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From low to high fertility in Sulawesi (Indonesia) during the colonial period: Explaining the 'first fertility transition'

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This paper examines the past transition from low to high fertility which, in Indonesia as elsewhere, preceded the return to lower birth rates. Data from two parts of the island of Sulawesi where fertility rose during the colonial period are used to explain both why it rose, and why it was originally low. Economic conditions, it is argued, were the most important factors, affecting fertility via the supply of income and the demand for labour. Two schematic models of the 'first fertility transition' are proposed. In areas with low population densities and area-extensive forms of agriculture responsive to commercial stimuli, birth rates rose as the growth of commerce raised levels of prosperity, facilitated marriage, and undermined institutions such as debt-slavery which had previously acted to restrict marital fertility. In densely populated areas with labour-intensive agriculture and heavy state taxation in labour, fertility rose in response to demands for women's (and possibly child) labour that did not necessarily lead to gains in income.

Keywords: historical demography; Indonesia; Sulawesi; fertility transition; lactational amenorrhoea; institutional economics; women's autonomy; slavery

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A generation ago it was already clear to many demographers that the very low rates of population growth that had prevailed throughout most of human history reflected low birth rates as well as high death rates, and that the modern population boom resulted partly from rising fertility (Nag 1980; Dyson and Murphy 1985). Yet the older assumption that 'traditional' demographic patterns must have involved very high birth rates is slow to die, and there are still those who argue that in Asia, population changes before the current transition—actually a return—to low fertility were controlled 'largely by mortality' (Caldwell 2001, p. 7).

In Indonesia, the prevalence of low fertility in the most traditional, isolated communities of the archipelago had already attracted scholarly attention in colonial times (Nieboer 1903; Lucieer 1924). Anthony Reid (1987, p. 43), in a classic essay on low population growth and its causes in pre-colonial Southeast Asia, draws on the resulting literature to argue that in this part of the world the onset of sustained population growth involved increases in fertility brought about by 'changes in values and practices which accompanied the movement of animist swidden cultivators into the orbit of the world religions'. Yet so widespread and instinctive is the view that Indonesian women have always borne many children that in a recent publication Boomgaard (2003, p. 198) still finds it necessary to reiterate 'that high fertility rates are not a traditional feature of Indonesian societies but, on the contrary, should be regarded as a recent phenomenon'.

Two of the proximate causes of low fertility rates were mentioned by Reid (1987, pp. 41, 45) in his pioneering essay: induced abortion, in which some practitioners of Southeast Asian traditional medicine were exceptionally skilled (Shepherd 1995, pp. 5–7), and prolonged, intense breast-feeding, which reduces fecundity by extending lactational amenorrhoea. Boomgaard (1989, pp. 192–5; 1996, p. 18) adds two more: delayed marriage, well documented in colonial times from many Indonesian societies, and contraception by deliberate retroflexion of the uterus, an effective method according to late colonial medical sources (Verdoorn 1941, pp. 59–60) even if its incidence may have been exaggerated by

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some observers as a result of racial differences in the normal position of the womb (van Ravesteyn 1959). Other factors included infanticide (Kleiweg de Zwaan 1925) and post-partum sexual abstinence (Santow 1987).

There are sharp differences of opinion about the underlying reasons for these practices, and the reasons why they were modified during the subsequent transition to higher fertility. Reid (2001, pp. 54–7), who treats the traditional low-fertility regime essentially as a cultural phenomenon, argues that colonialism (and the creation of sedentary peasant societies) 'distorted the demographic pattern' by eroding the old fertility controls without improving economic standards of living. By contrast Boomgaard (1989, pp. 201–3; 2003, p. 211), who is more inclined to see fertility regimes as adaptations to economic conditions, argues for positive links between rising fertility and the new economic opportunities created by colonial commerce. In the present paper I argue that the economic approach is ultimately more productive than the cultural one here, but also that because the links between economic conditions and fertility patterns had to do with the demand for labour as well as the supply of income, Reid is right to doubt whether episodes of colonial population growth always reflected economic progress.

My paper takes a relatively systematic look at data from two areas (see map, Figure 1) where reproductive fertility demonstrably rose during the colonial period, and uses these data to shed light both on the reasons for the rise and on the puzzle of why Indonesian birth rates were traditionally so low. The first of the two areas is Minahasa in North Sulawesi, where colonial rule dates from early in the nineteenth century and demographic statistics are available from 1849 onward. The second is the central part of Central Sulawesi, where two quite extensive fertility surveys were carried out, one shortly before and one some years after the imposition of Dutch rule in 1905–1908. For both areas much contemporary contextual information on social and economic conditions is also available thanks to the writings of European missionaries, missionary–anthropologists, travellers, and administrators. This combination of sources is drawn on in an attempt to reconstruct the nature of the initial low-fertility regime, and the causes of the subsequent transition to higher fertility, in each setting.

Broadly speaking, it is argued, economic conditions were the most important determinants of fertility, which they affected via both the supply of income and the demand for labour. The links in question worked partly through deliberate changes in behaviour in response to new economic opportunities and constraints, and partly in indirect ways through changes in social structure and in breast-feeding practices. While some of the causes of the transition from low to high fertility were common to both of the areas studied, in the Minahasan case labour demand, deriving from compulsory state labour services and from agricultural intensification under population pressure, played a role that was more important than in Central Sulawesi and more independent of changes in income. This suggests that what Owen (1987) called the 'paradox' of early population growth in Java and the northern Philippines—both, like Minahasa, densely populated areas controlled in the nineteenth century by relatively strong colonial states—may reflect a fertility transition significantly different in its origins from the later shift to high fertility in other parts of Southeast Asia.

The paper is organized as follows. The first section introduces the two case-study areas, and presents in brief the evidence for rising fertility in both during (different parts of) the colonial period. The four central sections of the paper are devoted to explaining both transitions in terms of changes in, respectively: income, labour demand, gender relations, and social structure. Of these the first two draw mainly on evidence from Minahasa, while the third and fourth are mainly about Central Sulawesi. Some reference is also made to other parts of the island of Sulawesi. A concluding section summarizes the findings and proposes rudimentary models of two types of transition from low to high fertility.

Rising fertility: Minahasa 1850–1900 and Central Sulawesi 1900–25

Minahasa, at the tip of Sulawesi's northern peninsula, is a fertile volcanic region with an area of about 5,000 square kilometres. Originally stateless, it came under direct Dutch rule in 1809. From 1822 to 1899 its population was subject to a heavy regime of compulsory labour, involving corvée roadbuilding and the obligatory cultivation of coffee for delivery to the government. In the same period the population was converted to Christianity under the influence of Protestant missionaries. From 1849 onward systematic birth and death registers, administered for the state by the village heads and district clerks, were maintained and the resulting statistics for each year up to 1872 are preserved in the Indonesian

