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What about the race between education and technology in the Global South? Comparing skill premiums in colonial Africa and Asia

Ewout Frankema[1] | **Marlous van Waijenburg**[2]

[1]Wageningen University

[2]Harvard Business School

Correspondence
Marlous Van Waijenburg
Email: mvanwaijenburg@hbs.edu

Abstract

Historical research on the race between education and technology has focused on the West but barely touched upon 'the rest'. A new occupational wage database for 50 African and Asian economies allows us to compare long-run patterns in skill premiums across the colonial and post-colonial eras (*c.* 1870–2010). Our data reveal three major patterns. First, skilled labour was considerably more expensive in colonial Africa and Asia than in pre-industrial Europe. Second, skill premiums were distinctly higher in Africa than in Asia. Third, in both regions, skill premiums fell dramatically over the course of the twentieth century, ultimately converging to levels long observed in the West. Our paper takes a first step to explain both the origins of the Africa–Asia gap and the drivers of global skill premium convergence, paying special attention to the colonial context that shaped demand, supply, and labour market institutions.

KEYWORDS

Africa, Asia, education, human capital, skill premiums, wage differentials

JEL CLASSIFICATION

J24, J31, N35, N37

The historical co-evolution of technology, schooling, and labour market institutions, also known as the 'race between education and technology', is a central theme in the literature on modern economic growth and inequality.[1] To study the dynamics of this 'race', scholars have composed large datasets on wage structures for the deep and more recent pasts.[2] Skill premiums, defined as the relative price of skilled versus unskilled labour, are a key indicator of the adaptive (in)efficiency of labour markets and, more broadly, of the capacity of societies to accumulate workers' skills that complement production technologies and enable technical innovation. While long-run trends in skill premiums are thus of great importance for the study of comparative economic development, the academic literature shows a major imbalance in the attention devoted to the 'West' relative to the 'rest'.

Our study addresses this void by introducing a new database on long-term skill premiums for 34 African and 16 Asian economies, spanning most of the colonial and post-colonial eras (*c.* 1870–2010).[3] Our series extend the time horizon of post-war occupational wage data from the International Labour Organization (ILO)[4] by linking the latter to wage series from a range of colonial sources. Our century-spanning series reveal three overarching patterns that have so far gone unnoticed. First, until the start and during the initial phases of the rise of formal mass education, skilled artisanal and white-collar labour in Africa and Asia was far more expensive than it had been in pre-industrial Europe. Second, around 1900, skilled labour was distinctly more expensive in Africa than in Asia; a difference that we hereafter will refer to as the Africa–Asia gap. Third, both regions witnessed a dramatic fall in skill premiums over the course of the twentieth century, ultimately converging to levels long observed in the West. While the timing and extent of this decline varied, the pattern itself was universal.

These three insights raise a series of questions about the dynamics of the race between education and technology in two major non-Western world regions, including, but not confined to: Why was skilled labour so expensive in Africa and Asia? Was the Africa–Asia gap the result of a differentially felt technology shock during colonial rule, or did it predate colonial times? And why did skill premiums converge so rapidly over the course of the twentieth century? Developing an analytical framework to study the interaction between education and technology in a colonial setting, we formulate tentative answers to these questions, which can serve as guiding hypotheses for a research agenda that extends beyond the scope of this article.

I | WESTERN PERSPECTIVES ON LONG-TERM HUMAN CAPITAL ACCUMULATION

Modern economic growth is characterized by a long, sustained rise in labour productivity propelled by the powerful feedback loops between human skills, knowledge, and production technologies. Technological change creates new demands for skilled labour, while changing supplies of skilled labour as a result of educational expansion spur technological innovation. The sustained economic growth that has been recorded for the West for more than two centuries since

[1] Goldin and Katz, *The race*, pp. 1–8.

[2] Allen, 'European wages'; Kunst, Freeman and Oostendorp, 'Occupational skill premia'; van Zanden, 'Skill-premium'.

[3] Colonial Africa in this paper refers to Africa south of the Sahara, excluding the (autonomous) Republic of South Africa. Colonial Asia refers to southern and eastern Asia, excluding central and western Asia. We refer to present-day boundaries of countries for periods in which these did not yet exist.

[4] Kunst, Freeman, and Oostendorp, 'Occupational skill premia'.

the industrial revolution would have been impossible without large-scale accumulation of human capital.[5]

The idea of a 'race' between education and technology was first formulated by Tinbergen,[6] but has been analysed in its most elaborate form by Goldin and Katz for the US economy.[7] In their study of the United States' 'human capital century', Goldin and Katz argue that the formal, school-based education system that grew in the nineteenth century laid the foundation for US technological leadership in the twentieth century by supplying the economy with a large pool of workers possessing flexible, multi-purpose skills. This basis, in turn, allowed for a smooth adaptation of the labour market to the rapidly widening demand for specialized production skills.[8] They also demonstrate that up to 1980, the expansion and deepening of education systems kept pace with rising and changing demand for high-skilled workers, thus suppressing wage dispersion while boosting broad-based welfare growth. After 1980, however, a slowdown in labour productivity and educational investments resulted in rising income inequalities, partly driven by growing gaps in wages and salaries between the lower and the higher educated segments of the US labour force.[9]

Comparatively rich historical sources for the West have also allowed economic historians to trace various aspects of human capital accumulation centuries back in time. There are sizeable literatures on the European origins of mass education[10]; on the importance of literacy, guilds, craftsmen, and 'enlightened' scientists in the run-up to the British industrial revolution[11]; on the role of different education systems in the 'productivity race' between Britain, the United States, and Germany from the 1850s to the 1990s[12]; on the ways in which wage differentials and migrants' educational backgrounds shaped the age of mass migration;[13] and on the significance of long-term trends in the relative price of skilled labour.[14]

To analyse skill premium trends over the very long run, economic historians have mostly focused on the wages of carpenters or other artisans employed in the building trades, assuming that the associated skill sets remained relatively constant over time. Figure 1 illustrates this approach, showing the average carpenter premium in Britain for the period 1250–2000. After a notable decline in the aftermath of the Black Death, the carpenter premium hovered between 40 per cent and 60 per cent of an unskilled worker's wage for about five centuries. This remarkable stability suggests that British apprenticeship systems were effective in forging a long-run price equilibrium for artisanal skills – an equilibrium that was also not immediately affected by the onset of modern economic growth. Similar stable skill premiums have been found for larger parts

[5] Acemoglu, 'Technical change'; Galor, *Unified growth theory*; Mankiw, Romer, and Weil, 'Empirics of economic growth'; Romer, 'Increasing returns'.

[6] Tinbergen, 'Substitution'; idem, *Income distribution*.

[7] Goldin and Katz, 'Origins'; eisdem, *The race*.

[8] Goldin and Katz, *The race,* p. 29 and ch. 1.

[9] Ibid., ch. 2.

[10] Boli, Ramirez, and Meyer, 'Explaining the origins'; Lindert, *Growing public*, ch. 5.

[11] Epstein and Prak, *Guilds*; Mokyr, *The enlightened economy*; Ogilvie, *The European guilds*; de Pleijt and van Zanden, 'Accounting'.

[12] Broadberry, *The productivity race*, pp. 110–18; O'Mahoney, Wagner, and Paulsen, 'Changing fortunes'.

[13] Abramitzky, Boustan, and Eriksson, 'A nation of immigrants'; Betrán and Pons, 'Skilled and unskilled'; Hatton and Williamson, *The age of mass migration*.

[14] Allen, 'European wages'; Clark, *A farewell*, p. 180; van Zanden, 'Skill-premium'.

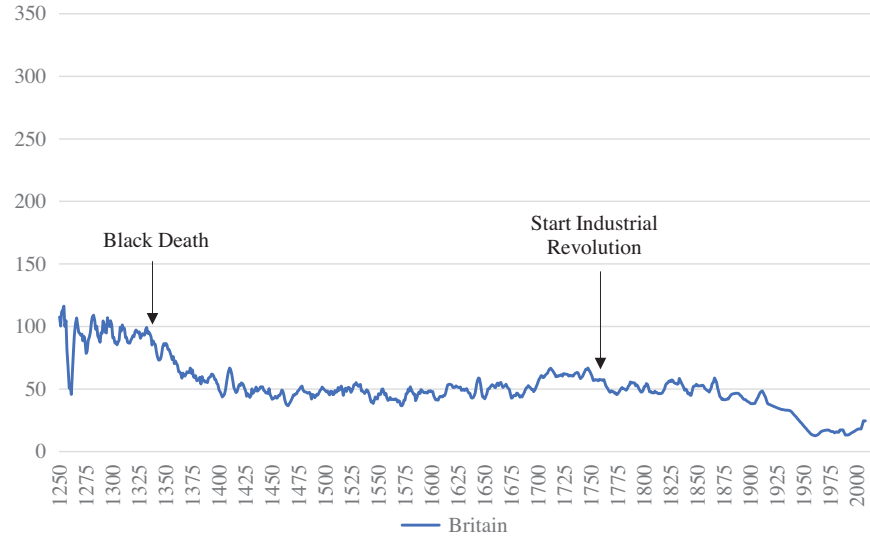

FIGURE 1 Wage premium of British carpenters as percentage of unskilled worker's wage, *c.* 1250–2000 (five-year average, in per cent). *Sources*: Allen, 'European wages'. Wages after 1913 were taken from the ILO's occupational wage data series. *Notes*: Series are shown as five-year moving averages. We interpolated missing years on the basis of a linear trend
[Colour figure can be viewed at wileyonlinelibrary.com]

of pe-industrial continental Europe, even though differences existed between western and central Europe (approximately 40–60 per cent), southern Europe (approximately 60–80 per cent), and eastern Europe (approximately 60–100 per cent).[15]

Although the efficiency of early modern European apprenticeships has been widely recognized[16] – and partly contested[17] – such pre-industrial systems of intergenerational skill transmission were certainly not unique to Europe. In many commercialized parts of medieval and early modern Asia[18] and western Africa,[19] institutionalized transfers of specific (artisanal) skills occurred beyond the inner circles of extended families as well. Nonetheless, our understanding of these older systems of skill transmission and their effects on markets for skilled labour has remained extremely thin. Moreover, the role of colonialism, which confronted many African and Asian societies with a sudden influx of foreign technologies and practices related to the first and second industrial revolutions, has rarely been the subject of systematic comparative historical research.[20]

[15] van Zanden, 'Skill-premium', p. 127.

[16] de la Croix, Doepke, and Mokyr, 'Clans, guilds'; Epstein and Prak, *Guilds*; Minns and Wallis, 'The price of human capital'; Mokyr, 'The economics of apprenticeships'; Zeev, Mokyr, and van der Beek, 'Flexible supply'.

[17] Ogilvie, *The European guilds.*

[18] Moll-Murata, 'Chinese guilds'; Nagata, 'Brotherhoods'; Roy, 'The guild in modern South Asia'.

[19] McNaughton, *The Mande blacksmiths*; Tamari, 'Caste systems in West Africa'.

[20] This imbalance partly reflects the preponderance of nationally oriented research agendas among Western scholars and the greater availability of fine-grained historical sources. But the preoccupation with the Western experience may also reflect a broader tendency to focus on cases of 'economic success', which are easier and more rewarding to explain in hindsight than the diffuse contributions of human capital accumulation to growth in the Global South; see for example Pritchett, 'Where has all the education gone?'.

This article takes two steps towards uncovering the historical patterns of the race between education and technology in the Global South. First, we develop an analytical framework that captures the colonial context in which a critical part of the race unfolded. Colonialism matters because it had a distinctly transformative impact on all three core factors of the race: (1) the technology regimes,[21] (2) the education systems, and (3) the institutions that governed local labour markets. Second, we introduce the Africa–Asia Occupational Wage Database (AAOWD), which greatly extends the geographic and temporal scope of existing databases. Our emphasis on Africa and Asia – and the exclusion of Latin America and the Caribbean – allows us to zoom in on the second wave of imperialism, a period in which industrial technologies spread across European empires with increasing speed and impact.[22] Since Japan became a major imperial power during this era and shared traits of colonialism with its European counterparts, we analyse Japan separately from the rest of Asia.

