Australian National University

Development Policy Centre
Crawford School of Public Policy
ANU College of Asia & the Pacific

Institutional constituents of human well-being in Papua New Guinea: A second district-level analysis

Colin Filer, Jon Fraenkel and Terence Wood

Abstract

In a previous discussion paper, Filer and Wood (2021) derived two measures of human well-being from the 2000 national census and sought to establish the relative strength of their association with 12 geographical variables in a comparative study of the 85 partially rural districts of Papua New Guinea. In this paper, we seek to compare the relative significance of these geographical variables and a smaller range of institutional variables for which we have been able to secure reasonable robust measures at a district level. We find that the degree of linguistic diversity or 'ethno-linguistic fragmentation' is quite strongly associated with a high level of child mortality, but is not associated with low levels of school attendance. Other institutional variables are only weakly associated with one or other of these two dependent variables, once the more significant of the geographical variables are taken into account. We conclude with a discussion of several issues that need to be taken into account in an interpretation of these findings.

A codebook and spreadsheet containing measures for all the variables assessed in both discussion papers is available at https://doi.org/10.6084/m9.figshare.14456229.

Discussion Paper 95

DATE MAY 2021

Series ISSN 2206-303X

Institutional constituents of human well-being in Papua New Guinea: A second district-level analysis

Colin Filer, Jon Fraenkel and Terence Wood

Colin Filer is an Honorary Professor at the Crawford School of Public Policy, The Australian National University.

Jon Fraenkel is a Professor in Comparative Politics in the School of History, Philosophy, Political Science and International Relations at Victoria University of Wellington.

Dr Terence Wood is a Research Fellow at the Development Policy Centre, Crawford School of Public Policy, The Australian National University.

Filer, C, Fraenkel, J & Wood, T (2021). Institutional constituents of human well-being in Papua New Guinea: A second district-level analysis, *Development Policy Centre Discussion Paper 95*, Crawford School of Public Policy, The Australian National University, Canberra.

This is the second discussion paper in a two paper series involving district-level analysis of human well-being in Papua New Guinea. See also:
Filer, C & Wood, T (2021). Geographical constituents of human well-being in Papua New Guinea: A district-level analysis. *Development Policy Centre Discussion Paper 92*, Crawford School of Public Policy, The Australian National University, Canberra.

The Development Policy Centre is a research unit at the Crawford School of Public Policy, The Australian National University. The discussion paper series is intended to facilitate academic and policy discussion. Use and dissemination of this discussion paper is encouraged; however, reproduced copies may not be used for commercial purposes.

The views expressed in discussion papers are those of the authors and should not be attributed to any organisation with which the authors might be affiliated.

For more information on the Development Policy Centre, visit
http://devpolicy.anu.edu.au/

Institutional constituents of human well-being in Papua New Guinea: A second district-level analysis

1. Introduction

In development economics, and development studies more broadly, there has been a long debate about whether development trajectories and outcomes are primarily influenced by geographical or institutional factors. The geographical determinists focus on the way that development is encouraged or constrained by a range of environmental variables (e.g. Diamond 1997; Morris 2010; Sachs 2006), while the institutional determinists pay more attention to the way that societies are organised (e.g. Acemoglu & Robinson 2012; North 1990; Rodrik et al. 2004). Much of this argument has been conducted by means of cross-country studies that use a variety of statistical techniques to test hypotheses about the relationship between specific measures of development and a range of independent variables. There is a smaller body of literature that seeks to test such hypotheses by making comparisons between different parts of the same country. The advantage of this second approach is that some of the independent variables considered in cross-country comparisons can be held constant. The disadvantage, especially in less developed countries, is that some variables cannot be so easily or reliably measured at a subnational level.

In a previous discussion paper (Filer & Wood 2021), we examined variations in the geographical constituents of human well-being across the 85 partially rural districts of Papua New Guinea (PNG) (see Appendix 1). We described these as 'constituents', rather than 'determinants', in order to avoid making questionable assumptions about the direction of causality. We identified two aspects of human well-being for which we had reasonably robust measures at the district level. We then identified 12 geographical variables for which we had equally robust measures and sought to establish which of these independent variables were most closely associated with one or both of these measures of human well-being by means of a series of regressions. In that paper we took a fairly broad view of what constitutes a 'geographical' factor or variable, but we made an implicit distinction between geographical and institutional factors, and we excluded institutional factors from our analysis.

In this paper, we adopt an equally broad view of what count as 'institutional' factors or variables, allowing that these might otherwise be described as social, political or cultural factors. We resort to the international literature to identify three institutional variables that are commonly said to be associated with differential development outcomes in countries, like PNG, that were formerly subject to European colonial rule without becoming European settler states with indigenous minorities. These are: (1) the degree of ethno-linguistic fragmentation; (2) the degree of hierarchy that existed in pre-colonial political institutions; and (3) the impact and legacy of colonial rule. We then seek to establish the best available measures that can be obtained for each of these three variables at a district level, and why we might (or might not) expect them to be associated with one or other of our two measures of human well-being. Then we run a set of regressions to compare the significance of these institutional variables with the geographical variables that proved to be most significant in our previous study. Finally, we discuss the relevance of our findings to the broader international debate about the relative significance of geographical and institutional factors and to more specific arguments about current development trajectories in PNG.

2. Institutional theories of development

A number of arguments have been put forward by those scholars who favour an institutional, as opposed to a geographical, explanation of differences in the level of economic development or human well-being achieved by different countries. Economists commonly use the word 'institution' in a fairly broad sense, to include things such as customs, traditions and norms, as well as the rights and obligations established by law (North 1990). Here we shall concentrate on the way that institutional explanations have been applied to comparisons between countries that were formerly subject to European imperial or colonial rule but not to extensive European settlement. Most of these countries are to be found in different parts of the African continent, the Middle East and the Asia-Pacific region. In some instances, these arguments have also been applied to comparisons between different parts of the same country.

One common argument is that national development outcomes are a function of the quality of national governance (World Bank 2017). But what makes for good governance? In the recent literature, especially that focused on Africa, institutional determinists have

identified three different factors, or groups of factors, that might serve to answer this question.

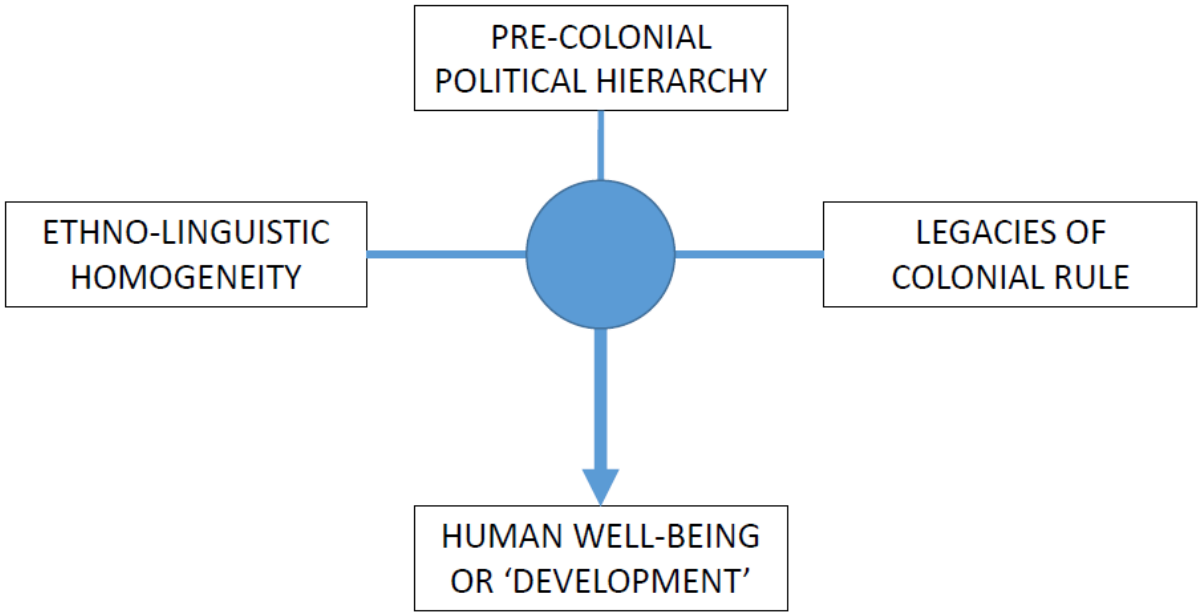
The first factor is variation in the extent of ethno-linguistic fragmentation. The argument here is that a high level of ethno-linguistic homogeneity is conducive to better development outcomes (Alesina et al. 1999; Alesina & Ferrara 2005; Easterly & Levine 1997; Fearon & Laitin 1996; Fish & Brooks 2004; Mauro 1995; Rodrik 1999). In this argument, the level of linguistic fragmentation is commonly taken as a proxy for the depth of 'ethnic' divisions, even though the relationship between language and ethnicity is itself quite variable (Gerring et al. 2018; Posner 2004, 2005). Proponents of this argument are not always explicit about the reasons why linguistic or ethnic diversity should have such a negative influence, but economists tend to regard these as factors that diminish 'trust', reduce the volume of 'social capital', or impair the capacity for 'collective action', thereby having a detrimental effect on the delivery of public goods and services.

The second factor, in countries formerly subject to European colonial rule, is variation in the quality or impact of different colonial regimes (Acemoglu et al. 2002; Acemoglu & Robinson 2012). In the case of India, the differential experience of British colonial rule has been put forward as an explanation of variation in post-colonial development outcomes between different states in the federation (Lee 2019). In some studies, the colonial legacy has been considered more broadly as something that encompasses variation in the experience of 'pre-colonial' commercial expansion, such as that occasioned by the slave trade in Africa (Nunn & Wantchekon 2011). The main difficulty with this line of argument is that the variable effects of different forms of colonial influence are liable to be diluted with the passage of time since countries achieved political independence (Maseland 2018).

In contrast to those scholars who stress the significance of different colonial legacies, others prefer to emphasise the enduring significance of pre-colonial 'hierarchy', or the centralisation of political power in pre-colonial state formations, as a key factor in promoting positive development outcomes in post-colonial states (Gennaioli & Rainer 2007; Herbst 2000; Michalopoulos & Papaioannou 2013). Similar arguments have been made about the endurance of pre-colonial political institutions in the Asia-Pacific region (e.g. Dell et al. 2018; Ziltener & Muller 2007).

Whatever the validity of these three lines of argument, the factors or groups of factors that they identify may also influence each other in a variety of ways (see Figure 1). For example, the state of Botswana, which is often cited as an African success story in the international literature (Acemoglu et al. 2001; Robinson 2009), has a high level of ethno-linguistic homogeneity, and has retained a form of pre-colonial hierarchy, partly because of the conditions under which it was administered as a British protectorate and separated from the dominion of South Africa. Indeed, the variety of ways in which the three factors might have interacted with each other is one of the reasons why it is hard to prove that one of them alone is the most significant determinant of current or recent development outcomes.

Figure 1: Hypothetical model of institutional effects on development outcomes



3. Papua New Guinea

PNG does not fare very well in global rankings of development performance or the quality of governance. The United Nations currently has it ranked at 155 out of the 189 countries listed in the Human Development Index, with a gross national income of US$4,301 per capita, an average life expectancy of 64.5 years (almost certainly an overestimate), and an average period of formal schooling that lasts just 4.7 years (UN 2020). There is no country with a lower ranking in the whole of the Asia-Pacific region (unless Afghanistan

is counted as part of that region). Transparency International ranks PNG at 142 out of the 180 countries listed in the Corruption Perceptions Index, and PNG falls within the lowest quintile of countries ranked in the World Bank's indicators of 'government effectiveness' and 'control of corruption'.

Shaun Larcom has linked this rather poor performance to the argument that PNG has 'the most decentralised precolonial institutions of any country' and 'is often cited as the world's most ethnically fractionalised state' (Larcom 2019, p. 819). Comparing PNG with two other Pacific Island states (Tonga and Samoa), Larcom goes on to argue that the level of 'precolonial jurisdictional hierarchy' is inversely correlated with the degree of 'ethnic fractionalisation', at least in this particular region (p. 824). Regardless of whether this correlation can be shown to exist in international comparisons, PNG would therefore seem to be something of an extreme case that can be (and has been) cited in support of two of the arguments made by the institutional determinists. If the Pacific Island states are compared to those on the continent of Africa, PNG would seem to be situated at one end of a continuum that has Botswana (as well as Tonga and Samoa) at the other end.

PNG cannot so readily be placed at the extreme end of any continuum with respect to its colonial legacy. The most peculiar thing about the period of colonial rule is the initial division of the country between German and British domains in 1884. British New Guinea became Papua in 1906, when the Australian Government took full responsibility for its administration. The Australians ousted the Germans from their territory after the outbreak of the First World War. However, the two territories were administered separately until after the Second World War, when a single Territory of Papua and New Guinea was established under a mandate of trusteeship from the United Nations. Self-government was achieved in 1973 and full independence in 1975. No one has argued that the jurisdictional bifurcation of the early colonial period had any specific effect on the country's post-colonial development performance. Instead, there has been an argument on the question of whether the colonial authorities laid the foundation for a poor post-colonial performance by failing to alienate more than 3 per cent of the country's land area from the institutions of customary ownership and use (Filer 2014; Fingleton 2005; Hughes 2004; Lea & Curtin 2011).

Our aim in this paper is not to test the validity of arguments that seek to compare PNG with other countries in the Pacific Island region or the rest of the post-colonial world in order to identify the institutional factors that influence national development outcomes. Our aim is to test the validity of such arguments as they apply to comparisons between the districts or 'open electorates' recognised as integral parts of the post-colonial political system. This means that our analysis is necessarily constrained by the availability of statistical evidence at the district level. At this level, we have no robust evidence on household or personal incomes, let alone on the quality of governance. As explained in our previous paper (Filer & Wood 2021), we have instead identified two indicators of human well-being — the child mortality rate and the school attendance rate — for which we do have reasonably accurate measures derived from the 2000 national census. The question now to be addressed is whether and how we can find measures for the institutional variables that might help to explain district-level variation in these two measures of human well-being. Then we can move on to the question of how well these variables explain such variation when compared with the geographical variables that we discussed at length in our previous paper.

3.1 Measures of linguistic diversity or fragmentation

Scholars who have previously tried to measure the extent of 'ethno-linguistic fractionalisation' or fragmentation in PNG for the purpose of international comparisons have not reached a consensus on how this should be done (Alesina et al. 2003; Fearon 2003; Gerring et al. 2018). But it is hard to understand why there should be much disagreement on this score so long as we do not get confused about the relationship between measures of linguistic diversity and measures of cultural fragmentation or 'ethnic fractionalisation'.

PNG is quite rightly renowned for the number of vernacular languages spoken by the indigenous population — roughly ten times as many as the number of partially rural districts where the languages are spoken. But the number of such languages varies enormously between these 85 districts. We therefore need to find a way to measure the linguistic diversity of each district in order to establish whether this has something to do with measures of human well-being. In doing so, we suggest that the level of linguistic

diversity can be taken as a proxy for the level of traditional cultural diversity, which can manifest itself in many different ways.

However, this does *not* require the assumption that each language belongs to a single 'culture', nor is there any reason to suppose that the people who speak a common language — the members of a single 'language group' — have much if anything else in common that sets them apart from the speakers of another language in the same part of the country (Barth 1971; Filer 1990; Roscoe 2000; Terrell & Welsch 1990; Welsch et al. 1992). We only need to assume that language is one of the dimensions of cultural difference between neighbouring communities, and allow that some measure of linguistic diversity reflects a broader degree of cultural diversity because other dimensions of cultural difference (art, ritual and technology, for example) are not so easily measured. In some respects, the relationship between linguistic diversity and other forms of pre-colonial cultural or institutional diversity will remain something of a puzzle because some of the evidence was obliterated before it could be documented and some is contained in documents that are hard to access or interpret.[1]

Linguists who work in PNG know that any measure of the number of discrete vernacular languages in a given geographical area is bound to be somewhat arbitrary. One reason for this, especially in areas of relatively low linguistic diversity, is the existence of 'dialect chains' connecting groups who can all understand what their neighbours are saying even though the people at each end of the chain would not be able to understand each other if they were to meet up (Rumsey 2010). To this can be added a second kind of uncertainty resulting from the fact that some of the languages that were spoken by small numbers of people when PNG became an independent country in 1975 have since become extinct, but linguists have not been able keep track of the rate of extinction in all parts of the country.

Our provisional estimate of the number of vernacular languages spoken in each district is based on the attribution of languages to rural village census units recognised in the

[1] Much of the discussion of this issue has concentrated on the relationship between language and 'material culture', since the latter can still be found in museums around the world (Craig et al. 2008; Fyfe 2013; Welsch et al. 1992). But material culture consists of the products of human labour, which cannot in themselves be counted as social or cultural institutions. The spatial distribution of institutions may differ from the spatial distribution of different kinds of artefact, just as it may differ from the spatial distribution of languages.

1980 national census. For this purpose, we have compared the 1980 census maps with the language atlas produced by linguists at the Australian National University (Wurm & Hattori 1981) and a more recent language atlas produced by the missionary linguists at the Summer Institute of Linguistics (Lewis et al. 2016). In some parts of the country, the linguists responsible for the ANU language atlas published separate studies in which they assigned vernacular languages to villages listed in a late colonial 'village directory' (TPNG 1968), most of which could still be identified in the 1980 census (Dutton 1973; Laycock 1973; Z'Graggen 1975). In other parts of the country, our attributions are not made with the same level of confidence because of question marks over the accuracy of the maps we are comparing. However, such uncertainties have little effect on the resultant measures of linguistic diversity.

The academic and missionary linguists are not in complete agreement about the number of languages present in any given area. What one side treats as two dialects of a single language may be treated by the other side as two distinct languages. On this score we have given preference to the number identified by the missionary linguists because their evidence is more recent. We have not counted languages that were recorded as having fewer than ten speakers in the ANU language atlas on the grounds that these would most likely have become extinct by 1980. Some of the remaining languages might also have become extinct by 1980, but we should be wary of making this assumption because some of them were spoken in remote and thinly populated parts of the country where the population is known to have been undercounted in the census (Dwyer & Minnegal 2018; Kirsch 1997).

We can get a preliminary sense of the range of variation between the 85 districts by making some simple observations. There are seven districts with just one vernacular language. One is the district of Rabaul in East New Britain Province, while the other six are located in the Highlands Region. On the other hand, roughly half the districts (42) have more than ten vernacular languages; 17 have more than 20; six have more than 30; and one has more than 40. However, these figures take no account of variation in the size of the rural village population at the time of the 1980 census. Rabaul District had a single language spoken by 13,000 rural villagers, whereas Okapa District in Eastern Highlands Province had six languages spoken by more than 44,000 rural villagers.

We can refine our measure of variation in the extent of linguistic and cultural diversity in light of the way that linguists group languages into 'families'. The authors of the ANU language atlas identified low-level families as groups of languages that share as much of their vocabulary as Romance languages like French, Spanish and Italian, and are therefore likely to be descended from a single ancestral language that was spoken between 1,000 and 2,000 years ago. Another group of linguists has since constructed a second dataset, known as Glottolog, in which a somewhat different methodology is used to distinguish what they call 'top-level families' (Hammarström et al. 2020). These are groups of languages that are likely to be descended from a single ancestral language that was spoken at an earlier date — perhaps as much as 6,000 years ago (Holman et al. 2011). A top-level family may consist of one or more low-level families, and both types of family may consist of one or more languages. A language that is the only member of a family is known as an 'isolate'.

