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FERTILITY AND THE ECONOMIC VALUE OF CHILDREN: EVIDENCE FROM NEPAL

by

MELANIE DAWN FROST

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ABSTRACT

ECONOMIC THEORIES OF FERTILITY TRANSITION: EVIDENCE FROM NEPAL

By Melanie Dawn Frost

Economic theories of fertility transition were the dominant paradigm during the second half of the twentieth century, but in more recent years their relevance has been questioned and sociological or cultural explanations have become more popular in the demographic literature. In many cases theoretical perspectives have been abandoned all together in favour of an empirical approach leaving economists and demographers isolated from each other.

Using data collected in Nepal as part of the World Bank's Living Standards Measurement Study, which includes large amounts of economic information at the household and individual level, the feasibility of the economic approach to fertility transition is tested in the context of rural Nepal. In order to do this it was necessary to check the quality of the Nepali fertility data. This was done and it was concluded that higher parity births tend to be underreported, while childlessness tends to be over-reported. It was also found that the quality of urban fertility data is suspect – rural fertility is focussed on throughout since it relates to economic variables in a substantively different way to urban fertility.

The relationships between fertility and the main components of income in rural Nepal – agriculture and remittances – are studied. It is hypothesised that fertility and landholding are related through the land-security hypothesis and the land-labour hypothesis. The land-security hypothesis holds that owned landholding and children are substitutes because they are both forms of security, while the land-labour hypothesis holds that cultivated landholding and fertility are complements since children can assist in tilling the land. Remittances are purported to affect fertility through increasing son preference. This is because remittances provide security and sons send remittances.

Support is found for all the hypothesised relationships. This implies that the people of rural Nepal value children for the economic benefits they can bring. The economic value of sons vastly outweighs that of daughters and the findings of this thesis indicate that increasing remittances and high levels of functionally landless households mean that son preference is unlikely to disappear soon.

Overall, this research highlights that economic theories of fertility transition have been unjustly neglected and are important for our understanding of fertility determinants – they are therefore extremely relevant for both demographers and policy makers.

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DECLARATION OF AUTHORSHIP

I, Melanie Frost

declare that the thesis entitled

Fertility and the Economic Value of Children: Evidence from Nepal

and the work presented in the thesis are both my own, and have been generated by me as the result of my own original research. I confirm that:

- this work was done wholly or mainly while in candidature for a research degree at this University;
- where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
- where I have consulted the published work of others, this is always clearly attributed;
- where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
- I have acknowledged all main sources of help;
- where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
- none of this work has been published before submission

Signed: ……..

Date:…….

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धन्यबाद्

CHAPTER 1

INTRODUCTION

1.1. Aims

Explaining fertility levels has kept researchers occupied for many decades, but a complete understanding of how fertility is determined still eludes us. Economic theories have been side-lined by demographers in recent years in favour of ideational and socio-cultural theories despite the fact that governments continue to use financial incentives to encourage childbearing, implying that they, at least, believe that economic factors affect childbearing. Very few recent attempts have been made within the demographic literature to test whether or not economic factors actually affect fertility in a specific context, especially in the developing world and researchers have tended to ignore theoretical approaches to understanding fertility in favour of an ungrounded empirical approach.

The aim of this thesis is to investigate the idea that economic factors influence fertility because individuals make decisions about their fertility (at least partly) by weighing up the economic costs and benefits of children. More specifically this thesis seeks to show that in Nepal there are situations where a larger number of children is economically advantageous and situations where children are used as a substitute for other forms of security; the evidence found raises the possibility that this may be the case in other areas of the developing world and supports the idea that economic theories of fertility transition may be important for understanding how fertility levels are determined. This thesis identifies the state of economic theories of fertility transition and seeks to highlight some of the gaps in those theories. Existing theories will be clarified and the identified gaps narrowed through using available data in a new way.

Over twenty five years ago Schutjer et al. (1983) stated that:

"An understanding of fertility behaviour in rural areas of less developed countries is essential to policy efforts aimed at lowering fertility and slowing population growth. Since the majority of the developing world resides in rural areas, and will continue to do so… a substantial proportion of total world growth in the next two decades will be due to growth in the rural sector." (p.393)

The relevance of this statement is little diminished today, over quarter of a century later. In 2005 it was estimated that 73 per cent of people in the least developed countries of the world still resided in rural areas, while in Nepal the corresponding percentage was 84.2 (United Nations 2008). The world is urbanising – by 2050 even the least developed countries are expected to have less than 50 per cent of their population living in rural areas – but still it is in rural areas where the highest fertility persists. And it is rural areas where the greatest gains can be made in terms of fertility reduction.

It is most likely that children will have a positive net economic value in rural areas where the labour market is not active and children can assist in agricultural production and help their parents in later life both physically and monetarily. Children in urban and more developed areas, on the other hand, are likely to be relatively costly.

1.2. Nepal

Nepal is a small landlocked country in South Asia; bordered by two countries with over a billion people in them – India and China – Nepal has been constantly buffeted by the strong forces surrounding it and by turmoil within. Sudden and violent political change has been an all too common feature of the Nepali landscape in recent years with the recently ended Maoist insurgency, the massacre of the royal family in 2001 and the abolition of the world's last Hindu monarchy. While Nepal is now a republic and a democracy it is also a fragile state prone to *bandhs* (shutdowns) and regular protests by the Maoists.