II | THE COLONIAL RACE BETWEEN EDUCATION AND TECHNOLOGY

While the general forces of demand, supply, and the frictions that shape the 'race' are universally applicable, they had specific colonial features in Africa and Asia. Figure 2 illustrates the three core dimensions of the confrontation between indigenous and colonial systems of education, technology, and labour market institutions. At the heart of this diagram is the relative price of skilled labour, which reflects the interaction between the demand for and supply of skills, and any frictions that result from (colonial) labour relations and market regulations. On the outer rim of the framework, we situate the principal actors that shaped demand, supply, and sources of labour market frictions: the colonial state, local and foreign employers, Indigenous labour, and migrant labour. This abstract picture can help us think through the particularities of the colonial race from a theoretical point of view.

Our theoretical conception of the colonial 'race' starts with the technology shock created by imperial relations. All colonial governments primarily sought to advance two main sectors of the economy, namely the export sector and the public sector, and more specifically the state administration. The expansion of export sectors – mostly cash crops and minerals – required investments in infrastructure, such as railways, harbours, bridges, roads, telegraphs, airports, mills, and factories. These investments spurred the adoption of Western production techniques that were at the fore of the global technology frontier, such as motorized transportation, electricity, steel machinery, and an infinite range of new artisanal tools, practices, and work equipment. Unlike the Japanese experience, where Western technologies were imported by indigenous political and economic entrepreneurs for the explicit purpose of technological, economic, and military catch-up, their adoption in colonial societies occurred primarily under coordination of foreign investors, enterprises, and colonial states.[23]

The colonial state-building project also stimulated the introduction of Western accounting methods, administrative and fiscal procedures, and specific military practices and technologies.[24]

[21] We define a 'technology regime' as a set of production techniques and principles, including the complementary (human) knowledge, skills, and organizational procedures and protocols required to operate them.

[22] For example, see Headrick, *The tools of empire*, pp. 9–12.

[23] Ibid.

[24] Frankema and Booth, eds., *Fiscal capacity*; Frankema and van Waijenburg, 'Metropolitan blueprints'.

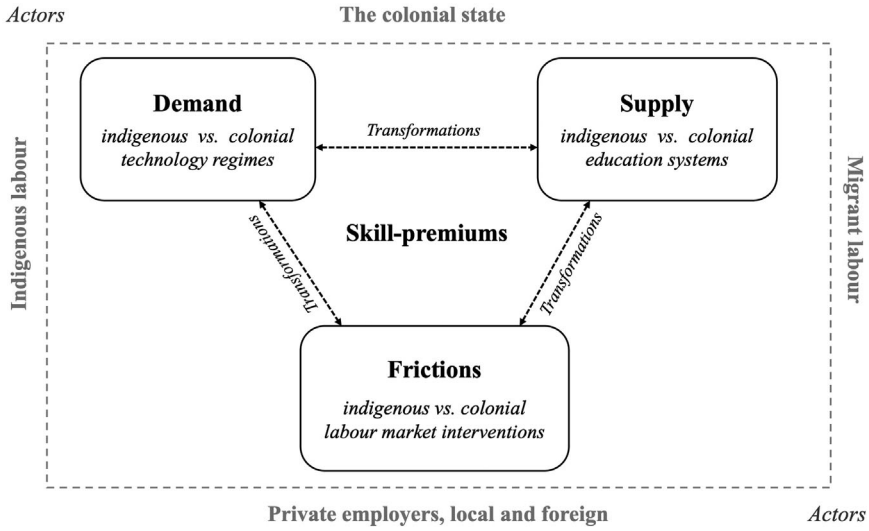

FIGURE 2 Framework to analyse the colonial race between education and technology. *Source*: Authors' own.

As such, the twin projects of colonial state formation and export development generated a demand impulse for specific categories of skilled labour that were complementary to the reigning Western technology regimes: administrators who knew how to read, write, and compute; construction workers who understood specific engineering practices in the development of railways, roads, bridges, and offices; middlemen and intermediaries who could do cultural brokering for commercial contracts and labour hires; workers trained to operate electrical and motorized machinery in mines and on plantations; teachers who could teach a formal school curriculum; and soldiers who knew how to operate modern firearms.

Theoretically, such an exogenous technology shock can generate high returns to workers who are the first to master the new technology.[25] For example, a study of students attending the first regional schools in colonial Benin has shown that the early-educated cohorts obtained significantly higher living standards, were less likely to become farmers, and more likely to be politically active.[26] Following this line of reasoning, skill premiums must have been especially high in societies where newly imported tools, techniques, and working practices represented a profound break from existing technologies and practices.

The educational adaptation to such innovation-induced demand shocks involved a combination of Indigenous systems of skill transfer and Western practices of formal schooling, which came in the form of both public and mission schools. While missionary education in Africa and Asia was externally imposed, these schooling revolutions were further carried on by Indigenous missionaries and local communities.[27] This entanglement, however, did not result in a merger of pre-colonial and colonial education systems, if only because 'Christian' teaching curricula met with very different local receptions: to some groups they meant access to Western customs,

[25] Foster and Rosenzweig, 'Technical change'.

[26] Wantchekon, Marko, and Novta, 'Education'.

[27] Frankema, 'The origins'; Jedwab, Meier zu Selhausen, and Moradi, 'The economics of missionary expansion'.

technology, and ideas, and to others they posed a threat.[28] Especially in Muslim areas, the spread of Christian missionary schools was met with strong opposition.[29]

All other things equal, low or declining skill premiums are to be taken as a sign of an effective supply response to the colonial technology shock, while high skill premiums signal demand running ahead of supply. Such processes of educational adaptation, however, go beyond the nature of local and colonial schooling systems. The expansion of (in)formal apprenticeships and on-the-job training schemes, which are largely overlooked in official schooling statistics produced by colonial governments, also mattered greatly for the accumulation of (new) skills. Intra-empire migrant communities opened up new channels of skill transmission as well, as migrant workers were often supported by strong communal resources that facilitated entry into new trades or specific sectors of the colonial economy. Knowledge and expertise in these communities was shared with new arrivals and younger generations, but not necessarily with outsiders.[30] As such, resources to enhance skill transfers remained often allocated along specific ethnic, religious, or social lines.

Finally, the colonial race between education and technology took place in a context of profound labour market interventions. While frictions that prevent markets from clearing on the basis of an equilibrium price exist in any labour market, several sources of friction were unique to colonial labour markets. In both Africa and Asia, the colonial state facilitated the large-scale withdrawal of labour from Indigenous production systems to enhance export sectors and infrastructural development.[31] Colonial rule often added novel dimensions of racial and ethnic discrimination in state-sanctioned labour recruitment schemes. In addition, long-distance (international) migration – both forced and voluntary – altered local supplies of labour across colonial Africa and Asia, including skilled labour.[32] To the extent that those forced labour schemes lowered the price of unskilled labour below market clearing rates, these interventions also affected long-run trends of skill premiums.

Taking another look at figure 2, a striking observation about the state of our knowledge stands out: while there are substantial bodies of literature on all three dimensions of the colonial 'race', these strands of research largely exist in isolation from each other. Research on technological innovation and capital investment in the former colonies has focused on the development of railways;[33] on the volume and direction of foreign capital investment;[34] and on the development of state capacity and fiscal systems;[35] or the expansion of health and education services.[36] However,

[28] Bellenoit, *Missionary education*; Berman, *African reactions*; Lindenfeld, 'Indigenous encounters'.

[29] Frankema, 'The origins', pp. 339–47; Kruithof, 'Shouting in a desert'.

[30] A good example is the specialized skill development of South Asians in parts of British East Africa; see Gregory, *South Asians*, pp. 20–5.

[31] Lasker, *Human bondage*; van Waijenburg, 'Financing'.

[32] Gregory, *South Asians*; de Haas and Frankema, 'Intra-African migration'; Kaur, *Wage labour*; McKeown, 'Chinese emigration'. In both regions labour migration has also resulted in intra-regional wage convergence, albeit at different times. See for Southeast Asia, Huff and Caggiano, 'Globalization'; and for Sub-Saharan Africa, de Haas and Travieso, 'Cash-crop migration systems'.

[33] Bogart and Chaudhary, 'Engines'; Jedwab, Kerby and Moradi, 'History, path dependence, and development'.

[34] Rönnbäck and Broberg, *Capital*; Rönnbäck, Broberg, and Galli, 'Colonial cash-cow'.

[35] Cogneau, Dupraz, and Mesplé-Somps, 'Fiscal capacity and dualism'; Frankema and Booth, *Fiscal capacity*; Gardner, *Taxing*.

[36] Chaudhary and Garg, 'Does history matter?'; Doyle, Meier zu Selhausen, and Weisdorf, 'Blessings of medicine'; Dupraz, 'French and British colonial legacies'; Huillery, 'History matters'.

none of these studies systematically explores the implications for the development of colonial labour markets.

Research on colonial education, in turn, has seen a wave of studies that link exposure to missionary schooling to a wide range of present-day outcomes at the national, regional, or individual levels.[37] Additionally, research on long-term literacy and numeracy trends has expanded its reach to large parts of Africa and Asia.[38] There is also new work done by economic historians on the spread of mass education, including the role of gender gaps.[39] However, none of these studies have explicitly connected such forms of educational development to changing technology regimes or the simultaneous expansion of colonial export sectors and state bureaucracies.

Finally, while the economic history literature on colonial labour markets has seen rapid development over the past decades, the emphasis has been on the development of real wages;[40] on the purposes and long-run effects of coercive labour market institutions;[41] and on labour relations.[42] To be sure, some social and cultural historians have focused more explicitly on historical systems of skill training,[43] but these studies tend to be micro-oriented and do not engage with larger economic history questions concerning the interaction between schooling, technology, and labour market regimes.

In sum, any meaningful analysis of long-run trends in skill premiums in Africa and Asia will have to take into account how colonialism shaped the interplay between the technology regimes that allowed for the expansion of key export sectors; the education and training systems that catered to the rising demand for complementary skills; and the institutions that regulated labour markets. This unlocks a large set of questions, which will require a variety of qualitative and quantitative historical methods to untangle. The promise of this research endeavour, however, is equally large: globalizing the study of the race between education and technology can shed new light on the colonial and pre-colonial roots of the South–South divergence that unfolded (largely) during the post-colonial era, and which continues to reconfigure global economic relations in the twenty-first century.[44]

III | THE AFRICA–ASIA OCCUPATIONAL WAGE DATABASE

The AAOWD contains time series data on occupational wages earned by Indigenous male workers. While the vast majority of the countries included in our database are former colonies, for comparative purposes we also included Japan and three countries that largely remained sovereign (China, Thailand, and Ethiopia). Our series include wages of unskilled workers, three blue-collar

[37] For a comprehensive survey, see Jedwab, Meier zu Selhausen, and Moradi, 'The economics of missionary expansion', online appendix table A1.

[38] Cappelli and Baten,'Numeracy'; Crayen and Baten, 'Global trends'.

[39] Baten et al., 'Educational gender inequality'; Mitch and Cappelli, *Mass education*.

[40] Cha, 'Unskilled wage gaps'; Frankema and van Waijenburg, 'Structural impediments' and 'Africa Rising?'; de Zwart and Lucassen, 'Poverty or prosperity'.

[41] Archibong and Obiliki, 'Prison labor'; Hup, 'Labor coercion'; van Waijenburg, 'Financing'.

[42] Bellucci and Eckert, *General*; Hofmeester and de Zwart, *Colonialism*.

[43] Fretwell, 'Tools of tailoring'; Lee, 'Socially skilling toil'; Osborn, 'From bauxite to cooking pots'.

