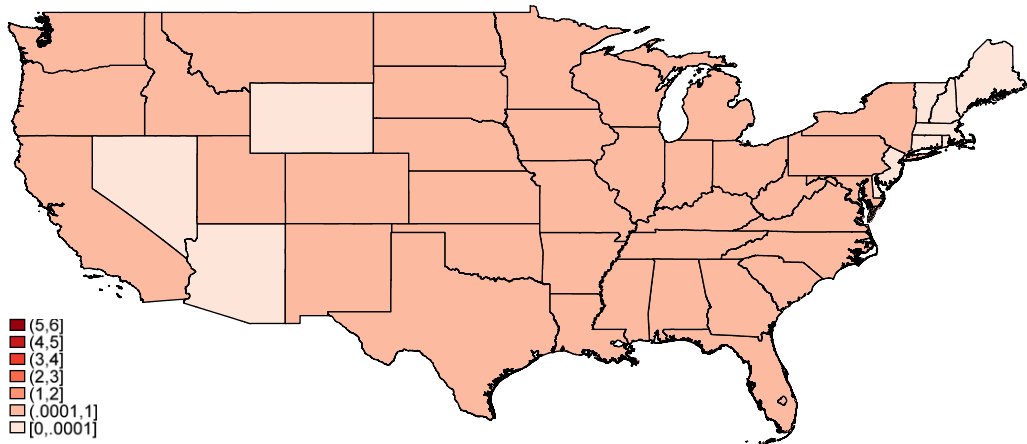
(f) United States, 1870-1913

Figure 2. (Continued).

section, Indonesian gains were mainly driven by sugar. Cane sugar had to compete with the rapid growth in the supply of beet sugar in the decades around 1850.[80] Yet, thanks to market integration, the export price of Java sugar held on—though it did not rise—until the mid-1880s. By then, there was no longer room for markets to further integrate and the price started declining (Figure A6 in Appendix B).[81] Admittedly, we have not been able to consider export products such as tobacco, mostly from Java, or oil, rubber or copra from the outer islands.[82] However, these products became relevant only quite late during our period.[83] Moreover, hardly any of the profits from oil were kept in the local economies.[84] Hence, while the inclusion of more products might mitigate the difference between Java and the outer islands somewhat, it is not expected to alter the conclusion that Java benefited the most from market integration, particularly over the long run.

Consistent with the wider range of products, gains for British India were regionally more diffuse than those for the other two countries but were nevertheless rather large in the northeastern states. All the provinces gained something, ranging from 0.08% in Mysore to 4.3% in Bihar and Bengal in the long run. The benefits of late globalization were smaller in general but remained rather significant in Bengal and Bihar (2.7%) and were nearly as high in Assam (2.6%), where most Indian tea came from.

To examine the effects of market integration on inequality between regions, Figure 3 compares the standard measure of dispersion of regional GDP pc, the (population weighted) coefficient of variation, with the counterfactual estimate without market integration around 1913. We obtain these counterfactual estimates by subtracting the regional gains from market integration: the difference from the actual level of dispersion can be interpreted as the effect of market integration on regional inequality.

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[80]George Hill and Reinhart Hugo Michael Langer, *Agricultural Plants* (Cambridge: Cambridge University Press, 1991), 197–9.

[81]International sugar prices declined in the 1880s in the wake of beet sugar protection policies in Europe, not least because the fall stimulated technical progress in cane sugar production, see Pierre van der Eng, *Agricultural Growth in Indonesia: Productivity Change and Policy Impact since 1880* (Houndmills: Palgrave Macmillan, 1996), 217–18.

[82]Louise Moore Coleman, *Tobacco Trade in the Netherlands and the Netherland East Indies no. 89* (Washington DC: US Government Printing Office, 1929), 9 and 39.

[83]In 1913, petroleum and tobacco were the two most important exports after sugar. Together, they accounted for 29% of exports, even more than sugar (23%). However, in 1870, tobacco accounted for less than 3% of exports and no petroleum was exported (Tables 6A and 6B in Korthals Altes, *Changing Economy*).