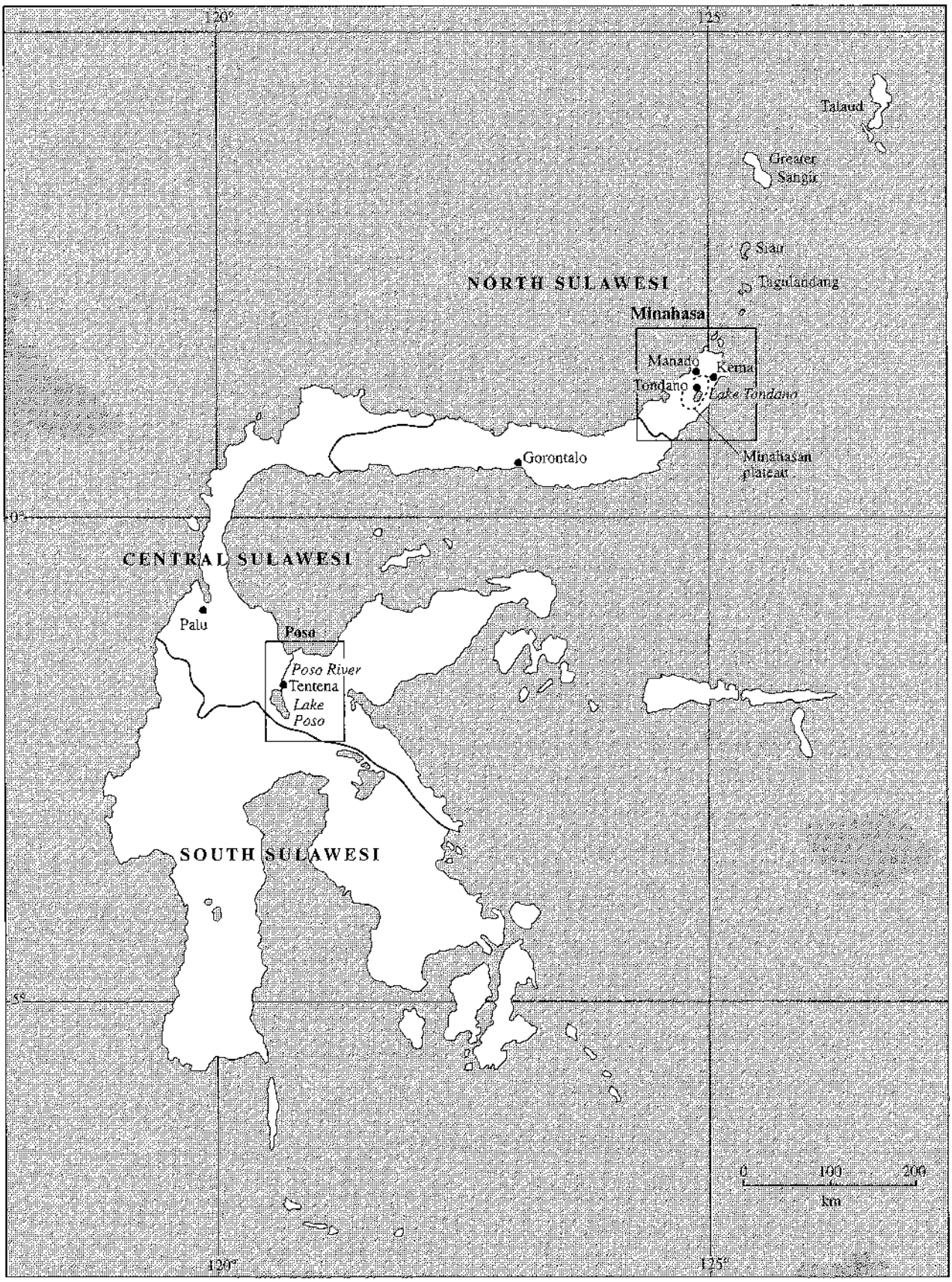

Figure 1 Northern Sulawesi

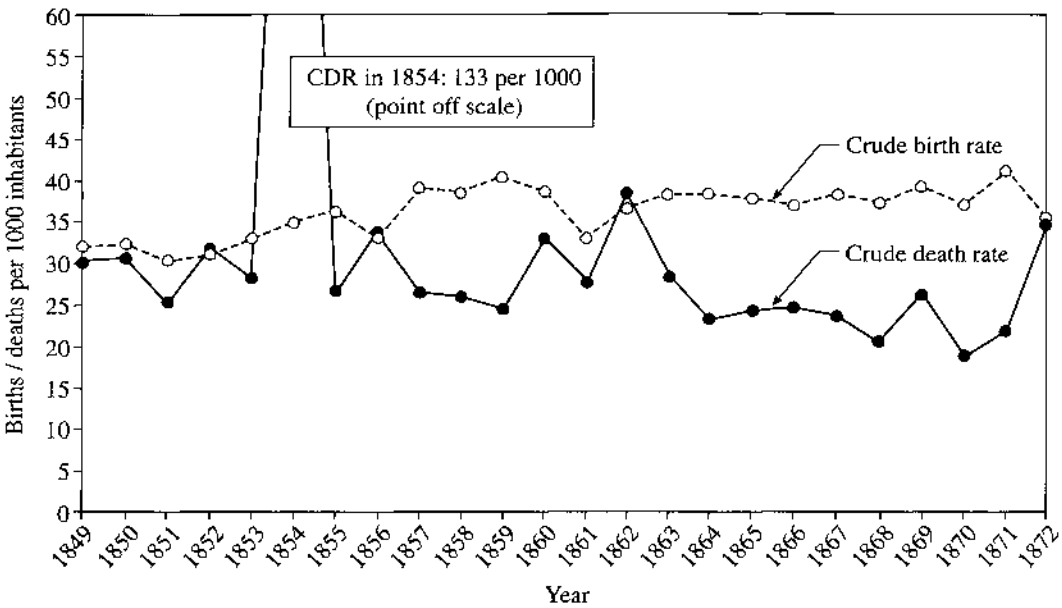

Figure 2 Recorded crude birth and death rates, Minahasa (Indonesia), 1849–72
Source: Henley 2005, p. 365.

national archive in Jakarta. These data are summarized graphically in Figure 2.

The birth rate figures from Minahasa refer to a period of transition from something approaching a demographic equilibrium to a situation of sustained population growth. Although the earlier statistics are less reliable, it appears that in 1849 the total population of Minahasa, at approximately 100,000, was no larger than it had been in 1800 (Henley 2002, p. 179). By 1872, however, it had increased to a little under 120,000, and by 1900 to 180,000. The transition to growth resulted in part from reduced death rates, the reasons for which I explore elsewhere (Henley 2005, pp. 289–362). The dramatic mortality crisis of 1854, caused by a mixed epidemic of dysentery, cholera, measles, and malaria, was the last of a kind that had been frequent in earlier periods, and the routine background death rate also fell significantly after 1855. At the same time there was an equally significant rise in fertility. The average annual crude birth rate was consistently a little above 30 per thousand in the first years of the documented period, but almost 40 per thousand toward its end. It was rising fertility almost as much as falling mortality which, by the late 1860s, had opened up a steady gap of about 15 per thousand between crude birth and death rates. Fertility continued to increase after the end of the period for which the continuous data series is available: fragmentary statistics from the early twentieth century, by which time population growth had accelerated to some 1.7 per cent per year, indicate birth rates in excess of 40 per thousand (Kündig 1934, p. 175; Gooszen 1999, p. 125).

The heart of Sulawesi is a large, remote, and infertile region where Dutch rule was not established until the years 1905–1908, a century later than in Minahasa. As in the case of Minahasa, its precolonial societies were tribal in character, with little political centralization or economic specialization. Unusually in Indonesia, Protestant missionaries were present here some years before the colonial conquest, although their efforts to convert the population to Christianity became successful only later. In 1902, the missionary–anthropologist Albert Kruyt (or his assistants) questioned 458 post-menopausal women in the Poso area of northern Central Sulawesi about the number of children they had borne and the proportion of these who had died 'as small children' (Kruyt 1903, p. 197). In 1924 the same procedure was repeated, this time by mission schoolteachers, with almost all of the post-menopausal women (more than 4,000 of them in total, spread over 181 villages) living in that part of Central Sulawesi where the Dutch Missionary Society was active (Tillema 1926, pp. 25–48).

