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Population and the Means of Subsistence: Explaining the Historical Demography of Island Southeast Asia, with Particular Reference to Sulawesi

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The phenomenon of low population growth in pre-colonial Southeast Asia is often interpreted in terms of epidemic disease, internecine warfare or cultural idiosyncracies affecting the birth rate. The modern population boom, in these analyses, results from medical and public health improvements, military pacification or foreign cultural influences. This article, by contrast, argues that in Indonesia and the Philippines population growth has typically been a result of economic growth, and that the general sparsity of the population in early historical times reflected the low 'carrying capacity' of the environments in question under the prevailing economic conditions.

> Taken as a whole, Southeast Asia was sparsely populated in 1600 . . . . The most extraordinary feature of Southeast Asian population, however, was the very slow rate of growth in the seventeenth and eighteenth centuries, even if compared with that of China, India, and Europe, followed by exceptionally high growth in the nineteenth and twentieth centuries. . . .[1]

> It is an obvious truth . . . that population must always be kept down to the level of the means of subsistence . . . . The reason that the greater part of Europe is more populous now than in former times is that the industry of the inhabitants has made these countries produce a greater quantity of human subsistence.[2]

The central problem in the demographic history of Southeast Asia remains that of why for so long, the population of the region remained so sparse. The total human population of Southeast Asia in 1600, as calculated by Anthony Reid in a seminal essay, was approximately 22 million, and the average population density little more than five persons per square kilometre.[3] While these are crude and questionable estimates, it is

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1 Anthony Reid, *Southeast Asia in the Age of Commerce*, vol. 1 (New Haven: Yale University Press, 1988–93), pp. 13–15.

2 Thomas Robert Malthus, *An essay on the principle of population, 1798* (New York: W.W. Norton, 1976), pp. 15, 31.

3 Anthony Reid, 'Low population growth and its causes in pre-colonial Southeast Asia', in *Death and disease in Southeast Asia*, ed. Norman G. Owen (St. Lucia: University of Queensland Press, 1987), pp. 34–5.

clear that Southeast Asia at that time was indeed sparsely populated compared with China, India or Europe. Equally certain is that whatever the reasons for the sluggish growth of its population before the nineteenth century, very rapid growth in the colonial and postcolonial periods has since brought the total number of Southeast Asians to over 500 million, perhaps 20 times more people than inhabited the same portion of the globe four centuries ago.

Observations like these have led many to conclude that pre-colonial Southeast Asia must have consisted for the most part of an 'open frontier', in which there was 'an abundance of rich agricultural land' and population densities 'remained far below the carrying capacity of the environment'.[4] Demographic trends, in other words, bore little or no relation either to economic constraints or to economic opportunities. Explanations for low pre-colonial population growth, accordingly, have been sought in non-economic factors like epidemic disease, internecine warfare or cultural idiosyncrasies affecting the age at which people married, the number of children they desired, and the frequency with which they resorted to abortion and other types of pre-modern birth control.[5] The modern population boom, in these analyses, is interpreted respectively as a consequence of medical and public health advances, military pacification or foreign cultural influences.

In what follows, by contrast, I will argue that population growth in this region has typically been a result of economic growth, and that the general sparsity of Southeast Asia's population in early historical times was a better reflection of its 'carrying capacity' under the prevailing economic conditions than many recent authorities would have us believe. The empirical bases for this argument come from insular Southeast Asia – that is, from Indonesia and the Philippines, two countries with the relevant literatures on which I am relatively familiar – and in particular from the northern half of Sulawesi, a part of Indonesia bordering on the Philippines for which a favourable combination of demographic, economic and anthropological data exists in the colonial sources and to which I have devoted extensive study.[6]

My argument, which is wide-ranging and draws on literatures seldom brought into association with each other, proceeds as follows. The initial two sections of the paper present two different types of evidence for the predominance of economic factors in determining macro-demographic patterns and trends. The first section, 'population

4 The quotations are respectively from: Reid, *Southeast Asia*, vol. 1, p. 26; Laura Lee Junker, *Raiding, trading, and feasting: The political economy of Philippine chiefdoms* (Honolulu: University of Hawai'i Press, 1999), p. 134; and Han Knapen, *Forests of fortune: The environmental history of Southeast Borneo, 1600–1800* (Leiden: KITLV Press, 2001), pp. 390–1.

5 Han Knapen, 'Lethal diseases in the history of Borneo; mortality and the interplay between disease environment and human geography', in *Environmental challenges in South-East Asia*, ed. Victor T. King (Richmond, Surrey: Curzon, 1998), p. 87; Knapen, *Forests of fortune*, pp. 391–6; Joachim K. Metzner, *Agriculture and population pressure in Sikka, Isle of Flores: A contribution to the study of agricultural systems in the wet and dry tropics* (Canberra: Development Studies Centre, Australian National University, 1982), pp. 90–1; Reid, 'Low population growth', pp. 17–18; John Robert Shepherd, *Marriage and mandatory abortion among the 17th-century Siraya* (Arlington, VA: American Anthropological Association, 1995); Enid M. Wylie, 'Economic change and disease in Malaya c.1820–1920: a study in human ecology' (Ph.D. diss., Griffith University, 1993), p. 276.

6 David Henley, *Fertility, food and fever: Population, economy and environment in North and Central Sulawesi, 1600–1930* (Leiden: KITLV Press, 2005).

geography', points out that the distribution of Southeast Asia's population in space has always corresponded rather closely to variations in the agricultural productivity of its soils. The second, 'population history', uses evidence from northern Sulawesi and elsewhere to argue that demographic changes over time were associated in the first place with changes in the volume of trade. When commerce was limited, broadly speaking, the population was sparse; and when commerce grew, so did the population.

The remainder of the paper attempts to account, in various mutually complementary ways, for this association between demographic and economic conditions. Under the rubric 'commerce and mortality', firstly, it is argued that death rates fell when economic conditions improved as a result of trade growth. A related section on 'misconceptions concerning mortality and morbidity in the Southeast Asian past' argues that other influences on the death rate, such as warfare and medicine, have often been exaggerated in the existing literature. Under the rubric 'commerce and fertility', direct links are identified between birth rates on the one hand, and economic opportunities and household labour demands on the other. Under 'demography and social structure', it is argued that commercialization of the economy also boosted birth rates indirectly by weakening social institutions which encouraged traditional forms of birth control. Some of the arguments in this last section, and in the subsequent concluding discussion, are partly speculative; it is hoped that they will stimulate further research by demographers, historians and anthropologists on the nature of the links between economic and demographic change in Southeast Asia and elsewhere. Throughout the paper, attempts are made to put Southeast Asian demographic issues in the context of debates on world population history.

Population geography

The first and most obvious problem with any model of Southeast Asian population history in which demographic processes operate independently of their ecological and economic settings is that both in terms of internal distribution and in comparison with other parts of the globe, the region's population geography has always been a rather close reflection of its physical geography. Like Reid, other commentators on the low population densities and growth rates prevailing in Southeast Asia in the past also tend to take Europe, India or China as their points of reference.[7] In environmental terms, however, demographic contrasts with temperate and subtropical areas, where lower temperatures and rainfall make leaching and soil erosion less serious impediments to agriculture than in the equatorial tropics, are misleading. A more appropriate and informative comparison, as the geographer Pierre Gourou emphasized more than half a century ago and as Jeffrey Sachs now once again insists, is with those parts of Africa and South America which straddle the equator.[8] Much of Indonesia, in fact, has even poorer soils and a more

7 For instance: Charles A. Fisher, *South-East Asia: A social, economic and political geography* (London: Methuen, 1964), pp. 61, 76, 176; Charles Hirschman, 'Population and society in twentieth-century Southeast Asia', *Journal of Southeast Asian Studies*, 25, 2(1994): 381–2.

8 Pierre Gourou, *Les pays tropicaux: Principes d'une géographie humaine et économique* (Paris: Presses Universitaires de France, 1947); Jeffrey D. Sachs, 'Tropical underdevelopment' (Working Paper 57, Boston Center for International Development, Harvard University, 2000).

consistently wet, hot climate than the Amazon and Congo basins, areas with which it shares a historical background of low-intensity subsistence agriculture and generally very sparse settlement.

In this perspective Indonesia, with its local pockets of denser population in Java, Bali, South Sulawesi and elsewhere, actually stood out from an early date as an unusually populous part of the tropical world. John Crawfurd, in fact, may well have been right to identify it at the beginning of the nineteenth century as the region 'of highest indigenous population which exists *anywhere* in the immediate neighbourhood of the equator'.[9] Modern Malthusians attribute its ability to support an even larger population today partly to the unusually fertile volcanic soils of Java and Bali, which are among the 'ecologically exceptional regions of the humid tropics'.[10] Lowland Sumatra and Borneo, by contrast, are more typical tropical rain forest environments. A detailed survey of land use potential in West Kalimantan in 1977 concluded that about half of that province was intrinsically unsuitable even for swidden rice cultivation, and that further extension of the area under this type of land use in its existing form was already 'hardly possible'.[11]

The link between demography and ecology is clear if we consider the population geography of Indonesia and the Philippines in the middle of the twentieth century, with concentrations of dense settlement in Java, Bali and parts of Luzon; very low densities in Borneo, lowland Sumatra and West New Guinea; and intermediate densities in North and West Sumatra, the Lesser Sundas, South Sulawesi and the Visayas (Map 1). The best-known environmental factor here is volcanic activity, which enriches the soil with fertile ash. Dutch colonial soil scientist E. C. J. Mohr went so far as to state that 'in the Netherlands Indies the population density is a function of the nature of the soil, and this is a function of the presence of active volcanoes'.[12] Another association, classically described by Charles Robequain, is with (relative) dryness – more specifically, with the occurrence of an annual dry season.[13] East-Central Java, Bali and the rest of the Lesser Sundas, the southern coasts of Sulawesi and the western parts of the Philippines all have an average of at least five dry months (in which potential evapotranspiration exceeds precipitation) each year.[14]

Many authors have pointed to the drawbacks of high, year-round rainfall for farmers in the tropics. Among the most serious threats to the success of swidden agriculture, for

9 John Crawfurd, *History of the Indian Archipelago. Containing an account of the manners, arts, languages, religions, institutions, and commerce of its inhabitants* (Edinburgh: Archibald Constable, 1820), vol. 1, p. 12 (original emphasis).

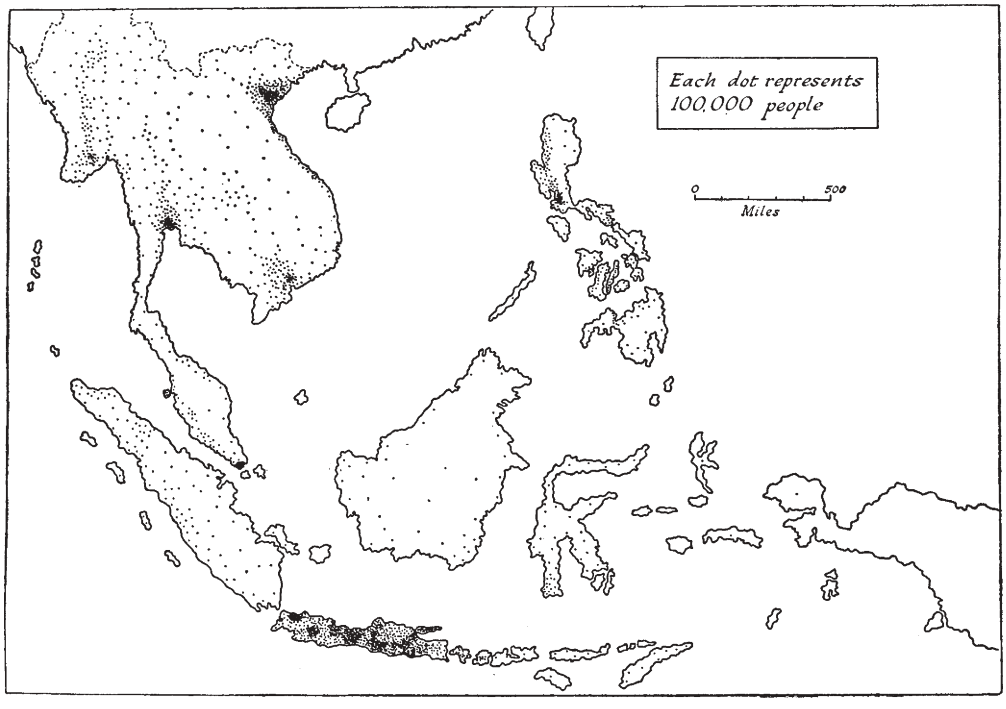
10 Wolfgang Weischet and Cesar N. Caviedes, *The persisting ecological constraints of tropical agriculture* (Harlow, Essex: Longman Scientific, 1993), p. 137.

11 Ernst Löffler, 'Übersichtsuntersuchungen zur Erfassung von Landresourcen in West-Kalimantan, Indonesien', in *Forschungsbeiträge zur Landeskunde Süd- und Südostasiens: Festschrift für Harald Uhlig zu seinem 60. Geburtstag*, ed. E. Meynen and E. Plewe (Wiesbaden: Franz Steiner, 1982), p. 131.

12 E. C. J. Mohr, 'The relationship between soil and population density in the Netherlands East Indies', *Comptes rendus du Congrès International de Géographie Amsterdam 1938*, vol. 2, *Géographie coloniale* (Leiden: E.J. Brill, 1938), p. 493.

13 Charles Robequain, *Le monde malais: Péninsule Malaise, Sumatra, Java, Bornéo, Célèbes, Bali et les petites iles de la Sonde, Moluques, Philippines* (Paris: Payot, 1946), pp. 107–8.

14 Robert E. Huke, *Agroclimatic and dry-season maps of South, Southeast, and East Asia* (Los Baños: International Rice Research Institute, 1982).



Map 1. Southeast Asia: distribution of population, 1950

Source: Charles A. Fisher, 'South-east Asia', in *The changing map of Asia*, ed. W.G. East, O.H.K. Spate and Charles A. Fisher (London: Methuen, 1950), p. 201.

example, is rain during the season in which the new swiddens were opened for planting. If the slashed fallow vegetation cannot be dried out adequately before the burn, as William Marsden observed on Sumatra in the 1780s, 'the spot is commonly abandoned, or, if partially burned, it is not without considerable toil that it can be afterwards prepared for sowing'.[15] A ripening period without too much rain or cloud cover is especially beneficial to rice, originally a crop of drier, sunnier subtropical and warm temperate latitudes which does not usually produce optimal yields under equatorial conditions.[16] Most important of all, however, is the effect of rainfall on soil quality, a factor also well described by Mohr:

> It is obvious that leaching decreases with the rainfall. Hence in areas where the dry East monsoon is felt, the soil is generally comparatively fertile, and what is more, retains its fertility comparatively long. This rule applies all over the globe. All old civilizations which have been able to hold their own for many centuries have had little rain. Cases in point are Mexico, Peru, Carthage, Egypt, Palestine, Mesopotamia, India, China. The most highly developed cultures that have appeared in the Netherland Indies flourished in Middle Java,

15 William Marsden, *The history of Sumatra* (Kuala Lumpur: Oxford University Press, 1975), p. 70.
16 Peter Bellwood, *Prehistory of the Indo-Malaysian archipelago* (Honolulu: University of Hawai'i Press, 1997), pp. 242–5; Ooi Jin-Bee, *Land, people and economy in Malaya* (London: Longmans, 1963), p. 369.