There are 22 districts, including the seven monolingual districts, in which the vernacular languages belong to a single low-level family, and another 15 districts in which they belong to a pair of such families. At the other end of this particular scale, there are 21 districts in which the vernacular languages belong to more than five low-level families, including seven districts in which they belong to more than ten. When we get to the top-level families, we find that there are 31 districts, including the seven monolingual districts, in which the vernacular languages belong to a single top-level family, and another 28 districts in which they belong to a pair of such families. At the other end of this higher scale, there are only eight districts in which the vernacular languages belong to more than five top-level families. On both of these family scales, some districts in the Southern and Momase regions appear to be areas of much greater diversity or fragmentation, while most districts in the Highlands Region appear to be areas of much greater uniformity or homogeneity.

If there were a constant relationship between the number of languages and the number of low-level and top-level families to which they belong, then we would not need to take account of family relationships in our measure of linguistic diversity or fragmentation. But the relationship is not constant. For example: the district and province of Manus has 30 different languages that belong to three low-level families and just one top-level family; Nuku District in West Sepik Province has 33 languages that belong to ten low-level

families but only two top-level families; while Angoram District in East Sepik Province has 37 languages that belong to 18 low-level families and 12 top-level families. So three districts that seem to have fairly similar degrees of diversity at the language level have quite different degrees of diversity at one or other of the two family levels.

Now we could arrive at a compound measure of vernacular linguistic diversity by simply adding up the number of languages, low-level families and top-level families in each district and expressing the result as a function of the overall size of the rural village population. But this is not the standard way of measuring 'ethno-linguistic fractionalisation' in the international literature to which we have previously made reference. Standard measures of fractionalisation also seek to take account of variations in the relative size of the groups to which they are applied by calculating the probability that two randomly selected individuals in any given population would belong to the same group (Alesina et al. 2003; Fearon 2003). If District A contains four language groups (or families) of roughly equal size, while District B contains four language groups (or families), but one of them accounts for the vast majority of the population, then District A gets a higher score than District B. In the present case, we have adopted one standard measure of fractionalisation, which is calculated as the complement of the Herfindahl-Hirschman index, and applied it separately to each of the three levels of linguistic diversity that we have previously identified. This measure is represented by the following formula, in which *i* represents the population of each language group or language family group as a proportion of the rural village population in each district:

$$1 - \sum_{1}^{N} i^2$$

We have then taken the arithmetic mean of these three measures as the overall index of fractionalisation or fragmentation in each of the 85 districts. A map summarising the result of this exercise is shown in Appendix 2.

Our seven monolingual districts naturally get a score of zero on this index, but there are 37 districts that get a score of more than 50, if the index is represented as a score out of 100, and seven that get a score of more than 75. These seven districts are Middle Fly and South Fly in Western Province, Kikori in Gulf Province, Bogia in Madang Province, Angoram and Ambunti-Dreikikir in East Sepik Province, and Vanimo-Green River in West

Sepik Province (see Appendix 1). So once again we see that the epicentres of diversity are to be found in the Southern and Momase regions. A full set of numbers for our measurement of different forms of linguistic diversity is shown in Appendix 3.

3.2 Measures of pre-colonial political centralisation or hierarchy

Although Papua New Guineans sometimes use the word 'tribe' to refer to the collection of people who speak a single vernacular language, this way of imagining the existence of different political communities has no traditional counterpart. In a review of ethnographic literature dating from the early colonial period, Hogbin and Wedgwood (1953) defined a pre-colonial 'parish' as a group of people who had four things in common: a name for themselves as a group, a set of rules for the maintenance of internal order, a single territorial domain, and a capacity to defend this domain against attacks by the members of neighbouring groups. They reckoned that such autonomous political communities normally contained between 70 and 300 members, but allowed that they could sometimes contain as many as 1,000. In a subsequent review, Forge (1972) came to a similar conclusion. He reckoned that the groups he called 'basic residential units' normally had a population of between 150 and 350, but also allowed for the existence of larger political communities, which he called 'federations', in regions of high population density. The lower limit on the size of a political community was determined by its capacity to defend itself, while the upper limit was determined by what Forge called 'normative factors'.[2]

If this is an accurate picture of the range of variation in the size of pre-colonial communities, then it is obviously much smaller than the range of variation in the size of vernacular language groups, the largest of which, the Engan group, had 139,000 members in 1980. What appears on a language atlas to have been a large language group had no internal solidarity, nor would its members have even recognised its existence as a distinctive entity.[3] Traditional political communities may have been somewhat larger in

[2] The designation of these local communities as 'political' entities assumes a distinction between 'political' and 'non-political' institutions that does not make much sense in stateless social formations. We have chosen to describe them as political entities because that is what they became once they were subjected to colonial rule.

[3] Speakers of the Engan language did not have a single name for the language that they spoke. The name (spelt 'Ee-nga' in early sources) seems to have been applied to some of them by people living around the

areas of greater linguistic uniformity than in areas of greater linguistic diversity, but population density would seem to have been a more significant factor. What have been found in areas with high levels of linguistic diversity are a small number of communities that were bilingual or even trilingual at the time when their languages were recorded (Laycock 1973; Z'Graggen 1975). This would reflect the continual processes of fission and fusion that occasionally led to the reconstitution of these communities. While Forge's normative factors would lead a community to break up if its population grew beyond the point at which internal order could be maintained, a bilingual community could result from a variety of circumstances in which groups of people speaking one language were assimilated into a community whose members spoke a different language (Filer 1990).[4] However, there is no reason to assume that these processes of fission and fusion were any less prevalent in areas of greater linguistic uniformity. The ethnographic and colonial records abound with examples from all parts of the country.

It has been suggested that an increase in the size of 'maximal political units' in the central highland region accompanied the population explosion that followed the introduction of the sweet potato to highland agricultural systems about 300 years ago (Golson 2008; Golson & Gardner 1990;). The population explosion certainly had the effect of expanding the size of the language groups in this region, even if they were relatively large before the sweet potato got there (Ballard et al. 2005; Brookfield & White 1968; Modjeska 1982; Watson 1965, 1977; Wiessner & Tumu 1998). But the patrilineal clans that constituted the 'basic residential units' amongst members of the Engan language group were recorded as having an average membership of 350 in the 1950s, with a range of between 100 and 1,000 (Meggitt 1965). Although these clans had allies who could be mobilised in times of war, the same was equally true of political communities in lowland regions. The more distinctive result of the so-called 'Ipomoean revolution' was a substantial increase in the volume of social interaction between neighbouring communities, and hence the elaboration of social institutions that limited the incidence of 'tribal warfare' (Brown 1973, 1978; Feil 1984,

current township of Mount Hagen, who speak a different language (Alan Rumsey, personal communication, March 2021).

[4] The creation of (temporarily) bilingual communities should not be confused with the existence of communities in which a large number of members were bilingual or even multilingual by virtue of their routine communication, and even inter-marriage, with members of neighbouring communities in areas of high linguistic diversity (Evans 2012; Rumsey 2019).

1987; Sillitoe 1979; Strathern 1971; Wiessner & Tumu 1998). The key point is that this did not lead to any form of political centralisation.

Anthropologists have recorded a bewildering variety of leadership patterns or institutions within traditional political communities. The key dimensions of difference are:

- the number of words in the local language that designate specific types of leadership position;
- the kinds of things that different kinds of leaders did to exercise their power or demonstrate their authority;
- the degree to which leadership positions were subject to a rule of succession or inheritance; and
- the extent to which leadership positions were inherited in practice, with or without an explicit rule of succession.

The distinction that Sahlins (1963) drew between Polynesian 'chiefs' and Melanesian 'big men' initiated a rather pointless debate about which of the leadership positions identified in Melanesian political communities qualified for either of these designations. This simple dichotomy placed far too much emphasis on the third dimension of difference, and far too little on the variety found in the other three dimensions (Allen 1984; Berndt & Lawrence 1971; Chowning 1979; Douglas 1979; Godelier & Strathern 1991; Lederman 1990; Roscoe 2000). One thing that Sahlins got right was that the leaders of traditional political communities in what is now PNG were only rarely and temporarily able to assert some authority over neighbouring communities, aside from the conduct of successful raids on their domains (Brown 1979; Hogbin & Wedgwood 1953; Oliver 1955; Watson 1965).[5]

Sahlins was an early participant in a separate debate about the way that forms of social stratification and political centralisation evolved during the colonisation of the Pacific Island region by the speakers of Austronesian languages (Kirch 1989; Sahlins 1958; Sand

[5] Like other scholars attempting to measure the extent of political or jurisdictional hierarchy in pre-colonial societies, Larcom (2019) based his assessment of the PNG case on Murdock's (1969) Ethnographic Atlas. Murdock reckoned that three out of the 49 Papua New Guinean 'cultural units' included in his database had 'one level of jurisdiction above the local level', which means that they counted as 'petty chiefdoms'. However, the ethnographic and historical evidence does not support the claim that any of the three had chiefs who were able to exert a lasting authority over more than one traditional political community.

2002). The current consensus amongst linguists is that all the Austronesian languages spoken in this region, including the 256 spoken in PNG, are descended from a single 'Proto-Oceanic' language that was spoken by a relatively small number of migrants from Southeast Asia, who first arrived in what is now the Islands Region of PNG about 3,400 years ago (Pawley & Green 1973; Pawley & Ross 1993). These people are sometimes known as Lapita people because they seem to have been responsible for the production of a distinctive type of pottery over a period of about 500 years following their arrival (Bedford et al. 2007; Chiu & Sand 2007; Kirch 1997; Torrence & Swadling 2008). Archaeologists suggest that they were responsible for a larger package of innovations that included other types of artefact, as well as things such as pigs and betel nuts (Pawley 2007; Spriggs 1997). The most significant of the other artefacts were the sailing canoes on which they had arrived, since these were the vehicles that enabled some of them to travel further east and begin to colonise the previously uninhabited islands in the regions that Europeans were later to call Polynesia and Micronesia (Bellwood 1978).

Linguists, archaeologists and anthropologists have debated the extent to which there was a distinctive group of Lapita people who were responsible for all the different components of the cultural package with which they have been associated (Allen & Gosden 1996; Green 2000; Pawley 2007; Spriggs 2007, 2011; Terrell et al. 2001; Terrell & Welsch 1997). But what now seems clear from the genetic evidence is that most of the genetic inheritance of the people who now speak Austronesian languages in the region that Europeans called Melanesia is not derived from the Lapita people, but rather from indigenous 'Papuans' who had already occupied this region for thousands of years before the newcomers arrived (Denham 2018; Friedlander 2007; Friedlander et al. 2008). The non-Austronesian languages still spoken in this region are divided between numerous top-level families, including a large number of 'isolates', so the people who speak them constitute a sort of residual category (Ballard 2010; Foley 2000; Rumsey 2019). But many of their fellow 'Papuans' *became* 'Austronesians' by adopting an Austronesian language once the Lapita people had arrived.

It is not clear why so many Papuans underwent this process of linguistic conversion or 'language shift'. There may have been some element of conquest, coercion or subordination, but it probably had more to do with the desirability of other elements of the Lapita package that were being adopted at the same time (Pawley 2007; Spriggs 2011;

Terrell & Welsch 1997; Torrence & Swadling 2008). Furthermore, the process did not stop when the Lapita people stopped making Lapita pottery, but seems to have continued ever since. To give but one example, some of the non-Austronesian Koita people who were living around Port Moresby before it was established as the capital of British New Guinea were already in the process of adopting the Austronesian Motu language at that time (Dutton 1994; Oram 1981; Seligmann 1910). The 'Motu-Koita' people who now speak the same language can still distinguish between Motu villages and Koita villages, but the latter are in no way subordinate to the former (Goddard 2011, 2019).

Once we abandon the assumption that each language contains a single 'culture', or that the boundaries of language families are coterminous with those of 'culture areas', there is no reason to assume that the process by which Papuan communities became Austronesian communities was also a process by which their members adopted an Austronesian form of leadership. Even if it is possible to identify an Austronesian form of leadership, it might have been adopted by Papuan communities that did not adopt an Austronesian language, while those that did adopt an Austronesian language might have retained whatever form of leadership they already possessed (Lin & Scaglion 2019). Indeed, there are many different ways in which Austronesian and non-Austronesian institutions could influence each other, just as there are numerous, yet separate, ways in which Austronesian and non-Austronesian languages could do so (Barker 2019; Dutton & Tryon 1994; Evans & Palmer 2011; Reesink 2005; Ross 2008).

The linguists who have attempted to reconstruct the vocabulary of the Proto-Oceanic language from comparison of the Austronesian languages now spoken in the Pacific Island region do believe that it contained a word that could either be translated as 'chief' or as 'big man'. They also argue that this word was applied to the leaders of unilineal (perhaps matrilineal) descent groups, that these positions of leadership were inherited by some rule of primogeniture, and that the groups themselves were arranged in a pecking order that allowed for distinctions to be made between 'nobles' and 'commoners' (Bellwood 2006; Blust 1980; Hage 1999; Marck 2008; Pawley 1982, 2007).

The ethnographic evidence does appear to indicate a pervasive concern with the ranking of unilineal (matrilineal or patrilineal) descent groups amongst the Austronesian communities of PNG, even if the ranking was sometimes a matter of competition or

contestation (Albert 1988; Barker 2019; Chowning & Goodenough 1971; Douglas 1979; Groves 1963; Hau'ofa 1971; Hogbin 1978; Lin & Scaglion 2019; Lomas 1979; Lutkehaus 1990; Mosko 1994; Otto 1994; Powell 1960; Scaglion 1996; Young 1994). There is less evidence of a distinctively Austronesian pattern of leadership in the other dimensions of difference that reach beyond this concern with a form of social or political hierarchy. Austronesian communities that did not have 'chiefs' would still have had 'big men' engaged in a competition to establish the precedence of their own clan over other clans, as well as their own position as clan leaders who might or might not be able to bequeath their leadership to their sons or nephews. The non-Austronesian or Papuan communities that shared the concern with ranking or hierarchy appear to be ones that had well-established forms of social interaction with Austronesian communities (Douglas 1979; Dutton 1982; Lipset 1985; Maher 1974; Scaglion 1996; Terrell & Welsch 1990; Thurnwald 1934; Williams 1933, 1940). On the other hand, some of the Papuans who have only recently turned into Austronesians, such as the Motu-speaking Koita people or the people who now speak the Mandak (or Madak) language in New Ireland Province, do not appear to share this concern (Clay 1992; Goddard 2011; Ross 1994).

Since the ethnographic literature does not enable us to make a definitive assessment of which communities or language groups shared this particular concern before the advent of European colonial rule, we have simply used our linguistic dataset to calculate the proportion of the rural village population that was speaking Austronesian, as opposed to non-Austronesian, languages around the time of Independence, and taken this as a provisional proxy for some form of social or political hierarchy in traditional political communities. There are 36 districts containing at least one of the Austronesian language groups that together accounted for roughly 21 per cent of this population. In 18 of the 30 districts where Austronesians accounted for more than 10 per cent of the rural village population in 1980, the languages they spoke were all members of the same low-level family. In 9 of the remaining 12 districts, a single low-level family still accounted for the languages spoken by the vast majority of Austronesians. Manus District is a case in point. Furthermore, a single low-level family (Siassi) accounted for all of the Austronesian languages spoken by people living along the north coast of mainland New Guinea, from Finschhafen District in the east to Aitape-Lumi District in the west.

These observations are consistent with the argument that most of the low-level Austronesian language families are associated with maritime exchange networks that operated, in one way or another, for hundreds of years before the start of the colonial era (Dutton 1982; Leach & Leach 1983; Harding 1967; Macintyre & Allen 1990; Schwartz 1963). On the other hand, this does not preclude the engagement of Papuan communities in these same networks for equally long periods of time, or the possibility that such engagement may well have helped to convert some of the Papuans into Austronesians (Irwin 1985, 1991; Lipset 1985; Terrell & Welsch 1990).

3.3 A measure of colonial impact

The European incursion into PNG might seem to resemble the previous Austronesian incursion in the sense that a relatively small group of colonisers made fundamental changes to a wide range of indigenous institutions and practices even though they did not stick around for very long. According to the argument considered in the first part of this paper, the changes made by the agents of European colonial rule could affect more recent measures of human well-being in two different ways. They could be directly responsible for what are now district-level variations in child mortality and school attendance rates because of spatial or temporal variations in the provision of health and education services by the colonial authorities. On the other hand, they could be indirectly responsible for such variations because of their effect on pre-colonial levels of 'ethno-linguistic fractionalisation' or pre-colonial forms of social organisation. The only way that we can begin to measure either of these impacts is to calculate the period of time through which the indigenous population of each district was subject to some effective form of colonial rule.

Although the current boundaries of the 85 partially rural districts were only established in 1977, it is possible to establish the approximate duration of European colonial rule in each of these areas by using a variety of historical sources to pinpoint the decade in which the first outpost or 'station' was successfully established and occupied by European missionaries or government officials (see Appendix 4). For this purpose, we define success as a period of at least five years of occupation from the date of a station's initial foundation, except in cases where stations were temporarily abandoned during the two world wars. Early plantations and trading posts are not here counted as agents of colonial

rule, even in the few cases where they were successfully established before the arrival of missionaries or government officials. That is because the planters and traders had no interest in changing the customary social institutions of the indigenous population, nor in the delivery of health and education services.

The first successful mission stations were established in the 1870s, before the British and German governments planted their respective flags in what became the colonial territories of Papua and New Guinea. British Protestant missionaries established themselves in what is now Port Moresby in 1874 (Langmore 1989; Oram 1989). We have treated that as the beginning of colonial rule over what is now Kairuku-Hiri District, which is the partially rural district that surrounds the national capital. Shortly afterwards, British Protestants established successful mission stations in what are now the districts of Kokopo in East New Britain Province (Firth 1983), and Alotau in Milne Bay Province (Langmore 1974). Once the British and German governments had staked their own territorial claims in 1884, there developed a kind of symbiotic relationship between missionaries and government officials, in which each exercised a different kind of authority over the indigenous population (Rowley 1965).[6]

In the early colonial period, which ended soon after the end of the Second World War, government officials were primarily concerned with the task of 'pacification', which meant the suppression of 'tribal fighting', and then with the task of regulating the supply of 'native labour' to European planters and miners (Firth 1983; Mair 1948; Rowley 1965). By the time that the Australian Government had assumed control over both territories at the beginning of the First World War, there was also a policy of allocating different areas to different Christian denominations as their separate 'spheres of influence' in order to reduce the risk of sectarian conflict amongst the missionaries and their converts. Although the German administration began to provide some limited health and education services to the indigenous population before the Australian takeover, their successors preferred to leave such matters to the missionaries (Rowley 1958; Smith 1989). Budget constraints produced a similar outcome in the Territory of Papua (Kadiba 1989; Murray

[6] In German New Guinea, this partnership was delayed until the turn of the century, because the German Government initially delegated the administration of the territory to the New Guinea Company, which was barely able to secure an indigenous labour force for its coconut plantations, let alone act like a government (Firth 1986).

1929; Oram 1971). In both territories, the government's provision of health services to the indigenous population was mainly confined to the conduct of occasional medical patrols (Allen 1983; Denoon 1989). It was only in the later colonial period, with the establishment of a unified Australian administration over what became the Territory of Papua and New Guinea, that government agencies began to embark on the development of new health and education facilities and the creation of new social institutions such as local government councils and agricultural cooperatives (Denoon 1989; Downs 1980; Fenbury 1978; Hasluck 1976; Snowden 1981).

At the outbreak of the First World War, 33 of what are now the 85 partially rural districts were subject to some degree of colonial authority, though it is hard to tell what proportion of the indigenous population had been effectively 'pacified' or 'converted' in each of these areas. These included 13 of the 15 districts in what is now the Southern Region, which formerly accounted for most of the Territory of Papua, and 9 of the 12 districts in what is now the Islands Region, comprising Bougainville, the Bismarck Archipelago and the Admiralty Islands (now Manus Province). At that juncture, none of the 34 districts in what is now the Highlands Region had been subject to any form of colonial control. However, ten of these highland districts were amongst the 32 that had been added to the list of districts under some form of colonial authority by the time of the Japanese invasion in 1942.