[44] Frankema, 'From the Great Divergence to South-South divergence: new comparative horizons in global economic history' (work in progress).

occupations, and two white-collar professions.[45] For blue-collar workers, we focused on carpenters, electricians, and car mechanics. Carpenters represent a traditional artisanal skill that was critical for the many infrastructural and construction projects of the colonial economy. Electricians and car mechanics represent 'new' occupations that spread to the colonies from the metropole, and which catered to the growing application of electricity, engines, and machines in production and transportation.

Our white-collar series focus on entry-level office clerks and bank tellers. Both occupations required proficiency in literacy and numeracy. Clerks were in great demand by all colonial administrations, but form a more heterogenous category of workers than craftsmen, making their tasks and skills harder to compare across time and space. To optimize comparability, our series are based on wages that were paid to entry-level clerks employed in the post and telegraphs department of colonial governments. These departments were often present from the start of the colonial period and were among the first to hire large numbers of Indigenous clerks that carried out relatively straightforward administrative tasks. For bank tellers, our observations start in the 1950s and stem exclusively from the ILO's 'October inquiries'.[46] However, this is the appropriate time frame for this occupation, as there were only a small number of commercial banks in Sub-Saharan Africa before the Second World War. Although there was more money in circulation in Asia (in per capita terms), the big expansion in the provision of financial services was a post-1950 phenomenon there, too.

The sources underpinning our wage and skill premium series and specific choices we made are documented in detail in appendix 1. To maximize cross-country and temporal consistency within and across series we adhered to three guiding principles.[47] First, we relied on the same source for as long as possible and for as many countries as possible. The fact that so many countries in our dataset were part of the same empire (e.g. France or Britain), means that there are great similarities in the nature and reporting format of the sources from which we derived wage observations for the colonial period (e.g. the *Blue Books*). While the format itself does not guarantee homogenous recording practices, it is hard to imagine any historical dataset of similar spatial scope for the pre-1950 era that rests on such a uniform source template. Second, we always took the unskilled and skilled wage from the same source, and – where possible – from the same subsection within that source. Third, we made sure to take wages from the same location within each country, usually one of the main urban commercial centres. While our series thus mainly refer to developments in urban areas, we adopt country labels, instead of local place names, to facilitate easy recognition.

Since we are primarily interested in the long-term evolution of skill premiums, one particular concern is that the transition between data sources would create an artificial break in the time series. This transition occurs when the sources produced by colonial governments end in the 1950s; however, our series continue on the basis of the ILO's 'October inquiries' (1950–2008) for the post-colonial period.[48] Fortunately, overlap between the two different sources during the 1950s

[45] The 1.0 version of the database is available on the *African Economic History Network* (AEHN) website: https://www.aehnetwork.org/data-research/. We welcome future collaborations to expand the scope and time period of the database.

[46] The 'October inquiry' was an annual survey which included wage information. The inquiries were published in the following ILO publications: *Yearbook of Labour Statistics* (1950–7); *International Labour Review Statistical Supplement* (1950–63); and *Bulletin of Labour Statistics October Inquiry Results* (1964–2008).

[47] For occasional exceptions and justifications see appendix 1.

[48] Note that the ILO has collected this information from 1924 onwards, but these data do not become available for most non-Western countries until the early 1950s. Over time, the ILO collected information on a growing number of occupations, ranging from 41 in 1951 to 161 after 1983.

allows us to assess the consistencies between these two sources. We have 109 pairs of country–year–occupation wage figures. On average, the ratio between the colonial and the ILO figures for the same category is 1.027, with a median of 0.987. A little over half of the ratios are within the range of 0.9–1.1, and about 80 per cent of the ratios fall within a range of 0.8–1.25 (see also appendix 2, figure A2.1). Overall, the wages reported in the two sources appear to be remarkably close.

Even though there do not appear to be significant artificial breaks in our series as a result of using different sources for different periods, this does not rule out the possibility of reporting inconsistencies within these main source bodies. Freeman and Oostendorp have explored these issues in depth for the ILO series, standardizing the data for 161 occupations in 150 countries for 1983–99.[49] They point to several areas of concern; some of which are relevant for the construction of our overall series as well.

First, the ILO data (especially after 1983)[50] are based on a mix of hourly, daily, monthly, and annual wages. We accommodated this concern by taking consistent units of analysis for the numerator (skilled) and denominator (unskilled), expressing all individual wage series in day rates. We maintained the following conversion principles, unless otherwise indicated in appendix 1: for yearly rates we assumed 312 work days per annum, for monthly rates we assumed 26 work days each month, and for weekly rates we assumed 6 days per week. These principles are supported by the primary sources on which the series are based, and are in line with standard practice in the economic history literature.[51]

Second, the consistency of reporting wages to the ILO varied dramatically over time and by country. This problem is not confined to the 1983–98 period, but plagues both the 'October inquiry' in its entirety and the colonial sources. Appendix 2 (tables A2.6–A2.10) presents an overview of the periods (5-year intervals) for which we have data available for each skilled occupation in our series. As we will argue below (section VII), the many data gaps make it difficult to conduct fine-grained regression analyses. However, since our primary interest is to uncover the long-run trends in skill premiums – which we achieve by lengthening the ILO series by some eight decades – this data limitation is less restrictive for our study.

Third, Freeman and Oostendorp express concern that the ILO wage data exclude social contributions and/or other irregular payments that were made to workers (e.g. bonuses). While there

[49] Freeman and Oostendorp, 'Occupational wages'. The Occupational Wages around the World Database (OWW) has recently extended its coverage to 1953–2008. The AAOWD is complementary to the OWW in three respects. First, whereas the OWW focuses on the comparability of occupational wages across the globe, the main goal of the AAOWD is to underpin the study of long-term historical skill premium trends. Second, the OWW is a global database, with similar problems of harmonization, while the AAOWD is constructed to bring the Global South into studies of the technology–education race. Third, the OWW contains nearly all listed occupations in the 'October inquiries', while the AAOWD focuses on just five occupations for which long-term series could be constructed by combining different sources. Since the AAOWD seeks temporal scope over occupational comprehensiveness, the occupations that were selected for the AAOWD lend themselves better for spatial and temporal comparisons. See Kunst, Freeman, and Oostendorp, 'Occupational skill premia' for the details.

[50] Until 1982, the 'October inquiries' report the wage data exclusively in hourly rates (both for the numerator and the denominator). Only for clerks and bank tellers were wages reported in monthly rates before 1983.

[51] Converting all renumerations to day wages also allowed us to check the database for questionable entries, as significant one-off deviations from surrounding years became more visible. While some of these price shocks could be related to specific events (e.g. wars of independence, periods of hyperinflation), where we were in doubt about the data quality, we removed these entries from our series. Such occasionally omitted values are reported in app. 1 and indicated in red in our online datasheets to assure maximum transparency. We should add here that since our series are intended to uncover long-run trends, cleansing the series of dubious data entries should not distort the larger picture, but rather generate a more workable database for other researchers to consult and use.

is no way to correct for this, we believe that for the post-colonial period, such bias would mainly affect the comparability of occupational wages of more developed economies, as for the majority of African and Asian countries such additional payments remained limited or non-existent. For the colonial period, we can clearly observe the absence of such payments in the statistical sources, as these types of 'supplements' tended to exclusively benefit European salaried personnel, who were often listed alongside Indigenous personnel.

A related concern is that omission of in-kind payments (e.g. rations) in the monetary wage estimates of unskilled workers would create biases in the data that may affect both spatial and temporal comparability. In principle, we relied on sources that explicitly included any possible in-kind components in the reported wages (see appendix 1 for an overview of what each of our main sources indicate on this). In cases where the sources were unclear about the inclusion of possible in-kind payments, we mitigated the concern of in-kind payments by taking the following steps. First, where possible, we relied on wages for unskilled and skilled workers that came from the same table. If we missed an in-kind component, this would likely have affected both the numerator and the denominator, therefore minimizing the bias on the skill premium. Additionally, we checked the wage levels against price data of major staple foods and against observations from the real wage literature to filter out observations that we deemed unrealistically low.

Finally, we should be cautious about the extent to which the skills and tasks performed varied between places. We tried to mitigate such variation as much as possible by focusing on occupations with relatively consistent skill sets (e.g. carpenters, entry-level clerks). The ILO database at large contains many more occupations than our database, including ones for which we suspect the variation to be especially large [e.g. information communications technology (ICT) personnel]. We deliberately chose not to create series for those types of occupations. If there was a general improvement in skills across the twentieth century as a result of more and better education, such improvements are not reflected in the sharply declining trends of the skill premiums.

IV | SKILL PREMIUMS IN AFRICA AND ASIA, 1870–2010

Let us now turn to the three main insights our skill premium series reveal. For space constraints, we will illustrate these patterns in this section with the carpenter premiums, as these can be compared with similar series for other world regions, and because we have the most balanced panel data for this occupational category.[52] First, from a global comparative perspective, the British carpenter premium in the order of 40 per cent to 60 per cent recorded between 1400 and 1900 (figure 1) was exceptionally low. As shown in figure 3, very few economies outside Europe recorded a skill premium for carpenters below 100 per cent on the eve of the twentieth century. Only in the Western offshoots (the United States, Canada, New Zealand, and Australia) and Japan did carpenter premiums match those recorded in western Europe. In virtually all of the colonial Asian and African economies, hiring a carpenter or other types of skilled artisanal labour was far more expensive. This observation holds for the other four occupations in the Africa–Asia Occupational Wage Database as well.

The great scarcity of skilled local workers during this period is reflected as well in the fact that colonial governments and European enterprises often had to import skilled workers to meet their labour needs. In the early days of colonial rule, European carpenters, electricians, car mechanics, and clerks made up a substantial part of the colonial bureaucratic apparatus and its technical work

[52] Our series for car mechanics, electricians, clerks, and bank-tellers can be found in app. 2, t. A2.2–2.5.