> East Java, and the islands of Bali and Lombok, that is, in areas where the total yearly rainfall was not more than two metres and the East monsoon was strongly felt.[17]

A third important association is between population density and altitude. Partly due to limited geographical resolution, this is less clear on our population map. Anthony Reid, however, has pointed out that until late in the nineteenth century, by far the greater part of the population of Sumatra lived in the high intermontane valleys of the Bukit Barisan, which are the ancient centres of Batak, Minangkabau, Rejang and Pasemah culture.[18] Similar patterns existed in northern Borneo, parts of Sulawesi and Luzon, where some of the most spectacular wet rice terracing in the world supported dense tribal populations at elevations of between 500 and 1,500 metres.[19] We now also know that in the interior of New Guinea, dense populations were found in valleys above 1,500 metres.[20] The favourability of high valleys for settlement and cultivation arose partly from the rainshadow effects of the surrounding mountains, which in many cases assured them of a more reliable dry season than the surrounding lowlands or seaward slopes.[21] Another factor was the facility with which small mountain streams, unlike the low-gradient, flooding rivers of the lowlands, could be dammed and diverted into series of gravity-fed wet rice fields without the need for very large labour investments or technological aids.[22] The lower temperatures in the uplands, finally, meant that soil weathering and nutrient loss were slower.[23]

Demographic patterns in space, then, were determined very largely by climate and soil fertility – in other words, by the economic potential of the land. Sophistry aside, most authorities agree, it is hardly conceivable that the persistent geographical correlation between relatively high population densities and naturally fertile soils, especially with respect to the broad contrast between populous Java and Bali on the one hand, and the sparsely settled outer islands on the other, is a historical accident.[24] That contrast, it should also be stressed, is no recent development: even a conservative estimate of

17 E. C. J. Mohr, 'Climate and soil in the Netherlands Indies', *Bulletin of the Colonial Institute of Amsterdam*, 1 (1938): 245.

18 Anthony Reid, 'Inside out: The colonial displacement of Sumatra's population', in *Paper landscapes: Explorations in the environmental history of Indonesia*, ed. Peter Boomgaard, Freek Colombijn and David Henley (Leiden: KITLV Press, 1997), pp. 61–89.

19 Felix M. Keesing, *The ethnohistory of northern Luzon* (Stanford: Stanford University Press, 1962), p. 312.

20 H. C. Brookfield and Doreen Hart, *Melanesia: A geographical interpretation of an island world* (London: Methuen, 1971), p. 68.

21 Reid, 'Inside out', pp. 78–9.

22 Ulrich Scholz, *Agrargeographie von Sumatra* (Giessen: Selbstverlag des Geographischen Instituts der Justus Liebig, Universität Giessen, 1988), pp. 10–12; Janice Stargardt, 'Water for courts or countryside: Archaeological evidence from Burma and Thailand reviewed', in *The gift of water: Water management, cosmology and the state in South East Asia*, ed. Jonathan Rigg (London: School of Oriental and African Studies, 1992), p. 61.

23 Mohr, 'Climate and soil', p. 245; Karl Pelzer, *Planter and peasant: Colonial policy and the colonial struggle in East Sumatra, 1863–1942* (The Hague: Martinus Nijhoff, 1978), p. 21.

24 Peter Boomgaard, 'Introducing environmental histories of Indonesia', in *Paper landscapes*, ed. Boomgaard *et al.*, pp. 3–4; Jonathan Rigg, *Southeast Asia: A region in transition: A thematic human geography of the ASEAN region* (London: Unwin Hyman, 1991), p. 83.

7.5 million for the total population of Java (with Madura) in 1800 already corresponds to an average population density of over 55 persons per square kilometre.[25] In 1930, by comparison, the equivalent figures for Sumatra and Borneo were still only 17 and four persons respectively.[26] At such an archipelagic scale, moreover, it also becomes very difficult to believe that the correspondence between soil quality and population density reflected constant migration from less productive to more productive areas; clearly, it must have resulted from *in situ* processes affecting fertility and mortality rates.

Population history

If demographic patterns in space were determined in the first place by the quality of local soils, demographic patterns in time seem to have been determined in the first place by the volume of external trade. Here I would like to turn more specifically to the results of my own historical study on the relationship between population, economy, and environment in northern Sulawesi – that is, the colonial residency of Manado or the post-colonial provinces of North and Central Sulawesi, covering between them almost half of the island and a land area of some 90,000 square kilometres (Map 2).[27]

Anthony Reid calls population 'the most difficult problem of quantification' for the historian of pre-colonial Southeast Asia, and some have doubted whether hard demographic conclusions can be drawn even from the copious nineteenth-century colonial statistics for Java and the Philippines.[28] The demographic source materials for northern Sulawesi, thanks in the first place to centuries of relatively intensive European political, commercial and missionary involvement, are relatively abundant over an unusually long period – longer, indeed, than for any other Indonesian region outside Maluku. Dutch East India Company (VOC) correspondence, colonial administrative records, travel accounts and missionary publications all contain numerous population figures for various parts of northern Sulawesi at various periods. The data for Minahasa, for example, begin as early as 1568 and include 15 estimates of various kinds dating from before 1800, 18 from the period 1800–48, and a complete series of annual statistics (including birth and death rates) from 1849 to 1872. The early figures in particular, however, are cryptic and unreliable, many of them expressed in problematic units such as 'fighting men' and incorporating deliberate distortions such as deflation in response to fiscal demands.[29] My adjusted population estimates are based on careful examination of the context in which each original figure was obtained and recorded, and on exhaustive

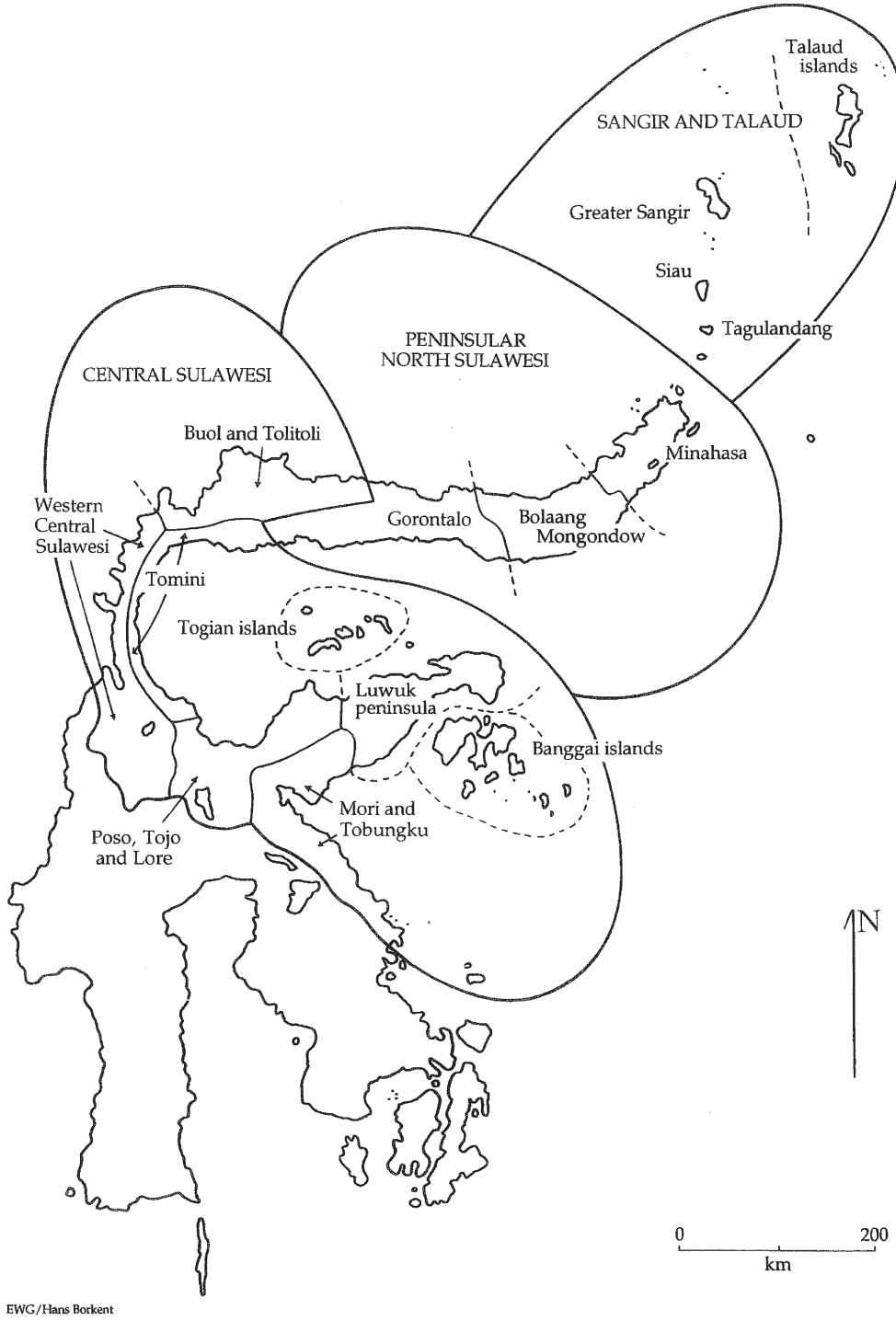
25 This estimate is from P. Boomgaard and A. J. Gooszen, *Changing economy in Indonesia 11: Population trends 1795–1942* (Amsterdam: Royal Tropical Institute, 1991), p. 82. For higher estimates, see Anne Booth, *Agricultural development in Indonesia* (Sydney: Allen and Unwin, 1988), p. 29; Bram Peper, *Grootte en groei van Java's inheemse bevolking in de negentiende eeuw* (Amsterdam: Antropologisch-Sociologisch Centrum, Universiteit van Amsterdam, 1967), pp. 117–18.

26 *Volkstelling 1930* (Batavia: Departement van Economische Zaken, 1933–36), vol. 4, p. 157; vol. 5, p. 155.

27 Henley, *Fertility, food and fever*.

28 Reid, *Southeast Asia*, vol. 1, p. 11; Norman G. Owen, 'The paradox of nineteenth-century population growth in Southeast Asia: Evidence from Java and the Philippines', *Journal of Southeast Asian Studies*, 18, 1 (1987): 57.

29 Four full chapters in my book *Fertility, food and fever* – to which interested readers are referred – are devoted to the presentation and interpretation of the demographic data.



Map 2. Northern Sulawesi: subregions for demographic analysis

Source: Henley, *Fertility, food and fever*, p. 124.

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comparison with other contemporary and related figures. They remain estimates rather than systematic approximations, and their reliability is impossible to quantify. Taken together, however, I am confident that they justify the conclusions drawn below regarding the links between demographic and economic trends.

Table 1 shows my rounded estimates of long-term population averages – smoothed out, as it were, to eliminate the sometimes quite dramatic fluctuations caused by epidemics – for a number of subdivisions within northern Sulawesi (see Map 2) at various periods between 1600 and 1930. The point of this summary is to identify the general trends as a basis on which to show that in almost every case, secular demographic changes were associated with changes in the extent of import and export commerce.

The number of people living on the east coast of Central Sulawesi in Banggai, Tobungku and Mori, to begin with perhaps the most interesting case, was at least 45 percent larger in 1700 than it was in 1900. This demographic collapse, the detailed course of which cannot be reconstructed for lack of quantitative data from the eighteenth and nineteenth centuries, coincided with the long decline of an important local export industry, iron smelting. Eastern Central Sulawesi is one of the few parts of Indonesia where accessible deposits of easily smelted iron ore are numerous, and for this reason its commercial importance was once considerable.[30] Banggai, the polity which originally controlled most of the iron trade, was mentioned in the fourteenth century both by Chinese sources and in the Javanese *Nagarakrtagama*.[31] From the seventeenth century onward, however, its commerce gradually declined due to imports of iron to Indonesia from Europe and China, and partly also due to political changes which caused control of the best iron sources in Sulawesi to shift from the east coast to Bugis communities on the Gulf of Bone in the south.[32] Significantly, the demographic decline that accompanied this change does not seem to have involved much emigration; historical sources do not

TABLE 1:
Population estimates for some subregions of northern Sulawesi, 1600–1930

	1600	1700	1800	1850	1900	1930
Banggai, Tobungku and Mori	–	>130,000	–	–	85,000	90,000
Gorontalo	–	–	85,000	75,000	120,000	185,000
Minahasa	–	55,000	100,000	100,000	185,000	310,000
Sangir	35,000	45,000	40,000	55,000	95,000	120,000
Talaud	–	35,000	45,000	45,000	25,000	25,000

Source: Henley, *Fertility, food and fever*, p. 405.

30 Reid, *Southeast Asia*, vol. 1, p. 110.
31 Roderich Ptak, 'The northern trade route to the Spice Islands: South China Sea–Sulu Zone–North Moluccas (14th to early 16th century)', *Archipel*, 43 (1992): 29, 31; Stuart Robson, *Desawarnana (Nagarakrtagama) by Mpu Prapanca* (Leiden: KITLV Press, 1995), p. 34.
32 David Bulbeck and Ian Caldwell, *Land of iron: The historical archaeology of Luwu and the Cenrana valley* (Hull: University of Hull Centre for South-East Asian Studies, 2000), pp. 96–100; Reid, *Southeast Asia*, vol. 1, p. 112.

indicate that people from Banggai, Mori and Tobungku turned up elsewhere during the period in question. The mechanisms involved, then, must have operated by affecting *in situ* mortality and/or fertility rates.