This meant that there were only four districts outside the current Highlands Region that were still awaiting the advent of colonial authority at the end of the Second World War — North Fly (in Western Province), Menyamya (in Morobe Province), Middle Ramu (in Madang Province), and Telefomin (in West Sepik Province). Of the remaining 24 districts in the Highlands Region, four were not effectively 'pacified' or 'converted' until the 1960s — Komo-Magarima (in what is now Hela Province), Kandep (in Enga Province), Karimui-Nomane (in Chimbu Province), and Obura-Wonenara (in Eastern Highlands Province). The 'remoteness' of these eight districts would seem to explain why they were not only the last to be subject to some form of colonial authority, but why they also feature amongst the poorest or most disadvantaged districts by the various measures mentioned in our previous discussion paper (Filer & Wood 2021).

During the early colonial period, one of the most significant effects of the European incursion was the decimation of the indigenous population by the introduction of new diseases that reached epidemic proportions at different times and in different places. The diseases mentioned in the literature include influenza, measles, chickenpox, smallpox, pertussis, tuberculosis, dysentery and gonorrhoea (Adels & Gajdusek 1963; Allen 1983; Barnes 1966; Riley 1983; Scragg 1954, 1977; Wigley 1971).[7] The effects were not only felt in areas under the direct control of missionaries or government officials but could extend some way beyond their moving frontier of influence. Although mortality rates seem to have declined in the 1920s and 1930s, they shot up again in areas directly affected by hostilities during the Second World War (Allen 1983; Stanner 1953). Given that the central highland region was not directly affected, and the European incursion into that region did not begin until the 1930s, the highlanders largely escaped the afflictions visited on people living within 100km of the coastline during the early colonial period.

At different moments in the early colonial period, there were significant discrepancies between measures of depopulation, including levels of child mortality, in different lowland areas. These receive a good deal of attention in the surviving colonial records.[8] However, the public health measures adopted in the late colonial period reversed the process of depopulation in those parts of the country where it had taken place (Denoon 1989). By the time of Independence in 1975, the lowland population had most likely got back to its pre-colonial size (van de Kaa 1972), so any remaining discrepancies in child mortality rates, in both highland and lowland regions, would have less to do with the introduction of new diseases than with other factors, including the level of access to

[7] Although gonorrhoea was rarely fatal, it had a negative effect on female fertility rates and thus made a significant contribution to depopulation in some areas (Scragg 1954).

[8] A striking example is the fate of two remote island communities — Aua and Wuvulu — in the western part of what is now Manus Province. Both contained about 1,000 people in 1890, and each apparently had a single hereditary chief. One of them (Aua) is actually one of the three 'cultural units' that is said to have 'one level of jurisdiction above the local level' in Murdock's (1969) Ethnographic Atlas, though there is no evidence that its chief did exercise any wider jurisdiction. In any case, the population of Wuvulu was decimated by the introduction of the malaria parasite through the importation of plantation labourers from the New Guinea mainland, while the population of Aua was likewise decimated when their chief ordered the murder of a German trader and a third of the population perished in a storm at sea while seeking to evade the prospect of a punitive expedition (Firth 1986, pp 114–115). In 1980, the combined population of these two communities, including those recorded as migrants to other parts of PNG, was barely half what it had been in 1890.

public health services. A similar argument applies in the field of education. At any given moment in the early colonial period, there were some areas in which lots of children were attending mission schools and others in which no missionaries had yet been sighted and no schools had yet been established. But by the time of Independence, the administration's policy of achieving greater equality in levels of access to both health and education services across all parts of the territory had substantially diminished both forms of inequality (Downs 1980; Hasluck 1976).

The depopulation of lowland areas in the early colonial period would have reduced the size of language groups in these areas to a greater or lesser degree, and thus increased the overall level of linguistic diversity in these areas by comparison with the central highland region, where the population continued to grow throughout the colonial era. This process could have been partially offset by the extinction of small language groups, or at least the disappearance of their languages, but there is no clear evidence that such extinctions were due to the incidence of disease. The languages shown as being extinct or nearly extinct in the ANU language atlas were mostly spoken in lowland interior areas with low population densities and might have disappeared regardless of the European incursion (Wurm & Hattori 1981). The colonial education and communication system does not appear to have made a separate contribution to the loss of vernacular languages since the losses generally took place in areas where local communities had very little communication with the colonial authorities until the very end of the colonial era. The loss could have been accelerated if large numbers of people had left their natal communities to settle in urban areas or other parts of the country on a permanent basis, but the preservation and containment of rural communities was one of the key planks of Australian colonial policy in both the early and late colonial periods (Fitzpatrick 1980; MacWilliam 2013).

It is not possible to measure the extent to which the duration of colonial rule transformed pre-colonial forms of leadership and community organisation. However, it is widely believed that the resurgence of 'tribal fighting' in the central highland region in the post-colonial period can be explained as the result of a superficial process of 'pacification' that only began in the 1930s, and only worked while local 'big men' thought they could gain some material advantage from compliance with colonial authority (Brown 1982; Gordon

1983; Podolefsky 1984; Reay 1982; Strathern 1977; Westermarck 1984).[9] At the other end of the scale, it is hard to even be sure what forms of pre-colonial leadership and community organisation actually existed in areas that were 'pacified' before the First World War, given the assumptions of the European government officials and missionaries who were trying to observe them and change them at the same time.

Albert Hahl, who was first an 'imperial judge' and then the governor of German New Guinea between 1896 and 1914, was quite keen to incorporate traditional community leaders into the colonial regime. He borrowed the Kuanua (Tolai) word for a fight leader (*luluai*) and applied it to the village headmen or chiefs that he and his subordinates appointed in different parts of the colony, apparently on the understanding that they should be men who already possessed some form of traditional authority (Firth 1983). In some areas, these individuals were elevated to a 'paramount' status, which meant that they were granted what would not have been a traditional form of authority over a number of adjacent communities (Blackwood 1935). Since these colonial chiefs were generally unable to speak German, Hahl established a separate role for interpreters (*tultul*) who did have this ability and were often former members of the colonial police force. The *luluai-tultul* system seems to have worked reasonably well amongst the Austronesian communities in what is now the Islands Region, but much less well in what is now the Momase Region, where Austronesian communities are few and far between. Its failings were mainly due to the tendency of some communities to nominate 'chiefs' who were not traditional leaders of any kind (Firth 1983; May 1997; Scaglion 1996). Nevertheless, the system was retained by the Australian colonial administration until the late colonial period (Mair 1948).[10]

Hubert Murray, who governed the Territory of Papua from 1908 until he died in 1940, did not share Hahl's interest in recruiting traditional community leaders to the colonial

[9] Feil (1987) has observed that most of the so-called 'resurgence' has taken place in areas where the intensity of traditional warfare was previously limited by the institutions of ceremonial exchange. On the other hand, Roscoe (2014) has argued for a parallel resurgence in some lowland areas where traditional warfare was conducted by means of raids and ambushes that are nowadays treated as criminal activities rather than cases of 'tribal fighting'.

[10] According to Mair (1948, p. 74), 66 'paramount luluais', along with 3,865 ordinary luluais, were recognised by the Australian colonial regime in 1939. When the luluai-tultul system was introduced to the central highland region, the luluais were sometimes granted authority over a number of neighbouring communities without being granted any 'paramount' status (Brown 1979).

regime. His preference was to appoint 'village constables' who were already fluent in Police Motu, the colonial lingua franca, because they had already been employed by Europeans, some as members of the regular police force, or were men who had been sent to jail for various offences, including breaches of the peace that they were now expected to maintain (Murray 1929). This meant that they did not need the assistance of interpreters, and could instead be regarded simply as agents of colonial authority, regardless of their traditional status in the communities for which they were accountable.

Academic observers generally agree that the power and authority of traditional leaders was sooner or later diminished in areas that were 'pacified' during the early colonial period, even if a few of them were able to obtain some short-term advantage from the occupation of subordinate positions in the apparatus of 'native administration' (Chowning 1979; Douglas 1979; Hogbin 1949, 1978; Leach 1982; Macintyre 1994; Maher 1967; Mair 1948; May 1997; Oliver 1973; Stephen 1979). In the central highland region, by contrast, this apparatus had only been established for a single generation prior to the introduction of local government councils and the promotion of indigenous business enterprise, so highland 'big men' had more of an opportunity to adapt their traditional form of leadership to the late colonial drive for political and economic progress (Brown 1979; Finney 1973; Harris 1975; Langness 1963; Meggitt 1982; Standish 1978; Strathern 1970). But we also need to remember that Christian missionaries were creating alternative forms of community leadership throughout the colonial period, both in lowland and highland areas, and this constituted a separate challenge to traditional forms of leadership, regardless of colonial state policies (Barker 1987, 1990; Fife 2001; Kahn 1983; Kanasa 1989; Lawrence 1956; Oram 1971; Williams 1944).

In the western part of the central highlands, where big men built much of their authority on their ability to control the distribution of shell valuables imported from distant coastal communities, the Australians were quick to diminish this form of authority by introducing a much larger quantity of these shells as a means of payment for goods and services (Feil 1982; Hughes 1978; Strathern 1971). A similar form of devaluation may have taken place in Austronesian communities where the power of local 'chiefs' was a function of their capacity to control the flow of highly valued products through maritime trading networks (Brunton 1975; Friedman 1981). However, this assumes an economic (or economistic) answer to the question of what traditional community leaders did to

exercise their power or demonstrate their authority (Dalton 1978). In some communities, like those in what is now Eastern Highlands Province, they were mainly in the business of killing enemies (Feil 1987). The power and authority based on physical violence was also undermined by the imposition of colonial rule, but not in the same way or with the same effect on what remained of traditional forms of leadership (Roscoe 2000; Schwoerer 2021).

4. Regression models

In our previous discussion paper, we used a number of regression models to determine the extent to which 12 geographical variables were associated with our two dependent variables — the child mortality rate and the gross school attendance rate. Two geographical variables were very clearly associated with both child mortality and school attendance:

- accessibility, calculated as the percentage of the rural village population with good (or very good) access to public (health and education) services in 2000; and
- the proportion of coastal people, calculated as the percentage of the rural village (citizen) population living within 10km of a coastline in 2000.

A third geographical variable was clearly associated with both child mortality and school attendance in almost all of the regression models that were used. This was gross population density, calculated as the average number of resident citizens per square kilometre of a district's total surface area in 2000.

Three additional geographical variables were found to be associated with one or other of the two measures of human well-being, though not in all models and sometimes in a manner that cast some doubt over the nature of the relationship. These were:

- natural agricultural potential, calculated as the percentage of rural villagers using land with high or very high natural fertility in 2000;
- land in use, calculated as the percentage of a district's total land/surface area used for agriculture or occupied by human settlements between 1975 and 2000; and
- the range of altitudes (at intervals of 100m) occupied by more than 90 per cent of the rural citizen population in 2000.

Summary statistics for these six variables, along with those for our two dependent variables, and for the three institutional variables discussed in the previous sections of this paper, are shown in Table 1. The full set of numbers for our institutional variables, including alternative measures of linguistic fragmentation, is shown in Appendix 3.

Table 1: Summary statistics for core variables of interest

Variable	Obs.	Min.	Max.	Mean	Std. dev.
Child mortality (per thousand)	85	26	226	84	40
Gross school attendance (%)	85	13	63	40	13
Linguistic fragmentation	85	0	86	41	26
Austronesian villagers (%)	85	0	100	23	36
Decades under colonial rule	85	1	10	5	3
Accessibility for rural villagers (%)	85	0	100	45	40
Coastal village population (%)	85	0	100	26	36
Gross population density (per km^2)	85	1	283	35	49
Land in use (%)	85	8	100	44	22
Range of altitudes (100m)	85	1	20	7	5
Natural agricultural potential (%)	85	0	100	21	26

Tables 2 and 3 show the results of a number of regression models applied to each of the two dependent variables. In both tables the first model (column 1) includes only the institutional variables as independent variables. The second model (column 2) includes, alongside these institutional variables, the three geographical variables that were most reliably associated with each of these measures of human well-being in previous regressions (Filer & Wood 2021). The third model (column 4) involves alternative specifications in which the three geographical variables that performed moderately well are substituted into the regression equations in place of the best performing geographical variables as a form of robustness test.

To reduce the risk that omitted variables may be driving the results, we add provincial fixed effects to the second and third models (in columns 3 and 5). This effectively eliminates all differences between the 19 rural provinces that existed at the turn of the

millennium and gains analytical leverage solely from differences within them.[11] Adding provincial fixed effects accounts for a suite of potential influences on development outcomes that is associated with the quality of provincial administration. This is potentially important because of the role that provincial governments play in the delivery of health and education services — especially the former (Howes et al. 2014). However, with a small sample of 85 districts, and with 19 provinces, using provincial fixed effects runs the risk of obscuring real findings. For this reason, we use fixed effects primarily as a sort of robustness test in order to enhance confidence in those findings that emerge from the two main models containing the geographical and institutional variables.

The first model (column 1) reveals a clear correlation between decades under colonial rule and both measures of human well-being: child mortality rates are lower, and school attendance rates are higher, in districts that experienced a longer period of colonial rule. The degree of linguistic fragmentation is clearly associated with higher child mortality rates. The relationship between linguistic fragmentation and school attendance is much less clear in the first model, and is not statistically significant, although the sign on the coefficient does possibly suggest an association with lower levels of attendance. By contrast, the first model indicates that the proportion of the village population speaking Austronesian languages is clearly associated with higher school attendance rates, but the association with lower child mortality rates is not statistically significant.

The picture changes when the first three geographical variables are included in the second regression model. The duration of colonial rule continues to display some relationship with both measures of human well-being, but the relationship is fragile.[12] The proportion of Austronesian villagers ceases to be related to either measure of well-being in a manner that is statistically significant once proximity to the coast is added to the second regression model. People may be better off in districts with a higher prevalence of Austronesian languages, but this relationship appears to reflect the fact that these are also districts in which more villagers live close to the coast. The degree of

[11] For the purpose of this analysis, the Autonomous Region of Bougainville is treated as one of the 19 provinces.

[12] The coefficient falls for school attendance rates and ceases to be statistically significant when provincial fixed effects are added. On the other hand, a relationship with child mortality rates is only present after provincial fixed effects are added.

linguistic fragmentation is still clearly correlated with higher child mortality rates in the second regression model, but is now associated with somewhat *better* school attendance rates. However, this latter relationship ceases to be statistically significant when fixed effects are added, and may simply be a spurious result stemming from some other variable omitted from the model.

While the findings for the institutional variables are patchy, the second model shows a clear association between accessibility and both measures of human well-being. Coastal proximity is also clearly associated with both of these measures except in the case of child mortality with provincial fixed effects. Gross population density performs less well, being clearly associated with an increase in school attendance rates, but not with a reduction in child mortality rates.

In the third model, the institutional variables perform better than the alternate geographical variables, especially when the child mortality rate is the dependent variable. In this model, the Austronesian language variable regains its significance, but that is probably because the coastal proximity variable is no longer part of the equation.

Table 2: Full regression results with child mortality rate as the dependent variable

	(1)	(2)	(3)	(4)	(5)
Linguistic fragmentation	0.95***	0.53**	0.60*	0.83***	0.68**
	(0.14)	(0.22)	(0.31)	(0.16)	(0.30)
Austronesian villagers	-0.08	0.10	-0.34	-0.00	-0.55*
	(0.12)	(0.15)	(0.37)	(0.10)	(0.32)
Decades under colonial rule	-5.34**	-2.13	-7.59**	-4.90**	-10.03***
	(2.19)	(2.10)	(3.66)	(1.99)	(3.00)
Accessibility for rural villagers		-0.48***	-0.32**		
		(0.13)	(0.13)		
Coastal village population		-0.36**	-0.23		
		(0.14)	(0.26)		
Gross population density		-0.01	-0.00		
		(0.06)	(0.07)		
Land in use				-0.21	-0.12
				(0.13)	(0.23)
Range of altitudes				1.83**	0.63
				(0.80)	(1.35)
Natural agricultural potential				0.04	-0.04
				(0.13)	(0.17)
Constant	73.97***	103.76***	119.96***	71.16***	115.66***
	(9.80)	(15.70)	(36.28)	(15.55)	(43.01)
Provincial fixed effects	No	No	Yes	No	Yes
Observations	85	85	85	85	85
R^2	0.35	0.51	0.68	0.41	0.65

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Full regression results with school attendance rate as the dependent variable

	(1)	(2)	(3)	(4)	(5)
Linguistic fragmentation	-0.06	0.10*	0.04	0.01	-0.02
	(0.05)	(0.05)	(0.07)	(0.05)	(0.07)
Austronesian villagers	0.09**	0.02	0.01	0.06*	0.11
	(0.04)	(0.04)	(0.08)	(0.03)	(0.08)
Decades under colonial rule	2.48***	1.26*	1.36	2.22***	2.73***
	(0.63)	(0.66)	(0.88)	(0.57)	(0.72)
Accessibility for rural villagers		0.10***	0.09***		
		(0.03)	(0.03)		
Coastal village population		0.13***	0.12**		
		(0.04)	(0.06)		
Gross population density		0.06***	0.06**		
		(0.02)	(0.03)		
Land in use				0.12***	0.16***
				(0.04)	(0.05)
Range of altitudes				-0.68***	-0.24
				(0.23)	(0.27)
Natural agricultural potential				0.01	-0.02
				(0.04)	(0.05)
Constant	27.65***	18.54***	33.51***	25.77***	29.17***
	(2.63)	(2.91)	(8.87)	(4.04)	(8.82)
Provincial fixed effects	No	No	Yes	No	Yes
Observations	85	85	85	85	85
R^2	0.43	0.58	0.79	0.53	0.75

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

A final check on the relative significance of the coastal proximity variable and the Austronesian variable has been obtained by running regressions with only those 37 districts that have a coastline. Running regressions with such a small sample is problematic but may still serve to illuminate the particular relationships between key variables in these 37 districts. It also serves as a robustness test, effectively eliminating the potential influence of possible omitted variables that differ between coastal and non-coastal districts. By way of concession to the small sample size, we use parsimonious regression models and focus only on variables of particular interest in light of our previous discussion. Tables 4 and 5 show the relationship between the Austronesian variable, the colonial variable and our two dependent variables (column 1), then the relationship between the accessibility variable, the coastal proximity variable and our two dependent variables (column 2), and finally the relative significance of all four of the independent variables (column 3).

The accessibility variable has a statistically significant relationship with both dependent variables in all the regression models in which it is included. The coastal proximity variable has a statistically significant relationship with both dependent variables when simply compared with the accessibility variable (column 1). The period under colonial rule is not statistically significant in either of the models in which it is included (columns 2 and 3). The Austronesian variable is statistically significant when included in a model without the geographical variables (column 2), but once the geographical variables are added to the regression model (column 3), it ceases to have a statistically significant relationship with either of the dependent variables. While coastal proximity also lacks a statistically significant relationship with either of the dependent variables in the model combining the geographical and institutional variables (column 3), it is still closer to being statistically significant than the Austronesian variable. Since the coastal proximity and Austronesian variables have been measured as percentages, one can also compare the sizes of the coefficients for a sense of the relative magnitude of the 'effect' that each one has on the two dependent variables. On this count also, the coastal proximity 'effect' is larger than the Austronesian 'effect' for both dependent variables.