[84]Bosma and van Leeuwen, 'Regional Variation', 368.
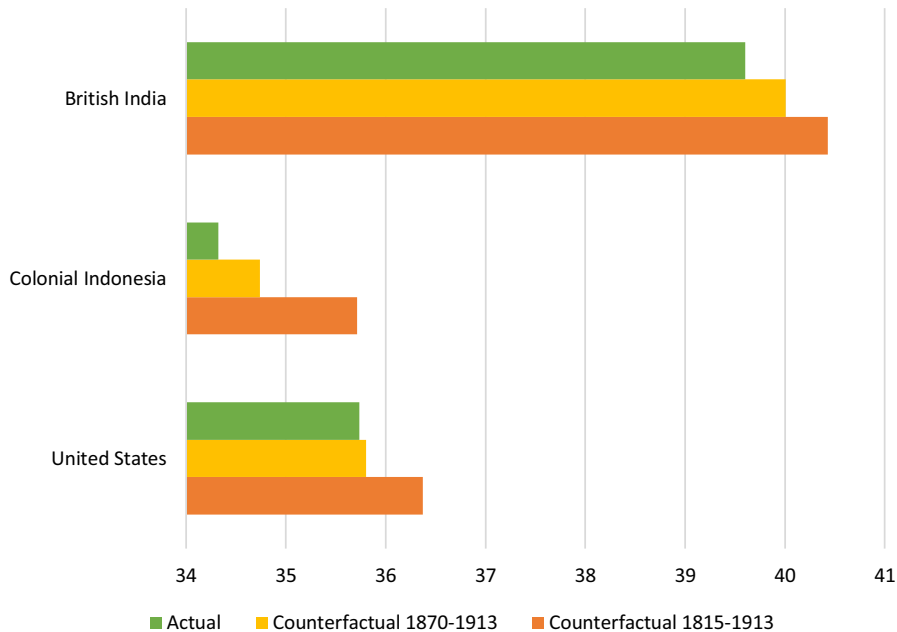
Figure 3. Changes in the regional dispersion of GDP in 1913 (%).
Source: Table A7 in Appendix B.
Note: Regional dispersion in GDP is measured with the (population-weighted) coefficient of variation (equal to the standard deviation divided by the mean).

Inequality between regions was particularly high in British India. In 1913, the GDP per capita of the richest region, Burma, was three and a half times that of the poorest, Bengal and Bihar. As we have just seen, Bengal and Bihar also happened to be the Indian provinces that benefited the most from market integration. Overall, the population-weighted coefficient of variation of regional GDP declined from 0.401 to 0.396 between 1875, the earliest available date, and 1911. Market integration accounted for almost three quarters of this very small change. Inequality between regions was also relatively pronounced in the United States, where average per capita production in the top five states (Dakota, California, Nevada, New York, and Washington) was more than three and half times greater than that in the five bottom states (South and North Carolina, Alabama, Mississippi, and Georgia), all located in the cotton-producing south. Thus, market integration of our products reduced inequality between regions there, too. However, it is not possible to precisely quantify its contribution to overall trends in inequality between regions: the effect of market integration was significant only in the long run and in the first decades of the nineteenth century GDP data by state are unavailable. In Colonial Indonesia, as in the other two countries, the main exporting areas (especially central and eastern Java) were poorer than the rest of the country. However, in contrast to the situation in British India, the gap widened after 1870: the (population-weighted) coefficient of variation in regional GDP per capita increased from 0.234 in 1870 to 0.342 in 1904. Therefore, in this case, market integration mitigated the increase in inequality between regions rather than contributed to its fall.[85]

In summary, we discovered a common pattern whereby the spatial distribution of the welfare gains from globalization was uneven within countries, with large gains for the regions producing agricultural commodities for the world market. Since the regions producing export crops tended

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[85]While north Sumatra was comparatively rich, the tin-producing islands which generated most of the gains we measure, were poor; see Bosma and van Leeuwen, 'Regional Variation', 370. Hence, there is evidence that within-region spatial inequality was also mitigated by market integration.

to be poorer than the rest, inequality between regions was significantly mitigated by these static gains. What about inequality within regions?