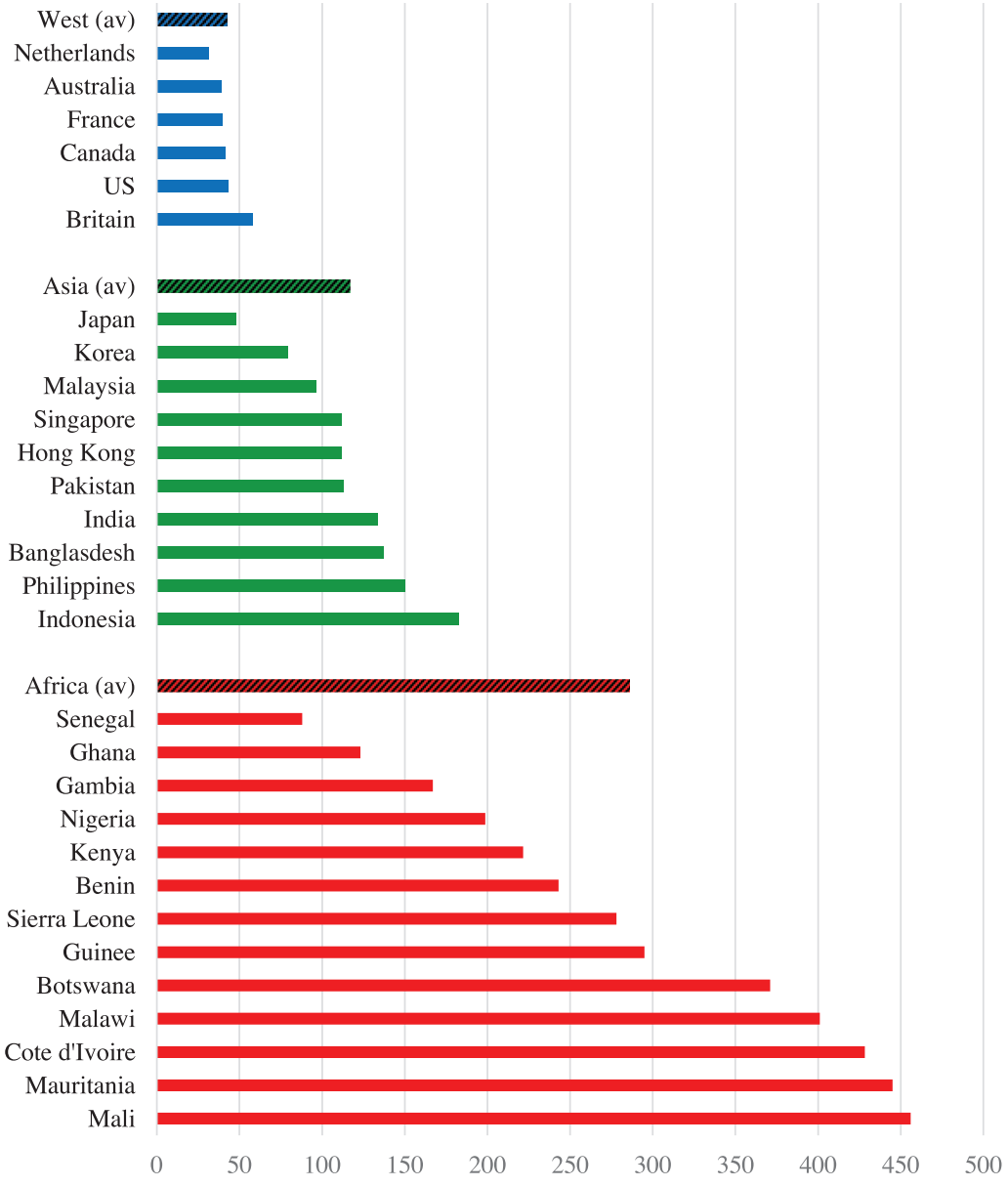

FIGURE 3 Skill-premium for carpenters, *c.* 1900 (in per cent). *Sources*: Wages for Britain, France and The Netherlands were taken from Allen, 'The great divergence'; the US observation was taken from the *US Historical Statistics*; the two Western 'off-shoots' (Canada and Australia) from the *Statistical Tables of the British Empire*. We took the year 1900 for all Western countries, as yearly fluctuations in the skill-premium for carpenters were negligible in this era. Only for the US the observation refers to 1914, which was the earliest year we could find in the source. For all Asian and African countries, we took the five-year average that we constructed for this paper that was closest to 1900. For most countries the observations refer to 1900–4, but for Benin, Guinée, Côte d'Ivoire and Mauritania, the skill-premiums refer to 1905–9. As a result, the African average refers to 1900–9. For a detailed description of the underlying data, see appendix A.1
[Colour figure can be viewed at wileyonlinelibrary.com]

force, but they were much more costly to employ. In similar vein, colonial governments tried to solve pressing skilled labour shortages on the railways by importing skilled migrant labour from other parts of their empires. The Ugandan railway, for example, was famously built with the labour of more than 32 000 Indian migrant workers – both skilled and unskilled – who could command significantly higher wages in East Africa than at home and relative to the local population.[53] As skilled labour became more readily available locally in the course of the twentieth century, such dependence on migrant labour was largely abandoned, albeit at varying speeds.

Second, figure 3 reveals notable disparities in skill premium levels within Asia and Africa, as well as between both regions. On the eve of the twentieth century, hiring a carpenter was extremely expensive in most parts of Africa. Where African carpenters could command a wage somewhere between two to five times that of an unskilled worker, this premium hovered around one to two times in Asia. Table 1 presents nominal wage data for as many Asian and African countries as we had wage and exchange rate data available. The table suggests that the disparities in the skill premiums of carpenters cannot be explained by structurally higher nominal wages of Asian unskilled labour (which would raise the denominator). As several studies have shown, the wages earned by unskilled urban workers were close to subsistence in most Asian and African countries around 1900.[54]

Third, our series point to a dramatic fall in skill premiums over the course of the twentieth century. Figure 4 reveals the great convergence of carpenter premiums in virtually all Asian and African economies towards levels long observed in the West. Moreover, when viewed from a global comparative perspective, the fall of skill premiums in Africa and Asia occurred at an extremely fast pace. Tables 2 and 3 document the magnitude of the fall by country, showing that while the timing and pace of the decline varied between countries, the falling trend was a near universal phenomenon. Appendix 2, tables A2.2–A2.5 present premiums for each occupation and country in our database in 20-year averages and show that this fall in wage premiums did not only occur for long-existing crafts, but also for new blue-collar occupations (electricians, car mechanics) as well as for office clerks and bank tellers.

Finally, there is a fourth pattern worth noting in our occupational wage database, which offers a more nuanced view of the Africa–Asia gap in skill premiums. Table 4 presents the average skill premium for all occupations by region. This decomposition shows that the Asia–Africa gap indeed holds for all three blue-collar occupations, with the differences between British and French Africa being relatively small, but Asian premiums being consistently lower for most occupations until the end of the twentieth century. However, for clerk premiums the picture is more ambiguous. While considerably more expensive in French Africa, the comparison between South and Southeast Asia and British Africa shows that clerk skills were highly prized in the former, and relatively cheap in the latter.[55] We should be careful, though, not to read too much into 20-year averages of such vast areas, and be reminded that also among entry-level clerks, the actual productive capacities

[53] Wolmar, *Blood, iron & gold*, p. 187.

[54] Allen et. al, 'Wages, prices, and living standards'; Bassino and van der Eng, 'The first East Asian economic miracle'; Cha, 'Unskilled wage gaps'; Frankema and van Waijenburg, 'Structural impediments'; de Zwart and Lucassen, 'Poverty or prosperity'.

[55] This difference between British and French Africa could in part be driven by the fact that clerk premiums for the early years for British Africa mostly refer to a set of British West African colonies, where skill premiums were generally lower than in British East Africa. For British East Africa we lack early clerk data, as these positions were commonly occupied by Asian workers (and European workers), and it is difficult to identify which workers were African workers in the underlying sources.

TABLE 1 Nominal wages and skill-premiums in pence per day, *c.* 1910

West Africa	Unskilled wage	Carpenter wage	Skill-premium
Benin	9.3	31.6	240
Cote d'Ivoire	9.1	51.2	463
Gambia	15.8	42.4	168
Ghana	11.6	29.3	153
Guinea	9.5	36.6	285
Mauritania	14.0	65.8	370
Mali	7.6	29.4	287
Niger	4.1	23.9	483
Nigeria	12.2	34.6	184
Senegal	22.7	54.9	142
Sierra Leone	9.7	32.9	239
Average	**11.4**	**39.3**	**274**
Central and East Africa			
Botswana	6.0	28.3	372
CAF	5.5	n.a.	n.a.
Chad	3.3	n.a.	n.a.
Congo	9.0	26.3	192
Gabon	9.1	49.1	440
Kenya	3.7	11.3	205
Malawi	2.8	13.9	396
Uganda	2.5	7.7	208
Average	**5.2**	**23**	**302**
East Asia			
Japan	12.9	19.5	51
South Korea	12.2	20.7	70
Average	**12.6**	**20.1**	**60**
South and Southeast Asia			
Bangladesh	11.5	18.2	58
Hong Kong	9.1	20.5	126
India	3.2	6.6	106
Indonesia	5.4	14.1	161
Malaysia	10.9	24.6	126
Pakistan	5.9	13.2	124
Singapore	7.6	16.2	113
Average	**7.6**	**16.2**	**116**

Sources: Historical exchange rates were derived from https://www.historicalstatistics.org/Currencyconverter.html and from the colonial Blue Books. See for further details about the wage and exchange rates appendix A.1.

Notes: In principle, we took the year 1910 for this table. Where no data was available for 1910, we took the closest surrounding year.

TABLE 2 Change in the carpenter premium in African countries (in percentage points)

Country	First obs.	Last obs.	Change in skill-premium (percentage points)		
			First obs. until 1950	1950 until last obs.	Total
AGO	1959	1999	n.a.	−418	−418
BDI	1968	1991	n.a.	−176	−176
BEN	1905	1985	−97	−28	−125
BWA	1904	1978	−213	+14	−199
BFA	1924	2000	−162	−160	−322
CMR	1924	1987	−143	+5	−138
CAR	1919	1997	−316	−123	−439
COG	1922	1979	−368	−78	−446
CIV	1907	2001	−219	−201	−420
DRC	1951	1983	n.a.	−41	−41
ETH	1951	1976	n.a.	+74	+74
ERI	1993	2000	n.a.	+3	+3
GAB	1915	1992	−200	−59	−259
GMB	1870	1959	−52	−101	−153
GHA	1881	1979	+4	−93	−88
GUI	1905	1957	−143	−31	−174
KEN	1905	1985	−90	−73	−162
LBR	1960	1981	n.a.	−143	−143
MDG	1910	2000	−449	−73	−523
MWI	1904	2002	−237	−83	−320
MLI	1903	1990	−438	+19	−419
MRT	1908	1967	−319	+2	−317
MUS	1919	2008	+20	−44	−24
MOZ	1988	1989	n.a.	n.a.	n.a.
NER	1914	1987	−340	−72	−412
NGA	1870	1985	−87	−142	−228
SEN	1882	1992	+19	−95	−76
SLE	1870	1996	−63	−144	−207
SDN	1949	1993	n.a.	−117	−117
TCD	1926	1999	−198	−329	−528
TGO	1924	1995	−45	−9	−54
TZA	1921	1983	−167	−146	−313
UGA	1907	1995	−71	−161	−232
ZMB	1921	1983	+44	−187	−144

Sources: See appendix A.1.

Notes: To compute the fall, we took the average of the first three years that were available, the average of the three years closest to 1950, and the average of the last three years in our dataset. If no three consecutive years were available, we took the average of two years, or – if no close years were available at all – we took one year. For the 1950 point, we took 1949–51 where available, or the first observations available after 1950, but no later than 1960. We do not report trend for countries for which we only have a few datapoints available (e.g. Mozambique). We have included these countries in our database for level-comparisons only.

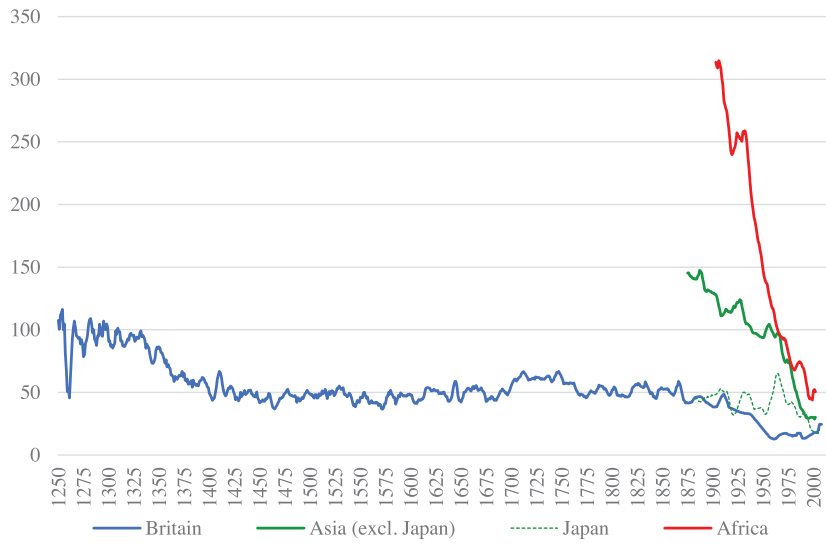

FIGURE 4 African and Asian carpenter premiums in global historical perspective, *c.* 1250–2000 (five-year average, in per cent). *Sources*: Wages for Britain were taken from Allen, 'The great divergence'. Wages after 1913 were taken from the ILO. See for a detailed description of the underlying data of our new African and Asian series appendix A.1. Notes: Series are shown as five-year moving averages. We started our series for Africa in 1900, when we had enough observations available for the trend to reflect regional variation (see tables 2, 3 and appendix tables A2.1–2.5 for more fine-grained country-level data). We interpolated missing years on the basis of a linear trend. Note that we added Japan separately to this figure to highlight that the trend of this first non-Western industrializer was more in line with the pattern observed in the West than in Asia as a whole
[Colour figure can be viewed at wileyonlinelibrary.com]

TABLE 3 Change in the carpenter premium in Asian countries (in percentage points)

			Change in skill-premium (percentage points)		
Country	**First obs.**	**Last obs.**	**First obs. until 1950**	**1950 until last obs.**	**total**
BGD	1870	1998	−56	−76	−132
KHM	1997	2001	n.a.	n.a.	n.a.
CHN	1929	2005	n.a.	n.a.	−35
HKG	1876	2001	−90	+12	−78
IND	1870	2000	n.a.	n.a.	−41
IDN	1875	1972	−25	−58	−83
JPN	1885	2004	−9	−17	−26
LAO	1955	1955	n.a.	n.a.	n.a.
MYS	1879	1993	−21	−41	−62
PAK	1870	2004	−23	−100	−123
PHL	1903	2004	−94	−46	−140
SGP	1870	2007	−24	−61	−85
KOR	1909	2005	+43	−122	−79
LKA	1925	1996	−78	−11	−88
TWN	1951	2004	n.a.	−28	−28

Sources: See appendix A.1.
Notes: See table 2.