In 1902 the recorded total fertility was 3.2, with an average of 2.4 children surviving beyond infancy (Kruyt 1903, pp. 197–8). Among two of the four ethnic groups included in the survey the reported number of births was in fact too low, given the prevailing infant mortality rates, to maintain the population at its existing size. This is consistent with impressionistic reports that during the second half of the nineteenth century the population of Central

Sulawesi was declining rather than growing (Adriani and Kruyt 1912–14, I, pp. 87–8). In 1924 the recorded average total fertility was somewhat higher at 3.9, with 3.1 children surviving beyond infancy (Tillema 1926, p. 47). While good aggregate demographic data for this area are not available until 1930, it is clear that the increase in fertility rates in Central Sulawesi between 1902 and 1924 coincided with the onset of sustained population growth, just as it had in Minahasa between 1849 and 1872. Fertility continued to rise into the post-colonial period: in 1971, according to the Indonesian census of that year, in Central Sulawesi the average number of children ever born to ever-married women aged 40–44 was over 5.8, of which 4.3 were still living (Biro Pusat Statistik 1974, pp. 139, 145).

In both Minahasa and Central Sulawesi, then, a rise in fertility contributed to the onset of the population boom which has continued in both areas, and indeed throughout Indonesia, up to the present day. Non-quantitative sources from the same era, moreover, confirm that in both areas fertility restrictions were instrumental in maintaining the pattern of demographic stasis which immediately preceded that boom. In what follows I review, in the light of both quantitative and qualitative evidence, the nature of those fertility restrictions and the reasons why they were relaxed when and where they were.

Fertility and income: wealth, bridewealth, and birth control

The best known type of premodern fertility control is delayed marriage, the classical form of the Malthusian 'preventive check'. In Central Sulawesi, early marriage was apparently always the norm despite the low fertility rate: at the beginning of the twentieth century Kruyt (1903, p. 194) estimated the average age of marriage for girls at 15 years, and in 1930 this was said to be 'little changed' (Volkstelling 1933–36, V, p. 68). In Minahasa, however, there is qualitative evidence that the nineteenth-century fertility transition coincided with a fall in the age at which women married. In 1896 a Minahasan informant reported that in the past women 'had to be 20 years old or more' in order to marry, but that 'over the last 50 years the situation has changed' (Rapport 1910, p. 64). In 1930, according to a local church official, Minahasan women 'usually' married 'between the ages of 17 and 23' (Volkstelling 1933–36, V, p. 67). There are indications that scarcity of farmland on the central plateau of Minahasa, which had always been densely populated, was one reason for the traditional pattern of delayed marriage, and that the colonization of the coastal lowlands after 1850 was instrumental in bringing about the change. Another factor, it appears, was the increased availability of cash and trade goods for bridewealth payments.

The payment of bridewealth to the family of the bride at marriage was an important aspect of indigenous social organization, and one that persisted into the twentieth century despite the disapproval with which it was viewed by the missionaries who converted Minahasa to Christianity (van Bemmelen 1987). In Minahasa, bridewealth payments often included pieces of land (van Spreeuwenberg 1845–46, II, p. 324; Rapport 1910, p. 67). The same was true in parts of the Sangir islands further north, where the population was similarly unusually dense and marriage traditionally rather late (van Dinter 1899, pp. 370–1), but not in more typical, sparsely populated regions of Sulawesi. Within Minahasa, moreover, it was noted that in the northern district of Tonsea (Kema), one of the least densely populated, a custom of very early marriage ('before they have grown out of children's shoes') existed 'such as is not to be found anywhere else' (Graafland 1867–69, II, p. 213). Taken together these observations suggest a link, mediated by a need to gain access to scarce land in order to marry, between late marriage and high population density.

In Minahasa, as in some other parts of Indonesia (Reid 1997), the population growth of the colonial period was accompanied by considerable emigration from old centres of settlement in the upland interior to previously uninhabited lowland areas (Henley 2005, p. 181). This movement resulted from improved transportation, from the elimination of piracy, and from the rise of copra, produced from coconuts which (unlike food crops) grew best at low altitudes, as an export commodity. It must have acted to facilitate marriage, and indeed to relax any other fertility restriction arising from the limited availability of farmland.

Age of marriage was influenced by the size as well as the nature of bridewealth payments. In 1847 one Dutch official in Minahasa complained explicitly that high brideprices 'make marriage difficult and so impede population growth' (Grudelbach 1847), and in 1930 the bridewealth custom was still regarded as the main reason why really young Minahasan brides were rare (Volkstelling 1933–36, V, p. 67). The fact that brideprice was mentioned by informants as an advantage of having female children confirms that

for most people its economic value was significant (van Doren 1854–56, II, p. 142).

Under these circumstances it is likely that a general correlation between nuptuality and economic prosperity, maintained at least in part by the brideprice mechanism, always existed in Minahasa. Contemporary observers certainly had that impression. In 1848 a Dutch official identified one of the reasons for the ongoing demographic stagnation in Minahasa as 'poverty, as a result of which marriages have become less common' (Gansneb Tengnagel 1848). A generation later the number of marriages was said to fluctuate from year to year depending on the size of the rice and maize harvest (Edeling 1875). Besides interannual fluctuations, recorded food-crop production per head of the population in Minahasa also showed a strong secular growth trend at this period, approximately doubling between 1853 and 1872 (Figure 3).

This development was related in turn to a rapid commercialization of the Minahasan economy (Henley 2005, pp. 353–5). Compulsory coffee cultivation underwent a major expansion in the years after 1850 and the cash that entered circulation at this time, and was used to buy food and other products in a growing number of local markets, originated partly from the monopoly purchase of coffee by the government and from payments made to carters who transported it to the coast along newly built roads. Later in the century, income from private-sector copra exports also became very important. Part of the earnings from coffee and copra was spent on imported goods, especially textiles, and the dramatic growth in the volume of imports that took place from 1850 to 1900 (Figure 4) reflects the increasing size and market orientation of the Minahasan economy. When the British naturalist Sydney Hickson (1889, p. 208) visited Minahasa in 1886, he was impressed by what he saw as its 'very considerable civilisation and commercial prosperity'.

Low birth rates in affluent post-industrial societies and rapid population growth in the less developed countries have accustomed us to associate high 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 (Lee 1997, p. 1074). During the early 1970s, just before the use of modern methods of family planning became widespread in Indonesia, Terry and Valerie Hull (1977) showed that there was a positive rather than negative correlation between fertility and economic class in Java—that is, that wealthier women had more children, not fewer, than their poorer counterparts. Boomgaard (1989, p. 197) and Elson (1994, pp. 289–90) have both associated increasing prosperity with rising nuptuality, and hence fertility, in nineteenth-century Java.