Moving further down Table 1 and from south to north, the population of Gorontalo declined in the first half of the nineteenth century before growing strongly in the second half. Contemporary sources show that the former period was also one of commercial decline in this area.[33] Reasons for the decline included the exhaustion of local gold mines which had formerly provided much export income; the effect of competition from European factory cloths upon local textile handicrafts, which had previously been exported to Central Sulawesi and Minahasa; and the imposition by the Dutch of heavy customs duties, which caused much of the Bugis transit trade in the Gulf of Tomini to shift from Gorontalo to the nearby Togian Islands. After 1870, by contrast, rattan and copra provided new sources of export income, customs restrictions were relaxed, there was what one observer described as an 'amazing' increase in the volume of trade, and the population grew steadily.[34] In Minahasa the nineteenth-century pattern was similar, with something approaching demographic stasis up to about 1860. In this case the static period was one of export growth, but in the context of a system of compulsory coffee cultivation and *corvée* road building which directed much of the existing labour supply into unproductive or not immediately productive activities, and led to a temporary impoverishment of the population. When internal market exchange and private-sector exports of copra began to pick up after 1860, sustained and ultimately very rapid population growth set in.

Still more interesting in the Minahasan case is the very considerable demographic increase, equivalent to a growth of about 0.6 per cent per year, which appears to have taken place in the course of the eighteenth century. Preceding pacification, cultural Westernization or colonial medicine and public health interventions, this coincided with a strong expansion in the export – partly under the auspices of the Dutch East India Company, and increasingly also by private traders – of Minahasan rice and forest products to Maluku.[35] Here again there was no significant migration to help account for the change. In Sangir, the best source of demographic data from the VOC period, little net population change took place between 1700 and 1850, but the seventeenth century does appear to have seen some growth – possibly in connection with coconut oil exports, which were more significant in 1700 than in 1600.[36] The very rapid demographic growth on Sangir between 1860 and 1900 was certainly associated with a boom in copra production, an industry in which these islands led the region.[37] In this case, moreover, the fact that the onset of the trend coincided with the rise of an entirely new export industry

33 C. B. H. Von Rosenberg, *Reistogten in de afdeeling Gorontalo, gedaan op last der Nederlandsch Indische regering* (Amsterdam: Frederik Muller, 1865), p. 23.

34 G. W. W. C. Baron van Hoëvell, 'De Assistent-Residentie Gorontalo, voor zoover die onder rechtsreeksch bestuur is gebracht', *Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap*, 8 (1891): 42.

35 E. C. Godée Molsbergen, *Geschiedenis van de Minahassa tot 1829* (Weltevreden: Landsdrukkerij, 1928), pp. 87, 106, 113, 122.

36 *Documenta Malucensia*, ed. H. Jacobs (Rome: Institutum Historicum Societatis Iesu, 1974–84), vol. 1, p. 262; Pieter van Dam, *Beschrijving van de Oostindische Compagnie*, vol. 2–1 (The Hague: Martinus Nijhoff, 1931), pp. 56, 67, 71–2.

37 Encyclopaedisch Bureau, 'De zelfbesturende landschappen Tahoelandang, Siaoe, Taboekan, Kandhar-Taroena en Manganitoe op de Sangi- en Talaud-eilanden', *Mededeelingen van het Bureau voor de Bestuurszaken der Buitenbezittingen*, 2 (1912): 48–9.

serves to dispel any suspicion that commercial growth was a result of population growth rather than vice versa.

Neighbouring Talaud, by contrast, never produced much copra, and here the population actually fell by 45 per cent in the last quarter of the nineteenth century. The proximate causes of this spectacular decline were a series of epidemics and food shortages, accompanied by considerable emigration to the mainland of Sulawesi and to Maluku.[38] The underlying cause, however, may well have been the collapse of the indigenous trading system by which the economy of Talaud had traditionally been linked with that of Sangir. This possibility is the more remarkable given that the principal commodity which Talaud had exported to Sangir was a proportion of its own population in the form of slaves, and that the colonial prohibition of slave trading was probably an important reason for its commercial decline.[39]

Many complications, of course, have been brushed over in this short account. The early nineteenth century, for example, saw a considerable exacerbation of the disease environment due to the arrival in Indonesia of a new Asiatic cholera virus in 1821.[40] Neither can exogenous changes in subsistence farming techniques be ruled out as demographic factors: agricultural historian Jouke Wigboldus has suggested, as did J. E. Spencer for the Philippines, that the introduction of a productive new American food crop, maize, was behind population growth in Minahasa prior to the nineteenth century.[41] All things considered, nevertheless, the strongest association is clearly that between demography and commerce: episodes of economic expansion, stimulated by demand for export products like coconut oil, rice, coffee and copra, were usually accompanied by rising population totals, while economic dislocation was associated with low or negative population growth. Demographers often warn that mechanisms adjusting population to resources, where operative at all, are effective only over a very long timescale, and may be overwhelmed in the short term by incidental changes in mortality or fertility.[42] In Sulawesi, however, the demographic response to economic change appears to have been remarkably sensitive. Although migration from poorer to richer areas was sometimes an important factor here, demographic change usually also seems to have involved *in situ* processes affecting fertility and mortality. These processes operated despite very low levels of occupational specialisation, and despite the persistence even in

38 Sydney J. Hickson, *A naturalist in North Celebes: A narrative of travels in Minahassa, the Sangir and Talaut islands, with notices of the fauna, flora and ethnology of the districts visited* (London: John Murray, 1889), p. 169; P. M. L. Tammes, 'De biologische achtergrond van het bevolkingsvraagstuk op Noord-Celebes en de Sangihe- en Talaud-archipel', *Tijdschrift voor Economische Geographie*, 31 (1940): 185–7.

39 D. Carlo Cuarteron, *Spiegazione e traduzione dei XIV quadri relativi alle isole di Salibaboo, Talaor, Sanguey, Nanuse, Mindanao, Celebes, Bornèo, Bahalatolis, Tambisan, Sulu, Toolyan, e Labuan presentati alla Sacra Congregatione de Propaganda Fide nel mese di Settembre 1852* (Roma: Tipografia della S.C. di Propaganda Fide, 1855): 116–17; Encyclopaedisch Bureau, 'De zelfbesturende landschappen', p. 25.

40 Peter Boomgaard, 'Morbidity and mortality in Java, 1820–1880: Changing patterns of death and disease', in Owen ed., *Death and disease in Southeast Asia*, p. 53.

41 J. E. Spencer, 'The rise of maize as a major crop plant in the Philippines', *Journal of Historical Geography*, 1 (1975): 15; Jouke S. Wigboldus, 'A history of the Minahasa c.1615–1680', *Archipel*, 34 (1987): 82–3.

42 Massimo Livi-Bacci, *A concise history of world population* (Oxford: Blackwell, 2001), p. 15; Chris Wilson, 'Understanding the nature and importance of low-growth demographic regimes', in *Asian population history*, ed. Ts'ui-jung Liu, James Lee, David Sven Reher, Osamu Saito and Wang Feng (Oxford: Oxford University Press, 2001), p. 38.

relatively commercialized areas of a subsistence-focused economic system in which most people continued to grow most of their own food, with trade and production for trade as supplementary part-time activities.[43] They also predated colonial intervention: medical and hygiene improvements under colonial rule were not necessary preconditions for demographic growth.

Evidence from other parts of island Southeast Asia, sketchy though it is at the present state of research, supports the idea that commerce and population growth were linked even in apparently unlikely settings. The population of Southeast Kalimantan, for example, seems to have doubled during a period of expanding rattan exports and general commercialization of the economy between 1840 and 1900.[44] For Java and for parts of the Philippines there is increasing evidence that the modern era of sustained population growth actually began not in the early nineteenth century with the intensification of colonial rule, but rather toward the end of the eighteenth.[45] Commodity export statistics assembled from a wide range of sources by Bulbeck and others indicate that this was also a period of very rapid commercial growth for Southeast Asia as a whole.[46] Fragmentary evidence from the Philippines, Maluku and Java, conversely, suggests a very widespread decline in population between 1600 and 1700, a seventeenth-century demographic crisis which coincided with a marked downturn in the volume of maritime trade.[47]

Commerce and mortality

The articulation between economic and demographic conditions seems to have worked via effects on both mortality and fertility. To begin with mortality: some of the population changes described above for northern Sulawesi were transparently associated with changes in the death rate. The case of Talaud in the late nineteenth century has already been noted. The earlier commercial and demographic decline in Gorontalo was likewise accompanied by a series of serious food shortages and epidemic mortality crises.[48] There is even impressionistic evidence that the physical stature of the Gorontalese population deteriorated in the period of economic difficulties between 1820

43 Van Hoëvell, 'De Assistent-Residentie Gorontalo', p. 41; D. van de Velde van Cappellen, 'Verslag eener bezoekreis naar de Sangi-eilanden', *Mededeelingen van wege het Nederlandsch Zendelinggenootschap*, 1 (1857): 50–1.

44 Knapen, *Forests of fortune*, p. 135.

45 Michael Cullinane and Peter Xenos, 'The growth of population in Cebu during the Spanish era: Constructing a regional demography from local sources', in *Population and history: The demographic origins of the modern Philippines*, ed. Daniel F. Doeppers and Peter Xenos (Madison: University of Wisconsin Center for Southeast Asian Studies, 1998), p. 94; Thomas Stamford Raffles, *The history of Java* (Kuala Lumpur: Oxford University Press, 1978), vol. 1, p. 67; M. C. Ricklefs, 'Some statistical evidence on Javanese social, economic and demographic history in the later seventeenth and eighteenth centuries', *Modern Asian Studies*, 20 (1986): 30; Canute Vandermeer, 'Population patterns on the island of Cebu, the Philippines: 1500 to 1900', *Annals of the Association of American Geographers*, 57 (1967): 334.

46 David Bulbeck, Anthony Reid, Lay Cheng Tan and Yiqi Wu, *Southeast Asian exports since the 14th century; Cloves, pepper, coffee, and sugar* (Leiden: KITLV Press, 1998), p. 15.

47 Anthony Reid, 'The seventeenth-century crisis in Southeast Asia', *Modern Asian Studies*, 24 (1990): 649–51; Reid, *Southeast Asia*, vol. 2, pp. 286–91.

48 David Henley, 'Carrying capacity, climatic variation, and the problem of low population growth among Indonesian swidden farmers; evidence from North Sulawesi', in *Paper landscapes*, ed. Boomgaard *et al.*, pp. 96–9.

and 1860.[49] Toward the end of the nineteenth century, conversely, booming copra and rattan exports made possible greater food imports and more intensive local market exchange, and by the 1920s rice imported direct from Singapore provided a permanent buffer against domestic shortages.[50]

In other cases the association between mortality and the food supply is less obvious, but can be deduced with reference to other possible factors. Detailed demographic statistics collected by the colonial government in Minahasa during the second half of the nineteenth century show that a decline in the death rate was definitely involved in the sustained population growth of that period (Figure 1). The deadly mixed epidemic of cholera, measles, influenza and malaria which struck in 1854, and which reflected an ancient pattern of periodic mortality crises, was the last of its kind; thereafter, moreover, the routine death rate in normal years also showed a clear downward trend. Since there was no significant armed conflict in Minahasa after 1809, military pacification cannot have played a direct role in the mortality transition which took place 50 years later. The most

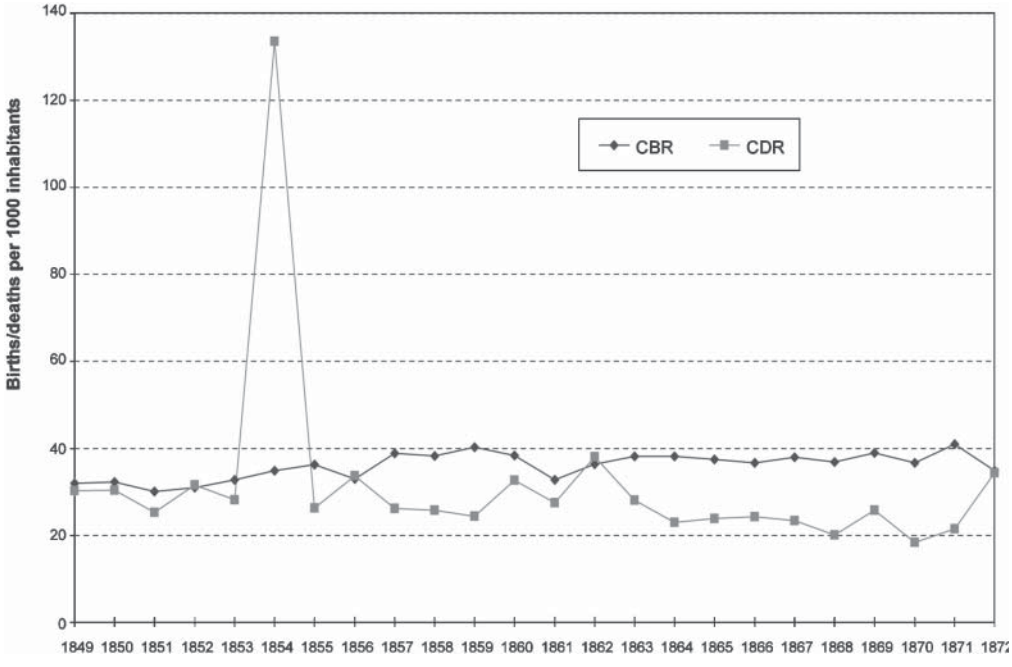

Figure 1. Recorded crude birth and death rates, Minahasa, 1849–1872

Source: Henley, *Fertility, food and fever*, p. 365.

49 C. J. C. Reinwardt, *Reis naar het oostelijk gedeelte van den Indischen Archipel, in het jaar 1821* (Amsterdam: Frederik Muller, 1858), p. 520; J. G. F. Riedel, 'De landschappen Holontalo, Limoeto, Bone, Boalemo en Kattinggola, of Andagile, geographische, statistische, historische en ethnographische aanteekeningen', *Tijdschrift voor Indische Taal-, Land- en Volkenkunde*, 19 (1870): 68–9.
50 J. J. F. Pino, 'Vervolg memorie van overgave van de afdeling Gorontalo' (Nationaal Archief, The Hague, Memorie van Overgave KIT 1185, 1920), p. 7.