Nepal is an incredibly diverse country; focusing on the dichotomous north-south, Hindu-Buddhist, Indian-Tibetan influences would belie a great deal of Nepal's ethnic, cultural, linguistic and topographic diversity. There are at least 70 different languages spoken by more than 103 different ethnic or caste groups, and while over 80 per cent of the population claim to be Hindu, the fact is that in Nepal Buddhism and Hinduism show great

similarities, due in no small part to their shared past. Tribal and Shamanic religions are also significant.

From the summit of *Sagarmatha* (also known as *Chomolungma* or Everest) at 8,848m above sea level to the outer reaches of the Gangetic plain in the Southern Terai which is barely above 70m Nepal covers virtually every kind of terrain imaginable, with more than five different climatic zones. Nepal is split into three different ecological zones: the mountains (or *himal*) bordering Tibet in the north, the hills encompassing the Kathmandu Valley and the terai (planes) in the south. While it is the Himalayan communities that are most famously disadvantaged due to the harsh environment in which they live, the terai is also an area of great poverty where high population density and lack of infrastructure mean that the fertile land in the area does not yield the advantages one would expect. Indeed, while the poverty of the mountains is not surprising the continued poverty of the terai is proof that good geographical circumstances do not necessarily lead to prosperity. Semple (2007) argues that mountainous regions the world over are simply "regions of much labour and little leisure, of poverty today and anxiety for the morrow, of toil-cramped hands and toil-dulled brains" while she goes on to argue that "in the fertile alluvial plains are wealth, leisure… [and] centres where commodities and ideas are exchanged" (p.67) – this is most certainly not the case in the densely populated terai.

Nepal is an extremely poor country with the majority of its population involved in agriculture and little else; the gross national income (GNI) at purchasing power parity (PPP) per capita for 2007 was the lowest of any country in Asia for which the data was available (World Bank 2009). Opportunities are increasing but a severe lack of communications within the country itself continues to hinder development greatly. Out of 75 administrative districts in the country nine have no roads at all and a further four only have a few kilometres of dirt track; the country has just two regularly maintained highways. In rural areas goods are mainly transported (as they always have been) on foot and this, at least in part, means that polyandry is still common in some communities since men spend up to half their time away from home trading goods (Sapkota 2007).[1]

[1] The Loba population of Mustang are the most notable polyandrous group, but others exist in the Mid-Western and Far-Western Mountains.

In terms of its demography Nepal is home to around 29 million people (Central Bureau of Statistics and UNFPA Nepal 2003). Almost 50 per cent of the population lives in the terai, which accounts for just 23 per cent of the land area, while just 7 per cent live in the mountains, which account for 35 per cent of the land area. Figure 1.1 shows the distribution of the population according to the Nepali Central Bureau of Statistics; The Kathmandu Valley stands out as being the most densely populated area, followed by the areas bordering with India, while the North of the country is very sparsely populated. The rate of natural increase for the country as a whole is around two per cent and it is projected that the population will reach nearly 50 million by 2050 (Central Bureau of Statistics (CBS) 2010); given that the terai is already suffering from overpopulation, with dangerous levels of deforestation meaning an increase in landslides and a serious firewood shortage and virtually all arable land currently being used and limited opportunities for multi-cropping, such a high growth rate could have disastrous consequences (Massey, Axinn and Ghimire 2010).

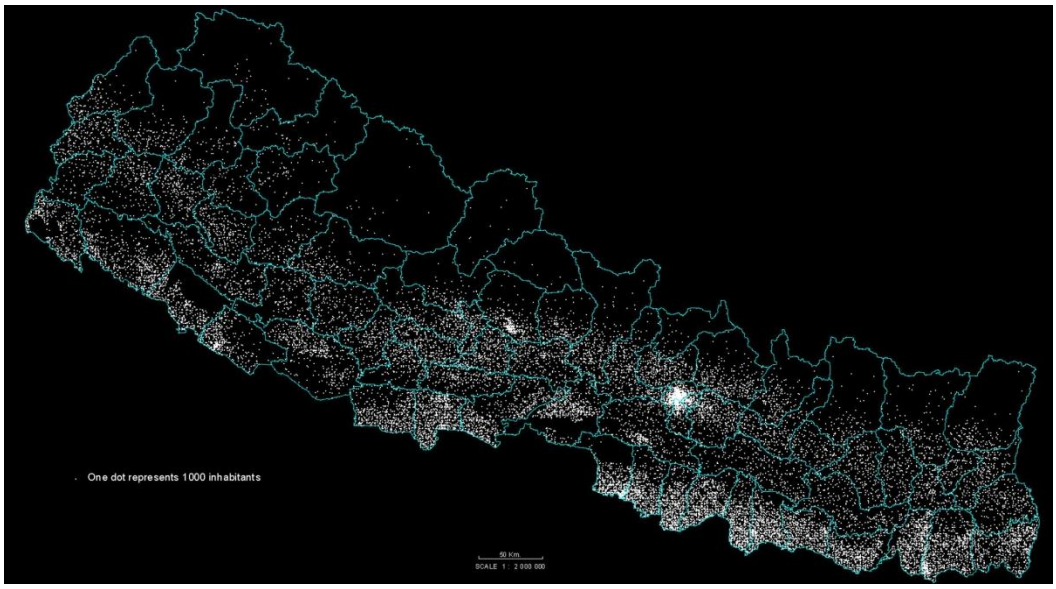

Figure 1.1 The geographical distribution of population in Nepal (source: www.cbs.gov.np)

The population of Nepal is currently very young, with almost forty per cent of the population aged under fifteen and just four per cent aged over sixty five, though life expectancy is a healthy 64 (United Nations Development Programme 2009). Fertility in Nepal is high for South Asia, with a total fertility rate (TFR) of 3.1 (Ministry of Health and Population (MOHP) [Nepal] and New ERA and Macro International Inc. 2007), which is only topped by Pakistan, though there is a lack of recent estimates; the 2011 Census and 2011 Demographic and Health Survey should provide more up to date estimates soon.