In Boomgaard's view this was not the only reason why fertility levels were positively correlated with

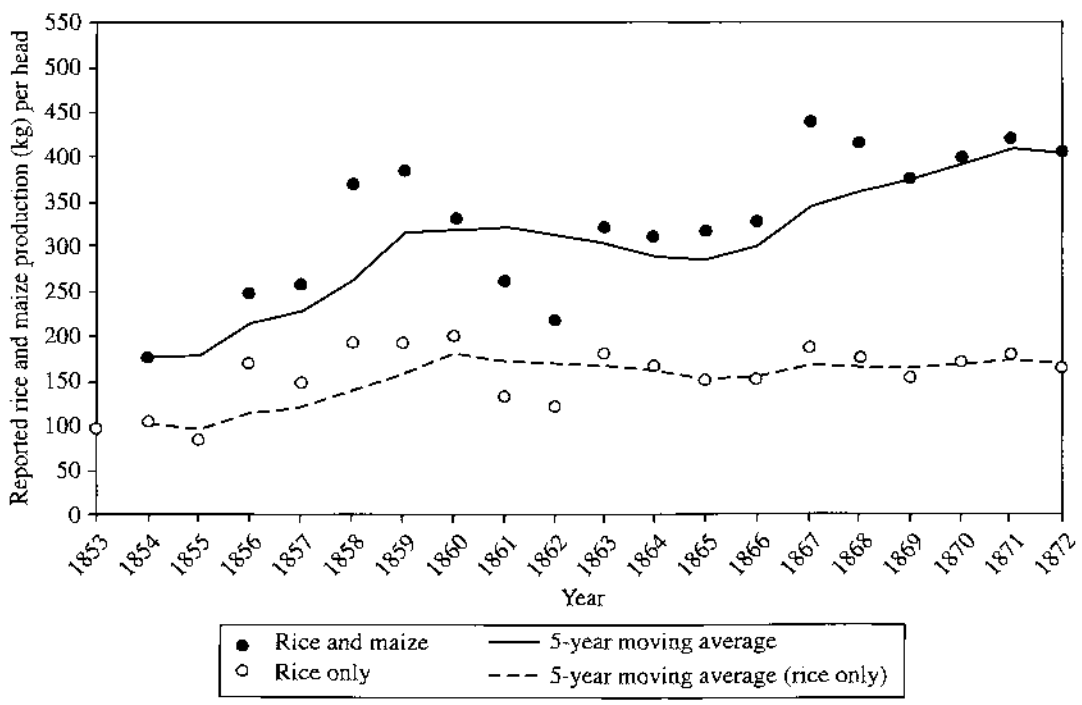

Figure 3 Reported production of staple foodstuffs per head of population, Minahasa (Indonesia), 1853–72
Source: Henley 2005, p. 336.

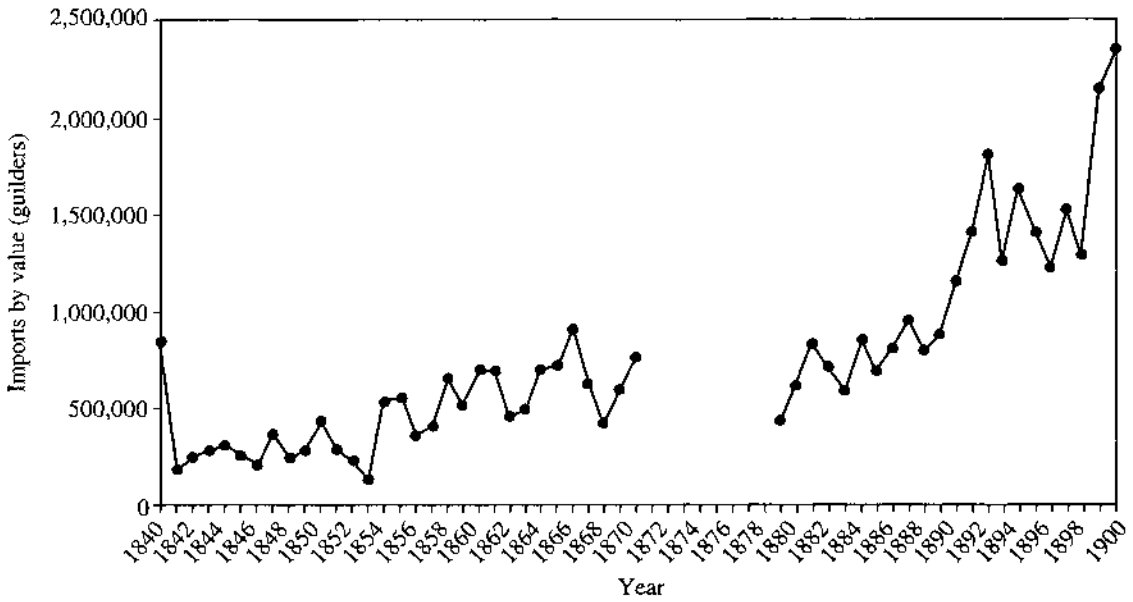

Figure 4 Imports by value, Minahasa (Indonesia), 1840–1900
Source: Henley 2005, p. 355.

economic opportunity; traditional forms of deliberate birth control, he argues, were also used in a calculating way by Javanese women in their efforts to realize a 'target' household size determined largely by economic considerations. There is documentary evidence of the use of all of the methods of fertility control implicated by Boomgaard in the Javanese case, including abortion, contraceptive retroflexion of the uterus, and infanticide, in nineteenth-century Minahasa (Graafland 1867–69, I, pp. 173, 245; de Clercq 1870, p. 133). In Central Sulawesi, where their use was even better documented in the last years before the colonial conquest, the frequency with which pregnant women resorted to abortion (by means of internal medication or external manipulation) shocked Dutch observers (Kruyt 1903, p. 201). Some of the reasons for limiting household size, moreover, were definitely related to economic scarcity. In the Palu Valley of Central Sulawesi, for example, a female custodian of family heirlooms reportedly sometimes remained childless simply in order 'to keep the inheritance undivided in her possession' (Tillema 1926, p. 221).

On the face of it, then, the evidence, although largely circumstantial, seems clear: rising fertility in Minahasa after 1850 must have been related to the improved access to wealth and land created by a combination of colonial government and international commerce. A close look at some more concrete evidence on how fertility patterns were related to economic and political conditions, however, reveals that things were not quite that simple.

Fertility, labour demand, and lactational amenorrhoea

Adam Smith (1976, p. 98) declared in *The Wealth of Nations* that 'the demand for men, like that for any other commodity, necessarily regulates the production of men'. Scholars interested in Indonesia have played a significant role, at least at a theoretical level, in linking demographic growth with the demand for human labour. Their starting point here has been the observation that the population boom in nineteenth-century Java coincided with a period in which Javanese households were subject to a greatly increased labour burden in connection with the Cultivation System, a regime of compulsory export-crop deliveries imposed on them by the colonial state from 1830 to 1870 (and in some places later). White (1973, p. 233) initiated the debate by suggesting that Javanese parents had met this demand for additional household labour partly by altering the allocation of food within their families in such a way as to allow more of their children to survive. Alexander and Alexander (1979) agreed that such a response must have taken place, but argued that it had worked via fertility rather than mortality and that its mechanism had been the deliberate relaxation of traditional fertility restrictions (abortion, delayed marriage, and prolonged breast-feeding). Paul Alexander (1984, 1986) later came to favour a modified version of the labour-demand theory in which conscious agency was no longer involved. The 'increased participation of women in arduous and sustained work' under the

Cultivation System, he now proposed, left them less time for breast-feeding and forced them to wean their children more quickly (Alexander 1986, p. 257). This led automatically to shorter intervals between successive pregnancies, partly because of reduced lactational amenorrhoea and partly owing to a custom, well documented in modern Java, of avoiding sexual intercourse for as long as breast-feeding continues.

In *Children of the Colonial State*, Boomgaard (1989, pp. 176, 186) showed that when demographic and economic statistics for 19 Javanese residencies over the period 1830–80 were compared, a significant correlation emerged between fertility rates and the percentage of the population subject to Cultivation System labour services. This result could be seen as providing support for one or other variant of the Alexanders' labour-demand theory. Instead, however, Boomgaard (1989, p. 197) chose to interpret the correlation between compulsory cultivation and fertility in terms of a positive response to 'the growth of the non-agricultural sectors of the Javanese economy, generated by the Cultivation System, which created new economic opportunities with higher returns to labour'. This interpretation is diametrically opposed to that of the Alexanders, in which the Dutch forcibly worked Javanese women into producing more children despite static or deteriorating economic conditions.