Distribution of gains within regions

We measure the effects of market integration on income inequality *within* regions by comparing actual inequality outcomes with the counterfactual inequality levels in the absence of market integration. We compute these counterfactual measures after distributing gains among income groups. We rely on standard measures of income inequality: the labour income share, the Gini coefficient and the top 1% income share. Available sources make it possible to compute counterfactual distributions of income only in the cotton-producing states of the United States and Java, which nevertheless accounted for respectively 83% and 94% of the gains that we estimate for these countries. Unfortunately, there are no suitable social tables for India: the available tables are distant in time, distinguish too few groups and refer to the whole country rather than India's export areas.[86]

We distribute gains from the integration of global cotton (and wheat) markets in the southern United States with the factor shares implied by DeCanio's Cobb–Douglass agricultural production function, using the marginal productivities of labour as estimates of actual labour income shares.[87] In so doing, we exploit a well-known result in economics.[88] The producer's surplus and, therefore, welfare gains would accrue to landowners under both the 'Marshallian' and 'Ricardian' approaches described above, since they owned almost all of the capital invested. Most gains preceded emancipation (Figure 2e and 2f).[89] Thus, it is highly implausible that labourers shared in the gains to any significant extent.[90] It follows that the labour income share in agriculture declined because of market integration. Comparing actual and counterfactual labour income shares (Figure 4) allows us to estimate the size of these losses.[91]

A striking feature of the figure is how low agricultural labour income shares were in the southern United States. The standard textbook figure of the labour income share, which matches

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[86]The social tables by Angus Maddison are distant in time (1750 and 1947), very aggregate (only eight groups) and, above all, refer to all of British India rather than to production areas, see Angus Maddison, *Class Structure and Economic Growth: India and Pakistan since the Moghuls* (New York: W.W. Norton, 1971). This aggregation issue applies also to the social tables produced by Roy, which include only six groups (in 1875 and 1895), the old quasi-social table reconstructed by Atkinson and the recent article by Alvarado et al., which considers only the top 0.1% of incomes, see Roy, *Inequality in Colonial India*, 23; Fred J. Atkinson, 'A Statistical Review of the Income and Wealth of British India', *Journal of the Royal Statistical Society* 65, no. 2 (1902): 209–83; Facundo Alvarado, Augustin Bergeron, and Guilhem Cassan, 'Income Concentration in British India, 1885–1947', *Journal of Development Economics* 127 (2017): 459–69.

[87]Stephen DeCanio, *Agriculture in the Post Bellum South: The Economics of Production and Supply* (Cambridge, MA: MIT Press, 1974), 168.

[88]The underlying assumption of competitive labour markets is arguably reasonable after the Civil War, see DeCanio, *Agriculture*, 10–13. If employers enjoyed market power, the labour income shares would be even lower than implied by our figures.

[89]See also Chilosi and Federico, 'Early Globalizations', 5.

[90]According to data underlying Table 5.2 in Lindert and Williamson, *Unequal Gains*, https://gpih.ucdavis.edu/tables.htm, on average, enslaved workers in southern states retained approximately 70 dollars per year, while free workers in all sectors (and including skilled workers) earned 330 dollars.