Nepal saw a rapid decline in its fertility rate at the beginning of the millennium when it fell from an estimated 4.1 to 3.1 in the space of five years (Karki and Krishna 2008), but no estimates of the TFR are available after the end of the Maoist insurgency raising the question of whether or not this substantial decline was due to internal displacement and insecurity during the fighting. The government views fertility and the associated growth rate as too high and its official policy states that fertility reduction is key to development in Nepal – they aim to reduce the fertility rate to around 2.1 as soon as possible (National Planning Committee 2007).

1.3. Research Aims

The overarching aim of this thesis is to consider how economic considerations might impinge upon childbearing decisions theoretically and to test if those theoretical relationships exist in practice. This is no small task and thus the remit of this thesis is constrained to Nepal. The aim is to see if the main components of income in rural Nepal affect fertility. These components are agriculture and remittances and between them they account for at least two thirds of income in rural Nepal (Central Bureau of Statistics (CBS) 2009). However, in order to address the potential relationship between the main sources of income and fertility it was first necessary to study the wider literature on economic theories of fertility; it was also necessary to test the quality of fertility data. Having looked at the broader research context and ascertained the quality of fertility data it was then possible to study in depth the relationship between agriculture (specifically landholding[2]) and fertility, and then between remittances and fertility.

The main research questions which this thesis hopes to address are listed below. The first question is addressed in Chapter Two, the second and third in Chapter Three, the fourth in Chapter Four and the final one in Chapter Five.

i. What are the gaps in current economic theories of fertility decline?

[2] This thesis considers the relationship between landholding and fertility but agriculture has many aspects and these may well be related to fertility as well. Landholding was chosen due to a longstanding theoretical debate on this subject.

ii. **How good is the quality of fertility data available in the Nepal Living Standards Surveys? Is it possible to identify those parts which are sound and also those parts which are not?**

iii. **What is the nature, form and extent of son preference in Nepal?**

iv. **What is the nature of the relationship between landholding and fertility? Do the following two hypotheses hold?**
   a. **The Land-Labour Hypothesis.**
   b. **The Land-Security Hypothesis.**

v. **How are remittances related to childbearing decisions? Do couples living in communities with high levels of remittances have more children *ceteris paribus*?**

1.4. Organisation of the Thesis

The thesis is split into six chapters. This first chapter includes the rationale behind this research as well as some background information on the country of Nepal and the research questions that this thesis hopes to address.

The second chapter contains a detailed literature review considering the development of economic theories of fertility transition. This chapter identifies those questions left unanswered in the current literature concentrating on the concept of children being used as an insurance good and how this concept fits within the broader context of economic theories of fertility transition. It also forms a more detailed explanation of how this thesis will contribute to the current literature.

The data used is studied in the third chapter; three Nepal Demographic and Health Surveys and two Nepal Living Standards Surveys are compared in order to assess the quality of the fertility data within these five surveys. It is concluded that there are problems with all five surveys but that parts of the data are of a sufficient standard in order to carry out detailed analyses. Son preference is also studied and substantial evidence for its continued high prevalence in Nepal is presented.

Chapter Four looks at the relationship between arable landholding and fertility in Nepal. Elucidating the causal mechanisms through which these two factors operate has

been neglected in recent times. Two hypotheses are considered: (1) landholding decreases fertility since both children and land provide security, (2) access to operational landholdings increases the desire for children since they are a source of cheap and secure labour. The Nepal Living Standards Surveys show, not only that there is a relationship between landholding and fertility but also that the direction of this relationship is exactly as the two hypotheses predict.

Chapter Five looks at the relationship between fertility and remittances. It is hypothesised that the demand for sons will be affected by chances of future labour migration and remittances. It is found that remittances are related to sons ever borne and that more profitable regional labour migration destinations are related to both sons ever borne and the proportion of children ever borne who are sons.

The final chapter pulls together the results from the thesis and places them within the context of the existing research in order to draw out commonalities in these analyses. A discussion of the policy implications, limitations and future directions for research is also included.