Table 4: Partial regression results with child mortality rate as the dependent variable

	(1)	(2)	(3)
Austronesians villagers	-0.38***		-0.08
	(0.13)		(0.14)
Decades under colonial rule	-4.65		-0.50
	(3.17)		(2.76)
Accessibility for rural villagers		-0.53***	-0.50***
		(0.08)	(0.09)
Coastal village population		-0.36**	-0.29
		(0.17)	(0.22)
Constant	135.27***	121.81***	123.63***
	(26.55)	(15.26)	(27.49)
Observations	37	37	37
R^2	0.26	0.48	0.49

Standard errors in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

Table 5: Partial regression results with school attendance rate as the dependent variable

	(1)	(2)	(3)
Austronesians villagers	0.10**		0.01
	(0.04)		(0.04)
Decades under colonial rule	0.78		-0.25
	(0.88)		(0.84)
Accessibility for rural villagers		0.12***	0.12***
		(0.03)	(0.03)
Coastal village population		0.11*	0.11
		(0.06)	(0.07)
Constant	36.82***	36.49***	38.47***
	(7.47)	(4.44)	(7.92)
Observations	37	37	37
R^2	0.20	0.38	0.38

Standard errors in parentheses

* p < 0.1, ** p < 0.05, *** p < 0.01

5. Discussion

Central amongst the findings we have just presented is a clear correlation between linguistic fragmentation and child mortality. Child mortality is higher in districts where language fragmentation is higher. This association exists even when we account for the influence of other factors such as limited access to public goods and services. Yet, while the relationship between linguistic fragmentation and child mortality is clear, we find no relationship between linguistic fragmentation and school enrolment, our other measure of human well-being. Although it is not always present, there is often a clear correlation between the duration of colonial rule and measures of well-being. Districts that were colonised earlier tend to have lower child mortality and higher levels of school enrolment. On the other hand, we failed to find any robust evidence of a relationship between pre-colonial hierarchy, at least as proxied by the proportion of people speaking Austronesian languages, and measures of human well-being.

There is, in other words, evidence of a relationship between what we have loosely termed 'institutions' and human well-being in PNG. Yet the relationship is not present for all institutional variables, and only present inconsistently for others. The nature of our work is such that we cannot claim relationships are causal either. Nevertheless, our collaboration provides the first district-level statistical evidence of the presence of relationships of this type. In the remainder of this part of our paper, we draw the reader's

attention to a number of issues arising from comparison of these findings with our review of the literature relating to the three institutional variables that we have been able to measure.

5.1 Missing institutional variables

Our statistical tests seem to show that the accessibility and coastal proximity variables have a consistently closer relationship to both measures of human well-being than the proportion of Austronesians in the district population or the number of decades through which each district was subject to some form of colonial authority. However, we cannot therefore conclude that human well-being in coastal areas or districts with a coastline is primarily a function of geographical rather than institutional variables. There are two reasons for this. The first is that regressions alone can only test for the presence of correlations. They cannot provide definitive evidence of a causal relationship even when a correlation is present. The second is that regressions can only be performed on variables for which we have reasonably robust measures. There may be other variables — both geographical and institutional — that would prove to be more significant constituents of human well-being if only we could measure them. Furthermore, any given combination of geographical and institutional variables may be associated with different measures of human well-being in quite different ways. We have only considered two measures of human well-being in our own analysis since other robust measures are not available.

Those observers who believe that the institutions of customary land ownership have been the most significant constraint on post-colonial development outcomes might argue that the most significant institutional variable missing from our own analysis is the proportion of the land area in each district that has been alienated from its customary owners and turned into public or private property (Gosarevski et al. 2004; Hughes 2004; Lea & Curtin 2011). We know that most of the land that had been alienated at the time of Independence was alienated during the early colonial period and lay within 10km of a coastline (Sack 1973). In theory, it should be possible to arrive at a measure of the extent of the alienation that occurred in each district by inspecting the records held by the Department of Lands and Physical Planning. In practice, this could be difficult because the records themselves appear to have deteriorated with the passage of time, and even if

they were all in order, they might conceal the extent to which customary rights have since been reasserted (Filer 2014).

We have no way of knowing whether this institutional variable would prove to have any special significance if it were added to our regression models. We merely cite it as one example of a historical variable that might be significant if it could be measured. There are many others that could be derived from the literature dealing with the institutional changes that took place during the colonial period, but most of them would be even harder to measure with confidence and consistency at a district level.

For example, we might consider the possibility that people's allegiance to different Christian denominations has something to do with one or other of our two measures of human well-being. The colonial policy of creating distinctive spheres of influence for each of the main denominations might encourage us to ask whether there is a measurable difference between districts whose rural communities were more or less rapidly converted by different kinds of Catholic or Protestant missionary. However, this particular colonial policy had already ceased to be effective in the late colonial period. Although a question about religious affiliation has since been included in each national census, the framing of the question has made it impossible to establish how many of the people in each district belong to which of a growing number of denominations. Indeed, it could be argued that a form of religious or sectarian fragmentation has either reproduced or replaced the form of 'ethno-linguistic fragmentation' that existed before the missionaries arrived. The trouble is that we currently have no way of measuring the extent of the correlation between these two forms of cultural fragmentation, let alone the extent to which the new religious form is associated with the child mortality rate or the school attendance rate.

5.2 Language and ethnicity

In 1965, shortly after the election of 36 indigenous politicians to PNG's first house of assembly, one author described the result as a 'parliament of a thousand tribes' (White 1965). By this he presumably meant that each of the indigenous members of what was then a body of only 54 elected representatives was representing one or more of the country's vernacular language groups. Ever since then, social scientists have been

debating the political significance of linguistic diversity or fragmentation, whether as a factor in determining the outcomes of national, provincial and local elections or simply as the source of 'ethnic conflict' in a wider range of social contexts.

The first point to be made here is that language *families* have almost no political significance at all. For example, the distinction between 'Austronesians' and 'Papuans' is of no interest to anyone in PNG except for a few members of the academic community. There are some parts of the country where proper names are more widely used to designate groups of people who speak closely related languages, but these appear to be names adopted (if not invented) by colonial administrators in their own attempts to draw culturally meaningful boundaries between groups of traditional political communities.[13] When Papua New Guineans use the Tok Pisin term *wantok*, they may be talking about people who speak the same language or they may be talking about people who hail from the same district or even from the same province. While the formation of 'ethnic' identities above the level of the language group dates back to the colonial period (Chowning 1986; Epstein 1978), it is not so clear that the concept of ethnicity does anything to explain the appearance of the so-called 'cargo cults' that posed a political challenge to the colonial authorities (Worsley 1957). Ethnic divisions could be held responsible for some or all of the 'micronationalist' movements that have threatened the integrity of the post-colonial nation state (May 1982), but these divisions have been ameliorated by the well-established propensity of Papua New Guineans to marry people from other language groups, districts or provinces once they have the opportunity to do so (Beer & Schroedter 2014; Filer 2021; Levine 1999; Lind 1969; Rosi & Zimmer-Tamakoshi 1993).

So what has language got to do with the political behaviour of people who still reside, for most of the time, in one of the many thousand traditional political communities that predated the establishment of colonial rule? Answers to this question have been somewhat muddled by the tendency of some commentators to treat language groups as 'ethnic' groups in areas of high linguistic diversity, but then to treat traditional political communities as 'ethnic' groups in areas of low linguistic diversity — especially in those

[13] Examples would include the 'Palai' people in Nuku District (Filer 1996), the 'Matankor' people in Manus District (Gustafsson 1998), and the 'Baining' people in Gazelle District (Rohatynskyj 2001).

parts of the Highlands Region that are renowned for the intensity of political competition and the resurgence of 'tribal fighting' (Reilly 2004, 2008; Reilly & Philpott 2002). In these areas, it does appear that traditional exchange networks have been modified by post-colonial big men as a means to deliver blocks of votes from neighbouring communities to individual candidates standing in the national elections that are held every five years (Brown 1989; Burton 1989; Haley & May 2007; Ketan 1996, 2004; Rumsey 1999; Standish 1983, 1989, 1996; Warry 1987). However, this form of political manipulation (or intimidation) is not always effective, nor is it typical of electoral behaviour in districts that were subject to longer periods of colonial rule (Hegarty 1983; King 1989; May et al. 2013; May & Anere 2002; Oliver 1989; Saffu 1996). In other words, national elections are not simply contests between confederations of traditional political communities, let alone between language groups in those districts that have a medium or high level of linguistic diversity.

Since PNG's electoral statistics are more reliable than most of the other statistics collected by national government agencies, it is possible to test the relationship between levels of ethno-linguistic fragmentation recorded in 1980 and a number of different measures of 'political volatility' — most notably the number of candidates contesting the elections in each district since 1977 (which is often very large) and the number of individuals who have won the elections and occupied each of these seats over a period of 40 years. In our own preliminary investigations, we were unable to find any statistically significant relationship between these two sets of variables. So, if the level of linguistic fragmentation has some relationship with an increase in the child mortality rate, or with other indicators of human well-being that we have not been able to measure, there is no evidence to suggest that this relationship is mediated by the way that people elect their members of parliament. If there is a causal relationship, any mediating factors would have to stem from patterns of collective action that are not associated with this particular form of political behaviour.

5.3 Post-colonial hierarchies

One of the difficulties that arises in any discussion of the possible influence of pre-colonial political hierarchies on post-colonial development outcomes in PNG is the political process that Ron May (1997) has described as the '(re?)discovery of chiefs'. This process

is illustrated in the career of Sir Michael Somare, who first came to be known as 'the chief' because he was the chief minister when PNG achieved self-government in 1973, but who promptly justified this designation by reference to his possession of a chiefly title in his own traditional political community (Somare 1975).

The number of individuals staking a claim to some kind of traditional chiefly status has since proliferated on two different grounds. In the first instance, it reflects the desire to establish a neo-traditional form of political order in the face of a growing disaffection with electoral politics and the perceived failure of state bureaucracies to deliver public goods and services. In this respect, the 'ideology' of chieftainship seems to have been imported to PNG from other parts of the Pacific Island region where the *institutions* of chieftainship had a stronger traditional foundation (Filer et al. 2017; White & Lindstrom 1997). The most fertile ground for this form of political innovation has been the province or region of Bougainville, where it is strongly linked to a secessionist movement (Ghai & Regan 2000; May 1997; Regan 2000).

The second form of innovation has taken place in the vicinity of major resource projects, where claims to chiefly status are also claims to control the distribution of resource rents to local landowners (Filer 1997; Filer & Le Meur 2017). This form is rarely found in other parts of the Pacific Island region, but it does have obvious counterparts in some of the resource-dependent economies of Africa (Watts 2004). In the PNG context, the two forms of innovation have most notably been combined in political contests over the distribution of resource rents from PNG's oil and gas projects, which have not only given rise to a proliferation of 'chiefs' in an area formerly populated by 'big men', but have also enabled local 'micronationalists' to narrow the limits of the contest through the creation of a new province (Haley & May 2007; Zurenuoc & Herbert 2017).

The transformation, reconstruction or fabrication of 'traditional' forms of leadership in the post-colonial period obviously makes it difficult for social scientists to have a sensible discussion with members of the national political elite about the influence of pre-colonial institutions on post-colonial development outcomes (May 1997). But it also raises a couple of other awkward questions. One concerns the possibility that the relationship between institutional variables and different measures of well-being may itself have been changing over the course of the post-colonial period, although we currently have no way

of measuring such changes. The other is the possibility that recent yet variable changes in the nature of local-level political hierarchies may simply be adding to the difficulty of disentangling 'truly traditional' institutions from those that were already transformed, reconstructed or fabricated in areas that experienced several decades of colonial rule.

5.4 The problem of endogeneity

The reliance of our own study on measures of linguistic diversity and measures of human well-being that date from particular moments in time entails another kind of difficulty that is sometimes known as the problem of 'endogeneity'. This is essentially the problem of determining the direction of the causal relationship between different variables. The problem can be illustrated by what appears to be the absence of any statistically significant relationship between the degree of 'ethno-linguistic fractionalisation', as measured in 1980, and the school attendance rate, as measured in 2000. Since the first measure was taken before the second one, it seems reasonable to conclude that the first variable has no effect on the second variable. But this does not enable us to rule out the possibility of a causal relationship that runs in the opposite direction — at least in the post-colonial period — but is concealed by the available statistical evidence.

We have not found any historical evidence to suggest that variable levels of school attendance had any significant effect on degrees of linguistic diversity in the colonial period. However, a recent survey of senior high school students from many different parts of the country found that most of them had a very limited knowledge of the vernacular languages that they might have learned from one or both of their parents (Vojtech Novotny, personal communication, October 2020). Attempts have previously been made to preserve such knowledge through the adoption of vernacular languages as the languages of instruction in the first two years of formal schooling. However, this could only be done in rural village schools where all the pupils belonged to the same language group, and still proved to be very difficult in districts and provinces with high levels of linguistic diversity (Weeks 1993). Furthermore, this vernacular education policy was apparently abandoned or diluted in 2013 because of concerns about the low levels of English-language literacy amongst students at higher levels in the educational system (Temple et al. 2015). This problem has been compounded by the growing frequency of marriage between members of different language groups, especially in urban areas. So

the same practice that ameliorates the risk of 'inter-ethnic conflict' may also be responsible for the loss of vernacular language knowledge amongst the more educated sections of the population (Nekitel 1998). And this loss could be more acute in districts with higher school attendance rates and higher levels of linguistic diversity.

A similar issue could be present in the relationship between levels of linguistic diversity and the child mortality rate, or other measures of life expectancy, but in this instance with a longer time frame. While we have been treating the child mortality rate as a dependent variable for the purpose of our own study, the level of linguistic diversity could also be treated as the dependent variable in another kind of study that allows for it to be affected by a range of geographical, demographic and institutional factors over the very long period of time that elapsed before the different parts of PNG were subject to European colonial rule (Evans 2017; Foley 2000; Greenhill 2014). Further consideration of this aspect of the problem of endogeneity is beyond the scope of the present paper, but recognition of the problem does serve to highlight the somewhat arbitrary nature of the distinction we have drawn between 'geographical' variables, 'institutional' variables and variables that count as measures of human well-being.

6. Conclusion

By way of conclusion, we should once again stress that the findings presented in this paper are suggestive, but not conclusive. We do not pretend to have an explanation for the discovery that higher levels of linguistic diversity are associated with higher rates of child mortality but not with lower levels of school attendance, as measured at the time of the 2000 national census. All we can say is that the degree of 'ethno-linguistic fragmentation' appears to be a more significant constituent of one measure of human well-being than either of the other two institutional variables that we have been able to measure.

One thing we can say with confidence is that our measures of all three institutional variables, which essentially date from the time when PNG became an independent country, are reasonably robust, and their values at that time are unlikely to be altered by further investigation. Further historical inquiries might lead us to make some minor modifications to our calculation of the period for which each of the 85 districts was

subject to some form of colonial rule, and further examination of the relationships between the country's vernacular languages might result in some minor changes to our measure of linguistic diversity. But the changes would be too small to lead to substantially different findings in our statistical tests of the relationships between different variables.

What we *cannot* say with confidence is that a variable for which we have a reasonably accurate measure is a valid proxy for some other variable that we cannot measure directly. This is most obviously the case with the Austronesian variable — the proportion of a district's rural village population that spoke an Austronesian language around the time of Independence. The accuracy of our measure is not in question, but there is no good reason to think that this can be taken as a measure of the extent of social and political hierarchy in what we have called traditional political communities. On the other hand, the ethnographic literature that describes different forms of leadership in different communities at different moments during the colonial era is itself so diverse that we have not been able to extract alternative measures from these sources.

Many of the anthropologists who wrote about indigenous social institutions during the colonial period had two particular blind spots. One was a tendency to overlook the extent to which these institutions had already been changed by the colonial encounter. The other — less obvious but more pervasive — was a tendency to assume that the institutions discovered in one local community must be typical of all communities whose members spoke the same vernacular language. That is why it is rather difficult to reconstruct the forms of institutional or cultural diversity that existed before the imposition of colonial rule — especially in areas where the imposition took place before the First World War (Neumann 1992; Roscoe 2000; Spriggs 2008).

If we now ask which pre-colonial institutions were most likely to have survived, alongside vernacular languages, at the end of the colonial period, the most plausible candidates would seem to be those directly attached to the 'mode of production', even if these were also modified, to some extent, by the introduction of steel tools and other new technologies. That is partly because the subsistence practices of rural villagers are adapted to relatively permanent features of the natural environment, and partly because the colonial authorities had little interest in changing these practices. If we compare the boundaries of the 287 indigenous agricultural systems distinguished by the Mapping

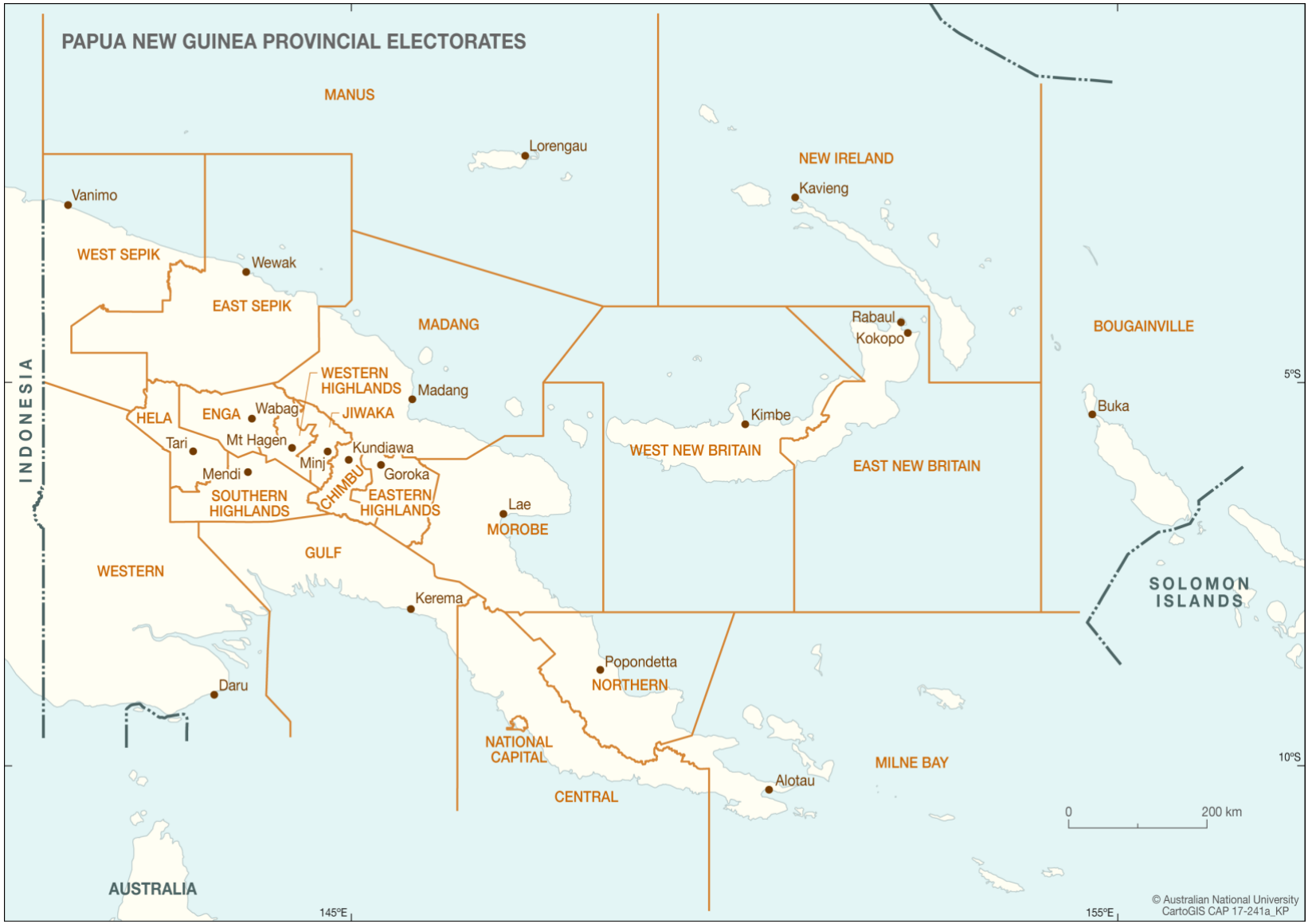
Agricultural Systems Project (Bourke et al. 1998) with the boundaries of the 176 low-level language families distinguished in the ANU language atlas (Wurm & Hattori 1981), we find no clear correspondence between these boundaries in most parts of the country. This can be taken as evidence in support of our argument that linguistic diversity should only be taken as a proxy for traditional cultural diversity so long as we do not assume that each language family somehow represents a single 'culture area'. But it also signals the somewhat arbitrary nature of the distinction between institutional and geographical variables, since agricultural systems clearly contain a mixture of both.