[91]Agricultural value added figures are needed to convert gains (in $) into shares of agricultural income and thus compute their counterfactual labour income shares. The data are from the same source that we use for American states' GDP, see Klein, 'New State-Level Estimates', 231–2. The source reports 'agriculture service income' by state, which includes wages, salaries, and proprietor's income, but not rental income, which is included under 'proprietor income', together with personal-interest and dividend income. Nevertheless, comparison with national figures shows that 'agriculture service income' captures the lion's share of the agricultural value added, 97.4% of it to be precise, see Alessandro Nuvolari and Emanuele Russo, 'Technical Progress and Structural Change: A Long-Term View', in *New Perspectives on Structural Change: Causes and Consequences of Structural Change in the Global Economy*, ed. Neil Foster-McGregor, Ludovico Alcorta, Adam Szirmai, and Bart Verspagen, (Oxford: Oxford University Press, 2021), 347–77. The remainder is distributed across states weighted by their share of agricultural workers.
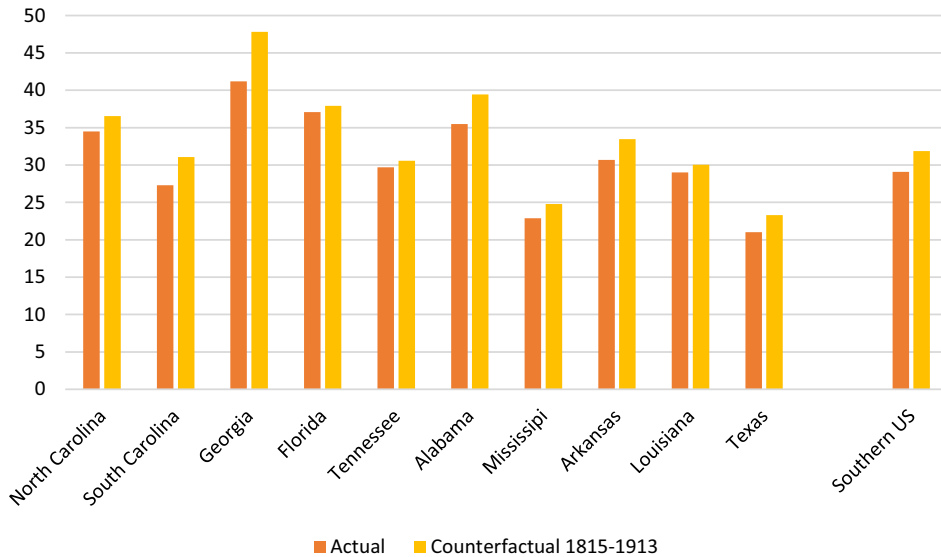
Figure 4. Changes in the labour income share of agricultural GDP in 1913 within the American southern states (%).
Source: Table A8 in Appendix B.
Note: Aggregate figures for the southern United States are simply averages weighted by the share of agricultural value added. We report only long-term results, as gains after 1870 were very small (Figure 2d).

post-World War II US data, is 66%.[92] In contrast, the highest share in Georgia was just over 40% and the lowest in Texas was nearly half of that. Market integration helps to explain this anomaly: the labour income share would have been significantly higher in the absence of integration: 2.76 percentage points in the southern US as a whole and up to a maximum difference of 6.63 percentage points in Georgia. Lindert and Wiliamson detected particularly high increases in inequality and property income shares in the American south, during the antebellum decades.[93] Our results suggest that market integration was a significant contributor to these trends.

Our estimate of the distribution of gains for Java relies on the 1924 social table reconstructed by Booth.[94] We assumed these data to be representative of the distribution in 1913, as the effect of the First World War on income distribution was likely small in a colony of a neutral country.[95] On the island, coffee trees were grown in plantations and sugar was produced in modern 'factories'.[96] Canes quickly lose their sugar content and thus must be processed within two days after harvest. In the late nineteenth century, sugar plantations, called 'factories' in Java and 'centrales' in Cuba,

[92]Charles I. Jones, 'The Facts of Economic Growth', in *Handbook of Macroeconomics*, vol. 2, ed. John B. Taylor and Harald Uhlig (Amsterdam: Elsevier, 2016), 14.

[93]Lindert and Williamson, *Unequal Gains*, 117–8.

[94]Anne Booth, 'Living Standards and the Distribution of Income in Colonial Indonesia: A Review of the Evidence', *Journal of Southeast Asian Studies* 19, no 2 (1988): 325.