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important medical advance of the nineteenth century, smallpox innoculation, can be ruled out on similar grounds: mass vaccination in Minahasa began in 1822, and epidemic smallpox was almost entirely absent from the area after 1841, its eradication coinciding with a period of demographic stasis rather than growth. The use of quinine to treat malaria began in the 1850s and seems to have had some success, particularly among temporary migrants to coastal areas where this disease was endemic; movements to and from the coast, however, had been less intensive in the past, and malaria infections correspondingly less frequent.[51] Personal hygiene may have improved somewhat under missionary influence, but judging by the situation in the early twentieth century, any such improvement was not great.[52]

The disappearance of the periodic epidemic crises, it could be argued, might have reflected a transition of key diseases from epidemic to endemic status as a result of improving communications and incipient population growth, an interpretation for which there is some evidence in the case of dysentery.[53] In the absence of other mitigating factors, however, any such transition would surely have involved some countervailing increase in the normal background death rate, whereas in fact this too declined.[54] In my opinion the mortality decline in Minahasa between 1850 and 1870 must be attributed in large measure to greater availability and better distribution of food, per capita production of which was certainly rising according to Dutch statistics (Figure 2) thanks to the growth of an internal market for rice and maize stimulated by a general commercialization of the economy.[55] Data on rice consumption in other regions, it is true, suggest that the recorded initial production level of some 200 kg of food grains per head would already have been adequate given conditions of effective and equitable distribution.[56] What is nevertheless certain is that the much greater quantities (especially of maize) produced in later years continued to be consumed entirely within Minahasa – food exports in this period were negligible – and that the internal market trade in foodstuffs accelerated markedly.[57]

The 'nutritional' interpretation of the modern rise of population was classically formulated in a European context by Thomas McKeown in 1976.[58] It has since been criticized by some for its oversimplification of the relationship between nutrition and mortality, its failure to appreciate the importance of certain public health and hygiene improvements which took place in Europe from the early nineteenth century onward,

51 Mieke Schouten, *Leadership and social mobility in a Southeast Asian society: Minahasa, 1677–1983* (Leiden: KITLV Press, 1998), p. 69.
52 A. C. N. Bouvy, 'Uit en over de Minahasa I. De Minahassa en de geneeskunst', *Bijdragen tot de Taal-, Land- en Volkenkunde van Nederlandsch-Indië* [hereafter, *BKI*] 80 (1924): 382; N. Graafland, *De Minahassa. Haar verleden en haar tegenwoordige toestand* (Rotterdam: M. Wijt, 1867–69), vol. 1, p. 257.
53 Ibid., vol. 2, p. 158.
54 Massimo Livi-Bacci, *Population and nutrition: An essay on European demographic history* (Cambridge: Cambridge University Press, 1991), p. 120.
55 Henley, 'Carrying capacity', pp. 117–20. The figures refer to husked rice (the weight of which is about half that of unhusked *padi*) and stripped maize grains.
56 Roy F. Ellen, 'Sago subsistence and the trade in spices: a provisional model of ecological succession and imbalance in Moluccan history', in *Social and ecological systems*, ed. P. C. Burnham and R. F. Ellen (London: Academic Press, 1979), p. 61; Lucien M. Hanks, *Rice and man: Agricultural ecology in Southeast Asia* (Chicago: Aldine Atherton, 1972), p. 48.
57 P. van der Crab, *Memorie van overgave van de residentie Menado*, 1875 (Nationaal Archief, The Hague, Memorie van Overgave MMK 229), pp. 269–70; Graafland, *De Minahassa*, vol. 2, p. 195.
58 Thomas McKeown, *The modern rise of population* (London: Edward Arnold, 1976).

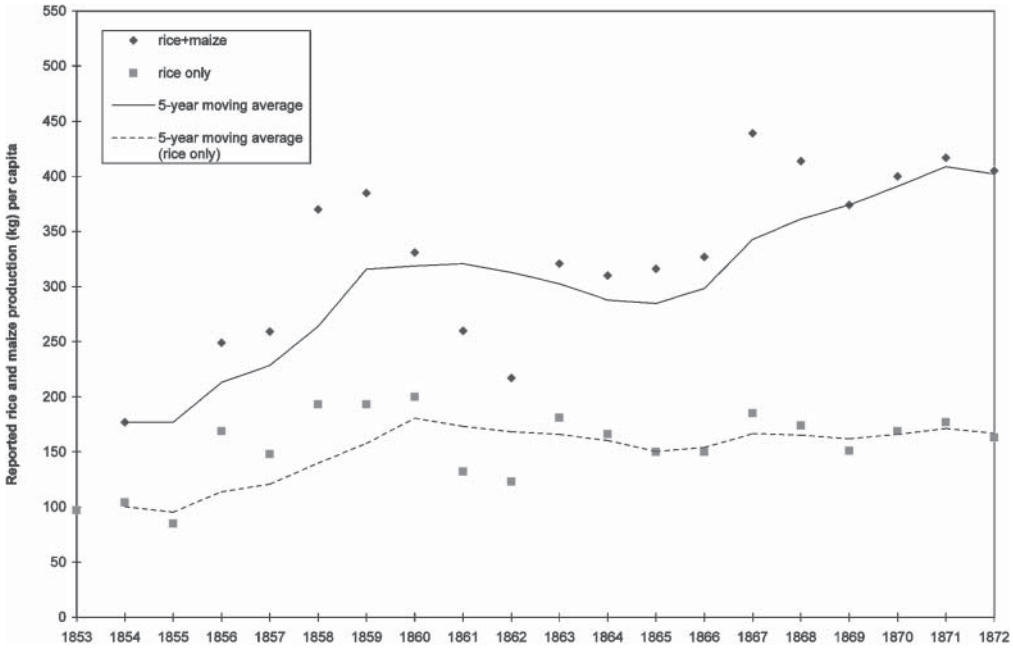


Figure 2. Reported production of staple foodcrops per head of population, Minahasa, 1853–1872

Source: Henley, *Fertility, food and fever*, p. 336.

and its tendency to use the food supply or 'standard of living' as a catch-all residual explanation for any mortality changes which cannot immediately be explained in terms of medical advances.[59] Given, however, the broad correlation between economic and demographic trends which is evident at many periods in European history, and most obviously the fact that the beginning of the decline in British mortality in the eighteenth century coincided with the onset of the industrial and agricultural revolutions but preceded major advances in scientific medicine and public health, other demographers have continued to favour an essentially Malthusian interpretation of secular changes in the death rate.[60] There remains good evidence that even if actual famine had accounted only for a small proportion of mortality in pre-industrial Europe, much of the improvement in life expectancy after 1750 resulted from the elimination of chronic malnutrition, an achievement based on 'advances in agricultural and related technologies that permitted the per capita consumption of food to increase'.[61]

59 Livi-Bacci, *Population and nutrion*; Simon Szreter, 'The importance of social intervention in Britain's mortality decline c.1850–1914; a re-interpretation of the role of public health', *Social History of Medicine*, 1 (1988): 1–37.

60 R. W. Fogel, 'New findings on secular trends in nutrition and mortality: Some implications for population theory', in *Handbook of population and family economics*, ed. Mark R. Rosenzweig and Oded Stark (Amsterdam: Elsevier, 1997), vol. 1A, pp. 433–81; Ronald D. Lee, 'Population dynamics: Equilibrium, disequilibrium, and consequences of fluctuations', in the same source, vol. 1B, pp. 1063–115.

61 R. W. Fogel, 'Second thoughts on the European escape from hunger: Famines, chronic malnutrition, and mortality rates', in *Nutrition and poverty*, ed. S. R. Omani (Oxford: Clarendon, 1992), p. 280.

The demographic significance of malnutrition, as opposed to famine, is of special interest in the Indonesian context. Episodes of visible famine are well attested to in the histories of Java and the climatically dry Lesser Sunda Islands.[62] But the near absence of adult starvation in either the oral or the documentary records from certain wetter and more sparsely populated parts of Indonesia, where sago and wild tubers provided reliable emergency food sources, has led some writers to deny the existence in these cases of any articulation between demography and the resource base via the food supply and its influence on mortality.[63] This, however, is a naive interpretation of the Malthusian 'positive check', which under most circumstances, as Malthus himself was quick to note, 'is not so obvious to common view' as the 'preventive check' of fertility control.[64] The demographic impact of malnutrition, in fact, works mainly via enhanced infant mortality. In remote communities on Borneo, it has been observed, the normal situation is one in which 'few persons go hungry but poor nutrition reduces the strength of adults and has more serious effects on the very young and very old'.[65] Han Knapen, while stressing that 'starvation from hunger was practically unknown' in Southeast Kalimantan between 1600 and 1880, also shows that infant and child mortality rates were 'awfully high' and concedes that 'persistent undernourishment may have contributed to the loss of lives' by rendering the population less resistant to disease.[66]

Medical research on Madura in the 1980s confirmed that even where 'real hunger' was never evident, infant death rates still reflected variations in the availability of food. One reason for this correlation is that the birth weight of children born to underfed mothers tends to be dangerously low; another is that breast milk produced by undernourished women is deficient in fat and energy. In order to 'promote infant survival and growth', concluded the authors of this policy-oriented study, 'safeguarding food security at the household level is the most appropriate intervention'.[67] Earlier research in Yogyakarta found that the weight of Javanese infants at birth was consistently correlated with the level of prosperity enjoyed by their parents.[68] Economic historian Pierre van der Eng argues for Indonesia as a whole that increased domestic food production after 1905 fuelled population growth through the medium of dietary improvements leading to reduced infant mortality.[69] While cultural factors may also play an important role in

62 Peter Boomgaard, 'Crisis mortality in seventeenth-century Indonesia', in Liu *et al.* ed., *Asian population history*, pp. 197–9; W. R. Hugenholz, 'Famine and food supply in Java 1830–1914', in *Two colonial empires*, ed. C. A. Bayly and D. H. A. Kolff (Dordrecht: Martinus Nijhoff, 1986); Metzner, *Agriculture and population pressure*, p. 90; F. J. Ormeling, *The Timor problem: A geographical interpretation of an underdeveloped island* (Djakarta: J. B. Wolters, 1955), pp. 26, 237.

63 Patrice Levang, *La terre d'en face: La transmigration en Indonésie* (Paris: Éditions de l'Orstom, 1997), pp. 105–6; Reimar Schefold, *Lia: Das große Ritual auf den Mentawai-Inseln (Indonesien)* (Berlin: Dietrich Reimer, 1988), pp. 68–9.

64 Malthus, *Essay on the principle of population*, p. 36.

65 Jennifer Alexander and Paul Alexander, 'Economic change and public health in a remote Sarawak community', *Sojourn*, 8 (1993): 258.

66 Knapen, *Forests of fortune*, pp. 160, 183.

67 J. A. Kusin and Sri Kardjati, 'Summary and overview of main findings', in *Maternal health and nutrition in Madura, Indonesia*, ed. J. A. Kusin and Sri Kardjati (Amsterdam: Royal Tropical Institute, 1994), pp. 25–6, 34.

68 M. Timmer, 'Prosperity and birthweight in Javanese infants', *Tropical and Geographical Medicine*, 13 (1961): 316–20.

69 Pierre van der Eng, *Food consumption and the standard of living in Indonesia, 1800–1990* (Canberra: Research School of Pacific Studies, Australian National University, 1993), pp. 33, 41.

shaping food consumption patterns, World Health Organization reports dealing with Southeast Asia have stressed the close relationship between malnutrition and poverty.[70]

The production of cash crops for export has often been thought of as a threat to the food security of subsistence farmers, and in the special case of Java during the Cultivation System (1830–70), when farmers were forced by the colonial government to transfer limited land and labour resources from subsistence to export crops, there is certainly some evidence for a temporary decline in food production and consumption.[71] Under market conditions, however, the relationship between export crop production and human nutrition is most often a positive one. One reason for this is that the income obtained from exports can be used to purchase more food even if those who produce the export crops grow less for themselves.[72] Rice imports paid for out of profits from copra exports, as already noted, provided an important buffer against local production shortfalls in northern Sulawesi during the late colonial period, and in the 1930s one third of all the rice consumed in Minahasa was routinely imported from Java, South Sulawesi, and mainland Southeast Asia.[73] Even in Java under the Cultivation System, road improvements and market formation (together with some state-organized famine relief) appear ultimately to have compensated for the decline in domestic food production by improving the means of distribution between districts.[74]

Lubrication of local food exchange as a result of foreign trade could take place even in non-monetized economies: among the Iban of Sarawak, according to Derek Freeman, imported 'prestige' goods such as Chinese ceramics were acquired partly with a specific view to exchanging them for rice in the event of a food shortage within the household.[75] In the remote Tinombo area of Central Sulawesi, according to Tania Li, the formation of trading partnerships between members of upland and lowland population groups constitutes an important element of social insurance strategies designed to safeguard subsistence itself in the event of a crisis.[76] Trading contacts affected the diet in terms of quality as well as quantity; medical research in the Poso and Mori areas of eastern Central Sulawesi soon after the Second World War, for instance, found that it was among the economically isolated populations of the mountainous interior that nutrition was poorest:

> The sole source of food for the population was . . . the native soil. . . . Thus, the nutritional condition was determined by what was locally grown. This meant an enforced vegetarian

70 C. Gopalan, *Nutrition: Problems and programmes in South-East Asia* (New Delhi: World Health Organization Regional Office for South-East Asia, 1987), pp. 8–10, 66–7; Gopalan, *Nutrition in developmental transition in South-East Asia* (New Delhi: World Health Organization Regional Office for South-East Asia, 1992), pp. 13, 28. For arguments emphasizing the role of culture, see Selo Soemardjan, 'Influence of culture on food and nutrition: The Indonesian case', in *Nutrition and development*, ed. Margaret Biswas and Per Pinstrup-Andersen (Oxford: Oxford University Press, 1985), pp. 163–81; R. J. Wolff, 'Meanings of food', *Tropical and Geographical Medicine*, 17 (1965): 45–51.

71 Peter Boomgaard, *Children of the colonial state: Population growth and economic development in Java, 1795–1880* (Amsterdam: Free University Press, 1989), p. 98.

72 Per Pinstrup-Andersen, 'The impact of export crop production on human nutrition', in *Nutrition and development*, ed. Biswas and Pinstrup-Andersen, pp. 56–7.

73 A. H. Verkuyl, 'De Minahasa IV (slot)', *Tropisch Nederland*, 11 (1938): 106–7.

74 Boomgaard, *Children of the colonial state*, p. 188.

75 J. D. Freeman, *Iban agriculture: A report on the shifting cultivation of hill rice by the Iban of Sarawak* (London: Her Majesty's Stationery Office, 1955), p. 103.

76 Tania Murray Li, *Culture, ecology and livelihood in the Tinombo region of Central Sulawesi* (Jakarta: Environmental Management Development in Indonesia Project, 1991), p. 63.

> and one-sided diet. . . . Meat which could be had by hunting and fish which abounds in the rivers and lakes, were sporadically eaten but there was no efficient distribution in the market, except perhaps on the coast. . . . As regards schoolchildren from the Central Sulawesi coast, who have another mode of living and another diet (their fathers and brothers are merchants and fishermen), the weight-line is much nearer the general Indonesian standard. . . .[77]

By enhancing commercial demand for foodstuffs, finally, the 'multiplier effects' of foreign commerce could stimulate not only local food exchange, but also local food production. In nineteenth-century Minahasa, monetary income from coffee exports powered a process of market integration and a growth in commercial demand for foodstuffs which led to the marked rise in per capita food production depicted in Figure 2 even at a time when compulsory road-building duties, as well as coffee cultivation itself, were making heavy competing demands on the available labour resources. The emergence of a pan-Minahasan food market, it appears, both strengthened the direct economic incentives to invest labour in surplus food production and weakened older, social mechanisms of local redistribution (of which more below) which in the past had tended to discourage such investment.