TABLE 4 Skill-premiums for carpenters, mechanics, electricians and clerks by main region

	1880–99	1900–19	1920–39	1940–59	1960–79	1980–99
Carpenter						
British Africa	207	221	208	155	98	44
French Africa		329	264	148	99	68
South/Southeast Asia	143	114	107	103	86	47
Mechanic						
British Africa			321	146	142	91
French Africa		412	322	172	185	112
South/Southeast Asia				112	75	49
Electrician						
British Africa				133	167	76
French Africa			301	162	135	78
South/Southeast Asia			78	104	69	47
Clerk						
British Africa		266	209	183	86	86
French Africa		417	448	277	201	93
South/Southeast Asia		393	317	161	97	43

Source: See appendix A.1.

Notes: Regional averages were computed on the basis of the tables in appendix A.2. No averages were included for years where less than two observations were available.

may have varied substantially. We get back to this issue in section V, when we probe further back in time to trace the premiums paid to clerks in different parts of India.

All in all, our new dataset raises two overarching questions: (1) Why were skill premiums so much higher in Africa than in Asia at the start of the twentieth century (and possibly also in the centuries before)?; and (2) What drove the dramatic and universal fall in skill premiums? Section V probes into the first question by exploring the possible drivers of this gap. Sections VI and VII address the second question and explore the respective roles of education and colonial labour market institutions.

V | THE AFRICA–ASIA GAP

From a global comparative perspective, carpenter premiums were exceptionally high in many parts of Sub-Saharan Africa. Especially in interior regions like Niger, Mali, or Malawi, the relative price of a carpenter could be two or three times higher than in Asian economies. In the more commercialized and coastal areas of West Africa, such as southern Ghana, Senegambia, and parts of Nigeria, carpenter premiums were closer to the upper bound observed in Asia, hovering somewhere between 100 per cent and 200 per cent. Despite this large intra-regional variation in levels observed, the Africa–Asia gap in 1900 is considerable: on average, the carpenter premium in Africa was 136 percentage points higher than in Asia and is significant at the 1 per cent confidence level.[56]

[56] Including the non-colonies from our sample, this difference is slightly smaller (127 per cent) and significant at the 5 per cent confidence interval. We take 1900 as our starting point to look at the inter-regional gap, as this is the first year for which

TABLE 5 Skill-premiums in Northern India, 1600–870s

	Carpenter	Blacksmith	Mason	Clerk
Agra				
1600–90s	83%	133%	133%	
1700–810s	74%			495%
182–70s	93%	93%	186%	514%
Calcutta				
1600–90s				
1700–10s	162%	92%	208%	746%
1820–70s	129%	171%	236%	971%
Surat				
1600–90s	175%			317%
1700–810s	167%	120%	160%	307%
1820–70s				

Source: de Zwart and Lucassen, 'Poverty or prosperity'. We are grateful to the authors for sharing their database.

What explains this gap? A first relevant question to ask is whether the gap was structural or temporary. Since we lack consistent series stretching further back in time, we cannot establish this with a satisfactory degree of certainty. Indeed, the biggest limitation of our database is the lack of systematic occupational wage data before the 1870s. Extending our database further back in time to include pre-colonial times – that is, for occupations that existed in that era – is therefore a central part of the larger research agenda we envision (see section VII). That said, we can get a few glimpses into the levels of skill premiums before 1870.

The occupational wage data for India compiled by de Zwart and Lucassen allows for the computation of skill premiums for a number of Indian cities in the seventeenth to nineteenth centuries. These data, which are partly summarized in table 5, indicate that skill premiums for building trades (carpenters and masons) varied substantially across time and space. Nonetheless, they were mostly in the order of 100 per cent to 200 per cent, which is in line with our estimates for the late nineteenth century. The premiums for clerks and accountants in India in this period, however, were extremely high, at times approaching a ratio of 1:10. While we do not have clerk premiums again for India until the late twentieth century in the AAOWD, these exceptionally high premiums until well into the nineteenth century warrant some further reflection.

The most straightforward interpretation of these historically high premiums is that literate and numerate workers were extremely scarce. Yet, we have little information about the actual skills and position of these clerks, and they may well have been ranked higher than the entry-level clerks reported in the AAOWD. Moreover, in the context of India, it is possible that clerks benefitted from a 'caste' premium, in the sense that access to more prestigious clerical jobs was restricted to, or at least disproportionally skewed to, upper castes.[57] In any case, by the early twentieth century, clerk skills were likely much more widespread in British India than they were in British East Africa. In his account of the immigrants from northwest India in East Africa, Gregory discusses

we have a substantial set of countries in our sample (18 in total; 9 Asian, 9 African), reflecting the gradual incorporation of data for later conquered African territories. For the years before 1900 this would be based on 8 to 12 observations.

[57] For further discussion of castes and occupational patterns, see Chaudhary, 'Social divisions' and Olcott, 'The caste system'.

oral accounts indicating that clerical workers were attracted by the lure of much higher salaries offered by the colonial administrations in East Africa than they could command back home in Punjab, Baluchistan, or Rajasthan.[58]

For Africa, studies of Indigenous slavery contain valuable observations that go back to before 1870, as enslaved people – both skilled and unskilled – could be rented out by their owners for a market rate. For example, in his work on Senegal, Klein observes a pre-colonial premium for skilled labour between 300 per cent and 500 per cent:

> Slave ownership was widespread. A healthy slave with no skills cost about 300 francs in 1828 and could be rented out for 60 to 90 centimes a day. The slave received half of this for his upkeep. A skilled slave cost as much as 1500 francs and was hired for up to 3 francs 60 centimes a day.[59]

The historical records of European slave forts, where chartered companies employed different types of Indigenous wage workers, are another potential source of observations for pre-colonial Africa. Rönnbäck's study on living standards of Indigenous workers in eighteenth-century Gold Coast points to volatile labourer–carpenter wage ratios that could generate premiums of up to 250 per cent.[60] Such scattered observations for pre-colonial India and West Africa suggest that, compared with contemporary Europe, skilled workers were relatively scarce and could fetch impressive premiums, even in the more commercially developed areas of our sample. There is thus good reason to believe that the long twentieth century saw a fundamental break away from price structures for skilled labour that had prevailed in pre-colonial Asian and African societies.

However, this long-run decline in skill premiums was not a linear process. In a number of colonial economies, intensifying demand for skilled labour in the early colonial era first pushed the relative price of carpenters further up. Figure 5 shows this trend for Ghana (the former Gold Coast), Côte d'Ivoire, and (to a lesser extent) for Singapore, and contrasts these patterns with the series we have for Japan. The carpenter premium in Japan not only resembled Western levels, but despite a vigorous process of economic modernization since the 1870s, also remained much more stable in the course of the twentieth century. Thus, in Japan it seems that the supply of carpenters kept pace with rising demand, while in Ghana and Côte d'Ivoire demand ran ahead of supply until it caught up during the Great Depression, when many construction projects came to a temporary halt. The pattern for colonial Singapore falls in between these two ends of the spectrum, displaying less volatility but showing no sign that supply was running ahead of demand.

[58] Gregory, *South Asians*, pp. 10–19. Especially after WWI, a considerable share of Indian immigrants were skilled artisans or entrepreneurs who came to act as middlemen, especially in the British colonies of Uganda, Kenya, and Tanzania. Our sources indicate that Indian carpenters who moved to Kenya were able to command a skill premium of more than 1000 per cent of an average African male's unskilled wage in the early 1900s, and much more than 'Swahili' carpenters would earn. An impoverished headmaster from Baroda (Gujarat), who lived off of 250 rupees (Rs) a month, received 900 shillings (Shs) (approximately 600 Rs) as a teacher in Jinja (Uganda) – a sum that local African teachers would certainly not have earned (p. 16).

[59] Klein, *Slavery*, p. 23. While Klein is not specific here about the type of skilled labour that was performed by the enslaved person, he includes carpentry in his list of common occupations for enslaved people (p. 24, table 2.2). The other types of occupations for (male) enslaved persons are sailors, masons, weavers, cooks, blacksmiths, and traders. These types of crafts tended to catch comparable skill premiums as those for carpenters in years for which we have data available for both.

[60] Rönnbäck, 'Living standards', p. 195.

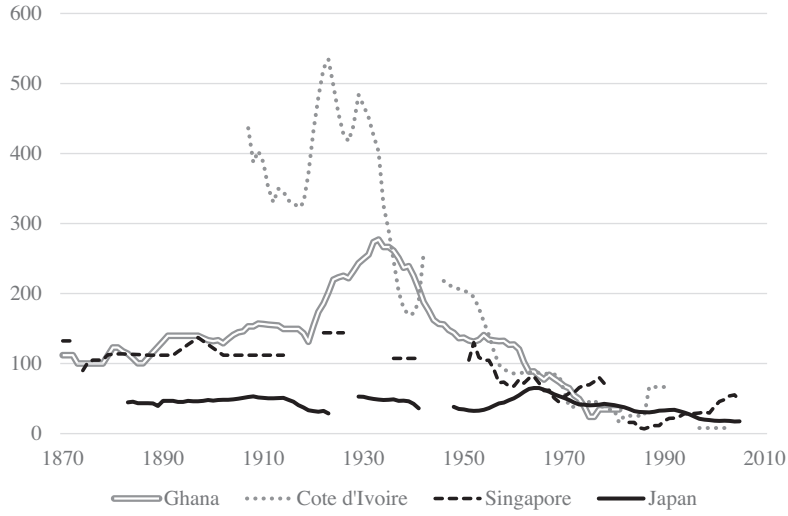

FIGURE 5 Skill-premium trends in Ghana, Cote d'Ivoire, Singapore and Japan, 1870–2010 (five-year averages). *Sources*: See appendix A.1.

Let us now return to our main question: Why were skill premiums on average so much higher in Africa than in Asia in the early colonial era? It is highly unlikely that carpenter premiums, or any other craftsman premiums for that matter, were structurally higher because of a more powerful demand shock in colonial Africa. On the contrary, in the interior regions of Africa, where the skill premiums were exceptionally high, investments in public works were relatively low. Bearing the analytical framework of section II in mind, the most plausible explanation for the Africa–Asia gap is, therefore, that Indigenous training systems had difficulties adapting to the new skills required to work with the exogenously introduced construction technologies: new steel tools, electrical machinery, measurement techniques, algebra, and so on. If the skills that were complementary to new technologies had made fewer inroads in Africa south of the Sahara than in southern and eastern Asia, then the supply of carpenters for colonial public works depended on the speed with which training programs could relieve supply constraints.