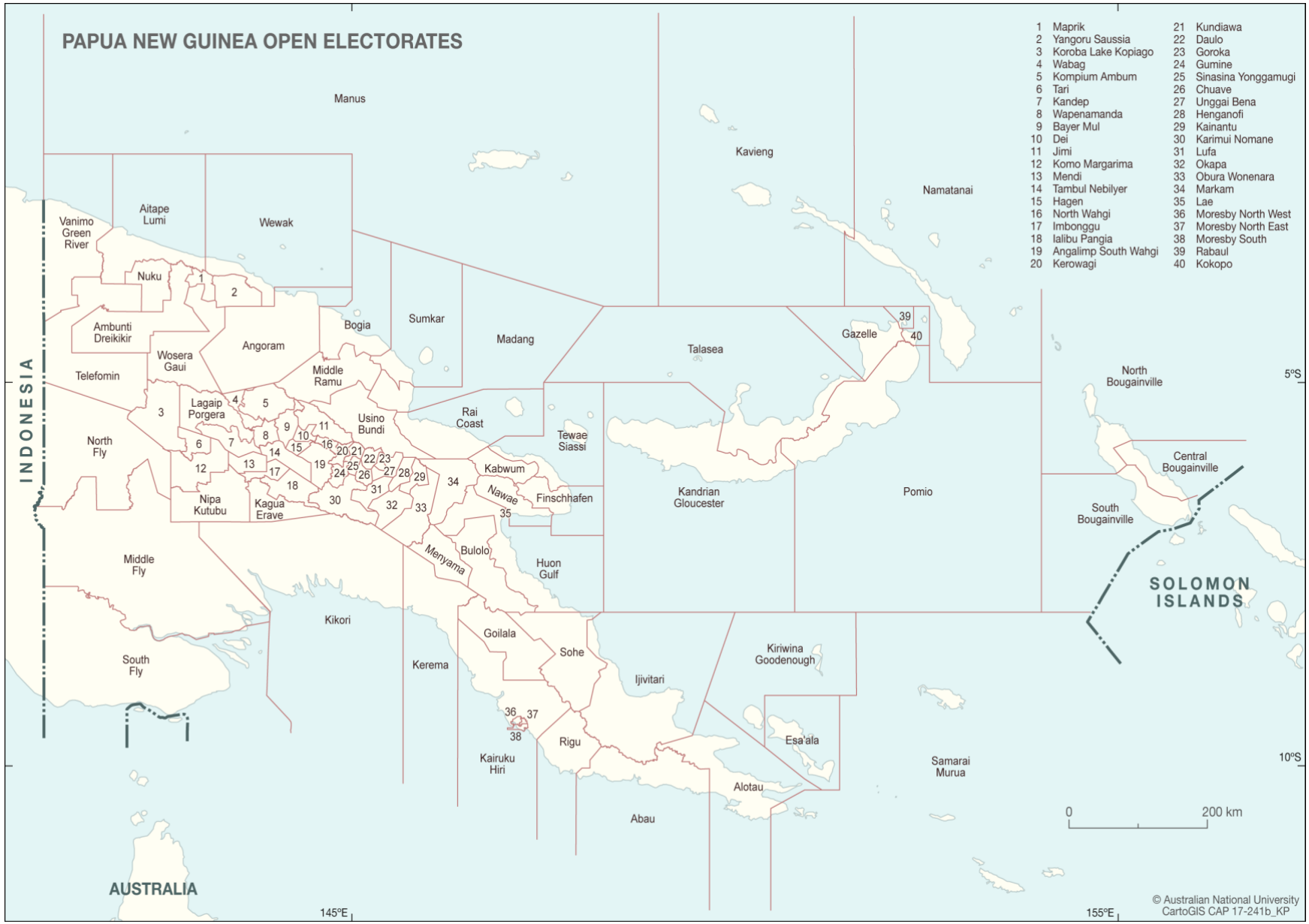
In our previous discussion paper (Filer & Wood 2021), we found that two geographical variables had an especially close relationship with our two measures of human well-being. One of these was essentially the proximity of each agricultural system to a central place in which public goods and services can be accessed by rural villagers. The other was the proportion of the rural village population living within 10km of a coastline. But in that paper we also noted that these were relationships for which evidence existed at one particular moment in time, around the turn of the millennium, and there is no reason to assume that the relationships have been constant throughout the post-colonial period, which has now lasted for more than 45 years.

It is possible that new measures of the child mortality rates and school attendance rates in each district will emerge from the national census that is due to be conducted in 2021. If that were to happen, we could ask a new set of questions about the relationship between these two measures of human well-being and a number of geographical and institutional variables, including the three institutional variables that we have discussed in this paper. Our dependent variables could be modified to include differential rates of change in both measures of human well-being. We might also be able to obtain time series data for some geographical variables, either from the census or from other sources. There would be no significant change in our colonial legacy variable, and the way we have measured the extent of linguistic diversity means that the measure would not change very much, even if some of the languages spoken by small numbers of people have become extinct since 1975.

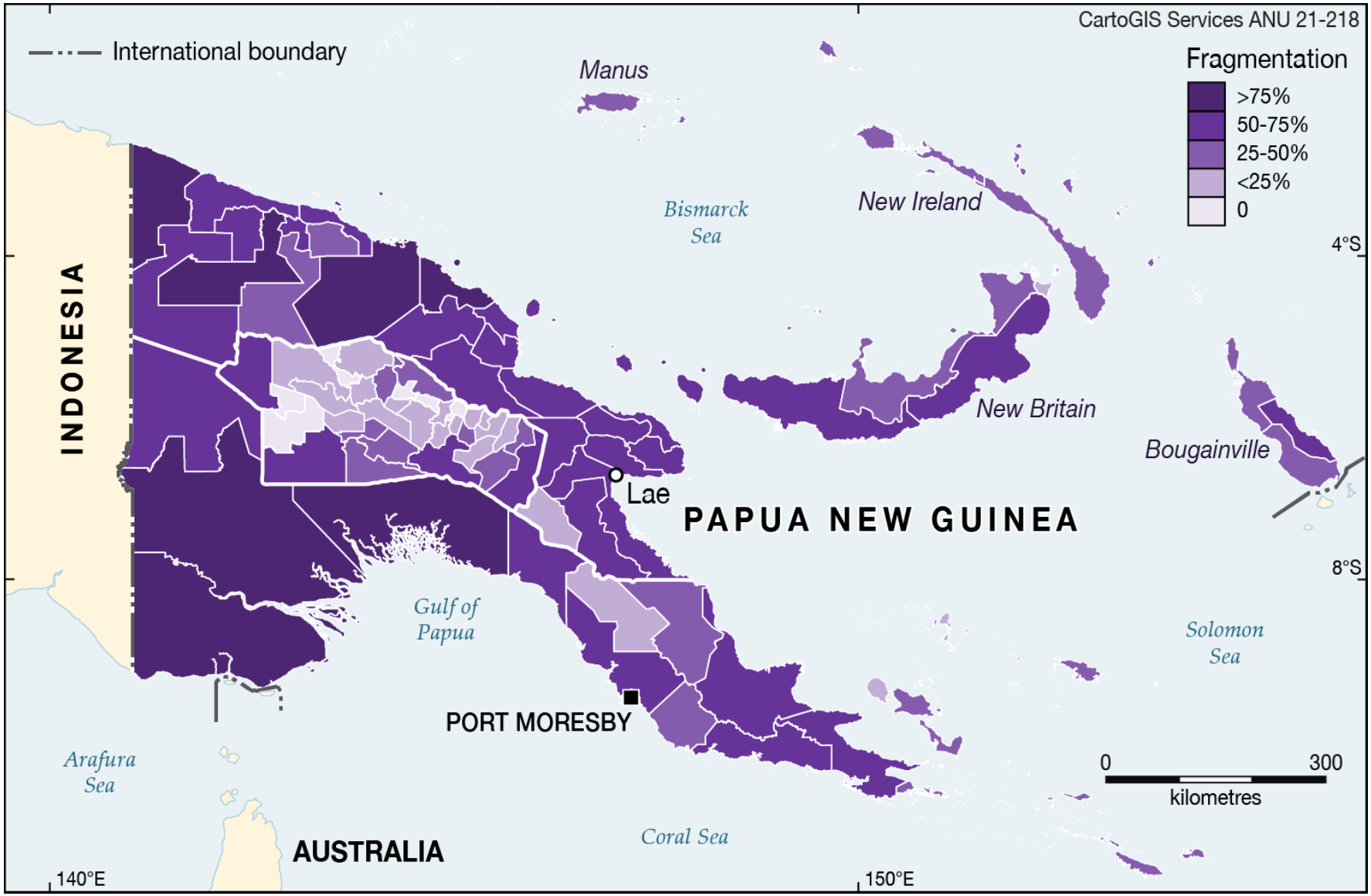
On the other hand, we might be able to add some new institutional variables to our equations, partly in recognition of the possibility that two of those we already have — the Austronesian and colonial legacy variables — might lose whatever limited significance they possess in our current statistical tests. Perhaps we could find some way to measure the volume or quality of the public goods and services that have been delivered to the residents of each district in the period since administrative district boundaries were aligned to those of open electorates in 1995. Or else we could measure novel institutional variables such as the extent of mobile phone coverage or the volume of social media communications in each district. Satellite imagery might enable us to measure new geographical variables at the same time, including differential rates of environmental change. With new variables or with new measures of those we have already tested, we might get a very different set of results from a statistical analysis of their mutual relationships.

Appendix 1: Provinces and districts of Papua New Guinea




PAPUA NEW GUINEA OPEN ELECTORATES
1 Maprik
2 Yangoru Saussia
3 Koroba Lake Kopiago
4 Wabag
5 Kompium Ambum
6 Tari
7 Kandep
8 Wapenamanda
9 Bayer Mul
10 Dei
11 Jimi
12 Komo Margarima
13 Mendi
14 Tambul Nebilyer
15 Hagen
16 North Wahgi
17 Imbonggu
18 Ialibu Pangia
19 Angalimp South Wahgi
20 Kerowagi
21 Kundiawa
22 Daulo
23 Goroka
24 Gumine
25 Sinasina Yonggamugi
26 Chuave
27 Unggai Bena
28 Henganofi
29 Kainantu
30 Karimui Nomane
31 Lufa
32 Okapa
33 Obura Wonenara
34 Markam
35 Lae
36 Moresby North West
37 Moresby North East
38 Moresby South
39 Rabaul
40 Kokopo
Manus
Kavieng
Namatanai
Aitape Lumi
Vanimo Green River
Wewak
Nuku
Ambunti Dreikikir
Wosera Gaui
Angoram
Bogia
Sumkar
Madang
Talasea
Gazelle
Telefomin
Middle Ramu
Lagaip Porgera
Usino Bundi
Rai Coast
Tewae Siassi
North Bougainville
5°S
INDONESIA
North Fly
Kabwum
Nawae
Finschhafen
Kandrian Gloucester
Pomio
Central Bougainville
South Bougainville
Nipa Kutubu
Kagua Erave
Menyama
Bulolo
Huon Gulf
Middle Fly
SOLOMON ISLANDS
Kikori
Goilala
Sohe
Kiriwina Goodenough
South Fly
Kerema
Ijivitari
Rigu
Esa'ala
Kairuku Hiri
Samarai Murua
10°S
Alotau
Abau
0
200 km
AUSTRALIA
145°E
155°E
© Australian National University
CartoGIS CAP 17-241b_KP

Appendix 2: Degrees of district-level linguistic fragmentation



Appendix 3: Variables used in this study

Measures of human well-being

Code	Description	Sources
CHM	The **under-five (child) mortality rate** (deaths per 1000 live births), averaged over the period from 1995 to 1999	2000 national census data (Tran et al. 2011)
GSA	The **gross school attendance rate**, calculated as the number of pupils enrolled in school as a percentage of school-age children in 2000	2000 national census data (GPNG 2004)

Institutional variables

Code	Description	Sources
EF1	First index of **ethno-linguistic fragmentation**, calculated at the level of individual languages in 1980	Lewis et al 2016; 1980 national census data
EF2	Second index of **ethno-linguistic fragmentation**, calculated at the level of low-level families in 1980	Wurm & Hattori 1981; 1980 national census data
EF3	Third index of **ethno-linguistic fragmentation**, calculated at the level of top-level families in 1980	Hammarström et al. 2020; 1980 national census data
EF4	Fourth index of **ethno-linguistic fragmentation**, calculated as the mean of the first three indices	
ATN	Proportion of **Austronesians**, calculated as the percentage of the rural village population speaking Austronesian languages in 1980	Hammarström et al 2020; 1980 national census data
COL	Decades under **colonial rule**, calculated as the number of decades in which a district was subject to the effective authority of European missionaries and/or government officials	Various historical sources (see Appendix 4)

Geographical variables

Code	Description	Sources
ACS	**Accessibility**, calculated as the percentage of the rural village population with good (or very good) access to (health and education) services in 2000	MASP dataset
CST	Proportion of **coastal people**, calculated as the percentage of the rural village (citizen) population living within 10km of a coastline in 2000	Geolocation of 2000 national census units
GPD	**Gross population density**, calculated as the average number of resident citizens per square kilometre of a district's total surface area in 2000	2000 national census data
LIU	**Land in use**, calculated as the percentage of a district's total land/surface area used for agriculture or occupied by human settlements between 1975 and 2000	PNGRIS and MASP datasets
ROA	**Range of altitudes** (at intervals of 100m) occupied by more than 90 per cent of the rural citizen population in 2000	Topographic map series and 2000 national census data
NAP	**Natural agricultural potential**, calculated as percentage of rural villagers using land with high or very high natural fertility in 2000	PNGRIS dataset with population estimates

Table A1: Values of variables by district (Southern and Highlands Regions)

District name	CHM	GSA	EF1	EF2	EF3	EF4	ATN	COL	ACS	CST	GPD	LIU	ROA	NAP
MIDDLE FLY	97	50	88	83	82	84	0	4	0	26	1	8	3	0
NORTH FLY	86	58	72	52	52	59	0	2	0	0	2	25	7	0
SOUTH FLY	71	55	90	79	79	82	0	9	22	56	1	8	1	0
KEREMA	164	33	65	52	52	57	1	9	6	47	9	42	15	15
KIKORI	94	39	86	77	77	80	0	9	0	84	2	10	1	0
ABAU	53	59	67	59	59	62	53	7	52	94	5	17	1	0
GOILALA	124	22	62	0	0	21	0	7	9	0	4	22	11	0
KAIRUKU-HIRI	45	56	85	39	39	54	73	10	93	62	8	20	2	5
RIGO	43	52	66	37	37	47	78	9	73	53	8	39	5	7
ALOTAU	77	55	92	42	42	59	70	10	33	78	10	44	8	19
SAMARAI-MURUA	77	48	78	19	19	39	89	9	31	100	14	39	1	29
KIRIWINA-GOODENOUGH	85	41	66	0	0	22	100	8	0	100	45	58	2	15
ESA'ALA	105	49	86	0	0	29	100	8	0	99	18	56	1	29
IJIVITARI	72	43	89	63	63	72	13	8	26	62	5	24	9	18
SOHE	72	36	76	26	20	41	0	8	79	6	6	15	7	57
IALIBU-PANGIA	59	29	41	41	41	41	0	2	41	0	21	46	7	0
IMBONGGU	94	31	54	48	0	34	0	2	94	0	58	61	7	17
KAGUA-ERAVE	100	18	71	13	13	33	0	2	76	0	16	27	8	36
KOMO-MAGARIMA	80	13	0	0	0	0	0	1	8	0	16	25	12	0
KOROBA-LAKE KOPIAGO	86	20	55	54	54	54	0	2	0	0	13	29	12	0
MENDI	71	29	46	0	0	15	0	2	69	0	71	41	5	16
NIPA-KUTUBU	83	19	71	44	44	53	0	3	56	0	14	12	15	0
TARI-PORI	49	23	0	0	0	0	0	2	0	0	40	54	4	27
KANDEP	149	19	6	0	0	2	0	1	0	0	24	27	4	0
KOMPIAM-AMBUM	56	24	13	4	4	7	0	2	41	0	15	39	13	0
LAGAIP-PORGERA	85	26	34	1	1	12	0	2	55	0	20	23	9	0
WABAG	70	43	0	0	0	0	0	3	77	0	54	36	9	0
WAPENAMANDA	71	39	34	0	0	11	0	3	86	0	51	45	7	0
ANGALIMP-SOUTH WAHGI	52	37	46	3	3	17	0	4	97	0	49	27	3	24
DEI	67	29	0	0	0	0	0	4	98	0	86	58	5	53
HAGEN	49	49	34	0	0	11	0	4	100	0	166	100	4	45
JIMI	83	23	75	11	0	29	0	2	0	0	16	55	8	2
MUL-BAIYER	61	38	49	49	0	33	0	3	60	0	41	55	10	1
NORTH WAHGI	33	39	0	0	0	0	0	3	100	0	114	66	3	49
TAMBUL-NEBILYER	78	29	42	0	0	14	0	3	100	0	33	100	12	38
CHUAVE	51	43	40	40	0	26	0	3	100	0	66	83	5	19
GUMINE	40	36	39	0	0	13	0	2	90	0	51	53	7	18
KARIMUI-NOMANE	189	27	78	55	55	63	0	1	7	0	10	25	12	0
KEROWAGI	37	42	40	0	0	13	0	4	100	0	100	64	5	69
KUNDIAWA-GEMBOGL	26	54	0	0	0	0	0	4	100	0	123	49	9	15
SINASINA-YONGGOMUGL	43	49	44	0	0	15	0	3	100	0	106	85	6	20
DAULO	40	44	34	0	0	11	0	4	99	0	50	52	6	38
GOROKA	34	54	27	0	0	9	0	4	100	0	242	66	5	57
HENGANOFI	54	32	40	1	0	14	0	4	99	0	59	68	5	0
KAINANTU	74	40	63	50	8	40	0	4	97	0	92	65	7	0
LUFA	73	32	45	0	0	15	0	2	95	0	34	47	6	28
OBURA-WONENARA	151	13	82	38	36	52	0	1	49	0	8	39	8	0
OKAPA	86	37	75	26	0	34	0	2	42	0	29	53	5	6
UNGGAI-BENA	53	40	40	0	0	13	0	4	97	0	49	69	7	33

Table A2: Values of variables by district (Momase and Islands Regions)