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CHAPTER 2

LITERATURE REVIEW: ECONOMIC THEORIES OF FERTILITY TRANSITION

2.1. Introduction

The 'economic model' of fertility transition was, for a considerable part of the last half-century, the dominant theoretical framework used to explain declining fertility rates. The origins of this approach are to be found in work by Leibenstein (1957) and Becker (1960) from the late 1950s, though demographic transition theory (from which this economic approach stems) was originally developed by Notestein (1945). The specifically economic approach to fertility transition was developed further with the addition of a "household production function" to the framework (Becker 1965; Schultz 1973) thus creating a model of "the market" for children that looked remarkably similar to any other market described by microeconomics, and it is this approach which has been most pervasive. All the neo-classical microeconomic assumptions were generally held to be necessary for the theory to hold (though subsequently some were relaxed): fixed preferences, maximising behaviour etc. In the 1970s some of this theory was questioned by Caldwell (1976) who introduced the concept of intergenerational flows, whilst, in the 1980s the idea of children as insurance strategies was hotly debated. Other developments were made such as the possibility for parents to display altruism towards their offspring. The notion of child quality was also developed (originally proposed by Becker &

Lewis (1973)) and since its inception has become a cornerstone of the economic approach (Cigno 1991). It was not until the 1990s that these economic theories began to fall out of favour and the feeling was that "the economic approach [had] not lived up to early expectations" (Robinson 1997, p.63). "Diffusionist" (Watkins 1987) and "ideational" (Cleland and Wilson 1987) theories became the more popular explanatory tools and the proponents of such theories set down what they considered to be a series of fatal flaws in the economic approach. Nonetheless some suggested that the economic approach could yet yield results (Bryant 2007; Caldwell and Caldwell 2004; Robinson 1997) and carefully listed the numerous flaws in existing theory which would need to be rectified; unfortunately little has been done to correct many of these flaws. Indeed the further development of theory in this area has been somewhat sparse over the past decade.

Over the next few pages we will look in more detail at the main branches of economic theory that have been developed since the 1950s. We will then proceed to look at the main criticisms that have been levelled against these approaches and consider the implications that these flaws have for future research in the area.

It is clear that studying fertility using an economic framework has limitations, but it is my belief (and hopefully one which is supported by this thesis) that this approach still provides the best basis available for the systematic study of the determinants of human fertility. Of course fertility is not solely governed by economic concerns, but this does not stop such a framework being useful. It is also important to understand that an economic framework can include concepts from other disciplines such as sociology for example. Many different disciplines engage in the study of human fertility and it seems likely that they all have a valuable contribution to make, especially if they can engage with one another.

2.2. Demographic Transition Theory: Beginnings

Notestein (1945) posited that fertility in premodern countries had been kept *artificially* high through a series of props: "religious doctrines, moral codes, laws, education, community customs, marriage habits and family organisations" (p. 39).

He further argued that high fertility was strictly necessary for the survival of the society involved. Formulations of demographic transition theory based on Notestein do not need to view premodern societies as the slightest bit rational, but rather tend to see these societies as guided in their actions almost exclusively by "attitudes, beliefs, traditions and irrationality" (Caldwell 1976, p.119). Somewhat bizarrely even propagates of economic theory characterise "the process of development as [the] changes from traditions and fatalism towards modern concepts and rationalism" (United Nations 1974, p.2). The whole point of economic theories of fertility transition is that it is *economically rational* to have large numbers of children in such societies. Notestein's theory, whilst the basis for much demographic theory that proceeded after him, was not an economic theory as such since it did not require economic rationality in the pre-transitional phase. Caldwell (1976) found the ethnocentricity of such statements so abhorrent that he felt it necessary to state in no uncertain terms that "the underlying assumption of [his] study [was] that *all* societies are economically rational" (p.327 – emphasis added). It is a basic point, but nonetheless an important assumption if we (and the economic approach) are to proceed.

It is also important to be clear that it is *societies* who must be economically rational and not each individual within a society; Leibenstein (1974) makes just this mistake stating that "the theory presumes that people behave as if they are buying consumer durables in a well organised market and in a calculating manner at every step of the way" (p.469). Though, this may be disingenuous to Leibenstein and it is possible to read 'people' as meaning 'people in general' rather than 'all individual persons' (though I am inclined to think he did mean the latter at the time). Either way, many demographers have read economic theories to mean that every individual must be behaving rationally; Blake (1968) was particularly unimpressed by this assumption which she mistakenly deemed as necessary for economic theories.

Proponents of the new home economics approach (more of which later), however, argue that "even if consumers behaved randomly, the market behaviour of an average of consumers would not differ from the behaviour of consumers who obeyed the assumption of rationality" (Keeley 1975, p.465). Naturally there are

those who wholeheartedly disagree with viewing childbearing in this manner: some find it plain offensive whilst others think it is mildly amusing. For example, a reviewer of Becker's theory states that they do not wish "to deny that family formation is a choice process. But equally then, a Shakespearean sonnet is a choice process over the English language under a fourteen-line budget constraint." (Arthur 1982, p.397). Blake (1968) meanwhile seems to wilfully misinterpret economic theories at every turn claiming that they "propound a *solely* economic analysis of fertility desires" (p.15 – emphasis in original) and thus they are necessarily invalidated by the existence of "societal support for the family" (p.23) and the lack of "direct control over the acquisition of *wanted* children" (p.15 – emphasis in original) never mind the existence of unplanned or unwanted children. Blake's position, while out-dated, is unfortunately still relatively common amongst demographers.