There is scattered evidence pointing in this direction. For one, while a range of handicrafts were well developed across the African continent – with the highest volumes and product diversity in West Africa, such as textiles, iron and brass works, canoe-making, mat- and basket-making, leather works, and furniture and wood carving,[61] carpentry was not frequently mentioned as a distinct trade.[62] Wood carving was far more common, but newly imported steel tools demanded different ways of working than the techniques connected to local iron tools. Saws replaced axes to fell trees and locally produced scooping and carving tools and knives were complemented by vices, esthesiometers, miter saws, and yardsticks. In one of the few available detailed studies on this subject, Lloyd observed how 'traditional' [sic] wood carvers in Yoruba society (present-day Nigeria, one of the most diversified economies in West Africa at the time), were cornered by newly trained carpenters who were in high demand because of their ability to create constructions that wood carvers could not. Carpentry tools, like other imported capital goods, were costly though:

[61] Austin, 'Labour intensity', pp. 203–7.

[62] Johnson, 'Technology, competition, and African crafts'.

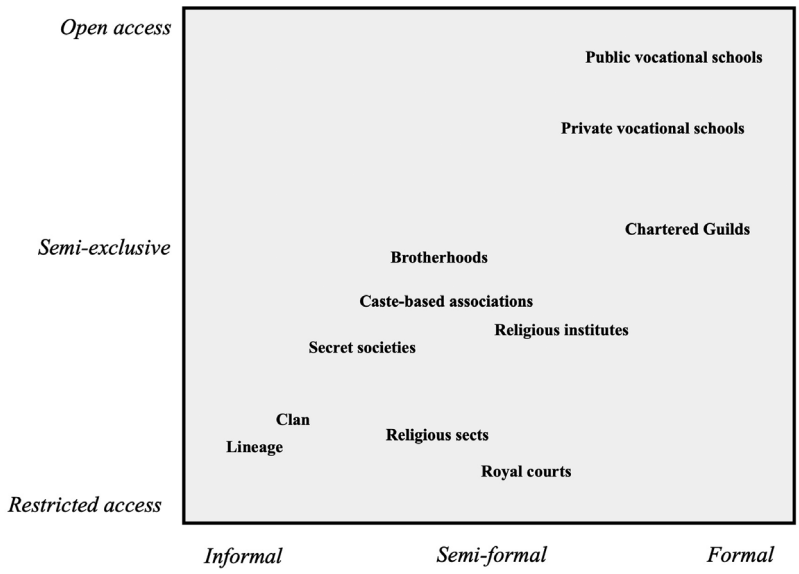

FIGURE 6 Spectrum of apprenticeship institutions. *Source*: Authors' own. *Notes*: The relative rankings of the different apprenticeship systems along the two axes in this figure are conceptual and are open to further debate.

> In most towns far more men are engaged in these new crafts than on the traditional forms. Including apprentices, there are in Iwo 40 goldsmiths, 120 carpenters, 400 tailors, 50 shoemakers, 80 barbers … Every craftsman must first acquire some tools or machines which are not made in his home town. Most are manufactured in England and must be purchased with money. The tailor needs a sewing-machine costing £25; for £5 a barber can buy a full set of instruments and a carpenter the basic tools of his craft.[63]

In the 1940s, £5 was the equivalent of about 75 day wages of an unskilled worker in Nigeria, but before 1940, such a set of tools could easily have required over 100 day wages – a considerable investment for the poor masses. Yet, the ability to work with such tools generated a handsome return in situations where carpentry skills were (still) scarce. Such scarcities were certainly not present in the main urban centres of China, Japan, and South Asia, where wood carving and carpentry were long-established distinct crafts, each with their own associations, apprenticeship systems, and tool-producing factories.[64]

This brings us to the role of changing education regimes. Figure 6 offers a conceptual framework to explore the variation in training systems in terms of their entry conditions (*y*-axis) and formalization (*x*-axis). Entry conditions influence both the volume and the responsiveness of supply to changes in demand. When entry into apprenticeships is regulated through kinship ties, which was often the case in decentralized polities with shallow markets, lineages or clans are in a position to control the diffusion of related craft skills and the production of crafts. Kin-based

[63] Lloyd, 'Craft organization', p. 35.

[64] Moll-Murata, 'Chinese guilds'; Nagata, 'Brotherhoods'. Note that these guild-like structures did not necessarily have the same political power as their European counterparts; see for example Roy, 'The guild in modern South Asia', p. 97.

systems may enforce their prerogatives through identity-forging discourses on secret knowledge, spiritual privilege, or other forms of socio-cultural consent. Such restricted entry conditions contrast sharply with public vocational schools, which would admit all interested boys and girls, irrespective of their social background, after completing a minimum degree of primary and/or secondary schooling. As illustrated in figure 6, kin-based associations and public schools thus form the outer ends of a wide spectrum of entry conditions.

The *x*-axis focuses on the formalization of apprenticeship training. Formalization is key to developing and monitoring a pre-agreed-upon set of quality standards, and in turn, underpins the wider cross-community mobility of educated workers. Formalization also includes a distinction between unwritten social codes and internal (within-group) rules with respect to quality control versus external dispute resolution mechanisms based on formal, codified rules (e.g. between crafts collectives and local authorities, customers, or merchant associations). Within a lineage-based system, the training of apprentices occurs in the informality of personal relations (e.g. fathers and sons) or the hierarchical relations between a master and enslaved person. In vocational schools, education is formalized and standardized with pre-defined curricula, certified degrees, uniform testing methods, and impersonal assessment.

Historically, a plethora of semi-exclusive and semi-formal forms of organization existed between these two ends of the spectrum.[65] One of the differences between craft guilds and kin-based associations is the possibility of responding to demand shocks. Even though guilds may effectively obstruct the use of new technology, kin-based associations limit innovation by default as even a temporary opening-up to 'outsiders' (non-kin) would undermine the thrust of the system. In so far as chartered guilds regulated the duration of apprenticeships, the payment of entry fees, and the mutual obligations of master and journeymen as well as set the conditions for the establishment of new workshops, this degree of formalization goes a long way in explaining Europe's comparatively low and stable skill premiums.

Lloyd discusses how the 'modernization' of carpentry in Yoruba upset existing systems of intergenerational skill transfer:

> Even if traditional craft organizations had been sufficiently flexible to absorb the new techniques – a point which itself is doubtful – their method of training could not have produced craftsmen quickly. A father will only train one or two sons in his lifetime; but a master who keeps two apprentices for a three-year course will train twenty craftsmen in thirty years. The form of organization adopted by the new crafts is similar in many ways to the social clubs; from them it seems to have copied unrestricted entry and the rules governing attendance and behaviour at the weekly meetings and members' ceremonies. The guilds which elect their head do not, however, have a patron; they thus make a final break with the custom of respecting one's elders.[66]

We are now getting to the heart of our explanation of the Africa–Asia gap. Where African crafts were predominantly predicated on kin-based systems, which were dismantled in the twentieth century, in major parts of Asia craft associations with 'guild-like' features had emerged (long) before the twentieth century and were operating in urban markets where volumes of trade and skills were larger.

[65] The European craft guild is, without doubt, the most intensively studied historical manifestation of such an intermediate form. See fn. 16.

[66] Lloyd, 'Craft organization', pp. 43–4.

FIGURE 7 The share of fathers' occupation of carpenter sons marrying in the Anglican church of Kampala, Uganda, 1910–60. *Source*: Meier zu Selhausen, 'Missionaries'. We are grateful to the author for sharing his data.

Another source of supply-side bottlenecks in Africa may be located in the widespread use of enslaved labour.[67] In the case of skilled enslaved labour, masters were to weigh the costs and benefits of transferring these skills to younger generations. This type of market control was disrupted when mission schools began to offer artisanal training to the sons of freemen and newly trained artisans entered expanding wage labour markets. This opening up of training opportunities in 'modern' crafts, however, did not occur overnight. Micro-level evidence from the marriage registers of the Anglican Church in Kampala in Uganda suggests that entry into such occupations may have remained the privilege of social elites for some while.[68] As illustrated in figure 7, a considerable proportion of the carpenters marrying in the church appeared to be the sons of chiefs. Later in the colonial era, the majority of these carpenter-grooms were sons of farmers. The fact that African chiefs were keen to send their sons to a local mission school offering training in carpentry skills reveals the attraction of both the earnings and the status wages that newly trained carpenters acquired.

In sum, we see three simultaneously operating explanations for the Africa–Asia gap in skill premiums. First, we believe that the exogenous technology shock was on average larger in Africa. As a result, those workers who did have the skills and tools to perform 'modern' forms or carpentry could capture substantial premiums. Second, deeply rooted apprenticeship institutions in Asia may have had lower entry barriers for specific artisanal occupations, including carpentry. Consequently, when the demand for skilled labour surged owing to colonial investments, a swift supply response was possible. Finally, in so far as slavery was more widespread in Sub-Saharan Africa than in southern and eastern Asia, the incentives of masters to invest in skill transfers may have differed.[69] These existing monopolies may also have created greater social resistance against the

[67] Lovejoy, *Transformations*.

[68] Meier zu Selhausen, 'Missionaries'.

[69] Dilley, 'Tukulor weavers', p. 129.

missionary 'schooling revolution' at the village community level. Nonetheless, while such forces can explain the initial gap in skill premiums, they cannot explain the second pattern we identified in our data: the long-run decline in premiums for all occupations in the course of the twentieth century. The next sections turn to this phenomenon.

VI | THE SCHOOLING REVOLUTION

The near-universal decline in the wage premiums of African and Asian carpenters, electricians, mechanics, clerks, and bank tellers during the twentieth century cannot be understood without the concomitant expansion of mass education. The so-called schooling revolution in Africa and Asia was initiated under colonial rule, but involved much more than rapidly rising school attainment rates alone. At its core, it implied a fundamental transition in the organization of knowledge and skill transfers from the realm of informal relationships and apprenticeship systems embedded in associational structures (e.g. caste, age cohort, guild), to more systematic and coordinated ways of learning, with shared pre-set curricula and generic means to test student capacities. This process was marked by vast intra-regional and inter-regional variations which we cannot discuss in detail here.[70] Instead, we will highlight two key drivers of diversity in these hybrid education regimes.

First, while virtually all colonial administrations acknowledged the importance of educational investments for their 'development' agendas, such investments remained heavily restrained by limited fiscal capacity and metropolitan insistence on balancing colonial budgets. With some notable exceptions, such as Mauritius, the Philippines, and the Japanese colonies of Korea and Taiwan, public spending on education was subordinate to investments in law and order, public works, and the colonial bureaucracy.[71] While such budget constraints were gradually alleviated over time, the real 'big push' in educational investments was mostly a late-colonial or even early-post-colonial affair.

A second key driver was the uneven expansion and diffusion of (semi-)private schools established by Christian missionary societies. Compared with the influence of Indigenous educational institutions, whether in the form of apprenticeship systems, Islamic schools, Buddhist teachings, or state administration training centres, the overall inroad of Christian missionary schooling was definitely larger in Sub-Sahara Africa than in eastern and southern Asia. Especially in places where Asian state bureaucracies and associated cultures of literacy pre-dated the inflow of Western missionaries, the spread of Christian schools was more constrained.[72] Indeed, the growth of missionary education depended in part on metropolitan ideologies and policies,[73] but even more so on local responses to missionary infiltration. Given that the vast majority of priests, pastors, mullahs, and school teachers were of Indigenous origin and were financed by local resources rather than Western church donations, the enthusiasm with which new beliefs were saluted by different ethnic groups, village communities, and local leaders was crucial.[74] Muslim-dominated

[70] For recent work on this topic see Mitch and Cappelli, *Mass education*.

[71] For Southeast Asia see Booth, 'Night watchman' and Furnivall, *Educational progress*. For Sub-Saharan Africa see Frankema, 'Colonial taxation' and Gardner, *Taxing*.

[72] For the contrast between India and Africa, see Bayly, 'Indigenous', pp. 17–9.

[73] British colonial policies tended to be more tolerant towards both Protestant and Catholic missions than French and Portuguese policies. See for example Cogneau and Moradi, 'Borders' and Dupraz, 'French and British colonial legacies'.

[74] Bellenoit, *Missionary education*; Berman, *African reactions*; Lindenfeld, 'Indigenous encounters'.