[95]Milanovic et al. find a decline in the Gini coefficient from 38.9% in 1880 to 31.8% in 1924, see Branko Milanovic, Peter H. Lindert, and Jeffrey G. Williamson, 'Pre-industrial Inequality', *Economic Journal* 121, no. 551 (2011): 263. This trend could also be related to the after effect of the final demise of the Cultivation System, but unfortunately it is not possible to check this hypothesis as the 1880 table they use only identifies groups by income brackets and not by economic group (small landowners etc.), see Jan Luiten van Zanden, 'Rich and Poor before the Industrial Revolution: A Comparison between Java and the Netherlands at the Beginning of the 19th Century', *Explorations in Economic History* 40, no.1 (2003): 1–23. The Gini coefficients from de Zwart, based on tax records, indicate an even higher level of inequality in the 1920s than our source, see de Zwart, 'Inequality in Late Colonial Indonesia'.

[96]Javanese peasants accounted for less than 1% of the production of sugarcane and did not produce coffee. In contrast, nearly 90% of coffee from the outer islands was produced by natives, see Centraal Kantoor voor de Statistiek, *Mededeelingen*, 4–5.

were integrated with modern steam-powered processing plants with internal railways to transport the cane as quickly as possible.[97] In our baseline estimation, we assumed that all gains accrued to owners of sugar factories or coffee plantations. Eighteen of the approximately 190 factories operating in 1908 were owned by Chinese capitalists, while the rest belonged to Europeans.[98] We therefore allocate 9% of the sugar's gains to 'Asiatic foreigners' and 91% to 'Europeans'.

Both counterfactual measures (Figure 5) imply that inequality in Java would have been lower in 1913 without market integration.[99] The increase in inequality is particularly pronounced if one measures income distribution with the share of the top 1% of incomes.[100] Europeans living in Java accounted for nearly half of the total income in this category and were the main beneficiaries of any increase in the profits of plantations. Europeans were very few, accounting for a mere 0.18% of the population, and benefitted greatly from market integration; in its absence, their income per capita would have been 34% lower in the long run and 17% lower since 1870. There were twice as many 'Asiatic foreigners' as Europeans living in Java. These individuals were the second richest group, but with a significant difference: their income per capita was seven times lower than that of Europeans. Consequently, even if Chinese capitalists owned only a small share of sugar factories, their gains were rather significant: 12% of income per capita in the long run and half of that since 1870.

This baseline 'Marshallian' estimate implicitly assumes that the 'big' sugar producers received all rents from plantation estates and that there were no other fixed factors (i.e. factors of production the availability of which cannot be changed easily).[101] Both assumptions are questionable. Planters did not own the land that they allocated to crop production. They leased about half of the land directly from peasants who had been granted collective ownership by the Agricultural Law of 1870. Alternatively, factories made agreements with indigenous rulers or obtained land from the government with 75-year-long leases.[102] In addition, to function, sugar factories relied on the engineering skills of specialized European workers. We thus add to the list of beneficiaries from market integration the European staff of 'factories', the government (and thus ultimately the civil servants who were paid with state revenues), and Javanese peasants.[103] We implicitly assumed that European human capital and peasants' land had no alternative uses and thus their returns depended exclusively on sales of sugar. This assumption is highly plausible for specialized European workers and is also an acceptable simplification for Javanese land. Peasants grew rice for subsistence in rotation with cane on the rest of their farms and there was no obvious alternative crop. Furthermore, the market for land was not competitive. Peasants could only lease land to the local sugar factory and contracts were often managed by village headmen and other

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[97]Knight, *Commodities and Colonialism*; Alan Dye, *Cuban Sugar in the Age of Mass Production: Technology and the Economics of the Sugar Central* (Stanford: Stanford University Press, 1998).

[98]Wiseman, 'Three Crises', 66; Knight, *Commodities and Colonialism*.

[99]European owners included some Dutch banks that had rescued local capitalists after the crisis of the 1880s. Considering that the Dutch banks' profits left the island would trim the baseline long-run rise in the top 1% share of 3.73% by about half a percentage point.

[100]Even with the Gini coefficient, the increase in inequality would have been sufficiently large to wipe out nearly all welfare gains from market integration, using Sen's approach of computing real national income as average income* (1-Gini coefficient), see Amartya Sen, 'Real National Income', *Review of Economic Studies* 43, no. 1 (1976): 19–39. Thanks to market integration, Java's real national income would increase by 0.21% (vs. 3.05% under the baseline) in 1815–1913 and by 0.07% (vs. 1.51%) in 1870–1913.