District name	CHM	GSA	EF1	EF2	EF3	EF4	ATN	COL	ACS	CST	GPD	LIU	ROA	NAP
BULOLO	119	37	90	66	66	74	53	4	54	0	11	28	14	11
FINSCHHAFEN	97	45	86	59	20	55	11	9	0	36	17	49	15	0
HUON GULF	64	45	89	74	39	67	74	7	1	47	8	26	2	2
KABWUM	117	41	83	52	22	52	13	5	0	0	15	35	11	0
MARKHAM	78	35	66	56	48	56	60	6	55	0	11	31	13	0
MENYAMYA	226	13	68	0	0	23	0	2	0	0	18	58	9	1
NAWAE	103	49	87	67	36	63	24	8	0	26	11	31	15	3
TEWAE-SIASSI	75	41	88	73	43	68	31	6	0	81	17	42	17	23
BOGIA	96	38	91	85	63	80	19	8	4	52	14	53	3	0
MADANG	54	52	91	75	29	65	18	8	80	55	34	97	3	16
MIDDLE RAMU	152	20	85	74	44	68	0	2	0	0	8	52	18	0
RAI COAST	124	32	92	76	17	62	9	9	1	57	10	42	18	1
SUMKAR	71	46	77	76	47	66	37	6	22	92	33	86	4	67
USINO-BUNDI	118	28	91	86	8	62	4	4	4	0	5	50	14	1
AMBUNTI-DREIKIKIR	160	33	91	85	63	80	0	5	32	0	5	22	4	39
ANGORAM	160	28	93	87	78	86	1	6	7	10	4	11	1	11
MAPRIK	103	41	63	54	54	57	0	4	97	0	53	66	3	70
WEWAK	97	58	83	74	65	74	27	7	20	78	28	78	3	12
WOSERA-GAWI	55	38	68	8	8	28	0	4	59	0	5	15	1	44
YANGORU-SAUSSIA	95	49	45	22	21	30	0	3	68	0	18	53	4	28
AITAPE-LUMI	106	41	87	70	56	71	37	8	0	53	9	22	7	56
NUKU	151	30	93	81	44	73	0	4	0	0	13	65	6	86
TELEFOMIN	144	31	84	68	38	63	0	3	0	0	2	15	20	0
VANIMO-GREEN RIVER	161	30	93	84	75	84	0	6	8	17	5	24	5	53
MANUS	56	63	95	13	0	36	100	6	16	99	22	87	3	13
KAVIENG	60	50	74	24	3	34	99	7	86	100	18	57	1	3
NAMATANAI	64	51	90	40	4	45	97	7	20	100	10	38	1	8
GAZELLE	58	56	41	36	36	38	78	8	92	73	24	32	3	82
KOKOPO	41	62	54	5	5	22	97	10	100	100	142	51	3	89
POMIO	131	43	81	58	54	64	65	4	0	58	4	18	8	5
RABAUL	32	62	0	0	0	0	100	9	100	95	283	61	2	100
KANDRIAN-GLOUCESTER	82	37	93	80	3	58	99	6	0	78	4	34	3	9
TALASEA	61	50	68	25	13	35	93	6	51	94	16	20	2	21
NORTH BOUGAINVILLE	74	55	87	40	21	49	88	6	57	99	24	55	2	53
CENTRAL BOUGAINVILLE	61	54	79	51	51	60	11	7	58	56	16	57	9	78
SOUTH BOUGAINVILLE	41	61	76	35	4	38	2	7	4	27	16	51	5	3

Appendix 4: Inception of colonial rule in each district

Table A3: Original government (G) or mission (M) stations (Southern and Highlands Regions)

District name	Station	Type	Year	COL	Source
MIDDLE FLY	MADIRI	M	1932	**4**	Weymouth 1988: 176
NORTH FLY	KIUNGA	G	1950	**2**	Jackson 1982: 3
SOUTH FLY	MABUDAUAN	G	1889	**9**	BNGAR 1890b: 15
KEREMA	IOKEA	M	1880s	**9**	BNGAR 1894a: xvi
KIKORI	OROKOLO	M	1880s	**9**	BNGAR 1894a: xviii
ABAU	MILLPORT HARBOUR	M	1907	**7**	TPAR 1908: 142
GOILALA	MAFULU (POPOLE)	M	1905	**7**	Dupeyrat 1935
KAIRUKU-HIRI	HANUABADA	M	1874	**10**	Langmore 1989: 271
RIGO	KAILE (GAIRE) & KEREPUNA	M	1880s	**9**	BNGAR 1890a: 9, 17
ALOTAU	SUAU ISLAND	M	1877	**10**	Langmore 1974: 7
SAMARAI-MURUA	SAMARAI	G	1888	**9**	BNGAR 1890a: 19
KIRIWINA-GOODENOUGH	KAVATARI (TROBRIANDS)	M	1894	**8**	BNGAT 1896: xvi
ESA'ALA	DOBU	M	1891	**8**	BNGAR 1892: xvi
IJIVITARI	WANIGELA	M	1898	**8**	Barker 1987: 66
SOHE	TAMATA (MAMBARE)	G	1895	**8**	BNGAR 1897: xii
IALIBU-PANGIA	IALIBU	G	1954	**2**	TPNGPR
IMBONGGU	IALIBU	G	1954	**2**	TPNGPR
KAGUA-ERAVE	ERAVE	G	1954	**2**	TPNGPR
KOMO-MAGARIMA	KOMO	G	1962	**1**	TPNGPR
KOROBA-LAKE KOPIAGO	KOROBA	G	1955	**2**	TPNGPR
MENDI	MENDI	G	1950	**2**	TPNGPR
NIPA-KUTUBU	LAKE KUTUBU	G	1949	**3**	TPNGPR
TARI-PORI	TARI	G	1952	**2**	TPNGPR
KANDEP	KANDEP	G	1960	**1**	Lacey 1982: 20; TPNG 1964: 4
KOMPIAM-AMBUM	KOMPIAM	G	1953	**2**	TPNG 1964: 3
LAGAIP-PORGERA	LAIAGAM	G	1952	**2**	Lacey 1982: 20; TPNG 1964: 3
WABAG	WABAG	G	1941	**3**	Lacey 1982: 19
WAPENAMANDA	POMPABUS	M	1948	**3**	Lacey 1982: 17
ANGALIMP-SOUTH WAHGI	REBIAMUL	M	1938	**4**	Ross 1969: 325
DEI				**4**	(No source found)
HAGEN	OGELBENG	M	1934	**4**	Smith 1981: 83
JIMI	TABIBUGA	G	1957	**2**	TPNG 1964: 4
MUL-BAIYER				**3**	(No source found)
NORTH WAHGI	BANZ	M	1947	**3**	Ross 1969: 326
TAMBUL-NEBILYER	ULGA	M	1947	**3**	Ross 1969: 326
CHUAVE	MONONO	M	1947	**3**	Howlett et al. 1976: 10
GUMINE	GUMINE	G	1954	**2**	Howlett et al. 1976: 10
KARIMUI-NOMANE	KARIMUI	G	1961	**1**	Howlett et al. 1976: 10
KEROWAGI	MINGENDE	M	1934	**4**	Howlett et al. 1976: 10
KUNDIAWA-GEMBOGL	EGA	M	1934	**4**	Smith 1981: 83
SINASINA-YONGGOMUGL	KOGE	M	1947	**3**	Howlett et al. 1976: 10
DAULO	ASAROKA	M	1937	**4**	Smith 1981: 83
GOROKA	GOROKA	G	1939	**4**	Munster 1986: 184
HENGANOFI	FININTEGU	G	1934	**4**	Munster 1986: 61
KAINANTU	UPPER RAMU (KAINANTU)	G	1932	**4**	Smith 1981: 83; TPNG 1964: 2
LUFA	RONGO	M	1958	**2**	Smith 1981: 32
OBURA-WONENARA	WONENARA	G	1960	**1**	TPNG 1964: 4
OKAPA	TARABO	M	1950	**2**	Smith 1981: 32
UNGGAI-BENA	BENA BENA	G	1935	**4**	Munster 1986: 162

Abbreviations: BNGAR = British New Guinea Annual Report; TPAR = Territory of Papua Annual Report; TPNGPR = Territory of Papua and New Guinea Patrol Report.

Table A4: Original government (G) or mission (M) stations (Momase and Islands regions)

District name	Station	Type	Year	COL	Source
BULOLO	WAU	G	1930	**4**	TPNG 1964: 2
FINSCHHAFEN	FINSCHHAFEN	G	1885	**9**	TPNG 1964: 1
HUON GULF	MALOLO	M	1907	**7**	Firth 1983: 147
KABWUM	KABWUM	M	1920s	**5**	(No source found)
MARKHAM	KAIAPIT	M	1917	**6**	Smith 1981: 81
MENYAMYA	MENYAMYA	G	1951	**2**	TPNG 1964: 3
NAWAE	DEINZERHOEHE	M	1899	**8**	Firth 1983: 147
TEWAE-SIASSI	SIO	M	1910	**6**	Firth 1983: 147
BOGIA	POTSDAMHAFEN	M	1899	**8**	Firth 1983: 96
MADANG	FRIEDRICH WILHELMSHAFEN	G	1892	**8**	Firth 1983: 92
MIDDLE RAMU	AIOME	G	1952	**2**	TPNG 1964: 3
RAI COAST	KONSTANTINHAFEN	G	1886	**9**	TPNG 1964: 1
SUMKAR	KARKAR ISLAND	M	1911	**6**	Stolberg 2017: 67
USINO-BUNDI	GUAIBI (BUNDI)	M	1933	**4**	Smith 1981: 123
AMBUNTI-DREIKIKIR	AMBUNTI	G	1924	**5**	May 1989: 123; TPNG 1964: 2
ANGORAM	ANGORAM	G	1913	**6**	Firth 1983: 92; TPNG 1964: 2
MAPRIK	BAINYIK	M	1933	**4**	Roscoe & Scaglion 1990: 416
WEWAK	BOIKEN	M	1909	**7**	Roscoe & Scaglion 1990: 414
WOSERA-GAWI	KUNJINGINI	M	1930s	**4**	George Curry, pers. comm.
YANGORU-SAUSSIA	NEGRIE	M	1948	**3**	Gesch 1985: 25
AITAPE-LUMI	TUMLEO ISLAND	M	1896	**8**	Firth 1983: 94
NUKU	MAIMAI	G	1938	**4**	TPNG 1964: 3
TELEFOMIN	TELEFOMIN	G	1948	**3**	TPNG 1964: 3
VANIMO-GREEN RIVER	ANGRIFFSHAFEN (VANIMO)	G	1918	**6**	Rowley 1958: 43; TPNG 1964: 2
MANUS	LORENGAU	G	1911	**6**	Firth 1983: 92; TPNG 1964: 2
KAVIENG	KAVIENG	G	1900	**7**	Firth 1983: 92; TPNG 1964: 1
NAMATANAI	NAMATANAI	G	1904	**7**	Firth 1983: 85
GAZELLE	VOLAVOLO	M	1894	**8**	Firth 1983: 143
KOKOPO	BALANAWANG (DUKE OF YORKS)	M	1875	**10**	Firth 1983: 9
POMIO	MALMAL	M	1931	**4**	Trompf 1994: 259
RABAUL	MATUPI	G	1886	**9**	TPNG 1964: 1
KANDRIAN-GLOUCESTER	GASMATA	G	1919	**6**	TPNG 1964: 2
TALASEA	TALASEA	G	1918	**6**	TPNG 1964: 2
NORTH BOUGAINVILLE	BUKA	M	1910	**6**	Firth 1986: 155
CENTRAL BOUGAINVILLE	KIETA	G	1905	**7**	Firth 1986: 86; TPNG 1964: 1
SOUTH BOUGAINVILLE	PATUPATUAI	M	1905	**7**	Firth 1986: 155

References

Acemoglu, D., S. Johnson and J.A. Robinson, 2001. 'An African Success Story: Botswana'. Cambridge (MA): Massachusetts Institute of Technology, Department of Economics (Working Paper 01-37).

Acemoglu, D., S. Johnson and J.A. Robinson, 2002. 'Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution'. *Quarterly Journal of Economics* 117: 1231–1294.

Acemoglu, D. and J.A. Robinson, 2012. *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*. New York: Crown Publishing Group.

Adels, B.R. and D.C. Gajdusek, 1963. 'Survey of Measles Patterns in New Guinea, Micronesia and Australia'. *American Journal of Hygiene* 77: 317–343.

Albert, S.M., 1988. 'How Big Are Melanesian Big-Men? A Case from Southern New Ireland'. *Research in Economic Anthropology* 10: 159–200.

Alesina, A., R. Baqir and W. Easterly, 1999. 'Public Goods and Ethnic Divisions'. *Quarterly Journal of Economics* 114: 1243–1284.

Alesina, A., A. Devleeschauwer, W. Easterly, S. Kurlat and R. Wacziarg, 2003. 'Fractionalization'. *Journal of Economic Growth* 8: 155–194.

Alesina, A. and E.L. Ferrara, 2005. 'Ethnic Diversity and Economic Performance'. *Journal of Economic Literature* 43: 762–800.

Allen, B.J., 1983. 'A Bomb or a Bullet or the Bloody Flux: Population Change in the Aitape Inland, 1941-1945'. *Journal of Pacific History* 18: 218–235.

Allen, J. and C. Gosden, 1996. 'Spheres of Interaction and Integration: Modeling the Culture History of the Bismarck Archipelago'. In J. Davidson, F. Leach, G. Irwin, A. Pawley and D. Brown (eds), *Oceanic Culture History: Essays in Honour of Roger Green*. Wellington: New Zealand Journal of Archaeology Special Publication.

Allen, M.R., 1984. 'Elders, Chiefs and Big Men: Authority Legitimation and Political Evolution in Melanesia'. *American Ethnologist* 11: 20–41.

Ballard, C., 2010. 'Synthetic Histories: Possible Futures for Papuan Pasts'. *Reviews in Anthropology* 39: 232–257.

Ballard, C., P. Brown, R.M. Bourke and T. Harwood (eds), 2005. *The Sweet Potato in Oceania: A Reappraisal*. Sydney: University of Sydney (Oceania Monograph 56).

Barker, J., 1987. 'Cheerful Pragmatists: Anglican Missionaries among the Maisin of Collingwood Bay, Oro Province'. *Journal of Pacific History* 22: 66–81.

Barker, J. (ed.), 1990. *Christianity in Oceania: Ethnographic Perspectives*. Lanham (MD): University Press of America (ASAO Monograph 12).

Barker, J., 2019. 'Mixed Grammars and Tangled Hierarchies: An Austronesian-Papuan Contact Zone in Papua New Guinea'. *Anthropological Forum* 29: 284–301.

Barnes, R., 1966. 'Epidemiology of 1964–1965 Influenza Outbreak in the Sepik District'. *Papua New Guinea Medical Journal* 9: 127–132.

Barth, F., 1971. 'Tribes and Intertribal Relations in the Fly Headwaters'. *Oceania* 41: 171–191.

Bedford, S., C. Sand and S.P. Connaughton (eds), 2007. Oceanic Explorations: Lapita and *Western Pacific Settlement*. Canberra: ANU E Press (Terra Australis 26).

Beer, B. and J.H. Schroedter, 2014. 'Social Reproduction and Ethnic Boundaries: Marriage Patterns through Time and Space among the Wampar, Papua New Guinea'. *Sociologus* 64: 1–28.

Bellwood, P., 1978. *Man's Conquest of the Pacific*. London: Collins.

Bellwood, P., 2006. 'Hierarchy, Founder Ideology and Austronesian Expansion'. In J.J. Fox and C. Sather (eds), *Origins, Ancestry and Alliance: Explorations in Austronesian Ethnography*. Canberra: ANU E Press.

Berndt, R.M. and P. Lawrence (eds), 1971. *Politics in New Guinea*. Nedlands: University of Western Australia Press.

Blackwood, B., 1935. *Both Sides of Buka Passage*. Oxford: Clarendon Press.

Blust, R., 1980. 'Early Austronesian Social Organization'. *Current Anthropology* 21: 205–247.

Bourke, R.M., B.J. Allen, P. Hobsbawm and J. Conway, 1998. 'Agricultural Systems of Papua New Guinea: Working Paper 1'. Canberra and Port Moresby: Australian National University, PNG Department of Agriculture and Livestock, and University of Papua New Guinea.

Brookfield, H. and P. White, 1968. 'Revolution or Evolution in the Prehistory of the New Guinea Highlands: A Seminar Report'. *Ethnology* 7: 43–52.

Brown, P., 1973. *The Chimbu: A Study of Change in the New Guinea Highlands*. London: Routledge & Kegan Paul.

Brown, P., 1978. *Highland Peoples of New Guinea*. Cambridge: Cambridge University Press.

Brown, P., 1979. 'Chimbu Leadership before Provincial Government'. *Journal of Pacific History* 14: 100–117.

Brown, P., 1982. 'Chimbu Disorder: Tribal Fighting in Newly Independent Papua New Guinea'. *Pacific Viewpoint* 23: 1–21.

Brown, P., 1989. 'The Simbu Election'. In M. Oliver (ed.), *Eleksin: The 1987 National Election in Papua New Guinea*. Port Moresby: University of Papua New Guinea

Brunton, R., 1975. 'Why Do the Trobriands Have Chiefs?'. *Man* (NS) 10: 544–558.

Burton, J., 1989. 'Tribal Structure and Rural Ballot Box Counts in Hagen Open'. In M. Oliver (ed.), *Eleksin: The 1987 National Election in Papua New Guinea*. Port Moresby: University of Papua New Guinea.

Chiu, S. and C. Sand (eds), 2007. *From Southeast Asia to the Pacific: Archaeological Perspectives on the Austronesian Expansion and the Lapita Cultural Complex*. Taipei: Academica Sinica.

Chowning, A., 1979. 'Leadership in Melanesia'. *Journal of Pacific History* 14: 66–84.

Chowning, A., 1986. 'The Development of Ethnic Identity and Ethnic Stereotypes on Papua New Guinea Plantations'. *Journal de la Société des Océanistes* 82/83: 153–162.

Chowning, A. and W.H. Goodenough, 1971. 'Lakalai Political Organization'. In R.M. Berndt and P. Lawrence (eds), *Politics in New Guinea*. Nedlands: University of Western Australia Press.

Clay, B.J., 1992. 'Other Times, Other Places: Agency and the Big Man in Central New Ireland'. *Man* (NS) 27: 719–733.

Craig, B., G. Lewis and W.E. Mitchell, 2008. 'War Shields of the Torricelli Mountains, West Sepik Province, Papua New Guinea'. *Oceania* 78: 241–259.

Dalton, G., 1978. 'The Impact of Colonization on Aboriginal Economies in Stateless Societies'. *Research in Economic Anthropology* 1: 131–184.

Dell, M, N. Lane and P. Querubin, 2018. 'The Historical State, Local Collective Action, and Economic Development in Vietnam'. *Econometrica* 86: 2083–2121.

Denham, T., 2018. 'The "Austronesian" Dispersal in Island Southeast Asia'. In T. Hunt and E. Cochrane (eds), *The Oxford Handbook of Prehistoric Oceania*. Oxford: Oxford University Press.

Denoon, D., 1989. *Public Health in Papua New Guinea: Medical Possibility and Social Constraint, 1884–1984*. Cambridge: Cambridge University Press.

Diamond, J., 1997. *Guns, Germs and Steel: The Fates of Human Societies.* London: Random House.

Douglas, B., 1979. 'Rank, Power, Authority: A Reassessment of Traditional Leadership in South Pacific Societies'. *Journal of Pacific History* 14: 2–27.

Downs, I., 1980. *The Australian Trusteeship: Papua New Guinea 1945–75*. Canberra: Australian Government Publishing Service.

Dupeyrat, A., 1935. *Papouasie: Histoire De La Mission (1885–1935)*. Paris: Dillen.

Dutton, T.E., 1973. *A Checklist of Languages and Present-Day Villages of Central and South-East Mainland Papua*. Canberra: Australian National University, Research School of Pacific Studies, Department of Linguistics (Pacific Linguistics B24).

Dutton, T.E. (ed.), 1982. *The Hiri in History: Further Aspects of Long Distance Motu Trade in Central Papua*. Canberra: Australian National University, Research School of Pacific Studies (Pacific Research Monograph 8).

Dutton, T.E., 1994. 'Motu-Koiarian Contact in Papua New Guinea'. In T.E. Dutton and D.T. Tryon (eds), *Language Contact and Change in the Austronesian World*. Berlin: Mouton de Gruyter.

Dutton, T.E. and D.T. Tryon (eds), 1994. *Language Contact and Change in the Austronesian World*. Berlin: Mouton de Gruyter.

Dwyer, P.D. and M. Minnegal, 2018. 'Captain Everill's Error: Mapping the Upper Strickland River in Papua and New Guinea, 1885–1979'. *Journal of Pacific History* 53: 310–329.

Easterly, W. and R. Levine, 1997. 'Africa's Growth Tragedy: policies and ethnic divisions'. *Quarterly Journal of Economics* 112: 1203–1250.