Demographic transition theory basically posits a link between mortality decline and subsequent fertility decline, which is a pattern observed again and again in the course of countries development (Davis 1963; Notestein 1945). If the demographic transition theory were a sufficient explanation of fertility change then couples' desired family size could be assumed to reflect a specific intended number of surviving children rather than a certain number of births. Thus, fertility would essentially be a function of infant and child mortality. Various potential mechanisms have been identified through which mortality may influence fertility behaviour. For example if couples have children to maximize the probability of ending up with a certain desired family size a reduction in mortality rates would mean they must control their fertility somehow or end up with a family size larger than they would desire. Essentially, an excess in the number of living children (over the desired number) should trigger a reduction in fertility. Similarly, under conditions of high child mortality, couples may choose not to use contraceptives in order to maximise fertility as an insurance strategy (Cain 1983). In less unpredictable environments, with lower mortality and with greater control over fertility, insurance strategies can be supplanted with replacement strategies.

2.3. New Home Economics

As any economics textbook will tell you the study of economics is concerned with the allocation of scarce resources to meet competing ends. The New Home Economics, inspired by the consumer choice theory, posited that rational, self-interested people will choose to consume those goods that yield them the greatest utility – and that this notion could be extended to include "virtually any activity involving scarce resources" (Keeley 1975, p.461). Under this framework, the changing balance between costs and benefits of childbearing drives parental demand for children and is therefore the fundamental force propelling fertility decline. Children contribute to utility while they use scarce resources. The rationale is worth illustrating at some length given its centrality:

> *"In all countries and in all eras, fertility follows changes in the demand for children, driven by considerations of both economics and taste. Fertility fails to fall in the early phases' of most countries development, and falls thereafter, for a straightforward reason: the relative costliness of extra children fails to rise until a fairly advanced stage in development… it appears therefore, that the fertility transition parallels the long term pattern of child costs and benefits." (Lindert 1983, p.495-496)*

Initially the demand was formulated as being for total number of births (an idea Bongaarts (1993) returned to later on in an attempt to empirically validate theory), but this was quickly updated to surviving children. By the 1970s this had been further amended and the theory stated that what was being demanded was not children per se but a flow of child services. This final point was vital since it allowed the empirical fact that there is an inverse relationship between income and fertility. Of course it could be argued that children are an inferior good with a negative income elasticity of demand. However, this is somewhat counter-intuitive given that an inferior good is substituted for higher quality goods when income

increases[3]; arguably children are a unique asset though meaning that no substitutes exist (though the uniqueness of child services is an idea with which some disagree e.g. Robinson 1997 p.66). This puzzle resulted in several developments of the original model; the cost of children was reformulated to include the value of parental time i.e. the opportunity cost, typically taken as the shadow price of women's time. Education and women's labour force participation were incorporated into the model to reflect their impact on fertility decisions as factors that further influence opportunity cost of time. The celebrated notion of child quality was also conceived (Becker and Lewis 1973), which will be discussed in more detail later. At this point we provide the most sweeping (and obscure) definition of quality to be found in any of the literature reviewed: "the *quality* of a person [is] defined as the maximum amount of goods to which such a person can gain access by his or her own best endeavours over a lifetime, given the level of parental benefactions received" (Cigno 1991, p.86).

Returning to the notion of child services (the flow of utilities produced for parents by their children). Investing in children can be characterized as a type of intergenerational transfer because children can be thought of as inputs into the household production function that can produce additional household income (Pörtner 2001), old-age security (Schultz 1997), and emotional rewards (Stecklov 1997). Children can also provide insurance against shortfalls in income under other circumstances in the absence of social safety nets (Cain 1983). These are the sorts of considerations to which we refer when discussing child services.

Child services can be split into current and future consumption. In terms of current consumption Children can work at home or as wage labour, and older children with their own households can remit money to their parents. In many less developed countries children begin to work a substantial number of hours per day from age of five or six. Indeed in extreme circumstances parents can (and do) sell their children as bonded labour (Pörtner 2001). In terms of future consumption

[3] The definition of an inferior good is a good for which demand decreases when income increases e.g. gruel or Tesco Value Baked Beans or any other low-quality goods (Varian 2003, p.96).

intergenerational transfers provide a mechanism for parents to smooth their consumption patterns in the absence of formal capital markets and social security systems that may otherwise preclude savings. Parents use children as a means to shift income from a period of present (certain) income to future periods with uncertain income. This is the sort of behaviour which economic theory would predict on the basis of Friedman's permanent income hypothesis or Modigliani's life-cycle hypothesis (Carlin and Soskice 2005, p.207-220).[4]

Concentrating on parents' motive for childbearing as a means of old-age income support, the perception of the minimal number of children necessary to meet support needs will be a function of (a) the likelihood of children surviving to adulthood, (b) the potential support they can expect from their children, and (c) the availability of alternative means of support (Cain 1983).

2.4. Insurance Strategies

In less developed countries insurance and credit markets are likely to be under-developed or even absent. While capital markets are thought to provide better savings opportunities than children, which could then be substituted for intergenerational transfers, in many countries of the developing world these options simply do not exist. Any need or desire for insurance would therefore have to be satisfied by other means, and under these circumstances children could serve as a form of incomplete insurance good for patriarchal risk, also influencing fertility decisions (Cain 1981, 1983, 1985, 1986b; Pörtner 2001; Robinson 1986).