[101]We cannot estimate the revised model for coffee for lack of information. In any event, gains from coffee were small and thus their omission does not affect the macroeconomic results.

[102]Van der Eng, *Agricultural Growth*, 212; Ulbe Bosma, *The Sugar Plantation in India and Indonesia: Industrial Production, 1770–2010* (Cambridge: Cambridge University Press, 2013). These long leases were also introduced by the 1870 Agricultural Law. As government land was not irrigated, in such cases factories constructed their own irrigation systems.

[103]While native landowners of medium or large farms could have also benefited, allocating the gains to small landowners is a conservative choice since it biases the results against our finding that market integration increased inequality.
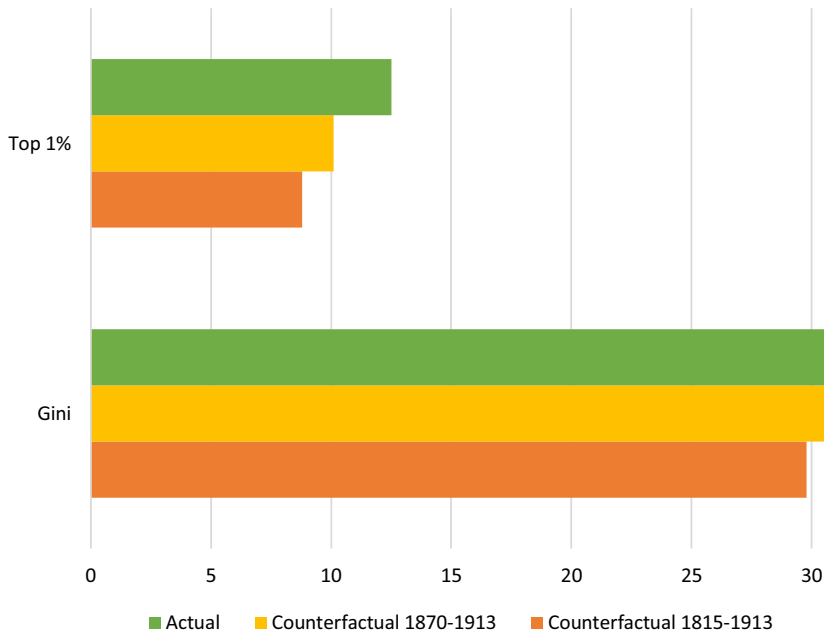
Figure 5. Changes in the distribution of GDP within Java (%).
Source: Table A9 in Appendix B.

members of the local elite.[104] We thus allocate, somewhat crudely, 60% of the total gains to small landowners, 20% to the local elite and 20% to government/civil servants. Any violation of the assumption of asset specificity would imply a bias in favour of Javanese landowners and specialized labour in the overall distribution of the gains. Thus, the actual distribution would be closer to our baseline estimates.

These 'Ricardian' extensions to the baseline model imply opposite effects of the increase in production from market integration. Europeans were paid more than natives, and therefore any increase in their number augmented overall inequality. In contrast, increased rents reduced inequality, particularly because we assign most gains to relatively poor small landowners. In 1926, the year of the social table, sugar factories used 179,677 hectares of land and paid 94.3 guilders per hectare as rent.[105] This sum amounted to only approximately 10% of the total producer's surplus, suggesting that plantations very effectively exploited their monopsonistic power vis-à-vis the peasants.[106] Over the long run, without market integration, each peasant renting her land would have lost approximately 3 guilders a year, corresponding to nearly 12% of the average income of a small landowner, according to the social table. This source of income was open only to about one peasant household out of ten, assuming that there were as many peasants renting their land as sugar cultivators.[107] We compute the no-market integration counterfactual income of European

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[104]Bosma, *The Sugar Plantation in India*, 119; Knight, *Commodities and Colonialism*, 157.