Epstein, A., L, 1978. *Ethos and Identity: Three Studies in Ethnicity*. London: Tavistock.

Evans, B. and B. Palmer, 2011. 'Contact-Induced Change in Southern Bougainville'. *Oceanic Linguistics* 50: 483–523.

Evans, N., 2012. 'Even More Diverse Than We Had Thought: The Multiplicity of Trans-Fly Languages'. In N. Evans and M. Klamer (eds), *Melanesian Languages on the Edge of Asia: Challenges for the 21st Century*. Honolulu: University of Hawai'i Press (Language Documentation & Conservation Special Publication 5).

Evans, N., 2017. 'Did Language Evolve in Multilingual Settings?' *Biology & Philosophy* 32: 905–933.

Fearon, J., 2003. 'Ethnic and Cultural Diversity by Country'. *Journal of Economic Growth* 8: 195–222.

Fearon, J.D. and D.D. Laitin, 1996. 'Explaining Interethnic Cooperation'. *American Political Science Review* 90: 715–735.

Feil, D.K., 1982. 'From Pigs to Pearlshells: The Transformation of a New Guinea Highlands Exchange Economy'. *American Ethnologist* 9: 291–306.

Feil, D.K., 1984. *Ways of Exchange: The Enga Tee of Papua New Guinea*. St Lucia: University of Queensland Press.

Feil, D.K., 1987. *The Evolution of Papua New Guinea Highland Societies*. Cambridge: Cambridge University Press.

Fenbury, D.M., 1978. *Practice without Policy: Genesis of Local Government in Papua New Guinea*. Canberra: Australian National University, Development Studies Centre (Monograph 13).

Fife, W., 2001. 'Creating the Moral Body: Missionaries and the Technology of Power in Early Papua New Guinea'. *Ethnology* 40: 251–269.

Filer, C., 1990. 'Diversity of Cultures or Culture of Diversity?' In N. Lutkehaus, C. Kaufman, W.E. Mitchell et al. (eds), *Sepik Heritage: Tradition and Change in Papua New Guinea*. Durham (NC): Carolina Academic Press.

Filer, C., 1996. '"Steak and Grease": A Short History of Political Competition in Nuku'. In Y. Saffu (ed.), *The 1992 Papua New Guinea Election: Continuity and Change in Electoral Politics*. Canberra: Australian National University, Research School of Pacific and Asian Studies, Department of Social and Political Change (Monograph 23).

Filer, C., 1997. 'Compensation, Rent and Power in Papua New Guinea'. In S. Toft (ed.), *Compensation for Resource Development in Papua New Guinea*. Canberra: Australian National University, National Centre for Development Studies (Pacific Policy Paper 24).

Filer, C., 2014. 'The Double Movement of Immovable Property Rights in Papua New Guinea'. *Journal of Pacific History* 49: 76–94.

Filer, C., 2021. 'Measuring Mobilities and Inequalities in Papua New Guinea's Mining Workforce'. In N.A. Bainton, D. McDougall, K. Alexeyeff and J. Cox (eds), *Unequal Lives: Gender, Race and Class in the Western Pacific*. Canberra: ANU Press.

Filer, C. and P.-Y. Le Meur, 2017. 'Large-Scale Mines and Local-Level Politics'. In C. Filer and P.-Y. Le Meur (eds), *Large-Scale Mines and Local-Level Politics: Between New Caledonia and Papua New Guinea*. Canberra: ANU Press (Asia Pacific Environment Monograph 12).

Filer, C., S. McDonnell and M.G. Allen, 2017. 'Powers of Exclusion in Melanesia'. In S. McDonnell, M.G. Allen and C. Filer (eds), *Kastom, Property, and Ideology: Land Transformations in Melanesia*. Canberra: ANU Press.

Filer, C. and T. Wood, 2021. 'Geographical Constituents of Human Well-Being: A District-Level Analysis'. Canberra: Australian National University, Crawford School of Public Policy, Development Policy Centre (Discussion Paper 92).

Fingleton, J. (ed.), 2005. *Privatising Land in the Pacific: A Defence of Customary Tenures*. Canberra: Australia Institute (Discussion Paper 80).

Finney, B.R., 1973. *Big Men and Business: Entrepreneurship and Economic Growth in the New Guinea Highlands*. Honolulu: Hawaii University Press.

Firth, S., 1983. *New Guinea under the Germans*. Melbourne: Melbourne University Press.

Fish, S. and R. Brooks, 2004. 'Does Diversity Hurt Democracy?' *Journal of Democracy* 15: 154–166.

Fitzpatrick, P., 1980. *Law and State in Papua New Guinea*. London: Academic Press.

Foley, W.A., 2000. 'The Languages of New Guinea'. *Annual Review of Anthropology* 29: 357–404.

Forge, A., 1972. 'Normative Factors in the Settlement Size of Neolithic Cultivators (New Guinea)'. In P.J. Ucko, R. Tringham and G.W. Dimbleby (eds), *Man, Settlement and Urbanism*. London: Duckworth.

Friedlander, J.S. (ed.), 2007. *Population Genetics, Linguistics, and Culture History in the Southwest Pacific*. Oxford: Oxford University Press.

Friedlander, J.S., F.R. Friedlander, F.A. Reed, K.K. Kidd, J.R. Kidd, G.K. Chambers, R.A. Lea, J.-H. Loo, G. Koki, J.A. Hodgson, D.A. Merriwether and J.L. Weber, 2008. 'The Genetic Structure of Pacific Islanders'. *PLoS Genetics* 4: e19.

Friedman, J., 1981. 'Notes on Structure and History in Oceania'. *Folk* 23: 275–295.

Fyfe, A., 2013. 'Exploring Spatial Relationships between Material Culture and Language in the Upper Sepik and Central New Guinea'. *Oceania* 79: 121–161.

Gennaioli, N. and I. Rainer, 2007. 'The Modern Impact of Precolonial Centralization in Africa'. *Journal of Economic Growth* 12: 185–234.

Gerring, J., M. Hoffman and D. Zarecki, 2018. 'The Diverse Effects of Diversity on Democracy'. *British Journal of Political Science* 48: 283–314.

Gesch, P., 1985. *Initiative and Initiation: A Cargo Cult-Type Movement in the Sepik against Its Background in Traditional Village Religion*. St Augustin: Anthropos Institut (Studia Instituti Anthropos 33).

Ghai, Y. and A.J. Regan, 2000. 'Bougainville and the Dialectics of Ethnicity, Autonomy and Separation'. In Y. Ghai (ed.), *Autonomy and Ethnicity: Negotiating Competing Claims in Multi-Ethnic States*. Cambridge: Cambridge University Press.

Goddard, M., 2011. 'Brammell's Rules: Custom and Law in Contemporary Land Disputes among the Motu-Koita of Papua New Guinea'. *Pacific Studies* 34: 323–349.

Goddard, M., 2019. 'The Dialectic of a Descent Dogma among the Motu-Koita of Papua New Guinea'. *Sociologus* 69: 127–146.

Godelier, M. and M. Strathern (eds), 1991. *Big Men and Great Men: Personifications of Power in Melanesia*. Cambridge: Cambridge University Press.

Golson, J., 2008. 'The Ipomoean Revolution Revisited: Society and the Sweet Potato in the Upper Wahgi Valley'. In P. D'Arcy (ed.), *Peoples of the Pacific: The History of Oceania to 1870*. London: Routledge.

Golson, J. and D. Gardner, 1990. 'Agriculture and Sociopolitical Organization in New Guinea Highlands Prehistory'. *Annual Review of Anthropology* 19: 395–417.

Gordon, R., 1983. 'The Decline of the Kiapdom and the Resurgence of "Tribal Fighting" in Enga'. *Oceania* 53: 205–223.

Gosarevski, S., H. Hughes and S. Windybank, 2004. 'Is Papua New Guinea Viable *with* Customary Land Ownership?' *Pacific Economic Bulletin* 19(3): 133–136.

GPNG (Government of PNG), 2004. 'Information Paper: Least Developed District Grant'. Port Moresby: National Economic and Fiscal Commission.

Green, R.C., 2000. 'Lapita and the Cultural Model for Intrusion, Integration and Innovation'. In A. Anderson and T. Murray (eds), *Australian Archaeologist: Collected Papers in Honour of Jim Allen*. Canberra: Coombs Academic Publishing.

Greenhill, S.J, 2014. 'Demographic Correlates of Language Diversity'. In C. Bowern and B. Evans (eds), *The Routledge Handbook of Historical Linguistics*. London: Routledge.

Groves, M., 1963. 'Western Motu Descent Groups'. *Ethnology* 2: 15–30.

Gustafsson, B., 1998. 'The Identity Construction of Ethnic and Social Groups in Contemporary Papua New Guinea'. In J. Wassman (ed.), *Pacific Answers to Western Hegemony: Cultural Practices of Identity Construction*. Oxford: Berg.

Hage, P., 1999. 'Linguistic Evidence for Primogeniture and Ranking in Proto-Oceanic Society'. *Oceanic Linguistics* 38: 366–375.

Haley, N. and R.J. May (eds), 2007. *Conflict and Resource Development in the Southern Highlands of Papua New Guinea*. Canberra: ANU E Press.

Hammarström, H., S. Nordhoff and R. Forkel, 2020. 'Glottolog 4.3'. https://glottolog.org/.

Harding, T.G., 1967. *Voyagers of the Vitiaz Strait: A Study of a New Guinea Trade System*. Seattle: University of Washington Press.

Harris, G.T., 1975. 'Rural Business Development in the Koroba Sub-District, Southern Highlands, Papua New Guinea'. *Oceania* 45: 308–319.

Hasluck, P., 1976. *A Time for Building: Australian Administration in Papua and New Guinea 1951–1963*. Melbourne: Melbourne University Press.

Hau'ofa, E., 1971. 'Mekeo Chieftainship'. *Journal of the Polynesian Society* 80: 152–199.

Hegarty, D. (ed.), 1983. *Electoral Politics in Papua New Guinea: Studies on the 1977 National Elections*. Waigani: University of Papua New Guinea Press.

Herbst, J., 2000. *States and Power in Africa: Comparative Lessons in Authority and Control.* Princeton (NJ) Princeton University Press.

Hogbin, H.I., 1949. 'Government Chiefs in New Guinea'. In M. Fortes (ed.), *Social Structure: Studies Presented to A.R. Radcliffe-Brown*. New York: Russell & Russell.

Hogbin, H.I., 1978. *The Leaders and the Led: Social Control in Wogeo, New Guinea*. Carlton: Melbourne University Press.

Hogbin, H.I. and C.H. Wedgwood, 1953. 'Local Grouping in Melanesia'. *Oceania* 23: 241–276.

Holman, E.W., C.H. Brown, S. Wichmann and e. al., 2011. 'Automated Dating of the World's Language Families Based on Lexical Similarity'. *Current Anthropology* 52: 841–875.

Howes, S., A.A. Mako, A. Swan, G. Walton, T. Webster and C. Wiltshire, 2014. *A Lost Decade? Service Delivery and Reforms in Papua New Guinea 2002-2012*. Canberra: Australian National University, Crawford School of Public Policy, Development Policy Centre.

Howlett, D., R. Hide, E. Young, J. Arba, H. Bi and B. Kaman, 1976. *Chimbu: Issues in Development*. Canberra: Australian National University, Development Studies Centre (Monograph 4).

Hughes, H., 2004. 'Can Papua New Guinea Come Back from the Brink?' Sydney: Centre for Independent Studies (Issue Analysis 49).

Hughes, I., 1978. 'Good Money and Bad: Inflation and Devaluation in the Colonial Process'. *Mankind* 11: 308–318.

Irwin, G.J., 1985. *The Emergence of Mailu as a Central Place in Coastal Papuan Prehistory*. Canberra: Australian National University, Research School of Pacific Studies, Department of Prehistory (Terra Australis 10).

Jackson, R., 1982. *Ok Tedi: The Pot of Gold*. Waigani: University of Papua New Guinea.

Kadiba, J., 1989. 'Murray and Education: Some Observations on the Ambivalence of Colonial Education Policy in Papua before World War II'. In S. Latukefu (ed.), *Papua New Guinea: A Century of Colonial Impact 1884–1984*. Port Moresby National Research Institute and University of Papua New Guinea.

Kahn, M., 1983. 'Sunday Christians, Monday Sorcerers: Selective Adaptation to Missionization in Wamira'. *Journal of Pacific History* 18: 96–112.

Kanasa, B., 1989. 'Leadership and Organisation among the Zia of Morobe Province'. *Catalysr* 19: 251–264.

Ketan, J., 1996. 'Electoral Politics in Mount Hagen: The Dei Open Election'. In Y. Saffu (ed.), *The 1992 Papua New Guinea Election: Continuity and Change in Electoral Politics*. Canberra: Australian National University, Research School of Pacific and Asian Studies, Department of Social and Political Change (Monograph 23).

Ketan, J., 2004. *The Name Must Not Go Down: Political Competition and State-Society Relations in Mount Hagen, Papua New Guinea*. Suva: University of the South Pacific, Institute of Pacific Studies.

King, P. (ed.), 1989. *Pangu Returns to Power: The 1982 Elections in Papua New Guinea*. Canberra: Australian National University, Research School of Pacific Studies, Department of Political and Social Change (Monograph 9).

Kirch, P.V., 1989. *The Evolution of the Polynesian Chiefdoms*. Cambridge: Cambridge University Press.

Kirch, P.V., 1997. *The Lapita Peoples*. Oxford: Blackwell.

Kirsch, S., 1997. 'Lost Tribes: Indigenous People and the Social Imaginary'. *Anthropological Quarterly* 70: 58–67.

Lacey, R., 1982. 'History'. In B. Carrad, D. Lea and K. Talyaga (eds), *Enga: Foundations for Development*. Armidale: University of New England, Department of Geography.

Langmore, D., 1974. *Tamate--A King: James Chalmers in New Guinea 1877–1901*. Melbourne: Melbourne University Press.

Langmore, D., 1989. *Missionary Lives: Papua, 1874–1914*. Honolulu: University of Hawaii Press (Pacific Islands Monograph 6).

Langness, L.L., 1963. 'Notes on the Bena Council, Eastern Highlands'. *Oceania* 33: 151–170.

Larcom, S., 2019. 'Linking Precolonial Institutions with Ethnic Fractionalisation: What Are We Measuring? *Journal of Institutional Economics* 15: 811–826.

Lawrence, P., 1956. 'Lutheran Mission Influence on Madang Societies'. *Oceania* 27: 73–89.

Laycock, D.C., 1973. *Sepik Languages – Checklist and Preliminary Classification*. Canberra: Australian National University, Research School of Pacific Studies, Department of Linguistics (Pacific Linguistics B25).

Lea, D. and T. Curtin, 2011. *Land Law and Economic Development in Papua New Guinea*. Newcastle-upon-Tyne: Cambridge Scholars Publishing.

Leach, J.W., 1982. 'Socio-Historical Conflict and the Kabisawali Movement in the Trobriand Islands'. In R.J. May (ed.), *Micronationalist Movements in Papua New Guinea*. Canberra: Australian National University, Research School of Pacific and Asian Studies, Department of Political and Social Change (Monograph 1).

Leach, J.W. and E. Leach (eds), 1983. *The Kula: New Perspectives on Massim Exchange*. Cambridge: Cambridge University Press.

Lederman, R., 1990. 'Big Men, Large and Small? Towards a Comparative Perspective'. *Ethnology* 29: 3–15.

Lee, A., 2019 'Land, State Capacity, and Colonialism: Evidence from India'. *Comparative Political Studies* 52: 412–444.

Levine, H.B., 1999. 'Reconstructing Ethnicity'. *Journal of the Royal Anthropological Institute* 5: 165–180.

Lewis, M.P., G.F. Simons and C.D. Fennig (eds), 2016. *Ethnologue: Languages of the World* (19th edition). Dallas (TX): SIL International.

Lin, H.-L. and R. Scaglion, 2019. 'Austronesian Speakers and Hereditary Leadership in the Pacific'. *Anthropological Forum* 29: 267–283.

Lind, A.W., 1969. *Inter-Ethnic Marriage in Papua New Guinea*. Canberra: Australian National University, New Guinea Research Unit (Bulletin 31).

Lipset, D., 1985. 'Seafaring Sepiks: Ecology, Warfare, and Prestige in Murik Trade'. *Research in Economic Anthropology* 7: 123–141.

Lomas, P.W., 1979. 'Malanggans and Manipulators: Land and Politics in Northern New Ireland'. *Oceania* 50: 53–66.

Lutkehaus, N., 1990. 'Hierarchy and "Heroic Society": Manam Variations in Sepik Social Structure'. *Oceania* 60: 179–197.

Macintyre, M., 1994. 'Too Many Chiefs? Leadership in the Massim in the Colonial Era'. *History and Anthropology* 7: 241–262.

Macintyre, M. and J. Allen, 1990. 'Trading for Subsistence: The Case from the Southern Massim'. In D.E. Yen and J.M.J. Mummery (eds), *Pacific Production Systems: Approaches to Economic Prehistory*. Canberra: Australian National University, Research School of Pacific Studies, Department of Prehistory (Occasional Paper 18).

MacWilliam, S., 2013. *Securing Village Life: Development in Late Colonial Papua New Guinea*. Canberra: ANU E Press.

Maher, R.F., 1967. 'From Cannibal Raid to Copra Kompani'. *Ethnology* 6: 309–331.

Maher, R.F., 1974. 'Koriki Chieftainship: Hereditary Status and Mana in Papua'. *Ethnology* 13: 239–246.

Mair, L.P., 1948. *Australia in New Guinea*. London: Christophers.

Malinowski, B., 1922. *Argonauts of the Western Pacific: An Account of Native Enterprise and Adventure in the Archipelagoes of Melanesian New Guinea*. London: Routledge & Kegan Paul.

Marck, J., 2008. 'Proto Oceanic Society Was Matrilineal'. *Journal of the Polynesian Society* 117: 345–382.

Martin, K., 2013. *The Death of the Big Men and the Rise of the Big Shots: Custom and Conflict in East New Britain*. New York: Berghahn Books.

Maseland, R., 2018. 'Is Colonialism History? The Declining Impact of Colonial Legacies on African Institutional and Economic Development'. *Journal of Institutional Economics* 14: 259–287.

Mauro, P., 1995. *'C*orruption and Growth'. *Quarterly Journal of Economics* 110: 681–712.

May, R.J. (ed.), 1982. *Micronationalist Movements in Melanesia*. Canberra: Research School of Pacific Studies, Department of Political and Social Change (Monograph 1).

May, R.J., 1989. 'The Impact of Early Contact in the Sepik'. In S. Latukefu (ed.), *Papua New Guinea: A Century of Colonial Impact 1884-1984*. Port Moresby: National Research Institute & University of Papua New Guinea.

May, R.J., 1997. '(Re?)Discovering Chiefs: Traditional Authority and the Restructuring of Local-Level Government in Papua New Guinea'. Canberra: Australian National University, Research School of Pacific and Asian Studies, Department of Political and Social Change (Discussion Paper 18).

May, R.J. and R. Anere (eds), 2002. *Maintaining Democracy: The 1997 Elections in Papua New Guinea*. Waigani: University of Papua New Guinea, School of Humanities and Social Sciences, Department of Politics.

May, R.J., R. Anere, N. Haley and K. Wheen (eds), 2013. *Election 2007: The Shift to Limited Preferential Voting in Papua New Guinea*. Canberra: ANU E Press.

Meggitt, M., 1965. *The Lineage System of the Mae-Enga of New Guinea*. Manchester: Manchester University Press.

Meggitt, M., 1982. 'History of Enga Local Government Councils'. In B. Carrad, D. Lea and K. Talyaga (eds), *Enga: Foundations for Development*. Armidale: University of New England, Department of Geography.

Michalopoulos, S. and E. Papaioannou, 2013. 'Pre-Colonial Ethnic Institutions and Contemporary African Development'. *Econometrica* 81: 113–152.