Whilst much emphasis has been placed on the use of children to insure against old age hardships there are other reasons why children might be seen as security against risk. For example, when mortality is high, there is a greater probability of being widowed at a young age. In societies where males are the main source of income generation, this may lead to economic hardships particularly for women (due

[4] Though these are competing theories of consumption they share the idea that consumers attempt to smooth consumption over their lifetime on the basis of (sometimes extremely limited) present knowledge.

to a high risk of widowhood, divorce, and abandonment) but this can be averted if the woman has a sufficient number of children to maintain a reasonable standard of living. While in some societies extended families provide a safety net, in others, older children are relied on as a primary source of income support. Children can therefore (in certain settings) provide insurance against becoming a destitute widow. But as mortality decreases, there is likely to be less need to rely on numerous children for an adequate level of support, and therefore less pressure to have many children to protect against future loss (Cain 1981). In northern India, patriarchal risks and political deterioration, along with poor access to credit and weak interventions by the state, lead to a higher demand for sons. In contrast, in southern India, where the risk environment is more benign and access to substitutes easier, emphasis on sons is less (Cain 1981).

Doepke (2005) argues that even assuming parents do see children as a form of insurance it is not clear what this means in practice. Supposing that parents were risk averse then they might have a large number of children in order to ensure some survivors to take care of them in old age; however, this would expose them to the risk of having a large number of surviving children to support in early life thereby lowering their consumption at this point. Doepke specifically argues that in moderate (and possibly high) mortality contexts where children are used as an incomplete insurance good "risk aversion with respect to the parent's own consumption tends to work against precautionary demand for children" (p.359). However Blacker et al. (2005) noted that a "study of southwestern Uganda showed that some parents still clung to the belief that their children were an insurance for their old age, even though this was becoming *increasingly illusory*… the recent rises in child mortality [could be seen] as a potential impediment to fertility decline, with parents opting for additional children to replace those who have died. This hypothesis is however *difficult* to verify" (p.369 – emphasis added). Pörtner attempted to verify the need for insurance against loss of permanent income using data from Guatemala and concluded "that increased risk of disasters that requires command of manpower to handle them will increase fertility and lower the education of children, while disasters where a larger family is of little use have a negative effect on fertility" (Pörtner 2001, p.122)

Cain's security-fertility theory has seen a variety of criticisms thrown at it, though many of these seem to stem from misunderstandings especially about the nature of insurance (Cain 1986a, 1986b; Thomas 1993). The majority of objections do not recognize the environment of risk necessary (so clearly stressed by Cain) or they fail to agree that there is a total lack of good substitutes for children. Others fundamentally agree with Cain and argue that "governmental programmes- whether land reform, credit provision, fair produce markets among others- can have massive generalized effects on security, and thus reduce the level of fertility" (Thomas 1993, p. 358).

2.5. Altruism

More recently altruistic considerations have been included since "introspection and casual observation suggest that parents may be altruistic towards their children" (Cigno 2006, p.268). For anyone wishing for a more empirically grounded justification then consider that 'some parents spend more than is strictly required to bring… children into the world and keep them alive; [this] must mean that some parents derive utility from (or feel morally compelled to take account of) the quality of the life of their children' (Cigno 1991, p.97). By introducing a dynastic utility maximization to the parents' utility function, the model is modified to acknowledge that parents derive pleasure from their children and their future progeny. Dynastic implies that the present decision maker acts on the behalf of future generation by making bequests and investments in addition to current expenditures (Cigno 1991 developed such a model).

Cigno and Rosati (1992) also attempted to compare old-age self-interest to intergenerational altruism as incentives for childbearing through the impact of social security. Using a three-period overlapping generations framework, a model of old age support was constructed whereby young working parents lend resources to their children at a given interest rate and then collect on these loans for old-age support. This is consistent with most microeconomic theories in less developed economies, which find that until children reach their teenage years, they represent a net economic loss to parents. The flow of resources appears to be from the parental

generation to the younger generation, and is reversed only at later ages (Stecklov (1997) found this in the Cote D'Ivoire). Under a model of altruism, children's utility is specified as part of the parents' utility. The researchers find that greater access to capital markets or fully funded social security coverage exerts a negative effect on fertility in the self-interest model. However, in the altruistic model greater access to capital markets and social security benefits has a positive effect on fertility. When tested empirically, their Italian time-series data supported the self-interest model.

Cigno (2006) again attempted to justify the inclusion of altruism by hypothesising that renegotiation proof family constitutions exist upholding a status quo about the direction and timing of intergenerational transfers:

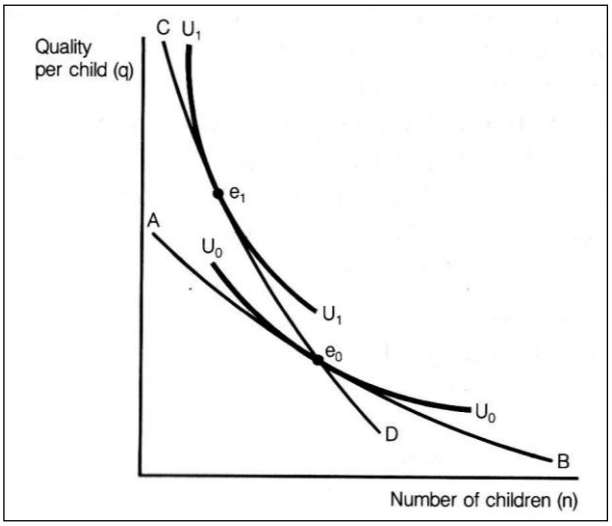
"For a constitution to be self-enforcing, adults must be at least as well-off complying with it, as going it alone in the market. For a constitution to be renegotiation-proof, the adults of the day must have no interest in amending it. Parental altruism makes it more likely that a constitution with these characteristics exists. But, if an agent is so rich and altruistic that she wants to give her children (not only while they are young but also when they grow up) more than the constitution prescribes, the constitution is obviously irrelevant." (p.281)

Though interesting the model is mainly applicable in a developed world context – The assumption is made that savings are possible for a start; in the previous section we saw that it was this very lack in the developing world which likely leads to higher fertility.