The argument from labour demand was based partly on the paradigm of 'static expansion' developed by Boeke (1953, p. 174) and elaborated by Geertz in *Agricultural Involution* (1963), according to which colonial Java had become caught in a developmental trap whereby the Dutch grew in wealth but the Javanese only in numbers. Boomgaard, by contrast, had a more sanguine (and sophisticated) view of Dutch colonialism and its impact, and was able to show empirically that the Cultivation System had created economic opportunities as well as burdens.

That Boomgaard did not take the labour-demand theory seriously was also partly because of the speculative character of the publications in which it had been proposed, and because no explicit contemporary evidence was available for reduced breast-feeding as a result of increased labour demands. Paul Alexander (1986, p. 259) had himself conceded that archival research was 'most unlikely to unearth accounts of such esoteric matters'. It must be said that, at first sight, the idea that Indonesian women bore more children as a result of working harder has a certain implausibility about it, particularly since some classic nineteenth-century accounts specifically identify the arduous workloads of women as a reason for *low* fertility in Indonesia (Raffles 1978, I, p. 70; Wallace 1987, p. 70). Nevertheless the income-supply and labour-demand models remain equally compatible, in principle, with the statistical evidence produced by Boomgaard. Indeed, the labour-demand interpretation is more parsimonious in that it offers a more direct explanation for the observed correlation between fertility levels and the proportion of households in each residency involved in the Cultivation System. In Boomgaard's reasoning, the latter variable is no more than a surrogate for a third, implied factor, the availability of remunerative employment opportunities in the transport and handicraft sectors incidentally stimulated by the System.

Against the backdrop of these sharp (yet largely unacknowledged) contradictions in the literature on fertility and the Cultivation System in Java, evidence from Minahasa from the same period sheds valuable light on the relative importance of labour demand and income supply to fertility patterns under conditions of compulsory export-crop cultivation. An official report on economic conditions in the area compiled by the civil servant A. C. J. Edeling in 1874 includes an investigation into the number of children born and still living in more than 8,500 Minahasan households distributed over 14 specified districts. For most of these districts, it also indicates the number of days per household per year spent on coffee cultivation. Plotting these two variables against each other in all cases for which figures for both fertility and labour engaged in coffee cultivation are available reveals a clear positive association (Figure 5). Those districts subject to the greatest burden of compulsory coffee cultivation also tended to be those in which women had borne the greatest number of children. The statistical correlation here is strong and there is little chance that it is accidental. The regression line shown carries an R^2 value of 0.78, and a Spearman rank correlation coefficient test on the same data gives a correlation coefficient of 0.90, which is significant at the 1 per cent level for the size of sample used.

In the previous section I noted that the payments made by the government for the coffee purchased under its monopoly system were important stimuli for a general expansion of commerce that took place in Minahasa after 1850 and which, if only by facilitating marriage, must have contributed in some degree to the rise in fertility that accompanied it. The income earned from coffee cultivation, however, was not proportional to the time spent on it. When average household earnings from coffee

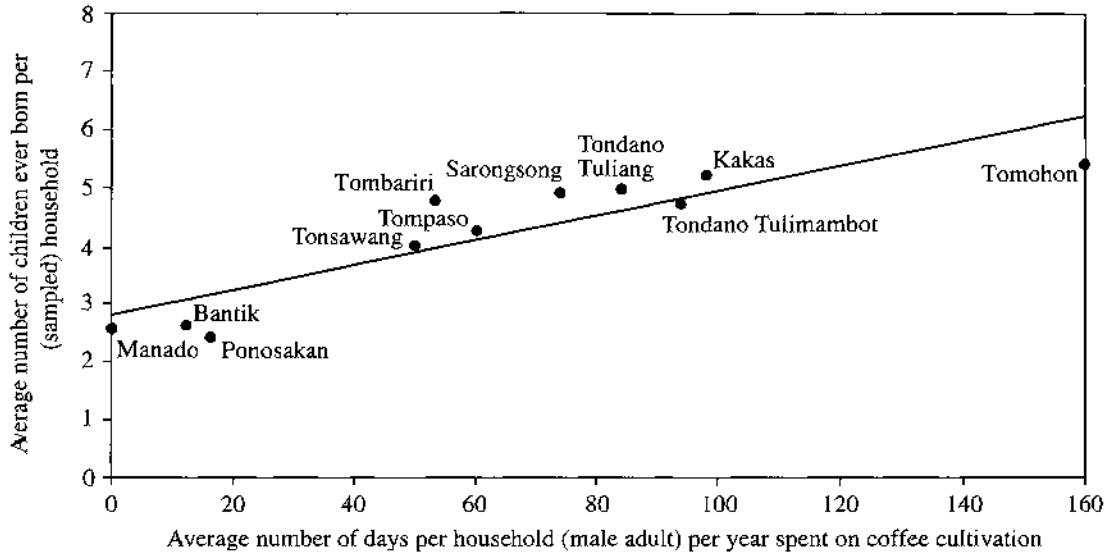

Figure 5 Women's fertility and the burden of compulsory coffee cultivation in some districts of Minahasa (Indonesia), 1874
Source: Henley 2005, p. 387.

cultivation in the years 1873–74 (also included in the Edeling report) are plotted against the results of his fertility survey for all districts for which figures for both variables are available, no significant correlation emerges (Figure 6). While non-agricultural employment opportunities associated with the compulsory deliveries, which as in Java were significant in the transport sector, cannot be taken into account here, their distribution over the districts was probably similar to that of the payments for coffee cultivation. Since coffee sales and carting were not the only sources of income in an increasingly commercialized economy, the lack of a specific correlation between income from coffee and household size in the 1870s need not contradict the argument that economic growth in late nineteenth-century Minahasa had a broadly positive effect on the birth rate. Fertility rates in Minahasa, it should also be noted, remained high after the abolition of compulsory cultivation at the end of the century. As far as the cultivation services themselves are concerned, however, the Minahasan evidence is clear: these elicited higher fertility directly via the labour burden they imposed, not indirectly via the income they supplied.

It is not clear whether this effect resulted from the deliberate production of more children to share the labour burden (which was allocated on a household basis), or from reduced lactational amenorrhoea among hard-worked women. The strength of the