[105]Centraal Kantoor voor de Statistiek, *Mededeelingen*, 32; Knight, *Commodities and Colonialism*, 249. We prefer to use the data for the mid-1920s to avoid having to deflate incomes from the social table. Between 1910 and 1920, the land under sugar cultivation increased, but not that much: from 4% to 5% of irrigated land in Java, see van der Eng, *Agricultural Growth*, 212.

[106]The high mark-up enjoyed by plantations renting land allows us to understand why the income distribution in Indonesian residencies with a high share of land cultivated by plantations tended to be particularly unequal, even if the possibility of renting land to sugar factories strengthened peasant communal ownership and thus reduced land inequality; see de Zwart, 'Globalisation, Inequality and Institutions'; Pim de Zwart and Phylicia Soekhradj, 'Sweet Equality: Sugar, Property Rights, and Land Distribution in Colonial Java', *Explorations in Economic History* 88 (2023).

[107]Booth, 'Living Standards', 325; Bosma, *The Sugar Plantation in India*, 159.

staff by assuming that their population was proportional to the production of sugar.[108] Without market integration, sugar output would have been 29% lower over the long run and 16% lower since 1870; the total income of European residents would have been 5% and 2% lower, respectively. Factoring in both effects in the counterfactual computations yields results very close to the baseline: the counterfactual 1% top income share becomes 8.8% in the long run and 10% since 1870, as compared to baseline values of 8.8% and 10.1% and to an actual share of 12.6%.

Last but not least, we drop the assumption that labour was perfectly mobile—i.e. that additional demand in cane cutting and factories was fully met by immigration, with no increase in local wages. Even if the cane harvest attracted a substantial number of workers from other islands,[109] immigration might not be sufficient. Indeed, the demand for labour was very strong: in the mid-1920s, when the sugar industry was in full bloom, it employed a total of 1 million cultivators, 250,000 cane cutters and 150,000 factory workers[110] out of 4,217,247 agricultural labourers and 1,240,296 'workers in Chinese and European enterprises'.[111] In this 'Keynesian' extension, if the market for labour were imperfect, some gains would have trickled down to local workers. Assuming, conservatively, an elasticity of wage with respect to the labour supply of −0.04,[112] the increased sugar production due to market integration would have pushed up the wages of 'workers in Chinese and European enterprises' by 0.38% and of 'agricultural labourers' by 0.28%.[113] Even in this somewhat unrealistic lower-bound hypothesis, market integration benefitted mainly 'big sugar' and significantly increased inequality between income groups on the island.

Conclusion

This article generated new quantitative evidence on the effects of the 'first globalization' on welfare and inequality within countries exporting agricultural products. We employed a novel approach, bridging gaps between the literature on inequality and that on market integration. We began by estimating the welfare gains of three major exporters of primary products, namely, British India, Colonial Indonesia, and the United States, from the increase in commodity prices caused by the integration of global markets of a representative sample of eleven different agricultural commodities. We confirmed that the gains were substantial and were particularly large for cash crops, such as Java sugar and American cotton. Our aggregate estimates omit gains from other trade flows, but their size suggests that transoceanic market integration contributed significantly to economic growth in the two Asian colonies. The effect was particularly large in Colonial Indonesia, which also grew faster than British India. The economic significance of market integration was not as marked for the United States, which was less open but experienced much higher rates of economic growth than the other two countries. These results are in line with those of our earlier study.[114]

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[108]The cost of 'factory staff', both in 1924 and in 1926, was 0.66 guilder per quintal of sugar, see Knight, *Commodities and Colonialism*, 249. In 1926, the total production of Java sugar was 20,010,420 quintals, see Centraal Kantoor voor de Statistiek, *Mededeelingen*, 4–5. At around the same time, there were 3,640 technicians—approximately 5% of the staff, see Wiseman, 'Three Crises', 415–16. Hence, each of them earned 3,628 guilders a year, three quarters more than the average European resident according to Booth's social table, see Booth, 'Living Standards', 325.

[109]Bosma, *The Sugar Plantation in India*, 177.