That subsistence-based communities sometimes suffer from food supply or dietary problems due to persistently marginal levels of production has been well documented both in Indonesia and elsewhere.[78] Among the Iban of Sarawak, Freeman observed that in a bad year only one in three families was able to meet its own rice requirements, and concluded that 'the subsistence economy of the Iban is one of scarcity rather than plenty'.[79] In a similar setting in Indonesian Borneo, Michael Dove likewise witnessed a 'disastrous' harvest after which most households were forced to beg seed rice from other longhouses up to a day's travel away.[80] One reason for such underproduction is that subsistence farmers often display a 'leisure preference' which makes them unwilling to invest labour in more than a minimum tolerable level of production that effectively exposes the more vulnerable members of their communities, notably the very young, to risk.[81] Up to the beginning of the nineteenth century, for instance, many Minahasans practised a system of biennial agriculture in which the opening of new swiddens and the planting of rice and maize took place only once every other year.[82] The second year of the cycle was known as 'the time of staying at home'.[83]

77 J. F. de Wijn, 'A nutritional survey of the Toradja population (Central Celebes) compared with other agrarian populations in Asia', *Documenta de Medicina Geographica et Tropica*, 4 (1952): 149–50.
78 Marshall Sahlins, *Stone Age economics* (Chicago: Aldine Atherton, 1972), pp. 51–74; Ronald E. Seavoy, *Famine in peasant societies* (New York: Greenwood Press, 1986), pp. 9–27.
79 Freeman, *Iban agriculture*, pp. 96–7, 104.
80 Michael Roger Dove, *Swidden agriculture in Indonesia: The subsistence strategies of the Kalimantan Kantu'* (Berlin: Mouton, 1985), pp. 149, 170, 214.
81 G. J. Knaap, *Kruidnagelen en Christenen; De Verenigde Oost-Indische Compagnie en de bevolking van Ambon 1656–1696* (Dordrecht: Foris, 1987), p. 127; Richard G. Wilkinson, *Poverty and progress; An ecological model of economic development* (London: Methuen, 1973), p. 84. Ronald Seavoy, underestimating its amenability to change in the presence of commercial incentives to greater diligence, went so far as to describe this as an 'ethic of indolence' (*Famine in peasant societies*, p. 195).
82 Schouten, *Leadership and social mobility*, p. 47; Wigboldus, 'A history of the Minahasa', pp. 78, 81–2.
83 J. Alb. Schwarz, *Tontemboansche teksten* (Leiden: E. J. Brill, 1907), vol. 3, p. 266.

Another reason for the underutilization of resources, paradoxically, was the so-called 'moral economy' of tribal and peasant societies, which tended to insist on the sharing of food and other resources within a collectivity defined by kinship or locality. While some individuals and households in this situation produced a surplus for redistribution in order to increase their social standing, many others were typically content to free-ride on the labour of their more ambitious neighbours, seldom producing enough even for their own subsistence needs.[84] In this way the pressure to share, while favouring a relatively equitable distribution of the existing food and other resources on a very local scale, also restricted the total size of the resource pool available to be shared. A further disadvantage of such tribal economies in nutritional terms is that even when particular social groups succeeded in accumulating food reserves, they often did so as a form of 'social production' aimed at the sudden dissipation of those reserves in profligate, status-boosting 'feasts of merit'.[85] At funeral feasts in pre-colonial Central Sulawesi, at least according to missionary sources, so much meat was consumed by people accustomed to a largely vegetarian diet that many of the guests typically became ill, and so much rice was eaten that 'a period of famine [*hongersnood*] always followed'.[86]

Subsistence economies, in short, tended to be very inefficient in their use of agricultural (and other) resources. Not all potential production factors were employed, and even of what was produced, a significant part was consumed in ways which did not encourage population growth. This is one reason, alongside the still not always fully appreciated poverty of rainforest soils, why the 'carrying capacity' of the sparsely-populated frontier areas in pre-colonial Southeast Asia was effectively very much lower than we now tend to assume; another is that subsistence economies were particularly vulnerable to the El Niño-related climatic fluctuations to which we now know the region is subject.[87] Under conditions of economic self-sufficiency, it can be concluded, only those areas with the most fertile soils and the most favourable climatic and hydrological conditions were in practice suitable for habitation and cultivation.

Some misconceptions concerning mortality and morbidity in the Southeast Asian past

Some early European travel accounts, Anthony Reid points out, emphasize the tall stature and good health of Southeast Asians.[88] These reports, however, need to be interpreted with caution as they are based largely on the appearance of active adults, a group whose condition, as Reimer Schefold noted on the Mentawai island of Siberut in the 1970s, may be a poor guide to that of the population as a whole:

84 N. Adriani and Alb. C. Kruyt, *De Bare'e sprekende Toradjas van Midden-Celebes (de Oost-Toradjas)* (Amsterdam: Noord-Hollandsche, 1950–51), vol. 1, p. 150; Sahlins, *Stone Age economics*, pp. 69–74, 114–15.

85 H. C. Brookfield, 'Intensification and disintensification in Pacific agriculture; a theoretical approach', *Pacific Viewpoint*, 13–1 (1972): 38.

86 N. Adriani and Alb. C. Kruyt, *De Bare'e-sprekende Toradja's van Midden-Celebes* (Batavia: Landsdrukkerij, 1912–14), vol. 2, p. 200; H. F. Tillema, *'Kromoblanda'; Over 't vraagstuk van "het wonen" in Kromo's groote land*, vol. 5–1 (n.p.: n.n., 1922), p. 211.

87 El Niño – *history and crisis*, ed. Richard H. Grove and John Chappell (Cambridge: The White Horse Press, 2000); J. R. E. Harger, 'ENSO variations and drought occurrence in Indonesia and the Philippines', *Atmospheric Environment*, 29 (1995): 1943–55.

88 Reid, 'Low population growth', pp. 37–8.

> In view of this long list [of prevalent diseases], it is not surprising that few Mentawaians reach an advanced age. Particularly at risk, of course, are the small children, of whom according both to my own notes and to information provided by the missionaries, well over half die, mostly in the first weeks after birth and at the time of weaning. Yet in spite of all this, the Mentawai islanders do not make a sickly impression. . . . In the middle of the last century, [European visitors] already observed that Mentawaians generally displayed a good state of health . . . .[89]

Adult body height is usually regarded as a good index of the nutritional and disease history of individuals.[90] But because infant and child mortality accounted for much of the death rate in pre-colonial times, the correlation between overall mortality and the stature of the surviving adults was often weak.[91] 'The conditions under which the Kalinga live', observed Edward Dozier of this isolated Philippine people around 1960, 'tend to eliminate all but the exceptionally fit. As a result, the adult populations are of magnificent physique, but the toll of those who do not make it into adult life is great'. One of these conditions, Dozier also noted, was 'a poor diet which lowers resistance to diseases of all sorts'.[92] In 1950, likewise, a survey of health conditions in part of Central Sulawesi referred to Toraja adults, who were taller and heavier than most Indonesians, as the exceptionally fit 'survivals' of an 'appallingly high death rate' caused by 'poor nutrition in youth'.[93] In this perspective the surprising thing about European and Southeast Asian stature in the sixteenth and seventeenth centuries is not that Southeast Asian adults were taller than their European counterparts, but rather that so many small and weak Europeans survived childhood and reached the other side of the world to compare themselves with Southeast Asia's surviving fittest.

It has sometimes been suggested, on the basis of twentieth-century sources, that gonorrhoea was a significant cause of low fertility among Southeast Asian tribal populations.[94] Earlier sources, however, indicate that in the more isolated parts of Indonesia (as opposed to the major states and trading ports) sexually-transmitted disease became prevalent only at a late date, and therefore cannot be implicated in the long-term pattern of low population growth.[95] In eastern Central Sulawesi, for example, venereal diseases were present in coastal trading settlements but 'completely unknown' in the tribal interior around 1900.[96] In the 1930s they continued to be 'virtually unknown' except in

89 Schefold, *Lia; Das große Ritual*, pp. 69–70.
90 Roderick Floud, Kenneth Wachter and Annabel Gregory, *Height, health and history* (Cambridge: Cambridge University Press, 1990), pp. 245–51.
91 John C. Caldwell and Bruce K. Caldwell, 'Pretransitional population control and equilibrium', *Population Studies*, 57 (2003): 200.
92 Edward P. Dozier, *Mountain arbiters: The changing life of a Philippine hill people* (Tucson: University of Arizona Press, 1966), p. 42.
93 De Wijn, 'A nutritional survey of the Toradja population', p. 168.
94 Reid, 'Low population growth', pp. 41–2; *Southeast Asia*, vol. 1, p. 161.
95 Knapen, *Forests of fortune*, p. 156; Anke van der Sterren, Alison Murray and Terry Hull, 'A history of sexually transmitted diseases in the Indonesian archipelago since 1811', in *Sex, disease, and society: A comparative history of sexually transmitted diseases and HIV/AIDS in Asia and the Pacific*, ed. Milton Lewis, Scott Bamber and Michael Waugh (Westport, CT: Greenwood Press, 1997), pp. 203–7.
96 Alb. C. Kruyt, 'Gegevens voor het bevolkingsvraagstuk van een gedeelte van Midden-Celebes', *Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap*, 20 (1903): 198.

'the more civilized places'.[97] As late as 1950 syphilis, at least, was still completely absent from the upland populations of this area 'thanks to their isolation'.[98] It was precisely among the remote populations untouched by sexually-transmitted diseases, strikingly, that the birth rate was lowest.

Epidemics often caused enormous loss of life in the short term, and some public health innovations of the colonial period, notably smallpox vaccination and certain forms of malaria control, led to significant reductions in mortality.[99] Nevertheless it does not seem likely that disease and medicine as such can do much to explain the longer-term patterns of demographic change in Southeast Asian history. The global pathogen exchanges described in works like W. H. McNeill's *Plagues and peoples* were of much less importance in Southeast Asia than in the New World, since in this region the more accessible populations, at least, have formed part of the great Eurasian 'disease pool' for as long as history records.[100] In Southeast Asia it was not the native people who perished as a result of global population movements, but the immigrants: approximately half of all the European newcomers to Batavia in the middle of the eighteenth century, to take the most extreme case, died within a year of their arrival there, mostly of malaria.[101]

Military pacification is another aspect of the colonial period which should not be overestimated in terms of its effects on mortality and population growth. Central Sulawesi, where headhunting was an important social institution and most settlements were permanently fortified, was in many ways typical of pre-colonial Southeast Asia's violent stateless societies. Missionaries working there before the Dutch conquest initially assumed that loss of life due to warfare must be heavy. Yet over a decade of more or less continuous war between two rival groups in the Poso area, each with a population of several thousand, they counted an average of fewer than 20 deaths per year on both sides – a surprisingly low depletion rate for a conflict which local informants insisted had been 'one of the bloodiest'.[102] Pitched battles were rare, most actions being limited to fleeting raids and ambushes, while the women and children of defeated enemies were captured alive if possible and taken into captivity as slaves. 'War and headhunting', the missionaries concluded, 'were not as important as one might imagine as direct reasons for the sparseness of the population, because the battles were seldom bloody and if ten people died as a result of a headhunt, that was already a large number.'[103] Since headhunting was typically a seasonal affair engaged in when 'the rice barns had just been filled after the harvest', it seldom disrupted food supplies, nor did the time spent on fighting detract

97 K. F. Avink, *Aanvullende bestuursmemorie onderafdeling Kolondale*, 1935 (Nationaal Archief, The Hague, Memorie van Overgave KIT 1214), p. 8.
98 De Wijn, 'A nutritional survey of the Toradja population', p. 166.
99 Peter Boomgaard, 'Smallpox, vaccination, and the Pax Neerlandica; Indonesia, 1550–1930', *BKI*, 159 (2003): 590–617; *Environmental measures for malaria control in Indonesia – an historical review on species sanitation*, ed. W. Takken, W. B. Snellen, J. P. Verhave, B. G. J. Knols, and S. Atmosoedjono (Wageningen: Wageningen Agricultural University, 1990).
100 William H. McNeill, *Plagues and peoples* (Oxford: Basil Blackwell, 1977).
101 P. H. van der Brug, *Malaria en malaise; De VOC in Batavia in de achttiende eeuw* (Amsterdam: De Bataafsche Leeuw, 1994), p. 59.
102 Adriani and Kruyt, *Bare'e-sprekende Toradja's*, vol. 1, p. 227.
103 Ibid., p. 77.

much from agricultural labour inputs: one missionary account describes warfare in Central Sulawesi as 'a sort of sport' which simply 'filled up in an exciting way the time during which the men's labour was not required in agriculture'.[104]

Doubts regarding the demographic significance of violence are strengthened by the fact that the long-term population trends reconstructed above for Central and North Sulawesi (Table 1) show no correlation with conditions of war and peace. The Minahasan population, for instance, seems to have grown steadily during a period of endemic domestic warfare in the eighteenth century, but stagnated or declined for several decades after the pacification of Minahasa by Dutch military forces in 1809.[105] The conclusion that warfare was not an important check on population growth in sparsely populated stateless areas is strongly supported by parallel evidence from Kalimantan.[106] It may well be that in the major indigenous states of Java and mainland Southeast Asia, the greater scale and economic disruptiveness of wars did make them important causes of demographic change in the short or medium term.[107] But if violence had really been a key long-term obstacle to population growth for the Southeast Asian region as a whole, then we would expect its effects to be greatest in the zones of least dense population, whereas in fact the reverse was true.

Much the same can probably be said of natural disasters such as volcanic eruptions and harvest failures caused by anomalous weather. Although some authors have made much of the mortality crises associated with such disasters, it bears repeating that the population of island Southeast Asia has always been concentrated in the vicinity of active volcanoes and in relatively dry regions subject to periodic drought – that is, in precisely the most disaster-prone areas.[108] Demographically speaking, the long-term advantages of vulcanism and aridity in terms of soil fertility far outweighed their short-term disadvantages in terms of eruptions and droughts. Even the significance of epidemic (as opposed to endemic) disease probably should not be overestimated: Peter Boomgaard has calculated that on Java in the period 1820–80, 'the excess mortality due to epidemics and other disasters amounted to little more than 10% of total mortality'.[109] The really important determinants of population density and change in Southeast Asian history were not spectacular events such as wars and plagues, but more subtle and persistent influences on health and reproductive fertility which arose from the availability or scarcity of economic resources.