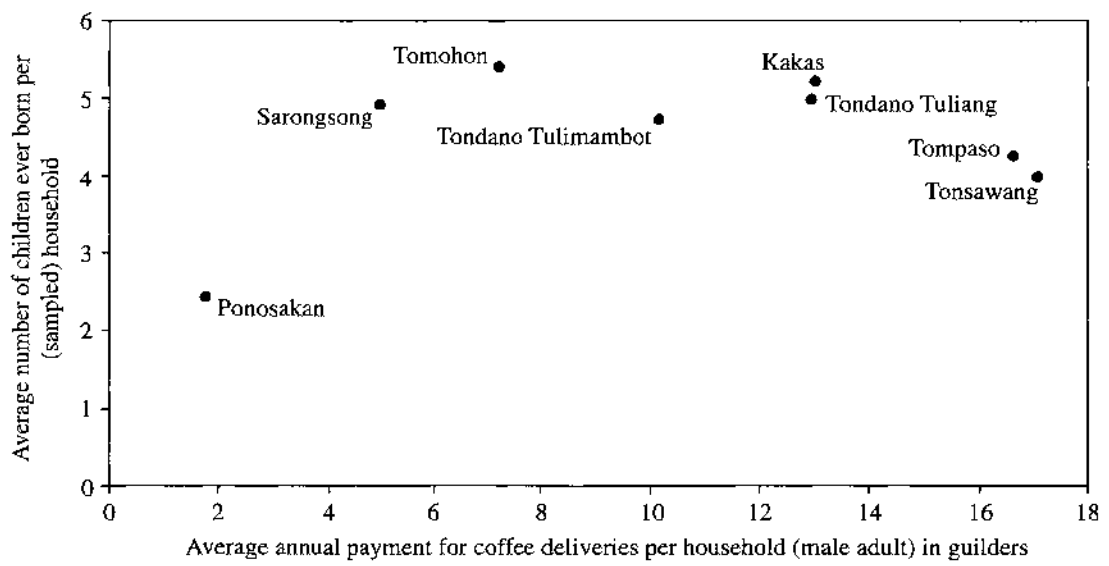

Figure 6 Women's fertility and income from compulsory coffee cultivation in some districts of Minahasa (Indonesia), 1873–74
Source: Henley 2005, p. 395.

correlation, however, tends to favour reduced breast-feeding, which as an unconscious mechanism would presumably have been less subject to cross-cutting influences. What is certain is that a substantial part of the compulsory labour burden was borne by women (Jansen 1861, p. 230; Graafland 1898, II, p. 250), and that despite Alexander's pessimism about the chances of finding direct contemporary evidence for reduced breast-feeding as a result of compulsory labour, Edeling (1875) states that the heavy workload imposed on Minahasan women is 'one of the reasons why mothers do not have enough time to give their children their natural food'. Complaints about over-rapid weaning of infants can be found even in published sources on Minahasa from the same period (de Clercq 1891, p. 219; de Lange 1897, p. 686). They stand in sharp contrast to the observation by a seventeenth-century Dutch visitor that Minahasans 'breast-feed their children for long periods' (Padtbrugge 1866, p. 327). While there is no evidence from Minahasa (or Central Sulawesi) for the practice of post-partum sexual abstinence to which some authors have attributed great demographic significance in Java (Alexander 1984; Santow 1987), the contraceptive effect of breast-feeding alone is widely acknowledged in the demographic literature (Saito 1996; Aguirre et al. 1998).

In nineteenth-century Minahasa, labour demand and income supply exerted mutually independent influences on fertility because the demand for labour was maintained largely by political compulsion rather than by economic incentives. Under these circumstances it is possible that in some districts, as the Alexanders argued for the whole of Java in the period of the Cultivation System, rising fertility coincided with diminishing rather than rising incomes. Over the broad sweep of Indonesian history this was no doubt the exception rather than the rule. The way in which the colonial state drove up export production in Java and Minahasa by political means, in the absence of commensurate economic incentives, was unusual even in the nineteenth-century context. In earlier periods the state was typically too weak to permit such exploits (Adas 1981; Reid 1998), and in the twentieth century it seldom saw fit to attempt them. The normal motor of economic growth in Indonesia, up to quite recent times, has been the spontaneous production by small farmers, in response to market demand, of commercial crops and other products (Booth 1998, p. 237; Touwen 2001, pp. 315–27). Under these conditions the two types of stimuli to heightened fertility, labour demand and income supply, have tended to work in tandem and reinforce each other.

There is nevertheless a second circumstance, besides political pressure, under which labour demand might increase in the absence of income gains: population pressure, forcing farmers to adopt progressively more labour-intensive agricultural techniques in order to produce a greater amount of food from a fixed area of farmland. In this model, classically formulated by Boserup (1965), it is precisely the diminishing returns to current labour inputs that create the demand for additional labour. In recent years the Boserup model has come under attack as many instances of what was once understood as demographically driven intensification have been reinterpreted as consequences of 'market pull' (Netting 1993, pp. 288–94)—that is, of market incentives to intensify agricultural inputs rather than demographic pressures to do so (Brookfield 2001, p. 215). In Minahasa, nevertheless, population pressure definitely played a role in a sustained expansion of the area under irrigation which began in the 1850s (Henley 2005, pp. 526, 587–90). An administrative report from 1873 welcomes spontaneous expansion of irrigation by farmers as 'an increasingly desirable and necessary course of action' given that 'woodland in which to open new dry fields is becoming more and more scarce' (van Harencarspel 1873).

A look at the recorded harvest statistics, moreover, shows that most of the production increase between 1853 and 1872 was accounted for by maize, at that period still almost exclusively a swidden crop, rather than rice (Figure 3). In fact rice production per head remained approximately stable after 1860, suggesting that the expansion of irrigation, in accordance with the Boserup model, was dictated less by price incentives to surplus production than by an endeavour to maintain rice consumption at existing levels under conditions of growing land scarcity. The implications of the resulting vicious circle—population pressure creates labour demands which lead via higher fertility to further population growth—will be discussed in the concluding section.

Fertility and gender relations: men's absence and women's autonomy

While some articulations between economic and fertility change operated directly via the effects of commercial incentives, income variations, and labour demands on the behaviour of individuals, others operated indirectly via changes in the social

institutions that shaped individual lives and decisions. Traditional social organization in Sulawesi, as in many other parts of Southeast Asia, featured large semi-corporate kin groups. In most cases these focused on large houses inhabited by multiple nuclear families related to each other on the female side (Chabot 1969, p. 95; Schrauwers 2000, p. 106). Under colonial rule they tended to disintegrate: in Minahasa, for instance, they 'gradually fell apart into [nuclear] families [*gezinnen*]' during the nineteenth century (Holleman 1930, p. 49). This dissolution of corporate kin groups contributed in several ways to the transition from low to high fertility.

The first mechanism involved here was related to the absence of men. In pre-colonial Central Sulawesi, one reason for low fertility was the frequent separation of married couples (Kruyt 1903, p. 204). During the agricultural off-season after the harvest, men routinely left their wives to make extensive journeys in connection with trade and warfare, or to the coast in order to manufacture salt from seawater. Padoch (1982, pp. 115–7), who identified men's absence as an important indirect form of fertility control among the Iban of Sarawak in the 1970s, noted that its frequency was determined partly by the productivity of subsistence agriculture. In those localities where food-crop yields were poorest, men spent more time away earning income from commercial activities (wage labour and the collection of forest products) with which to purchase food. The fact that during the nineteenth century temporary emigration by men was least highly developed in the most agriculturally productive part of northern Sulawesi, Minahasa, and most common in less fertile Central Sulawesi, suggests a similar pattern. In the early twentieth century, just as the birth rate began to rise, it became less common for men to be absent in Central Sulawesi. This change resulted partly from the transformation of the local economy under colonial pressure into one based on intensive wet rice agriculture, which employed men more continuously in the village sphere (Kruyt 1924, p. 46).

Under traditional conditions, there had been social as well as economic incentives for men to leave home. Foremost among these was the uncomfortable degree of subservience they were expected to show to their wives' relatives, in whose houses they were obliged to live whenever they were in the village (Kruyt 1938, III, p. 134). In the early twentieth century this too became less of a consideration as the matrifocal kin groups began to lose their importance and the old multiple-hearth houses were replaced by smaller dwellings that housed only one or two nuclear families (Tillema 1922, p. 219).