Modjeska, N., 1982. 'Production and Inequality: Perspectives from Central New Guinea'. In A.J. Strathern (ed.), *Inequality in New Guinea Highlands Societies*. Cambridge: Cambridge University Press.

Morris, I., 2010. *Why the West Rules — For Now: The Patterns of History, and What They Reveal About the Future.* New York: Farrar, Straus and Giroux.

Mosko, M.S., 1994. 'Junior Chiefs and Senior Sorcerers; the Contradictions and Inversions of Mekeo Hierarchy'. *History and Anthropology* 7: 195–222.

Munster, P.M., 1986. *A History of Contact and Change in the Goroka Valley, Central Highlands of New Guinea, 1934–1949*. Geelong: Deakin University (PhD thesis).

Murdock, G.P, 1969. *Ethnographic Atlas*. Pittsburgh: University of Pittsburgh Press.

Murray, H., 1929. *Native Administration in Papua*. Port Moresby: Government Printer.

Nekitel, O.I.M.S., 1998. *Voices of Yesterday, Today & Tomorrow: Language, Culture and Identity*. New Delhi: UBS Publishers' Distributors.

Neumann, K., 1992. *Not the Way It Really Was: Constructing the Tolai Past*. Honolulu: University of Hawaii Press (Pacific Islands Monograph 10).

North, D.C., 1990. *Institutions, Institutional Change and Economic Performance*. Cambridge: Cambridge University Press.

Nunn, N. and L. Wantchekon, 2011. 'The Slave Trade and the Origins of Mistrust in Africa'. *American Economic Review* 101: 3221–3252.

Oliver, D.L., 1955. *A Solomon Island Society: Kinship and Leadership among the Siuai of Bougainville*. Cambridge: Cambridge University Press.

Oliver, D.L., 1973. *Bougainville: A Personal History*. Melbourne: Melbourne University Press.

Oliver, M. (ed.), 1989. *Eleksin: The 1987 National Election in Papua New Guinea*. Port Moresby: University of Papua New Guinea.

Oram, N.D., 1971. 'The London Missionary Society Pastorate and the Emergence of an Educated Elite in Papua'. *Journal of Pacific History* 6: 115–132.

Oram, N.D., 1981. 'The History of the Motu-Speaking and Koita-Speaking People According to Their Own Traditions'. In D. Denoon and R. Lacey (eds), *Oral Tradition in Melanesia*. Port Moresby: University of Papua New Guinea and Institute of Papua New Guinea Studies.

Oram, N.D., 1989. 'The Western Motu Area and the European Impact, 1872–1942'. In S. Latukefu (ed.), *Papua New Guinea: A Century of Colonial Impact 1884-1984*. Port Moresby: National Research Institute and University of Papua New Guinea.

Otto, T., 1994. 'Feasting and Fighting: Rank and Power in Pre-Colonial Baluan'. *History and Anthropology* 7: 223–239.

Pawley, A., 1982. 'Rubbishman, Commoner, Big-Man, Chief? Linguistic Evidence for Hereditary Leadership in Proto-Oceanic Society'. In J. Siikala (ed.), *Oceanic Studies: Essays in Honour of Aarne A. Koskinen*. Helsinki: Finnish Anthropological Society.

Pawley, A., 2007. 'The Origins of Early Lapita Culture: The Testimony of Historical Linguistics'. In S. Bedford, C. Sand and S.P. Connaughton (eds), *Oceanic Explorations: Lapita and Western Pacific Settlement*. Canberra: ANU E Press (Terra Australis 26).

Pawley, A. and R. Green, 1973. 'Dating the Dispersal of the Oceanic Languages'. *Oceanic Lingustics* 12: 1–67.

Pawley, A. and M. Ross, 1993. 'Austronesian Historical Linguistics and Culture History'. *Annual Review of Anthropology* 22: 425–459.

Podolefsky, A., 1984. 'Contemporary Warfare in the New Guinea Highlands'. *Ethnology* 23: 73–88.

Posner, D.N., 2004. 'The Political Salience of Cultural Difference: Why Chewas and Tumbukas Are Allies in Zambia and Adversaries in Malawi'. *American Political Science Review* 98: 529–545.

Posner, D.N., 2005. *Institutions and Ethnic Politics in Africa*. Cambridge: Cambridge University Press.

Powell, H., 1960. 'Competitive Leadership in Trobriand Political Organization'. *Journal of the Royal Anthropological Institute* 90: 118–145.

Reay, M., 1982. 'Lawlessness in the Papua New Guinea Highlands'. In R.J. May and H. Nelson (eds), *Melanesia: Beyond Diversity*. Canberra: Australian National University, Research School of Pacific Studies.

Reesink, G., 2005. 'Sulka of East New Britain: A Mixture of Oceanic and Papuan Traits'. *Oceanic Linguistics* 44: 145–193.

Regan, A.J., 2000. '"Traditional" Leaders and Conflict Resolution in Bougainville: Reforming the Present by Re-Writing the Past?' In S. Dinnen and A. Ley (eds), *Reflections on Violence in Melanesia*. Canberra: Asia Pacific Press.

Reilly, B., 2004. 'Ethnicity, Democracy and Development in Papua New Guinea'. *Pacific Economic Bulletin* 19(1): 46–54.

Reilly, B., 2008. 'Ethnic Conflict in Papua New Guinea'. *Asia Pacific Viewpoint* 49: 12–22.

Reilly, B. and R. Philpott, 2002. 'Making Democracy Work in Papua New Guinea: Social Capital and Provincial Development in an Ethnically Fragmented Society'. *Asian Survey* 42: 906–927.

Riley, I.D., 1983. 'Population Change and Distribution in Papua New Guinea: An Epidemiological Approach'. *Journal of Human Evolution* 12: 125–132.

Robinson, J.A., 2009. 'Botswana as a Role Model for Country Success'. Helsinki: United Nations University, World Institute for Development Economics Research (Research Paper 2009/40).

Rodrik, D., 1999. 'Where Did All the Growth Go? External Shocks, Social Conflict, and Growth Collapses'. *Journal of Economic Growth* 4: 385–412.

Rodrik, D., A. Subramanian and F. Trebbi, 2004. 'Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development'. *Journal of Economic Growth* 9: 131–165.

Rohatynskyj, M.A., 2001. 'On Knowing the Baining and Other Minority Ethnic Groups of East New Britain'. *Social Analysis* 45(2): 23–40.

Roscoe, P., 2000. 'New Guinea Leadership as Ethnographic Analogy: A Critical Review'. *Journal of Archaeological Method and Theory* 7: 79–126.

Roscoe, P., 2014. 'The End of War in Papua New Guinea: "Crime" and "Tribal Warfare" in Post-Colonial States'. *Anthropologica* 56: 327–339.

Roscoe, P. and R. Scaglion, 1990. 'Male Initiation and European Intrusion in the Sepik: A Preliminary Analysis'. In N. Lutkehaus, C. Kaufman, W.E. Mitchell et al. (eds), *Sepik Heritage: Tradition and Change in Papua New Guinea*. Durham (NC): Carolina Academic Press.

Rosi, P. and L. Zimmer-Tamakoshi, 1993. 'Love and Marriage among the Educated Elite in Port Moresby'. In R.A. Marksbury (ed.), *The Business of Marriage: Transformations in Oceanic Matrimony*. Pittsburgh: University of Pittsburgh Press (ASAO Monograph 14).

Ross, M., 1994. 'Areal Phonological Features in North Central New Ireland'. In T.E. Dutton and D.T. Tryon (eds), *Language Contact and Change in the Austronesian World*. Berlin: Mouton de Gruyter.

Ross, M., 2008. 'A History of Metatypy in the Bel Languages'. *Journal of Language Contact* 2: 149–164.

Ross, W.A., 1969. 'The Catholic Mission in the Western Highlands'. In K.D. Inglis (ed.), *The History of Melanesia*. Canberra: Australian National University, Research School of Pacific Studies (with University of Papua New Guinea).

Rowley, C.D., 1958. *The Australians in German New Guinea 1914–1921*. Melbourne: Melbourne University Press.

Rowley, C.D., 1965. *The New Guinea Villager: A Retrospect from 1964*. Melbourne: F.W. Cheshire.

Rumsey, A., 1999. 'Social Segmentation, Voting, and Violence in Papua New Guinea'. *Contemporary Pacific* 11: 305–333.

Rumsey, A., 2010. 'Lingual and Cultural Wholes and Fields'. In T. Otto and N. Bubandt (eds), *Experiments in Holism: Theory and Practice in Contemporary Anthropology*. Oxford: Blackwell.

Rumsey, A., 2019. 'Melanesia as a Zone of Language Diversity'. In E. Hirsch and W. Rollason (eds), *The Melanesian World*. London: Routledge.

Sachs, J., 2005. *The End of Poverty: How We Can Make It Happen in Our Lifetime*. London: Penguin Books.

Sack, P., 1973. *Land between Two Laws: Early European Land Acquisitions in New Guinea*. Canberra: Australian National University Press.

Saffu, Y. (ed.), 1996. *The 1992 Papua New Guinea Election: Continuity and Change in Electoral Politics*. Canberra: Australian National University, Research School of Pacific and Asian Studies, Department of Social and Political Change (Monograph 23).

Sahlins, M., 1958. *Social Stratification in Polynesia*. Seattle: University of Washington Press.

Sahlins, M., 1963. 'Poor Man, Rich Man, Big-Man, Chief: Political Types in Melanesia and Polynesia'. *Comparative Studies in Society and History* 5: 285–303.

Sand, C., 2002. 'Melanesian Tribes vs. Polynesian Chiefdoms: Recent Archaeological Assessment of a Classic Model of Sociopolitical Types in Oceania'. *Asian Perspectives* 41: 284–296.

Scaglion, R., 1996. 'Chiefly Models in Papua New Guinea'. *Contemporary Pacific* 8: 1–31.

Schwartz, T., 1963. 'Systems of Areal Integration: Some Considerations Based on the Admiralty Islands of Northern Melanesia'. *Anthropological Forum* 1: 56–97.

Schwoerer, T., 2021. 'The Eastern Highlands of New Guinea (1930-1965)'. In J. Helbling and T. Schwoerer (eds), *The Ending of Tribal Wars: Configurations and Processes of Pacification*. New York: Routledge.

Scragg, R.F.R., 1954. *Depopulation in New Ireland: A Study of Demography and Fertility*. Port Moresby: Department of Public Health.

Scragg, R.F.R., 1977. 'Historical Epidemiology in Papua New Guinea'. *Papua New Guinea Medical Journal* 20(3): 102–109.

Seligmann, C.G., 1910. *The Melanesians of British New Guinea*. Cambridge: Cambridge University Press.

Sillitoe, P., 1979. *Give and Take: Exchange in Wola Society*. Canberra: Australian National University Press.

Smith, P., 1989. 'Education Policy in Australian New Guinea: A Classic Case'. In S. Latukefu (ed.), *Papua New Guinea: A Century of Colonial Impact 1884–1984*. Port Moresby: National Research Institute and University of Papua New Guinea.

Smith, R.M., 1981. *Conversion and Continuity: Response to Missionization in the Papua New Guinea Highlands*. Canberra: Australian National University (PhD thesis).

Snowden, C., 1981. 'Copra Co-Operatives'. In D. Denoon and C. Snowden (eds), *A Time to Plant and a Time to Uproot: A History of Agriculture in Papua New Guinea*. Port Moresby: Institute of Papua New Guinea Studies.

Somare, M., 1975. *Sana: An Autobiography of Michael Somare*. Port Moresby: Niugini Press.

Spriggs, M., 1997. *The Island Melanesians*. Oxford: Blackwell Publishers.

Spriggs, M., 2007. 'The Neolithic and Austronesian Expansion within Island Southeast Asia and into the Pacific'. In S. Chiu and C. Sand (eds), *From Southeast Asia to the Pacific: Archaeological Perspectives on the Austronesian Expansion and the Lapita Cultural Complex*. Taipei: Academica Sinica.

Spriggs, M., 2008. 'Ethnographic Parallels and the Denial of History'. *World Archaeology* 40: 538–552.

Spriggs, M., 2011. 'Archaeology and the Austronesia Expansion: Where Are We Now?' *Antiquity* 85: 510–528.

Standish, B., 1978. 'The "Big-Man" Model Reconsidered: Power and Stratification in Simbu'. Boroko: Institute of Applied Social and Economic Research (Discussion Paper 22).

Standish, B., 1983. '"They Want to Be the Highest Always": The Elections in Simbu'. In P. King (ed.), *Electoral Politics in Papua New Guinea: Studies on the 1977 National Elections*. Waigani: University of Papua New Guinea Press.

Standish, B., 1989. 'The Elections in Chimbu'. In P. King (ed.), *Pangu Returns to Power: The 1982 Elections in Papua New Guinea*. Canberra: Australian National University, Research School of Pacific Studies, Department of Political and Social Change (Monograph 9).

Standish, B., 1996. 'Elections in Simbu: Towards Gunpoint Democracy?' In Y. Saffu (ed.), *The 1992 Papua New Guinea Election: Change and Continuity in Electoral Politics*. Canberra: Australian National University, Research School of Pacific and Asian Studies, Department of Social and Political Change (Monograph 23).

Stanner, W.E.H., 1953. *The South Seas in Transition: A Study of Post-War Rehabilitation and Reconstruction in Three British Pacific Dependencies*. Sydney: Australasian Publishing Company.

Stephen, M., 1979. 'An Honourable Man: Mekeo Views of the Village Constable'. *Journal of Pacific History* 14: 85–99.

Stolberg, D., 2017. 'Historical Sociolinguistics in Colonial New Guinea: The Rhenish Mission Society in the Astrolabe Bay'. *Journal of Historical Sociolinguistics* 3: 55–92.

Strathern, A., 1970. 'Kiap, Councillor and Big Man: Role-Contrasts in Mount Hagen'. In M.W. Ward (ed.), *The Politics of Melanesia: Papers Delivered at the Fourth Waigani Seminar*. Canberra: Australian National University, Research School of Pacific Studies.

Strathern, A., 1971. *The Rope of Moka: Big-Men and Ceremonial Exchange in Mount Hagen, New Guinea*. Cambridge: Cambridge University Press.

Strathern, A.J., 1977. 'Contemporary Warfare in the New Guinea Highlands'. *Yagl-Ambu* 4: 135–146.

Temple, O., S. Dalsgaard and S. Kamene, 2015. 'Effect of Early Language Education on UPNG Students' Academic Performance'. *Language and Linguistics in Melanesia* 33(2): 77–92.

Terrell, J.E., K.M. Kelly and P. Rainbird, 2001. 'Foregone Conclusions? In Search of "Papuans" and "Austronesians"'. *Current Anthropology* 42: 97–124.

Terrell, J.E. and R.L. Welsch, 1990. 'Trade Networks, Areal Integration, and Diversity along the North Coast of New Guinea'. *Asian Perspectives* 29: 156–165.

Terrell, J.E. and R.L. Welsch, 1997. 'Lapita and the Temporal Geography of Prehistory'. *Antiquity* 71: 548–572.

Thurnwald, R.P., 1934. 'Pigs and Currency in Buin: Observations about Primitive Standards of Value and Economics'. *Oceania* 5: 119–144.

Torrence, R. and P. Swadling, 2008. 'Social Networks and the Spread of Lapita'. *Antiquity* 82: 600–616.

TPNG (Territory of Papua and New Guinea), 1964. 'Establishment of Government Stations: New Guinea'. Konedobu: Department of Native Affairs (unpublished typescript).

TPNG (Territory of Papua and New Guinea), 1968. *Village Directory*. Port Moresby: Department of District Administration.

Tran, L.N., A.E. Bauze, K.H. Nguyen, S. Firth and E. Jimenez Soto, 2011. 'Under-Five Mortality Analysis for Papua New Guinea'. Brisbane: University of Queensland, School of Population Health.

Trompf, G.W., 1994. *Payback: The Logic of Retribution in Melanesian Religions*. Cambridge: Cambridge University Press.

UN (United Nations), 2020. *Human Development Report 2020 – The Next Frontier: Human Development and the Anthropocene*. New York: UN.

Van de Kaa, D.J., 1972. *The Demography of Papua and New Guinea's Indigenous Population*. Konedobu: Bureau of Statistics.

Warry, W., 1987. *Chuave Politics: Changing Patterns of Leadership in the Papua New Guinea Highlands*. Canberra: Research School of Pacific Studies, Department of Political and Social Change (Monograph 4).

Watson, J.B., 1965. 'The Significance of a Recent Ecological Change in the Central Highlands of New Guinea'. *Journal of the Polynesian Society* 74: 438–450.

Watson, J.B., 1977. 'Pigs, Fodder and the Jones Effect in Postipomoean New Guinea'. *Ethnology* 16: 57–70.

Watts, M., 2004. 'Resource Curse? Governmentality, Oil and Power in the Niger Delta, Nigeria'. *Geopolitics* 9: 50–80.

Weeks, S., 1993. 'Education in Papua New Guinea 1973-1993: The Late-Development Effect?' *Comparative Education* 29: 261–273.

Welsch, R.L., J. Terrell and J.A. Nadolski, 1992. 'Language and Culture on the North Coast of New Guinea'. *American Anthropologist* 94: 568–600.

Westermarck, G., 1984. '"Ol i Skulim Mipela": Contemporary Warfare in the Papua New Guinea Eastern Highlands'. *Anthropological Quarterly* 53: 114–124.

Weymouth, R., 1988. 'The Unevangelised Fields Mission in Papua, 1931-1981'. *Journal of Pacific History* 23: 175–190.

White, G. and L. Lindstrom (eds), 1997. *Chiefs Today: Traditional Pacific Leadership and the Postcolonial State*. Stanford (CA): Stanford University Press.

White, O., 1965. *Parliament of a Thousand Tribes: A Study of New Guinea*. London: Heinemann.

Wiessner, P. and A. Tumu, 1998. *Historical Vines: Enga Networks of Exchange, Ritual and Warfare in Papua New Guinea*. Washington (DC): Smithsonian Institution Press.

Wigley, S.C., 1971. *Tuberculosis and New Guinea 1871–1971*. Port Moresby: Department of Public Health.

Williams, F.E., 1933. 'Trading Voyages from the Gulf of Papua'. *Oceania* 3: 139–166.

Williams, F.E., 1940. *Drama of Orokolo: The Social and Ceremonial Life of the Elema*. Oxford: Clarendon Press (Territory of Papua Anthropology Report 18).

Williams, F.E., 1944. 'Mission Influence amongst the Keveri of South-East Papua'. *Oceania* 15: 89–141.

World Bank, 2017. *World Development Report 2017: Governance and the Law*. Washington (DC): World Bank.

Worsley, P., 1957. *The Trumpet Shall Sound: A Study of 'Cargo' Cults in Melanesia*. London: MacGibbon and Kee.

Wurm, S.A. and S. Hattori (eds), 1981. *Language Atlas of the Pacific*. Canberra: Australian Academy of the Humanities in association with the Japan Academy.

Young, M., 1994. 'From Riches to Rags: Dismantling Hierarchy in Kalauna'. *History and Anthropology* 7: 263–278.

Z'Graggen, J.A., 1975. *The Languages of the Madang District, Papua New Guinea*. Canberra: Australian National University, Research School of Pacific Studies, Department of Linguistics (Pacific Linguistics B41).

Ziltener, P. and D. Muller, 2007. 'The Weight of the Past: Traditional Agriculture, Socio-Political Differentiation and Modern Development in Africa and Asia: A Cross-National Analysis'. *International Journal of Comparative Sociology* 48: 371–415.

Zurenuoc, M. and F. Herbert, 2017. 'The Creation of Two New Provinces in Papua New Guinea — A Story of False Starts and near Fatal Collisions'. Canberra: Australian National University, Coral Bell School of Asia Pacific Affairs, State Society and Governance in Melanesia Program (Discussion Paper 2017/2).