FIGURE 8 Carpenter school in the Gold Coast, *c.* 1890s. *Source*: The British National Archives (TNA): CO 1069-33-42.

areas in particular tended to draw few Christian missionaries. Colonial governments also often halted Christian missionary zeal at the Islamic frontier to avoid social upheaval.[75]

While the variation in curricula was vast, a common aim of Christian mission schools was to convert and, thereby, 'civilise' Indigenous populations. As illustrated in figure 8, in addition to instruction in reading the Bible and writing, many missionary schools offered specific forms of vocational training, including artisanal skills.[76] A good number of these mission schools were founded decades before colonial rule, and had already gained a reputation for training skilled workers. The Basel Mission school in Accra, for example, had been supplying coopers, cooks, and carpenters to the expanding palm oil trade since the mid-nineteenth century.[77]

Contemporary accounts document that the focus on such skills was not only a response to the growing demand for them, but that missionaries themselves saw training in 'practical' manual skills as an integral part of their 'civilising' mission, believing it would instil Indigenous boys with a Christian 'work ethic'.[78] Most missionary groups preferred to prepare students for life as an agriculturalist or artisan, which they deemed 'more morally healthy' than that of a trader, whose occupation exposed him regularly to the lure of 'alcohol and women'.[79] For girls, mission education focussed more on Victorian-style values such as hygiene, nursing, housekeeping, and

[75] Kruithof, 'Shouting in a desert'; Okoye and Pongou, 'Missions'.

[76] F. Lugard, 'Education in tropical Africa' report (1930), TNA CO 879/123/12, p. 6. Accessed via http://www.empire.amdigital.co.uk (6 November 2019).

[77] Lynn, *Commerce*, p. 135.

[78] Manley, 'Industrial education', p. 232; Walker, 'A history', p. 185.

[79] Gardinier, 'Vocational and technical education', p. 113.

TABLE 6 Average years of primary schooling for working-age males in a selection of African and Asian countries, 1880–2000

	1880	1900	1920	1940	1960	1980	2000
Africa							
Kenya	0.01	0.04	0.91	1.31	2.11	3.85	4.98
Mauritius	0.47	1.24	1.86	2.50	3.18	3.93	4.77
Ghana	0.03	0.08	0.40	0.71	1.45	3.63	4.43
Togo	0.02	0.05	0.19	0.48	0.84	2.83	4.32
Malawi	0.00	0.01	0.45	0.99	1.55	2.69	4.02
Cote d'Ivoire	0.01	0.02	0.19	0.37	1.03	1.92	3.37
Benin	0.01	0.01	0.04	0.51	0.85	1.34	2.76
Niger	0.00	0.00	0.11	0.50	0.66	0.89	1.55
Mozambique	0.00	0.01	0.04	0.55	1.32	1.78	1.37
Mali	0.00	0.00	0.03	0.14	0.28	0.74	1.26
Africa average*	**0.04**	**0.11**	**0.36**	**0.70**	**1.37**	**2.47**	**3.55**
Asia							
South Korea	0.00	0.43	1.87	3.89	4.30	5.60	5.93
Japan	1.07	2.01	3.75	4.48	5.42	5.73	5.90
Taiwan	0.00	0.02	0.53	1.79	3.23	4.54	5.56
Hong Kong	0.06	0.62	1.49	3.52	4.30	5.25	5.40
Malaysia	0.03	0.10	0.72	1.98	3.38	4.47	5.40
China	0.01	0.02	0.13	1.34	2.69	4.55	5.33
Philippines	0.05	0.16	0.92	1.35	2.36	4.10	4.98
India	0.05	0.22	0.73	1.20	1.53	2.23	3.65
Bangladesh	0.02	0.06	0.56	0.96	1.21	2.23	3.04
Pakistan	0.01	0.02	0.55	0.83	1.11	1.81	2.62
Asia average*	**0.14**	**0.37**	**1.01**	**1.88**	**2.75**	**3.93**	**4.65**
West							
US	4.10	4.71	4.88	5.30	5.43	5.92	5.95
Australia	2.24	3.02	3.98	4.99	5.53	5.89	5.87
Canada	3.04	3.32	4.07	4.83	5.35	5.67	5.87
UK	0.97	2.58	3.96	4.79	5.13	5.34	5.55

Note: The regional averages are based on all Asian and African countries present in these databases.
Sources: Barro and Lee, 'A new data set'; Lee and Lee, 'Human capital'.

child-rearing.[80] The most talented students at rural village schools could receive more advanced education in an expanding number of vocational and central (secondary) government schools in urban areas, opening up new routes to becoming a clerk, teacher, interpreter, or high-skilled (master) artisan.[81]

Table 6 presents the average years of primary education attainment of working-age males for a selection of African and Asian countries and some Western 'leaders' from 1870 to 2010. It shows

[80] Bantebya Kyomuhendo and McIntosh, *Women, work, and domestic virtue*, p. 54

[81] Harward, 'Education in Nigeria'; Lugard, 'Education'; Vischer, 'Native education'.

that attainment rates in Africa and Asia in 1950 had remained low by global standards, even though the rate of change in the first half of the twentieth century was impressive. The table also presents that throughout the twentieth century African attainment rates remained behind those in Asia, with a time lag of about three decades. By 1950, about one-third of the Asian population over the age of 15 had enjoyed some years in primary school, whereas this share was about one-fifth in Africa. By 2010, the share of the labour force that had never been in school had fallen to approximately one-quarter in Asia and one-third in Africa. Japan clearly stands out, being well ahead of other Asian and African countries by the late nineteenth century, with attainment rates that quickly converged with those in the West, rising from a little over 1 year in 1880 to almost 5 years of school attainment by 1940.

Ideally, the extended Barro and Lee panel dataset on educational attainment that reaches back to 1870 would allow us to formally test the relationship between the fall in skill premiums and the global expansion of mass education.[82] In practice, however, such a regression analysis is unlikely to identify the effect of the relative supply on the skill premium for two main reasons. First, the attainment data assembled by Barro and Lee are not comprehensive: they are based on official (colonial) government statistics that miss enrolment in informal indigenous schools (of which there were many, especially in Asia), and fail to capture alternative systems of skill training such as local apprenticeships, on-the-job training, or training in prisons. These omissions weigh heavily. As recently shown by Jedwab, Meier zu Selhausen, and Moradi, detailed historical ecclesiastical returns reveal that most of the widely used sources on missionary presence in Africa have missed anywhere between 50 per cent and 98 per cent of the settlements that were present.[83] Second, even if the education data were complete, the available measure of skill is the rate of literacy and/or years of schooling, which is a very rough proxy for most of the artisanal and technical skills at stake – occupational categories for which we would have most data observations available (appendix 2, tables A2.6–A2.10). While suitable to explore long-run patterns, our database does not lend itself well to fine-grained statistical analyses that rely on short-term variations.

We have included the details of a regression analysis of the relationship between the expansion of education and the skill premium in appendix 3. While we should interpret these results with caution, let us summarize the main takeaways of this exercise here. Our baseline regressions and the ones in which we control for country-fixed effects (table A3.1a), point to a strong negative relationship between skill premiums and educational attainment rates (significant at the 0.1 per cent level). Additionally, the regressions confirm systematic differences between developments in skill premiums in Africa and Asia (tables A3.1a–c and figure A3.10). At a finer level, however, within each country half-decade, the regressions show no relationship between the education data and the skill premium. As discussed above, this effect could be driven by the limitations of the available proxy for the supply of skilled labour.

VII | COLONIAL LABOUR MARKETS AND MIGRATION

While this large and near-universal fall in skill premiums could never have occurred without the concomitant expansion of education, we need to consider three additional possible lines of explanation. To what extent was the decline in skill premiums (co-)determined by the forces of (a) de-skilling; (b) factor-biased trade specialization, and/or (c) changes in the regimes that governed

[82] Barro and Lee, 'A new data set'; Lee and Lee, 'Human capital'.

[83] Jedwab, Meier zu Selhausen, and Moradi, 'The economics of missionary expansion', pp. 151–2.

colonial and post-colonial labour markets? While we do not believe the first two factors hold much explanatory power, the third may have played an important role in driving the fall and in shaping the magnitude of the Africa–Asia gap.

The de-skilling thesis holds that the relative price of particular skills drops as a result of factor-biased technological change associated with industrialization. There is a large body of literature – much of it in the Marxist tradition and focusing on de-skilling in Western economies – showing how artisanal crafts (e.g. spinners, weavers, blacksmiths, potters, glassblowers, and coopers) lost out as a result of new industrial technologies and factory production.[84] Additionally, new materials, such as plastics, have replaced products that were traditionally made by artisans from clay, iron, glass, or wood. To what extent have these mechanisms also undermined the income position of artisanal labour in Africa and Asia during the twentieth century, and more specifically, can this account for the universal (cross-occupational) decline of the premiums of the occupations under survey in this study?

We think the explanatory power of this force is limited at best. While the relative demand for workers with skills in spinning and weaving has evidently declined everywhere as textile production became increasingly factory-based and globalized, the relative demand for electricians and mechanics has only risen in Africa's and Asia's developing economies as a result of the expansion of machine-based production processes. Rising numbers of motor vehicles and machines required maintenance by mechanics. Electrification spurred the demand for electricians who mastered the skills associated with this new general-purpose technology. The per capita consumption of electric power in Africa rose from virtually nothing in the early twentieth century to approximately 321 kilowatt-hours (kWh) in 1971 and 512 kWh in 2010, while in the low- and middle-income countries of East Asia consumption rose to exceed 2300 kWh by 2010.[85]

White-collar workers were a different story altogether. The demand for bank tellers and office clerks rose exponentially. Administrative services became increasingly important to monitor, coordinate, and record collective sector arrangements and private business affairs. One may think of government departments, tax agencies, accounting companies, post offices, banks, archives, libraries, notaries, and all sorts of other administrative institutions. To be sure, automation due to ICT applications may have reduced the demand for office clerks and bank tellers in the most advanced economies in our sample (e.g. Japan, South Korea, Taiwan, Singapore, and Hong Kong), but this effect only played out after 1990, when skill premiums in these countries had already converged to levels in the industrialized world.

The demand for carpenters is perhaps the least clear-cut case as changes in construction techniques, such as the use of concrete and pre-fabricated wood frames, may have reduced the demand for carpenters after some point in time. For carpenters, 'de-skilling' did not occur in the sense that their skills became redundant, but rather because pre-fabricated substitutes increased their productivity, thereby lowering overall demand. Yet, for most of the twentieth century, the rise in infrastructural projects (ports, railways, bridges, and utility works), urban construction, and the consumption of household furniture first enhanced demand before it started to fall. In the majority of African and Asian economies, beds, chairs, carts, cabinets, tables, window frames, doors, roofs, boats, and canoes remained handmade by craftsmen, not by factory machines. Moreover, the use of pre-fab products has especially remained limited in the poorest economies in our sample, and these are the economies where the skill premium fall has been the steepest.

[84] For example, see Hobsbawm, *Workers* and Katz and Margo, 'Technical change'.

[85] Data from the World Bank, *World Development Indicators*. Last accessed 19 December 2022.

A second possible explanation could lie in the impact of global market integration. The standard Heckscher–Ohlin (H–O) model predicts that economies will specialize in products that use more of the relatively abundant production factors. In the majority of African and Asian countries, where skilled labour was scarce, this meant that these economies would specialize in export commodities that required large amounts of unskilled labour, agricultural land, or other natural resources. Indeed, for much of the late nineteenth and twentieth centuries, Africa and Asia (with the exception of Japan) have specialized in the export of (sub-)tropical cash crops, minerals, metals, ores, and tropical wood, while importing growing volumes of higher value-added manufactures with a higher skill intensity. According to the H–O model, the long-term rise in international trade and the ensuing Global North–South division of labour and skills would thus have generated an upward push of unskilled labour wages in the Global South, thereby reducing the wage premiums of skilled labour. How likely is the H–O effect to drive the fall we observe in skill premiums?