The same development also had consequences for another feature of traditional society that affected reproductive behaviour, the high degree of autonomy accorded to women as guardians of the house and other property of their extended kin groups. Combined with the central roles played by women in swidden agriculture and religious ritual, and with the help they could always expect from their co-resident blood relatives, matrifocal kinship organization meant that a woman's wishes were seldom subordinate to those of her husband: 'up to a certain point', declared Kruyt (1938, III, p. 133), 'she can say that she does not need a man'. The demographic significance of this autonomy lay in the fact that women, in general, were more strongly motivated than men to exercise traditional forms of deliberate birth control. 'For the husband', Kruyt and his colleague Adriani (Adriani and Kruyt 1912–14, II, p. 37) claimed, 'there is no possible reason not to wish for children, since the entire burden of caring for these is borne by the mother'. The reduction in the social status and economic autonomy of women which accompanied the breakdown of tribal social organization left women with less freedom, and less incentive, to resist conforming to the preference of (predominantly) men for large numbers of children. The existence of an inverse relationship between female autonomy and fertility is well established in the demographic literature from many parts of the world (Dyson and Moore 1983; Jejeebhoy 1995).

Both in Central Sulawesi and in Minahasa the disintegration of the traditional corporate kin groups was accelerated by the colonial state, which regarded the large multiple-family dwellings which housed them as uncivilized and unhygienic. The state, however, was not the essential factor here. In the Sangir and Talaud islands to the north of Minahasa, where Dutch power was limited and indirect until the end of the nineteenth century, the same development was already well underway in the 1880s as a result of increases in market exchange and material prosperity brought about by a booming export trade in copra (dried coconut flesh). Travelling through these islands in the 1880s, the British naturalist Sydney Hickson (1887, p. 140) commented extensively on 'the gradual diminution [...] of houses as the civilization or wealth of the inhabitants increases'.

The corporatism of the groups inhabiting the big traditional multi-hearth houses rested partly on the various forms of social insurance which they provided, and partly on the control by their senior members of the scarce prestige goods needed by individuals for brideprice payments and other major

transactions. As the economy grew more commercialized, prestige goods such as imported textiles and ceramics became more easily accessible to individuals through 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. Under these conditions the matrifocal corporate kin groups centred on the big houses were gradually replaced by a looser pattern of individual nuclear families, not because the state had intervened to dissolve them, but because the market had made them redundant by usurping both of their key economic functions.

Fertility and social structure: child-sharing and slavery

As well as their promotion of men's absence and women's autonomy, there is a third reason to believe that the extended family structures which typified social organization in Sulawesi under economically isolated conditions were conducive to low fertility. The theory that follows has been reproduced in briefer form, and with my consent, by Boomgaard (2003, p. 207).

In the traditional situation the economic (and other) benefits of children were typically enjoyed not only by their parents, but also by a wider circle of kin. Like other resources, children were effectively shared. The most obvious manifestation of this child-sharing tendency was a very high frequency of adoption between related couples. Such transfers of children were reportedly difficult to opt out of, and often resented (Kruyt 1899a, p. 81). Reluctance to comply with adoption requests is also reported from elsewhere in Indonesia (Alexander and Alexander 1993, p. 270) and Oceania (Marshall 1976, p. 34). One's children, then, were not 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 reduced the incentive to bear children by setting up 'collective action dilemmas' (Olson 1965; Lichbach 1996) 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.

Adoption and fosterage have remained important institutions in Minahasa and Central Sulawesi up to the present day. Nevertheless, the weakening of extended family structures must have entailed some 'privatization' of the benefits of children, since it was within the old corporate kin groups that the labour of juniors was most effectively shared. The dissolution of this institution, then, made it easier for parents to monopolize the benefits of their own children. It also made them more exclusively dependent on those same children for security in their old age, an important factor affecting desired family size in Java in more recent times (White 1976, pp. 311–31). Both of these developments contributed to rising fertility by strengthening the incentive to increase the size of the individual household by bearing and raising more children.

While some empirical studies have concluded that corporate kin groups are conducive to high fertility (Lorimer 1954, p. 90; Burch 1983, pp. 549–53), others contradict this (Nag 1975, p. 43; LeVine and Scrimshaw 1983, p. 680). I suspect that the former studies were of communities in which the groups in question had begun to lose their original economic functions, thus making the problem of children as public goods less marked. That the ideas of institutional economics, in which the difficulty of generating public goods plays a key role, could profitably be applied to the study of fertility behaviour was pointed out a generation ago by Ben-Porath (1980) and McNicoll (1980), pp. 454–6). The full implications, however, do not yet seem to have been appreciated, and I believe that the relationship between the economic basis of a community and its system of property rights in children will be a fruitful area of research in the future.

The links proposed here between corporate kin groups and low fertility as a consequence of men's absence, women's autonomy, and child-sharing remain speculative. There is no quantitative evidence that could be used to test them with any degree of rigour, and the motives and choices involved are mostly imputed. It is, however, possible to be more concrete about another traditional institution that tended to lower fertility—slavery. For several reasons, according to the missionary sources, in Central Sulawesi the incentives to practise birth control were strongest in those communities that contained the most slaves. Firstly, children were less economically important to slave-owners than to free couples without access to slave labour. 'If one has slaves', as Adriani (1915, p. 458) put it, 'then one also has servants, so that one of the principal reasons to hope for children is eliminated'. Since slave children were often taken away from their parents at an early age, many slave women also had 'no desire to bear and raise children for other people' (Kruyt 1903, p. 201; 1911, p. 91). Weak property rights in children, in other words, reduced the incentive to produce

children among slaves just as I have argued they did among members of child-sharing extended kin groups.

Some quantitative evidence for these effects is shown in Table 1, which uses data from a fertility survey organized by Kruyt in the Poso area in 1902. Besides two coastal Muslim groups about which little is known in relation to slavery, this survey included two neighbouring upland pagan groups which were alike in most respects but very different with respect to slavery: the To Lage, close to half of whom were slaves, and the To Pebato, among whom (unusually for Sulawesi) there were very few slaves.

Here the women of the slaveholding To Lage group show much the lower average completed fertility rate—and this despite the fact that infant mortality is far higher among the To Lage than among the To Pebato. The same association between slavery and low fertility is attested to by early Dutch sources from Ambon (Knaap 1987, p. 132) and Batavia (Raben 1996, p. 128) and has long been a commonplace in the literature on slavery in Africa (Robertson and Klein 1983; Meillasoux 1986, pp. 79–85).

Although warfare and slave-raiding played a role in places, in most cases slavery in Southeast Asia was an accepted obligation rather than something imposed and perpetuated by forcible means. The most common origin of this obligation was debt (Reid 1983, p. 8). Indigenous informants in Sulawesi stated that hereditary slaves were people whose ancestors had become irredeemably indebted to their masters (Kruyt 1911, p. 69). Often this occurred during subsistence crises, or was related to the 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 (Scott 1972, pp. 93–5). Accordingly, geographical variations in the prevalence of slavery were often related to differences in levels of economic security: slaves, in other words, were more numerous in poorer than in richer communities. With regard to the contrasting statistics from Central Sulawesi, it is striking that the territory of the slaveholding To Lage was one in which steady emigration was taking place as a result of 'overpopulation and the resulting lack of arable land' (Kruyt 1899b, p. 608). The non-slaveholding To Pebato, Kruyt (1911, p. 81) also noted, 'usually have more food' than the To Lage.