Commerce and fertility

Besides falling mortality, the Minahasan data also show a clear trend toward higher birth rates after 1850 (Figure 1). Peter Xenos and Shui-Meng Ng have found a similar

104 Alb. C. Kruyt, *De West-Toradjas op Midden-Celebes* (Amsterdam: Noord-Hollandsche, 1938).
105 Mieke Schouten (*Leadership and social mobility in a Southeast Asian society*, p. 49) believes that armed conflict in Minahasa was in fact on the rise during the eighteenth century.
106 Han Knapen, 'Koortsachtig koppen tellen in de binnenlanden van Zuidoost-Borneo (1700–1900)', *Spiegel Historiael*, 32 (1997): 445–7.
107 Reid, 'Low population growth', pp. 42–3; Wilbur Zelinsky, 'The Indochinese Peninsula: a demographic anomaly', *Far Eastern Quarterly*, 9, 2 (1950): 138.
108 The present author is among those who have exaggerated the importance of such mortality crises (Henley, 'Carrying capacity').
109 Boomgaard, *Children of the colonial state*, p. 187.

trend in demographic records from the Philippine parish of Nagcarlan (Luzon).[110] Although far more attention is naturally focused on the current near-global transition from high to low fertility, the fact that in many parts of the world there was an earlier historical transition from low to high fertility is also well known and has often been noted, at least in relation to swidden-farming tribal populations, in specifically Southeast Asian contexts.[111] A missionary survey of 458 post-menopausal women in the Poso area of Central Sulawesi in 1902, shortly before its population was colonized and converted to Christianity, found them to have borne a reported average total of 3.23 children each, of which just 2.41 had survived early childhood; some communities, indeed, were reproducing at well below the rates necessary to maintain their existing populations.[112] A little more than 20 years later, according to a comparable survey carried out over a much larger area of Central Sulawesi, the equivalent figures were 3.90 and 3.14 respectively.[113]

Anthony Reid mentions two of the most obvious proximate reasons for low traditional fertility rates in his pioneering essay: induced abortion, in which some practitioners of Southeast Asian traditional medicine were exceptionally skilled, and prolonged breast-feeding, which reduces fecundity by generating lactational amenorrhoea.[114] To these Boomgaard adds delayed marriage, a factor initially discounted by Reid on the basis of the earliest European sources, but well documented in colonial times from many Indonesian societies, and contraceptive rotation of the uterus, the effectiveness of which is clearly attested to in colonial sources even if its incidence may have been exaggerated by some observers as a result of racial differences in the normal position of the non-pregnant womb.[115] Other factors include the widespread practice of infanticide.[116] As far as Southeast Asia is concerned, then, there is clearly every reason to follow Marvin Harris and Eric Ross in rejecting the view that demographic patterns in pre-modern societies reflected 'a culturally unregulated surrender to sex, hunger, and death'.[117]

Low birth rates in affluent postindustrial societies and rapid population growth in the developing countries have accustomed us to associate high reproductive fertility with poverty rather than wealth. In the past, however, the reverse was more often true, partly because both the actual and the opportunity costs of childrearing were lower.[118] During

110 Peter Xenos and Shui-Meng Ng, 'Nagcarlan, Laguna: a nineteenth-century parish demography', in *Population and history*, ed. Doeppers and Xenos, p. 208.
111 Huw Jones, *Population geography* (London: Paul Chapman, 1990), p. 135; Reid, 'Low population growth', pp. 40–1.
112 Kruyt, 'Gegevens voor het bevolkingsvraagstuk', pp. 197–8.
113 H. F. Tillema, *Zonder tropen geen Europa!* (Bloemendaal: privately published, 1926), pp. 46–7.
114 Reid, 'Low population growth', pp. 41, 45; Shepherd, *Marriage and mandatory abortion among the 17th-century Siraya*, pp. 5–7; Marvin Harris and Eric B. Ross, *Death, sex, and fertility: Population regulation in preindustrial and developing societies* (New York: Columbia University Press, 1987), p. 8; Osamu Saito, 'Historical demography: achievements and prospects', *Population Studies*, 50 (1996): 546.
115 Boomgaard, *Children of the colonial state*, pp. 192–5; Reid, 'Low population growth', p. 38; Boomgaard, inaugural professorial lecture, Universiteit van Amsterdam: *Historicus in een papieren landschap* (Leiden: KITLV, 1996), p. 18; Johannes Adrianus Verdoorn, 'Verloskundige hulp voor de inheemsche bevolking van Nederlandsch-Indië (Ph.D. diss., Rijksuniversiteit Leiden, 1941), pp. 59–60; Th. L. W. van Ravesteyn, '*Retroflexio uteri* as an anthropological characteristic', *Tropical and Geographical Medicine*, 11 (1959): 61–5.
116 J. P. Kleiweg de Zwaan, 'Kindermoord in den Indischen archipel', *Mensch en Maatschappij*, 1 (1925): 22–39.
117 Harris and Ross, *Death, sex, and fertility*, p. 1.
118 Lee, 'Population dynamics', p. 1074.

the early 1970s, just before the use of modern methods of family planning became widespread in Indonesia, Terry Hull and Valerie Hull showed that there was a positive rather than negative correlation between reproductive fertility and economic class on Java – that is, that wealthier women had more children, not fewer, than their poorer counterparts.[119] Boomgaard and Robert Elson have both associated increasing prosperity with rising nuptuality, and hence fertility, in nineteenth-century Java.[120] My evidence from Minahasa in the nineteenth century confirms that delayed marriage, the classical form of the Malthusian 'preventive check', formed one important link between demography and economic resources. Up to the mid-nineteenth century, Minahasan women seldom married before the age of twenty; but during the period of commercial expansion after 1850, younger marriages became more common.[121] There are indications that scarcity of farmland on the densely populated central plateau had been one reason for the traditional pattern of delayed marriage, and that the colonisation of the less fertile lowlands in connection with the copra boom was instrumental in bringing about the change. Another factor was the increased availability of cash and trade goods with which to make brideprice payments.

Rates of deliberate and direct birth control by means of abortion and infanticide were also affected by economic conditions. 'Abortions', concluded W. H. Scott on the basis of early Spanish sources from the Philippines, 'were a common form of family planning, practiced by ranking ladies to limit their lineage and preserve their heritage, or by others because of poverty or poor prospects for their children'.[122] In one part of Central Sulawesi, a female custodian of family heirlooms reportedly sometimes remained childless simply in order 'to keep the inheritance undivided in her possession'.[123] These statements recall Mary Douglas' argument that conscious attempts at population control in traditional societies 'are more often inspired by concern for scarce social resources, for objects giving status and prestige, than by concern for dwindling basic resources'.[124] Prestige goods were often imported items, and the idea of a particularly direct link between imports and fertility patterns accords with the observed closeness of the relationship between commercial and demographic change.

Adam Smith declared that 'the demand for men, like that for any other commodity, necessarily regulates the production of men'.[125] Scholars concerned with Indonesia have played an important role in linking demographic growth with the demand for labour, noting that the colonial population boom in nineteenth-century Java coincided with a

119 Terence H. Hull and Valerie J. Hull, 'The relation of economic class and fertility: An analysis of some Indonesian data', *Population Studies*, 31 (1977): 43–57.
120 Boomgaard, *Children of the colonial state*, p. 197; R. E. Elson, *Village Java under the Cultivation System, 1830–1870* (Sydney: Allen and Unwin, 1994), pp. 289–90.
121 'Rapport over de 'adat kebiasaan, uitgebracht door een inlandsche commissie', *Adatrechtbundel*, 3 (1910): 64.
122 William Henry Scott, *Barangay; Sixteenth-century Philippine culture and society* (Quezon City: Ateneo de Manila University Press, 1994), p. 118.
123 Tillema, *Zonder tropen geen Europa!*, p. 221.
124 Mary Douglas, 'Population control in primitive groups', *British Journal of Sociology*, 17 (1966): 268.
125 Adam Smith, *An inquiry into the nature and causes of the wealth of nations* (Oxford: Oxford University Press, 1976), p. 98.

period in which Javanese households were subject to a greatly increased labour burden as a result of compulsory agricultural and road building work in connection with the Cultivation System. Ben White has suggested that Javanese parents had met this demand partly by altering the allocation of food within their households in such a way as to allow more of their children to survive.[126] Jennifer Alexander and Paul Alexander argue that the adjustment had worked via fertility rather than mortality as traditional birth control practices (abortion, delayed marriage, and prolonged breast-feeding) were deliberately relaxed.[127] Paul Alexander later came to favour an involuntary reduction in breast-feeding, as a result of the growing labour burden borne by women themselves, as the main factor.[128]

Evidence from Minahasa, where the population was subjected in the nineteenth century to a well-documented compulsory labour burden in connection with the cultivation of coffee under a state monopoly system, supports the labour-demand theory of population growth. Plotting the average number of children born to date into each household against the size of the compulsory labour burden for a number of Minahasan districts in the 1870s, a clear positive correlation emerges (Figure 3).[129] I cannot tell whether this results from the deliberate production of more children to share the labour burden (which was imposed on a household basis), or from reduced lactational amenorrhoea among hard-worked women, who also shared in that burden and who, according to the explicit testimony of contemporary sources, consequently had less time to care for and breast-feed their children.[130] The precision of the correlation tends to suggest reduced breast-feeding, which as an unconscious mechanism would presumably have been less subject to cross-cutting influences. In this context fertility appears to have been more closely linked to workload than to income, although I was only able to check this as far as income from the coffee deliveries themselves was concerned.

Since increased demands for household labour could result from new commercial opportunities as well as from political compulsion, it is reasonable to suppose that most episodes of economic growth elicited fertility increases by boosting both income supply and labour demand. But the two variables are not identical, and under some circumstances they may even change in opposite directions. Alexander and Alexander argue that in Java under the Cultivation System, the compulsory labour demand imposed on a household basis by the colonial government had the effect of raising the birth rate under conditions of diminishing rather than rising incomes – a conclusion fairly described by Terry Hull as 'diametrically opposed' to that of Boomgaard, who uses the proportion of households in each Javanese residency involved in the Cultivation System as a surrogate

126 Benjamin White, 'Demand for labour and population growth in colonial Java', *Human Ecology*, 1 (1973): 233.

127 Jennifer Alexander and Paul Alexander, 'Labour demands and the "involution" of Javanese agriculture', *Social Analysis*, 3 (1979): 22–44.

128 Paul Alexander, 'Women, labour and fertility: Population growth in nineteenth century Java', *Mankind*, 14 (1984): 361–71; Alexander, 'Labour expropriation and fertility: Population growth in nineteenth-century Java', in *Culture and reproduction: An anthropological critique of demographic transition theory*, ed. W. Penn Handwerker (Boulder, CO: Westview), pp. 249–62.

129 The regression line shown in the figure carries an R^2 value of 0.78.

130 F. S. A. de Clercq, 'De hervorming van het Minahasa-stelsel', *Indisch Genootschap: Verslagen der Algemeene Vergaderingen*, 1891, p. 219; A. C. J. Edeling, 'Memorie omtrent de Minahasa', *Adatrechtbundel*, 16 (1919): 72.

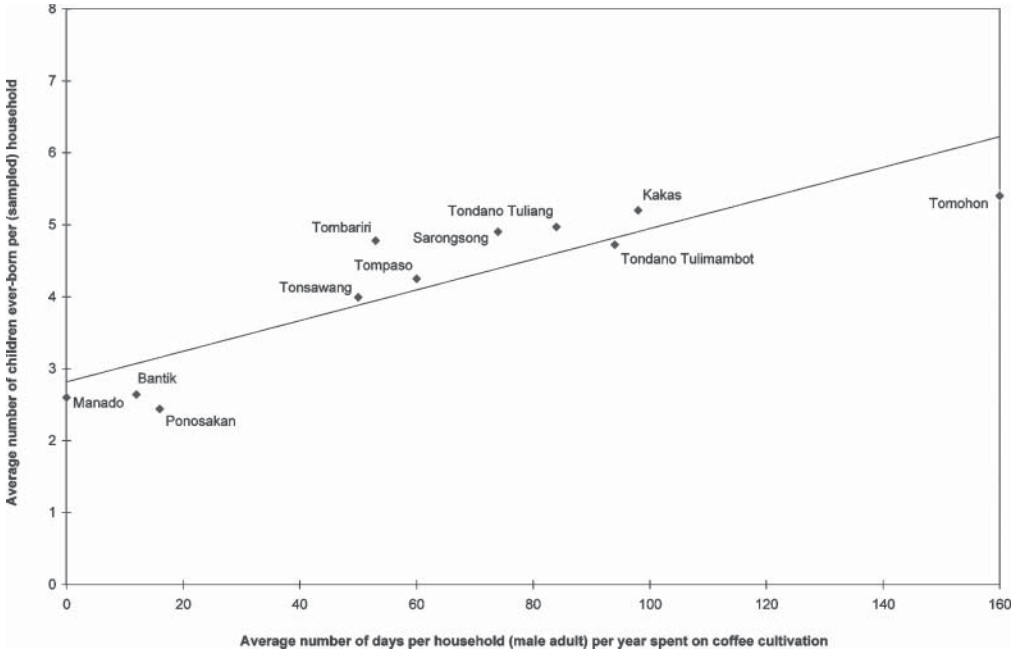


Figure 3. Female fertility and the burden of compulsory coffee cultivation in some Minahasan districts, 1874

Source: Henley, *Fertility, food and fever*, p. 387.

for the availability of remunerative employment opportunities in the transport and handicraft sectors incidentally stimulated by the System, and concludes that fertility was positively correlated with income.[131] A similar ambiguity, as we have seen, exists in the case of nineteenth-century Minahasa, and in this case the quantitative evidence seems to favour the labour-demand more than the income-supply explanation of fertility change.

There are, however, reasons to think that over the broad sweep of Southeast Asian history situations like these were more the exception than the rule, and reasons to follow Adam Smith and many modern macro-demographers in treating labour demand and income supply as more or less identical quantities.[132] The role of the nineteenth-century Dutch colonial state in driving up agricultural production by political means, in the absence of commensurate economic incentives, was rather unique even in terms of Southeast Asia's recent history, and in the pre-colonial past the power of the state was typically much too limited to permit such exploits.[133] The normal motor of economic

131 Boomgaard, *Children of the colonial state*, pp. 183–4; Terence H. Hull, 'Indonesian fertility behaviour before the transition: Searching for hints in the historical record', in *Asian population history*, ed. Liu *et al.*, p. 159.

132 Smith, *Inquiry into the nature and causes of the wealth of nations*, p. 98; Lee, 'Population dynamics', pp. 1064–5; E. A. Wrigley and R. S. Schofield, *The population history of England 1541–1871* (London: Edward Arnold, 1981), p. 465.