2.6. Quantity and Quality

Children can be viewed more as an incomplete insurance good or as a special type of capital good (or maybe both). They are long-lived assets involving both initial acquisition and periodic upkeep costs and their value is derived from the flow of child services they provide to the parents. The utility that parents derive from their children will depend, therefore, on the level of child services their child produces. The level of child services is held to be determined by the "quality" of the child. Parents can choose to have higher quality children by investing in their health

and education. They will be faced with a budget constraint that illustrates a trade off between quantity and quality of children. This view is simplistic, though, since Becker's original formulation (Becker 1991; Becker and Lewis 1973) of the quantity-quality budget constraint showed a multiplicative relationship, not a substitutive one. Quantity and quality are jointly determined and Becker explicitly showed that the price of children increases as quality of children increases and furthermore that the cost of quality increases as the quantity of children increases (see figure 2.1).



2.1 Interaction between quantity and quality: indifference curves and budget curves of a typical family (source: Becker 1991, p.147)

The concept of child quality provided an explanation for the empirical evidence that the quantity of children is not positively related to income, which would seem to imply that children are an inferior good. However "if the income elasticity of demand for quality…exceeds the elasticity of demand for quantity then higher income persons will face a higher price of quantity relative to quality" and therefore choose fewer higher quality children even though the income elasticity of demand for both may be highly positive (Keeley 1975, p.463). There are some major problems with the inclusion of quality into the model of fertility transition.

Firstly, how are we to define quality? Originally quality was seen as a form of human capital investment and so a fairly narrow definition involving education and health expenditures was provided (leaving out the genetic lottery element of quality). Subsequently, however, the definition of quality has been broadened so far as to

include “the maximum amount of goods to which a person can gain access by his or her own best endeavours given the levels of parental benefactions received” (Cigno 1991, p.86).

This brings us to our second problem, which is how we are to measure such a variable. Given that the notion of child quality is not particularly well defined in any of the literature (and where it is there either seems to be something lacking or the definition is ridiculously sweeping) the real issue is how anyone is ever to test the quantity-quality relationship empirically. Strulik (2004) makes the empirical decision to quantify child quality “as a two-dimensional vector of child health and schooling”, which follows from Becker (1991). Of course such simplifications are necessary in order to test these theories empirically and quality, for Strulik, is viewed as costs that parents have a choice over, but will nonetheless generally be motivated to incur (just at different levels); education and health are the obvious examples of this type of expenditure, though there may be others. Cigno’s definition might be “approximated by the value of all the parents’ home-time inputs, plus all purchased inputs, plus all bequests” (Robinson 1997, p.64), though it is unclear where we would find such data. Leibenstein (1975) argues that this notion of child quality is, therefore, essentially an empirical dead end:

“The object of my informal survey [of economic theories of fertility] was to examine theories where fertility is viewed in terms of an observable, namely, completed family size, or some other adjusted index of observable fertility. It seems to me unlikely for child services to be an observable in most cases… This leaves open the question as to what it is that the theory has to say about the relationship between income differences and observable fertility differences.” (p.469)

Robinson (1997) wholeheartedly agrees with this and furthermore points out that the model as it stands does not sufficiently explain how a couple may match quality and quantity to get the correct level of child services that they require:

“It begs important questions including what factors, internal or external to the household, lead couples to prefer higher-quality children? Are there really choices

open to couples, as they see the matter, among technologies for producing child-services?" (p.70)

2.7. Easterlin & Crimmins: A Supply Function

The most notable omission from the traditional new home economics approach to fertility is that of a supply function. Easterlin sought to correct this (Easterlin and Crimmins 1985; Easterlin 1978) with a framework explicitly including supply, demand and regulation variables.

This framework divides the fertility transition into five phases: in the first phase there is an excess demand for children due to high mortality rates. A decline in infant mortality rates transforms this excess demand into excess supply which is affected even more by a reduction in demand once individuals observe the increased survival rates. This should motivate fertility control behaviour. Excess supply will then be steadily eliminated, though the precise timing of this will depend on the various costs of regulating fertility behaviour. Finally equilibrium will be achieved between demand and supply.