Table 1 Completed fertility and child survival among two ethnic groups in the Poso area of Sulawesi, 1902

	To Pebato (non-slaveholding)	To Lage (slaveholding)
Number of post-menopausal women interviewed	155	41
Average number of children ever born per woman	4.03	2.85
Average number of children ever born per non-childless woman	4.19	3.25
Average number of children surviving beyond infancy per woman	3.12	1.24

Source: Kruyt 1903, pp. 197–8.

Conclusion: feedbacks, thresholds, and pathways

In this light slavery, like delayed marriage in other contexts, can be seen as a negative feedback mechanism which acted to adjust fertility 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 (1911, p. 80) 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 had little incentive to accumulate a food surplus which might simply be taken away from them by their masters. Probably there was indeed a vicious circle here, with slavery tending to perpetuate itself via underproduction and poverty. Both in this respect and in its negative effect on fertility, there is a direct parallel with the more egalitarian patterns of resource sharing characteristic of the traditional corporate kin group. At the cost of great oversimplification, the interlocking mechanisms of demographic homeostasis associated respectively with slavery and with the kin-based 'moral economy' can be represented as shown in Figure 7.

Trade, by creating new incentives to surplus production, was capable of breaking open the restrictions on demographic growth in subsistence-based economies. In parts of Sulawesi during the late nineteenth century, the appearance of a new vent for surplus in the form of foreign demand for copra was associated both with rapid population growth and with the breakdown of the traditional corporate kin groups in the face of expanding local market exchange. A similar process, I believe, was largely responsible for the remarkably smooth disappearance of the other institutional fertility check under

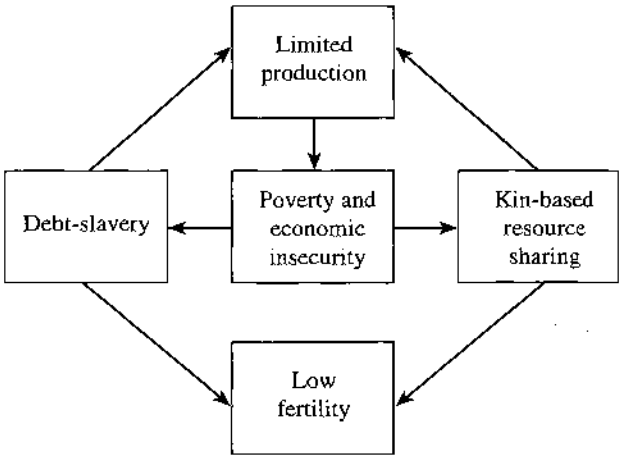

Figure 7 Low fertility as a consequence of demographic homeostasis in Sulawesi (Indonesia) during the pre-colonial past

discussion here, slavery. As in some other parts of Indonesia (Reid 1993, p. 69; Knapen 2001, p. 395), colonial edicts prohibiting slavery seem to have gone largely unresisted in Sulawesi, even in places where they could not adequately be enforced. Here again the underlying factor seems to have been increasing prosperity and market exchange, which reduced the incidence of poverty and subsistence crises, and at the same time 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.

For a long time most demographers abandoned the search for systematic links between demographic and economic change, concentrating instead on the diverse 'proximate determinants' of fertility and mortality. In the last decade, however, there has been renewed interest in identifying, as Malthus did, homeostatic mechanisms that act to maintain a balance between population and resources (see, for instance: Lee 1997; Mason 1997; Wood 1998; Wilson and Airey 1999; Bengtsson and Saito 2000; Abernethy 2002; Caldwell and Caldwell 2003). It may be too much to hope, with David Coleman (1986, p. 35), 'to develop a scheme of the development of population feedback systems so that the demographic regime of a society might be predicted from its economic type and environment'. Nevertheless a broad Malthusian correlation between demographic and economic conditions, as I have pointed out elsewhere, can clearly be discerned in the history of island Southeast Asia. Populations in this region have always been relatively dense where the soil is fertile, and relatively sparse where it is not; they have also tended to grow when commerce expands, and shrink when commerce contracts (Henley 2002). While variations in mortality are also important here, it is ultimately in the context of economic change that the phenomenon of rising fertility in colonial Sulawesi should be understood. Two key traditional institutions conducive to low fertility—slavery, and the corporate kin group—were adapted to economic scarcity but corroded by economic opportunity. In addition, economic opportunity also favoured higher fertility more directly by facilitating marriage and weakening the incentives to exercise deliberate fertility control within marriage.

This neat homeostatic pattern, however, is not the whole story. In the case of nineteenth-century Minahasa, another important reason for rising fertility was increasing demand for labour. Although this too was indirectly related to commerce, it was imposed in the first place by political means in the form of compulsory labour services. The Minahasan evidence also suggests that the principal way in which the additional labour burden led to higher fertility was by forcing women to breast-feed their infants less, leading to reduced lactational amenorrhoea and shorter intervals between pregnancies.

If compulsory cultivation services and corvée labour were the only factors here, this situation could be dismissed as a historical curiosity restricted to episodes of very heavy state taxation in labour. A second source of rising labour demand in colonial Minahasa, however, was labour-intensification in food-crop agriculture. This took place partly as a response to population growth and the resulting pressure on agricultural land, which forced farmers to replace swiddens with wet rice-fields in order to maintain food production per head of the population.

In this situation, probably much less unusual in historical terms than that of compulsory export crop cultivation, it is conceivable that the homeostatic processes outlined above were replaced by a pernicious positive feedback loop in which population growth led via agricultural intensification to further labour demand, higher fertility, and hence continued population growth. Ultimately, of course, such a process would inevitably be halted by declining food production per head of the population, leading to a Malthusian catastrophe or to the establishment of a new demographic equilibrium based entirely on high mortality. But as Geertz (1963, pp. 32–3) famously observed, the peculiar ability of wet rice-fields to keep responding to additional labour inputs even at already very high population densities meant that the transgression of such a critical threshold could long be delayed. The idea that wet rice cultivation as a system evokes, as well as absorbs, population

growth (Reid 2001, p. 56), and that it does so by means of labour demand in a way independent of changes in income, would certainly help to explain why in the early twentieth century many of Indonesia's old, densely populated rice-bowl areas were notorious for their poverty despite highly developed transport infrastructures and commercialized economies. A case in point is the irrigated zone around Lake Tondano in Minahasa, which in the 1880s was probably the most prosperous part of Sulawesi (Hickson 1889, p. 214) but by the 1930s had become an enclave of 'poverty' and 'overpopulation' amid the affluence of the surrounding copra-producing districts (Kündig 1934, p. 188; Brouwer 1936, p. 60).

For historical purposes, then, it seems useful to distinguish two different pathways from low to high fertility. In areas with relatively low population densities and area-extensive forms of agriculture responsive to commercial stimuli, birth rates rose in parallel with rising incomes as the growth of commerce facilitated marriage and undermined institutions such as debt-slavery and child-sharing which had previously acted to restrict marital fertility. In densely populated areas controlled by states which imposed heavy labour taxation and compulsory purchase systems that distorted agricultural commodity markets, fertility rose in response to demands for women's (and possibly child) labour which did not necessarily involve income gains. In so far as rising fertility in this second type of situation entailed a Boserupian labour-intensification of agriculture under population pressure, it led via what institutional economists call 'lock-in' or 'path-dependence' (North 1990, p. 94) to a vicious circle of overpopulation and poverty. No real historical situation, of course, is likely to correspond exactly to either of these two models. Although the two case studies of rising fertility presented above, Minahasa in the late nineteenth century and Central Sulawesi in the early twentieth, fit best into the second and first model respectively, each involved elements of both. My schematic distinction between these two types of transition from low to high fertility may nevertheless prove useful as an aid to structuring further research.

Note

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