[110]Bosma, *The Sugar Plantation in India*, 159.

[111]Bosma, *The Sugar Plantation in India*; Booth, 'Living Standards', 325.

[112]Brent Bratsberg, Oddbjorn Raaum, Marianne Røed, and Pal Schøne, 'Immigration Wage Effects by Origin', *Scandinavian Journal of Economics* 116, no. 2 (2014): 375.

[113]The figure is obtained by multiplying the increase in production from market integration (29%) by the elasticity (0.04) and by the share of agricultural and industrial workers (respectively 24% and 32%).

[114]Chilosi and Federico, 'The Effects of Market Integration'.

Subsequently, we analysed how the 'cake' was divided between and within regions. As production tended to be spatially concentrated, gains were unevenly spread, reaching as much as nearly 6% of GDP in some regions with large exports. The effects on inequality between regions conformed to a shared pattern: since the regions producing export crops tended to be poorer than the rest of their countries, the growth of global markets for our primary products, far from promoting regional divergence within their producing countries, acted as a leveller. We covered most agricultural exports; thus, it seems unlikely that extending the coverage of traded commodities would alter our main conclusion. We neglected to consider that merchants rather than producers might have seized some of the gains. However, the producing areas tended to be export hubs as well. Moreover, the lion's share of the gains came from crops cultivated on large plantations, which likely obtained favourable conditions from intermediaries. Future research could investigate the extent to which our results are robust after considering globalization's dynamic effects on investment and technology, which we are unable to capture with the approach we adopted here.

Our analysis of inequality within regions showed that, both in the American south and Java, plantation owners were the main winners. As a consequence, market integration significantly contributed to exacerbating the inequality of their income distributions. Without the integration of the global cotton market, in the southern United States, the agricultural labour income share would have been nearly 3 percentage points higher. In the absence of the integration of sugar and coffee global markets, in Java, the income of European expatriates would have been as much as a third lower; the concentration of income at the top, as measured by the top 1% income share, would have been 4 percentage points lower. In Java, owing to relatively abundant data, we were able to show that our results are robust to several relaxations of our baseline assumption that profit-earners were the only recipients of the producer's surplus. We allowed other stakeholders, including peasants renting out land to plantations, specialized managers or technicians and other plantation workers to share in the gains. The baseline conclusion remained robust: the predominance of plantation agriculture in the cultivation of export crops meant that market integration significantly increased income inequality. This finding aligns well with the recent emphasis in the literature on the key role of land ownership and land use in mediating the effects of globalization on income inequality.[115]

Our article also contributed methodologically to the global history literature. We developed a new microeconomic model to estimate aggregate gains from market integration. This model is easy to apply because it requires relatively little data.[116] Combining our aggregate gains with data on the distribution of production and income between and within regions, we developed a new approach to study a paradigmatic global history question: how was the income distribution of agricultural exporters affected by uneven interactions with the global economy during the 'long nineteenth century'?

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[115]de Zwart, 'Globalisation, Inequality and Institutions'; de Zwart, 'Inequality in Late Colonial Indonesia'.

[116]Thus, new evidence on trends of market integration that could be used to these ends are emerging from the Ottoman Empire, see Laura Panza, 'From a Common Empire to Colonial Rule: Commodity Market Disintegration in the Near East', *Economic History Review* (2023), doi.org/10.1111/ehr.13281; Nektarios Aslanidis, Oscar Martinez, and Federico Tadei, 'The Integration of West Africa in The Global Economy, 1842–1938', ECO & ECO-SOS Working Paper 03 (2020).

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Giovanni Federico is an economic historian, with a strong emphasis on data-intensive quantitative work. He started his academic career studying modern Italian economic growth and he is still working on Italian issues (most recently the North–South divide). Later he developed an interest in global and comparative history. He has written books on the silk industry and world agriculture since 1800. He has published several articles on market integration, trade, industrial and agricultural policy, as well as on the development of economic history. He has co-built the Federico-Tena World Trade Historical Database, with series of trade by country from 1800 to 1938.