133 Michael Adas, 'From avoidance to confrontation: Peasant protest in precolonial and colonial Southeast Asia', *Comparative Studies in Society and History*, 23 (1981): 217–47; Anthony Reid, 'Political "tradition" in Indonesia: the one and the many', *Asian Studies Review*, 22 (1998): 23–38.

growth in Indonesia, from pre-colonial up to quite recent times, has been the spontaneous production by small farmers, in response to market demand, of commercial crops and other products – a response facilitated in some cases, but hindered in others, by state policies and interventions.[134] For obvious Malthusian reasons, more generally, no combination of rising population and declining prosperity could be sustained indefinitely; ultimately the 'positive checks' associated with deteriorating nutrition could not fail to kick in, and as we have seen this would typically begin to happen long before the point of widespread famine and starvation was reached.

Under most historical circumstances, then, a rising demand for labour within the household was associated with increasing rather than declining prosperity and food consumption, so that the two types of stimuli to population growth – labour demand and income supply – worked in tandem and reinforced each other. In late nineteenth-century Minahasa, as we have seen, this was true even under restricted economic conditions: food production increased considerably thanks to domestic market formation despite simultaneous, competing claims on the available labour supply from compulsory coffee cultivation and road-building – activities which provided respectively the cash and the transport infrastructure on which the new foodcrop market was based.

Demography and social structure

While some of the articulations between economic and demographic growth worked directly via the effects of commerce on the health and fertility behaviour of individuals, others appear to have worked indirectly via changes in the social institutions which shaped individual lives and decisions. Traditional social organization in northern Sulawesi, as in many other parts of Southeast Asia, featured extensive sharing of food and other resources within large semi-corporate kin groups.[135] That this situation restricted food production by creating opportunities for 'free-riding' has already been noted; here I would like to suggest that for similar reasons, it also tended to restrict the production of children. Like other resources, children were effectively shared – a tendency most obviously manifested in a very high frequency of adoption between related couples. Like food exchanges, these transfers of children were difficult to opt out of: in upland Central Sulawesi, for instance, the brothers and sisters of a couple with children were said to 'exercise a certain right to [adopt] their nephews and nieces, so that the father must come up with good arguments if he refuses their request'.[136] Reluctance to comply with adoption requests is also reported from elsewhere in Indonesia and the Pacific.[137] One's children, like one's food, were not

134 Anne Booth, *The Indonesian economy in the nineteenth and twentieth centuries: A history of missed opportunities* (Basingstoke: Macmillan Press, 1998), p. 237; Vincent J. H. Houben, 'The premodern economies of the archipelago', in *The emergence of a national economy: An economic history of Indonesia, 1800–2000*, ed. Howard Dick, Vincent J. H. Houben, J. Thomas Lindblad and Thee Kian Wie (Leiden: KITLV Press, 2002): 45–7; Jeroen Touwen, *Extremes in the archipelago: Trade and economic development in the Outer Islands of Indonesia, 1900–1942* (Leiden: KITLV Press, 2001), pp. 315–27.

135 Albert Schrauwers, *Colonial 'reformation' in the highlands of Central Sulawesi, Indonesia, 1892–1995* (Toronto: University of Toronto Press, 2000), p. 106.

136 Alb. C. Kruyt, 'De adoptie in verband met het matriarchaat bij de Toradja's van Midden-Celebes', *Tijdschrift voor Indische Taal-, Land- en Volkenkunde*, 41 (1899): 81.

137 Alexander and Alexander, 'Economic change and public health', p. 270; Mac Marshall, 'Solidarity or sterility? Adoption and fosterage on Namoluk Atoll', in *Transactions in kinship: Adoption and fosterage in Oceania*, ed. Ivan Brady (Honolulu: The University Press of Hawaii, 1976), p. 34.

necessarily one's own. Certainly the material benefits of those children, including their contribution to the security of their seniors in old age, always had to be shared among a rather wide circle of kin. This situation, it can be surmised, contributed to low reproductive fertility by setting up 'collective action dilemmas' in which the 'public good' (children), although highly valued, was under-produced because whereas its most important cost (pregnancy) was borne individually, its benefits were more or less collectivized.[138]

The corporatism of large kin groups in many economically isolated societies is based partly on the social insurance provided by such groups with respect to food supplies, and partly also on the control by their senior members of the scarce prestige goods which are needed by individuals for brideprice payments and other major transactions.[139] In northern Sulawesi, they tended to disintegrate during the nineteenth and early twentieth centuries into nuclear family households.[140] This change was associated with increases in both market exchange and material wealth. In so far as it was reflected in changing residential patterns, the link between commerce and the breakdown of traditional social organization was evident even to casual observers. Travelling through the Sangir and Talaud islands in the 1880s, the British naturalist Sydney Hickson remarked on 'the gradual diminution ... of houses as the civilization or wealth of the inhabitants increases', adding that:

> This struck me particularly in my return journey from Nanusa [remote outliers of Talaud], as we gradually got within touch of civilization and the wealth of the inhabitants increased. The largest houses I saw were in Nanusa where foreign vessels very rarely call. In Lirung the houses were somewhat smaller, none of them I should think capable of holding more than 200 persons. At Manarang, also in Talauer [Talaud], a kampong [village] which ... carries on a considerable trade, the houses were still smaller, but nevertheless some of them must have been able to accommodate 60 or 100 persons. In Taroena and Manganitu, the two most important places in Great Sengir [Greater Sangir], and the centre of the cocoa-nut trade, places where money is used and cocoa [coconut] trees cultivated ... the houses were not large enough for more than ten or twenty persons .... One step further in this process and we arrive at mere hovels only capable of holding a man, his wife, and two or three children, such as we find in such a place as Menado, where natives and Europeans live and freely trade and mix together.[141]

As the economy grew increasingly commercialized as a result of the booming copra industry, prestige goods such as imported textiles and ceramics became more easily

138 An overview of the study of collective action dilemmas is provided by Mark Irving Lichbach in *The cooperator's dilemma* (Ann Arbor: University of Michigan Press, 1996). The classic work in the field is Mancur Olson, *The logic of collective action: Public goods and the theory of groups* (Cambridge, MA: Harvard University Press, 1965).

139 Richard A. Posner, 'A theory of primitive society, with special reference to primitive law', *Journal of Law and Economics*, 23 (1980): 10–15; Claude Meillassoux, *Anthropologie de l'esclavage: Le ventre de fer et d'argent* (Paris: Presses Universitaires de France, 1986), pp. 61–74.

140 H. Th. Chabot, 'Processes of change in Siau 1890–1950', *BKI* ,125 (1969): 98–100; F. D. Holleman, *Verslag van een onderzoek inzake adatgrondenrecht in de Minahasa* (Weltevreden: Landsdrukkerij, 1930), p. 49.

141 Sydney J. Hickson, 'Notes on the Sengirese', *Journal of the Anthropological Institute of Great Britain and Ireland*, 16 (1887): 140–1.

accessible to individuals via market channels. At the same time, the growing market in food undermined the importance of relationships with relatively distant kin as sources of subsistence security. In the first half of the nineteenth century there had been no marketplaces and very little circulating currency on Sangir.[142] By the 1940s, approximately half of all food eaten there was obtained by purchase.[143] Both developments weakened the traditional 'big house' groups, which then 'gradually fell apart into [nuclear] families [*gezinnen*]'.[144] Under these conditions parents were in a better position to monopolize the benefits of their own children, and also more exclusively dependent on those children for support in old age – both good reasons, in principle, to bear and raise more offspring.

If the link proposed here between corporate kin groups and demography remains speculative, on the subject of another very widespread traditional institution which tended to restrict fertility, slavery, it is possible to be more concrete. Some clear evidence for the negative effect of slavery on fertility comes from the writings of two missionaries who worked in Central Sulawesi at the beginning of the twentieth century, Albert Kruyt and Nicolaus Adriani. For several reasons, these men reported, both the economic and the social motives for birth control were most prevalent in those communities which contained the most slaves. Children, first of all, were less economically important to slave owners than to free couples without access to slave labour. 'If one has slaves', as Adriani put it, 'then one also has servants, so that one of the principal reasons to hope for children is eliminated'.[145] Since slave children were 'taken away from their parents at the age of six or seven (and often even younger) and divided among their masters', conversely, many slave women had 'no desire to bear and raise children for other people'.[146] These observations accord with, and partly inspire, recent interpretations of Indonesian historical demography which proceed from the assumption that slavery and childbearing can be regarded as economic alternatives.[147] An additional disadvantage of children for slaves was that slave mothers 'often do not have the time to look after them properly, so that in many cases they die'.[148] Quantitative evidence for these effects comes from the survey of fertility and child mortality carried out by Kruyt in 1902 among two neighbouring indigenous groups in the Poso area: the To Lage, close to half of whom were slaves, and the To Pebato, among whom (unusually for northern Sulawesi) there was very little slavery (Table 2).

Here the slave-holding group shows much lower average completed fertility rates, and since its infant mortality rates are also far higher, the number of offspring surviving

142 [A.J. van Delden], 'De Sangir-eilanden in 1825', *Indisch Magazijn*, 1-7/9 (1844): 23; D. van de Velde van Cappellen, 'Verslag eener bezoekreis naar de Sangi-eilanden', p. 51.
143 David Meskes Blankhart, 'Voeding en leverziekten op het eiland Sangir in Indonesië' (Ph.D. diss., Rijksuniversiteit Utrecht, 1951), p. 95.
144 F. D. Holleman, *Verslag van een onderzoek inzake adatgrondenrecht*, p. 49.
145 N. Adriani, 'Maatschappelijke, speciaal economische verandering der bevolking van Midden-Celebes, sedert de invoering van het Nederlandsch gezag aldaar', *Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap*, 32 (1915): 458.
146 Alb. C. Kruyt, 'De slavernij in Posso (Midden-Celebes)', *Onze Eeuw; Maandschrift voor Staatkunde, Letteren, Wetenschap en Kunst*, 11-1 (1911): 91; Kruyt, 'Gegevens voor het bevolkingsvraagstuk', p. 201.
147 Boomgaard, 'Introducing environmental histories of Indonesia', p. 8; Knapen, *Forests of fortune*, pp. 394–5.
148 Adriani, 'Maatschappelijke, speciaal economische verandering', p. 458.

TABLE 2:
Completed fertility and infant mortality rates as reported among two ethnic subgroups in Central Sulawesi, 1902

	To Pebato (non-slave holding)	To Lage (slave-holding)
Number of post-menopausal women interviewed	155	41
Average number of children ever-born per woman	4.03	2.85
Rate of childlessness (%)	3.9	12.2
Average number of children ever-born per non-childless woman	4.19	3.25
Proportion dead 'as small children' (%)	22.6	56.4
Average number of children surviving beyond infancy per woman	3.12	1.24
Average number of children surviving beyond infancy per non-childless woman	3.25	1.42

Source: Kruyt, 'Gegevens voor het bevolkingsvraagstuk van een gedeelte van Midden-Celebes', pp. 197–8.

to adulthood is actually well below the replacement rate. These samples, of course, are very small, and in the more extensive fertility survey of Central Sulawesi carried out in 1924 (more than a decade, admittedly, after the formal abolition of slavery in this area by the colonial government), the association between slavery and low reproductive fertility is much less clear.[149] That association is attested to, however, by early Dutch sources from Ambon and Batavia.[150] It has long been something of a commonplace in the literature on traditional slavery in Africa, where the explanations advanced for it mostly resemble those proposed by N. Adriani and Albert Kruyt in emphasizing the tenuousness of economic and other ties between slaves and their children in the face of claims to those children from slave-owners.[151]

Existing analyses of Southeast Asian slavery tend to focus on the demand for slaves rather than their supply, and to view slavery primarily, in the tradition of H. J. Nieboer's *Slavery as an industrial system*, as a means of extracting surplus labour in a resource-rich but people-poor environment.[152] Scholars of traditional slavery in Africa, however, have

149 Tillema, *Zonder tropen geen Europa!*, pp. 46–7; Adriani and Kruyt, *Bare'e sprekende Toradjas*, vol. 2, p. 341.
150 Knaap, *Kruidnagelen en Christenen*, p. 132; Remco Raben, 'Batavia and Colombo: The ethnic and spatial order of two colonial cities 1600–1800' (Ph.D. diss., Rijksuniversiteit Leiden, 1996), p. 128.
151 Meillassoux, *Anthropologie de l'esclavage*, pp. 79–85; *Women and slavery in Africa*, ed. Claire C. Robertson and Martin A. Klein (Madison: University of Wisconsin Press, 1983).
152 H. J. Nieboer, *Slavery as an industrial system: Ethnological researches* (The Hague: Nijhoff, 1900); Anthony Reid, 'Introduction', in *Slavery, bondage and dependency in Southeast Asia*, ed. Anthony Reid (St. Lucia: University of Queensland Press, 1983), pp. 8, 22–3; James F. Warren, *The Sulu Zone: The world capitalist economy and the historical imagination* (Amsterdam: VU University Press, 1998), pp. 39–40.

long questioned the assumption that this institution had to do primarily with the control of labour.[153] In addition, contemporary European descriptions of slavery in Southeast Asia frequently indicate that the slaves were not overworked, serving as much to glorify their masters as to enrich them.[154] This suggests that in examining the economics of slavery, it may be more profitable to look at the supply of slaves than at the demand for them.