Although we cannot rule out that factor-biased trade specialization plays any role in the decline, a pure H–O interpretation of this historical phenomenon is unlikely. The stylized H–O model, for one, assumes that technology is equal across all trading partners, before and after the opening of world trade. That was not the case: exposure to world trade went hand-in-hand with colonization and the introduction of new crops and cultivation techniques, as well as new modes of industrial production, transportation, communication, and administration. The introduction of these new technologies likely increased the relative demand for skilled blue- and white-collar labour, due to the growth in non-tradeable goods and services, such as construction, infrastructural development, and the expansion of administrative services (most in the colonial bureaucracy). It is hard to imagine that the abstract prediction of the H–O model can explain the dramatic, persistent, and universal decline we find in skill premiums across our sample.

A final explanation may be found in (differential) changes in the institutions that governed colonial labour markets. This explanation builds on two interrelated insights from the region-specific economic historical literatures: (1) the relative proportions of unskilled labour available for the expansion of the plantation and the mining export sectors within Africa and Asia; and (2) the relative impact of forced labour practices and regional labour migration patterns.

In the thinly populated African continent and in some parts of tropical Asia, land was the abundant production factor, and both skilled and unskilled labour were scarce relative to land. As volumes of works on African history have documented, colonial governments, chartered companies, mining enterprises, and settler farmers all faced problems in attracting a stable and cheap supply of labour.[86] In colonies where Europeans (mostly) allowed markets to mediate the supply and demand of labour (e.g. the Gold Coast, Nigeria), labour scarcity translated into comparatively high real wages for workers and encouraged voluntary labour migration to these work sites.[87] In other places, however, colonial administrations relied more heavily on coercion, including forced recruitment for public works and private employers, the introduction of vagrancy and pass laws, and high direct tax burdens. All these interventions were meant to raise the supply of labour at a cost price (far) below market-clearing rates.

Although the ultimate abolition of colonial forced labour policies did not occur until after the Second World War in most parts of the empires, the downward pressure such policies exerted on wages was already relieved at an earlier stage. The growing international momentum to end

[86] Austin, 'Resources, techniques, and strategoes'; Fenske, 'Land abundance'; Hopkins, *Economic history*.

[87] Frankema and van Waijenburg, 'Structural impediments'; de Haas and Travieso, 'Cash-crop migration systems'.

unfree labour practices in the course of the 1920s and 1930s exerted pressure on colonial governments to rely on voluntary labour only.[88] While the complete abandonment of forced labour was certainly not fully embraced, even the most notorious work sites, such as the Congo–Ocean railways, saw significant wage increases and growing numbers of voluntary workers in the course of the 1930s.[89] In parts of the Central African Copperbelt, wages rose in the course of the 1920s as the result of deliberate labour stabilization policies.[90] Wages and improvements in the labour conditions for African workers further improved in the course of the 1940s and 1950s, as a result of unionization and rising concerns about decolonization.[91]

Such colonial labour market dynamics could have been an important co-driver of (1) the fall in skill premiums and (2) the magnitude of the Africa–Asia gap. Let us start by exploring the former. If relatively more unskilled workers were subjected to forced labour than skilled workers, this would have resulted in greater downward pressure on the wages of the former. In this scenario, the very high skill premiums that we observe for the early period would reflect not just the relative scarcity of skilled labour, but also the disproportional repression of the costs of unskilled labour. The fall in skill premiums then would at least in part reflect the gradual abandonment of labour repression. Additionally, this effect would be further enhanced by the momentum unskilled workers enjoyed in the late colonial period. How likely is this scenario?

Although the decline of forced labour and the rising power of labour unions likely have some explanatory power, they cannot explain the long-term fall in skill premiums on their own. For one, the relative cost of skilled labour has fallen for all occupations. The data for bank tellers, for example, only start in the mid- to late-1950s, and are therefore mostly untouched by the effects that post-Second World War unionization and the abolition of forced labour had on the price for unskilled labour. Second, while clerks were exclusively made up of voluntary labour, this was not necessarily the case for skilled blue-collar workers. Since the expansion of physical infrastructure demanded large numbers of labourers and artisans, skilled workers were conscripted as well. If the downward pressure on the wages of skilled workers was stronger than that on unskilled wages, the observed skill premiums in the early twentieth century would not be amplified, but be a lower bound. Although there are unfortunately no historical records detailing the relative numbers of unskilled and skilled workers that were compelled to work on public works projects, some surviving qualitative sources suggest that the threat of labour coercion may have been even worse for artisans in some places, exactly because they were so scarce. In the report of an inquiry that was done on forced labour conditions in the Portuguese colonies the author, Professor Edward Ross, notes the following:

> A carpenter questioned tells that he has given three months unrequited work on the buildings at the Post. No rations. He was assisting a first class native carpenter who worked for months without wages or rations. For the industrial department of a mission school to make a native skillful is a doubtful kindness, for the skilled worker

[88] Fall, *Le travail*; Okia, *Communal labor*.

[89] Azevedo, 'The human price'.

[90] Juif and Frankema, 'From coercion to compensation'.

[91] Cooper, *The labor question*, especially chs. 7–8. Note that this tendency was continued by early post-colonial governments, many of which depended on the political support of urban labour movements. They were able to finance the expansion of relatively well-paid public sector jobs until the economies collapsed in the closing decades of the twentieth century. See Bates, *Markets and states* and Simson, 'Africa's clientelist budget policies.'

> is likely to be kept working for nothing for the Government a longer time than the unskilled. It is harder to replace the carpenter when his term is up than the hoe man; so they keep him on.[92]

While it is unlikely that such downward pressure on the numerator (skilled labour) was systematically stronger than that of the denominator (unskilled labour), it certainly did not just affect unskilled workers.

That brings us to the Africa–Asia gap. If labour repression indeed affected unskilled labour more than skilled, and if forced labour was practiced on a larger scale in Africa than in Asia, this could partly help explain the large initial skill premium gap between the two regions. While the labour scarcity, slavery, and forced labour are central themes in African history, such forms of unfree labour were commonplace in large parts of pre-colonial and colonial Asia as well.[93] Indeed, considerable parts of Southeast Asia were characterized by comparable labour shortages in the context of colonial export sector growth, which were frequently accommodated by forced labour and forced cultivation schemes.[94] However, there were some important structural differences between the two regions that likely reduced the reliance on forced labour in Asia compared with Africa.

First, the working-age populations in labour-scarce parts of Southeast Asia were growing at a (much) faster pace in the nineteenth and early twentieth centuries than in Sub-Saharan Africa; partly because of higher natural growth rates, and partly because of high immigration flows.[95] Second, large parts of Southern and Eastern Asia were so labour abundant that wage levels remained tied to subsistence even without coercion. Indeed, from the large 'labour reservoirs' in Southern China and India, millions of (indentured) labour migrants moved into the lowly populated areas of Southeast Asia such as Malaysia, southern Vietnam, and the Indonesian archipelago.[96] They mainly took up unskilled jobs in the mines, in transport, and on plantations, but a fraction of these migrants was able to perform skilled work as well.[97] Huff and Caggiano have demonstrated that the scale of intra-Asian labour migration up to 1940 was so large that it led to considerable wage convergence between sending and receiving regions.[98] Such large-scale migration flows likely exerted downward pressure on wage premiums in Asia, and reduced the region's dependence on forced labour schemes.

In Sub-Saharan Africa labour migration occurred on a large scale as well, but comparable labour reservoirs within the continent did not exist. While some migration was voluntary and attracted by lucrative economic opportunities in certain parts of the continent, many other flows of African labour migration were induced by repressive colonial policies in the sending regions.[99] Around 1900, the pressure to recruit unskilled labour was still so large that colonial officials

[92] Ross, *Report*, p. 16.

[93] Lasker, *Human bondage*; Lieberman, *Strange parallels*.

[94] For example, the cultivation system in the mid-nineteenth century Dutch Indies. See Fasseur and Elson, *Politics of colonial exploitation*.

[95] There is ample historical evidence that unskilled labour remained a scarce factor in Africa until at least the economic depression of the 1970s–1990s.

[96] Kaur, *Wage labour*; McKeown, 'Chinese emigration'.

[97] Persaud, 'Escaping local risk'.

[98] Huff and Caggiano, 'Globalization'.

[99] de Haas and Frankema, 'Intra-African migration'.

in British West Africa experimented with the import of indentured Chinese workers.[100] These endeavours failed for several reasons, including high mortality of the indentured workers and the considerable costs of transportation. The immigration of indentured Indian workers into eastern Africa was more successful and resulted in a longer-term presence. Nonetheless, both attempts show that Asian labour reservoirs were seen as the possible source of relief.

VIII | CONCLUSION

The historical co-evolution of education, technology, and labour market regimes is much better understood for the 'West' than for the 'rest'. To address this bias in economic history research we have (1) created the first large-scale occupational wage database for African and Asian countries and (2) developed a new conceptual framework that highlights how the main aspects of the 'race' were shaped by colonialism. We have argued that colonialism influenced the nature of the demand for skilled labour, the technologies that were imported to facilitate export sector growth and the expansion of the colonial state, and the education systems that either fully replaced or superseded older indigenous systems for intergenerational knowledge transfers.

Our database (AAOWD) has revealed three important historical insights about the development of skill premiums in Africa and Asia. First, we have shown that skilled labour in colonial Africa and Asia was expensive relative to pre-industrial Europe and late-nineteenth-century Japan. Second, we have demonstrated that skill premiums in colonial Africa were significantly higher than in colonial Asia. Third, our dataset revealed that in both regions, skill premiums of all five blue- and white-collar occupations in our sample declined dramatically in the course of the twentieth century.

In this article, we have made a first attempt to explain the main driving forces behind these general patterns. While it should be kept in mind that our interpretation reflects the limitations of what we can accomplish in the scope of a singular and inaugural study, a nutshell summary of our argument reads as follows. Existing educational institutions in Asia responded with greater efficiency to the demands for both new and existing skills that were forged by the expansion of colonial export sectors and state-building projects. In Africa, these adaptations produced a greater rupture with pre-existing technologies and with the relatively closed kin-based systems of intergenerational knowledge transfer than in Asia. The spread of mass education under colonial rule, however, did much to accommodate the increased demand for carpenters, electricians, mechanics, clerks, and bank tellers in both regions.[101] However, both the data and the currently available education measures are not ideal to establish a robust correlation that we expect to find between local schooling revolutions and the long-term decline of skill premiums. Moreover, different systems of labour market regulations, combined with the reforms of these systems after World War II, probably had a large confounding impact on the bargaining position of unskilled versus skilled workers, which adds to the explanation for the extremely sharp drop in skill premiums in large parts of Africa.

A more rigorous testing of this meta-narrative awaits in-depth investments in qualitative as well as quantitative research directions. We consider the following four directions key: (1) a deeper qualitative and quantitative understanding of the changes in occupational structures and how

[100] Phillips, *The enigma*, pp. 37–9.

[101] And many other occupations associated with the process of economic modernization for that matter.

these relate to the investments in the colonial public and export sectors; (2) systematic data on colonial capital goods imports that allow us to assess the volume and type of capital-embedded technologies; (3) fine-grained comparative assessments of the types of training that boys and girls received in state schools as well as in the (semi-)private mission schools, to trace the extent to which local curricula responded to the changing demand for (new) skills in the local economy; (4) the AAOWD requires expansion further back in time with scattered observations of skill premiums before 1870 and a spatial thickening for the period after 1870.

This is a large and ambitious research agenda, but much of it may focus on the main urban commercial centres and its immediate surroundings – centres that are easy to identify for all of the 50 countries we have covered. We believe that this research agenda holds two major promises. First, it will offer us a much better understanding of the human capital–growth nexus in economies that have not followed the stylized pattern of Western modern economic growth. Second, these efforts will bring us closer to a historical account of and explanation for the South–South divergence that is reconfiguring global economic relations in the twenty-first century with dazzling speed.

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