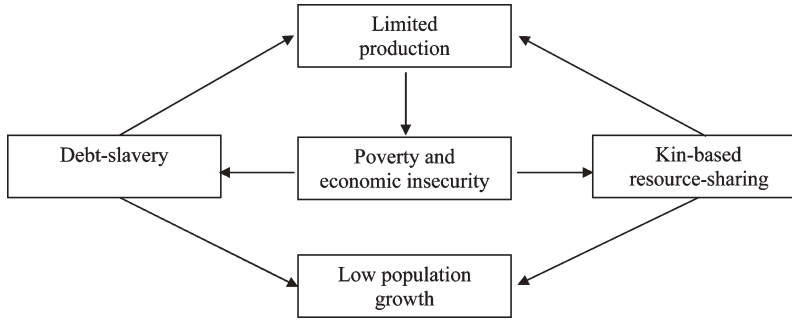
Although slave-raiding and warfare played a role in places, in most cases slavery in Southeast Asia was in fact an accepted obligation rather than something imposed and perpetuated by forcible means. 'If we seek a single origin for this system of obligation', Reid has observed, 'it appears to be debt.'[155] While Kruyt argued in accordance with race-orientated theories of social change that slavery in Sulawesi had probably originated in the conquest of some peoples by others, he also recorded the insistence of indigenous informants that the ancestors of hereditary slaves had simply become irredeemably indebted to those of their masters.[156] Very often this occurred in the context of subsistence crises, such as those which sometimes led pre-colonial Filipinos to sell their own children.[157] Besides the situation at the moment of enslavement, we also need to think in terms of the continuing social security function by which masters provided food and other aid to their slaves when necessary, just as 'patrons' have done for their 'clients' in more recent times.[158]

Geographical variations in the prevalence of slavery, correspondingly, were often related to differences in levels of economic security: slaves, in other words, were more numerous in poorer than in richer communities. In an early ethnography of the Ifugao of upland Luzon, for instance, R. F. Barton noted that before the American occupation 'the selling by parents who found themselves poverty stricken of one of their children was not at all uncommon' – except, that is, 'in those few parts of the habitat that were prosperous and in which the obtaining of the daily ration was not a serious problem'.[159] With regard to the contrasting demographic statistics from Central Sulawesi reproduced in Table 2, it is striking that the territory of the slave holding To Lage was one in which fire-climax grasslands dominated the landscape and steady emigration was taking place due to 'over-population and the resulting lack of arable land'.[160] The non-slaveholding To Pebato, Kruyt also observed, 'usually have more food' than the To Lage.[161]

In this light, slavery, like delayed marriage in other historical contexts, can be seen as constituting a negative feedback mechanism which automatically tended to adjust

153 Igor Kopytoff and Suzanne Miers, 'African "slavery" as an institution of marginality', in *Slavery in Africa: Historical and anthropological perspectives*, ed. Suzanne Miers and Igor Kopytoff (Madison: University of Wisconsin Press, 1977), pp. 68–9.
154 Crawfurd, *History of the Indian Archipelago*, vol. 3, p. 42; Van Delden, 'De Sangir-eilanden in 1825', pp. 6–7.
155 Reid, 'Introduction', p. 8.
156 Kruyt, 'De slavernij in Posso (Midden-Celebes)', p. 69.
157 Reid, 'Introduction', pp. 9–10; Scott, *Barangay*, p. 35.
158 Reid, 'Introduction', pp. 8–10, 24; James C. Scott, 'Patron-client politics and political change in Southeast Asia', *American Political Science Review*, 66 (1972): 93, 95.
159 R. F. Barton, *Ifugao law* (Berkeley: University of California Press, 1969), p. 28.
160 Alb. C. Kruyt, 'Het stroomgebied van de Tomasa-Rivier', *Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig* Genootschap,16 (1899): 608.
161 Kruyt, 'De slavernij in Posso', p. 81.

population levels to economic conditions. The fewer resources, to put it crudely, the more debt, dependency and slavery, and consequently the fewer children either born or surviving to adulthood. Kruyt himself was inclined to attribute low food production among the To Lage to the institution of slavery itself, which led slave-owners to rely for food on their slaves, who in turn were discouraged from accumulating a food surplus of their own because of the likelihood that this would simply be taken away from them by their masters.[162] Probably there was indeed something of a vicious circle here, with slavery tending to perpetuate itself, and hence low population growth, via underproduction and poverty. Both in this respect and with regard to its negative effect on fertility, there is a direct parallel here with the more egalitarian patterns of resource-sharing described above as characteristic of the traditional corporate kin group. At the cost of enormous oversimplification, in fact, the interlocking mechanisms of demographic homeostasis associated respectively with slavery and with the kin-based 'moral economy' can be represented in a single diagram:



Because both mechanisms incorporate vicious circles of underproduction, they are to some extent 'traps' acting to prevent economic growth as well as the demographic growth which this would generate. If the demographic response to commercialization was sometimes non-linear, with relatively small increases in trade generating unexpectedly rapid population growth, this may well have had to do with the existence of thresholds of wealth and commercial exchange at which the institutions creating the negative feedback effects began to break down.

What is at any rate clear is that the growth of trade, by creating new incentives to surplus production, was indeed capable of breaking open those restrictions on demographic growth associated with subsistence-based economies. In Sulawesi during the late nineteenth and early twentieth centuries, as we have seen, the appearance of a huge new vent for surplus in the form of foreign demand for copra was directly associated both with rapid population growth, and with the breakdown of the traditional corporate kin groups in the face of expanding local market exchange; any resistance to this expansion from the institutions of the 'moral economy' was weak and short-lived. A similar process, I believe, was largely responsible for the gradual and remarkably smooth disappearance in the same

162 Ibid., p. 80.

period of the other institutional fertility check under discussion here, namely slavery. The end of slavery in Southeast Asia is conventionally attributed partly to official prohibition and partly to the circumstance that 'the growing numbers of impoverished landless labourers made wage labour a cheaper and more efficient system of exploitation'.[163] In northern Sulawesi, however, there were few landless labourers even at the end of the colonial period, while the colonial state, although sometimes able to prevent slave-trading, was seldom powerful enough to implement the prohibition of local slavery by force. Yet colonial-era edicts on the matter, as in some other parts of Indonesia, seem to have gone virtually unresisted.[164] Here the main factor seems once again to have been an increase in wealth and market exchange, which both reduced the incidence of poverty and subsistence crises, and provided ways of coping with them other than the traditional practice of placing one's self in the debt, and at the service, of others.

A parallel for these processes comes from Japan in the Tokugawa period (1603–1868), when population growth in localities where the economy was expanding is thought to have resulted partly from the dissolution of extended families and the emancipation of their servile dependants. As Akira Hayami has pointed out:

> This increase in the marriage rate was generally associated with a change in the family structure. In Japan, the seventeenth century was a period in which patriarchal families split up into conjugal families. . . . Many domestic servants, most of whom had either remained celibate or married late, and many relatives who had formed part of the patriarchal family, gradually emancipated themselves and formed independent families. This was the result of a great change in the system of production which marked the appearance of the intensive agriculture which has characterised Japan from the eighteenth century up to our time.[165]

Here 'servants' take the place of debt-slaves, and nuptuality is seen as the sole link between the institutions in question and the birth rate; in the Southeast Asian context, as I have argued, a broader range of fertility control mechanisms, including deliberate abortion and contraception, was also involved. The fundamental pattern, nevertheless, is similar to that proposed above: economic development elicits a rise in fertility by allowing individuals and couples to escape from relations of vertical and horizontal dependency which previously discouraged or prevented them from raising children.[166]

Conclusion

In 1940, the botanist P. M. L. Tammes published a pioneering article in which he applied the insights of population biology to the limited data then available on the

163 David Feeny, 'The decline of property rights in man in Thailand, 1800–1913', *Journal of Economic* History, 49 (1989): 294–6; Feeny, 'The demise of corvée and slavery in Thailand, 1782–1913', in *Breaking the chains: Slavery, bondage, and emancipation in modern Africa and Asia*, ed. Martin A. Klein (Madison: University of Wisconsin Press, 1993), p. 100; Reid, 'Introduction', p. 33.

164 Knapen, *Forests of fortune*, p. 395; Anthony Reid, 'The decline of slavery in nineteenth-century Indonesia', in *Breaking the chains*, ed. Klein, p. 69.

165 Akira Hayami, 'Mouvements de longue durée et structures Japonaises de la population a l'époque de Tokugawa', *Annales de Démographie Historique 1971* (Paris: Mouton, 1972), p. 354.

166 In this Japanese case as in my Indonesian example, growth was occurring in commerce and cottage industry as well as agriculture; Akira Hayami, 'Population changes', in *Japan in transition from Tokugawa to Meiji*, ed. Marius B. Jansen and Gilbert Rozman (Princeton: Princeton University Press, 1986), p. 315.

historical demography of North Sulawesi. On many points, in retrospect, his conclusions were badly wrong; by refusing to believe in the efficacy of traditional fertility control, for example, he obliged himself to explain the demographic impact of economic growth exclusively in terms of mortality decline. Yet when all things are considered, it still seems that Tammes was ultimately right to argue, with Malthus, that 'population always increases where the means of subsistence increase'.[167] The same principle, however qualified and modified, still forms the ultimate theoretical context for much modern work in macro-historical demography.[168]

This article has served to confirm, qualify, deepen and broaden Tammes' insights, and to identify (or suggest) some of the specific ways in which economic expansion and population growth were linked. Of course, a great many issues pertaining to the relationship between demographic and economic change have not been discussed here. One is the important question of exactly how population growth has been related to per capita (rather than aggregate) income growth in different situations, and whether (and if so, why) under colonial conditions, as J. H. Boeke and Clifford Geertz famously proposed, the expansion of population ultimately tended to follow the expansion of economic opportunities with such grim precision as to cancel out any gains in the individual standard of living.[169] Nor have I tried to bring my story up to date by considering how it squares with the recent rapid transition from high to low fertility in an era of urbanization and industrialization.

In very general terms, nevertheless, it is clear that the historical demography of Southeast Asia can better be understood in terms of ecology and economics than in terms of cultural, military or medical history. As Pierre van der Eng correctly guesses, the fundamental reason for the demographic 'steady state' which prevailed in many of the more remote parts of Indonesia until late in the nineteenth century was the absence of 'new labour-absorbing income opportunities'.[170] This is not to argue that social and cultural patterns were not demographically significant, but rather that despite the dangers admittedly attendant on any functionalist interpretation of such patterns, they can often profitably be regarded as dependent rather than independent variables. Among the factors mediating between low economic growth and low population growth in the historically typical situation, I have suggested here, were two characteristic aspects of traditional Southeast Asian social organization: debt-slavery and the pattern of economic sharing associated with the 'moral economy'. Each of these institutions tended to imply both suboptimal food production and low reproductive fertility, and each was undermined in recent times not so much by state intervention, or by autonomous processes of cultural change, as by economic growth.

167 Tammes, 'De biologische achtergrond', p. 197.
168 John C. Caldwell, 'What do we know about Asian population history? Comparisons of Asian and European research', in *Asian population history*, ed. Liu *et al.*, pp. 5–7; Lee, 'Population dynamics', pp. 1107–9.
169 J. H. Boeke, *Economics and economic policy of dual societies as exemplified by Indonesia* (Haarlem: H. D. Tjeenk Willink, 1953), pp. 168–78; Clifford Geertz, *Agricultural involution: The process of ecological change in Indonesia* (Berkeley: University of California Press, 1963), pp. 69–70.
170 Pierre van der Eng, *Agricultural growth in Indonesia: Productivity change and policy impact since 1880* (London: Macmillan, 1996), p. 271.

Historically speaking, then, both the size and the distribution of Southeast Asia's human population have been determined mainly by economic factors; the dynamics of demographic change, in other words, were essentially Malthusian. The best short answer to the question of why the Southeast Asian countries are now so much more populous than in the past, accordingly, is ultimately the one given by Malthus when he posed himself the same question in relation to the western European nations two centuries ago: 'that the industry of the inhabitants has made these countries produce a greater quantity of human subsistence'.[171] The sparsity of settlement in most parts of Southeast Asia up to recent times resulted not from warfare, from an exceptionally hostile disease environment, or from cultural idiosyncrasies affecting reproductive fertility, but rather from a

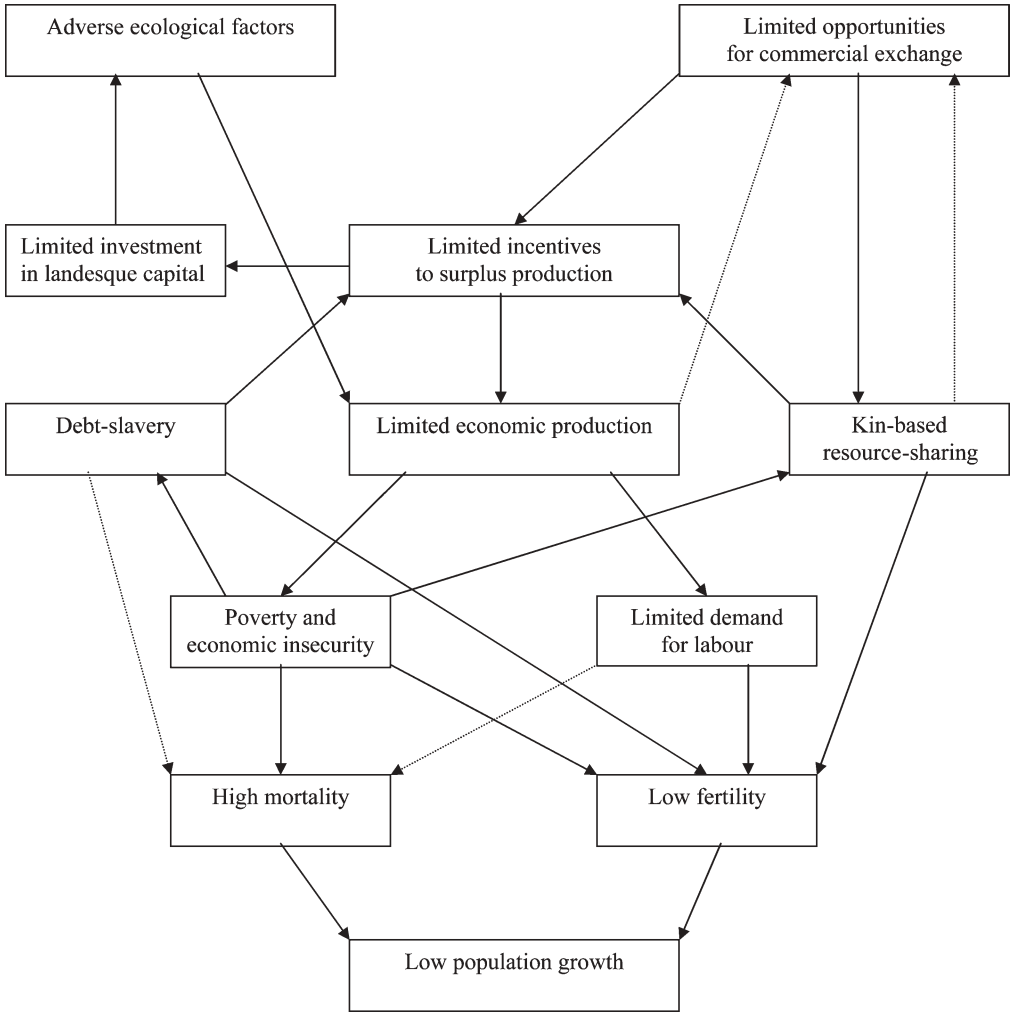


Figure 4. The causes of low population growth in the Southeast Asian past

171 Malthus, *Essay on the principle of population*, p. 31.

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combination of natural conditions relatively unfavourable to agriculture, and economic conditions unfavourable to exchange, export and investment. These conditions, schematically summarized in Figure 4, limited the supply of income and the demand for labour – the two variables which, albeit partly via complex intermediate processes, controlled long-term changes in the birth and death rates. When the economic situation improved sufficiently to overcome the existing environmental obstacles, for instance by creating a market for tropical tree crops, population growth was one of the consequences.