Whilst this theory is more complete, it still has very little to say about observed levels of fertility in premodern societies since:

"It is conditions relating to the supply of, not the demand for, children that govern observed fertility patterns. More generally, the theory of household choice is a demand theory, and is, in consequence, incomplete. The supply-demand framework that I developed with colleagues at Penn suggests that the determinants of fertility shift from supply to demand in the course of the demographic transition." (Easterlin talking in Macunovich 1997, p.127)

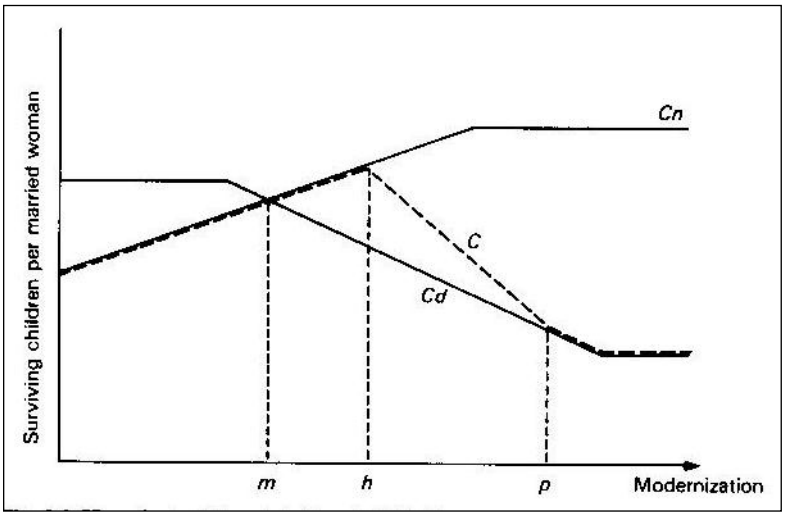


Figure 2.2 Hypothetical Trends in Supply (Cn), Demand (Cd), and the Number of Surviving Children (C) Associated with Modernisation. (Source: Easterlin & Crimmins 1985, p.27)

Figure 2.2 is often referred to as the Easterlin diagram. This diagram illustrates the five phases of Easterlin's model, but it also serves to show one of the criticisms levelled at it which is that "neither the motive for nor the cost of regulation appears as an explicit variable in this diagram…demand and supply define rather than cause motivation to control." (Robinson and Cleland 1992, p.108). This need not be the case though since it would be rather easy to include in the diagram fertility regulation costs (*RC* in Easterlin's terminology); precisely where we would place the *RC* curve is however problematic, which is probably what Robinson & Cleland were attempting to get at. Presumably, Easterlin would argue that *RC* must be higher than *Cn-Cd* between m and h since people are not motivated to actually regulate their fertility at this point. Between points *h* and *p*, *RC* would need to be of a sufficient magnitude to explain the difference between *C* and *Cd.* Finally *RC* would need to be small enough to allow *C* and *Cd* to coincide in stage five. It is, of course, pointed out in Easterlin & Crimmins (1985, p.28) that this diagram is highly simplified and that at the societal level these precise trends may well not be observable. The reasoning remains compelling though.

A further problem is that this framework (Like the New Home Economics approach earlier discussed) seems to assume that the desire for a final number of children is established regardless of spacing, timing or gender.

2.8. Decision Making

The issue of who makes decisions concerning family formation, how those decisions are made and when they are made is an important one. The idea that a couple makes a single decision about desired completed family size and then pursues this goal until it comes to fruition seems somewhat bizarre. One problem generally levelled at many of the models mentioned is that they are static and therefore ignore the possibility of dynamic decision making. Recently Pörtner & Ejrnaes (2004) suggested that the decision making process might be sequential and that couples would observe the genetic endowments of existing children before deciding whether or not to have another. Though sequentiality does not have to be so specific – couples might make decisions which are contingent on changes in their own circumstances (e.g. bringing forward childbearing to take advantage of unusually advantageous maternity leave or pay)[5]. Leibenstein (1957) also considered a model where fertility decisions were made at the margin. In fact, if decisions were made at the margin concerning utility to be gained from another child then this would not be too problematic for most frameworks; other issues concerning demand, however, are.

Firstly there is the issue of whether those in a developing world context can actually conceptualise demand for children and formulate concrete desires in this area. Opinion is split right down the middle; Caldwell & Caldwell (2004) argue that it is a mistake to think that every society can comprehend questions about "ideal family size" and that what they need is "contraception rather than concepts of contracepting" (p.16). Lee & Bulatao (1983) meanwhile are of the opinion that "this concept of demand is meaningful to the majority of couples in LDCs, who are generally able to cite some realistic number and provide verbal justification for their choice" (p.274). Family planning programmes are generally founded on the notion that couples can formulate a desired completed family size though Caldwell takes issue with this. Indeed, surveys show that some (and, in a few areas, many) couples

[5] This happened in Sweden when full maternity pay was given to women who had a second child within a certain time frame.

are not formulating desired family sizes since they respond to questions about their ideal family size with answers like “up to God”.

Assuming, however, that couples (or individuals at least) generally do configure a desired family size then there is the question of whether these desires will carry through into observable actions. Furthermore, whose demand will carry through. Most theories posit a single family utility function to be maximised subject to the *family* budget constraint (See Easterlin, Becker, Leibenstein, Cigno etc.). However, there is evidence that this is not sensible. Given that family planning programmes are generally implemented on the assumption that women don’t have the means to achieve the lower levels of fertility that they want it is absolutely necessary to ascertain whether or not women are genuinely in a position to make fertility decisions within the family situation; it is important to resolve this issue from both a practical and a theoretical point of view. As Eager (2004) points out “there is nothing obvious about the claim that women should [can or do] have the right to control their reproductive capabilities or have a right to make voluntary and informed choices about their reproductive and sexual health” (p.135). Voas (2003) concurs that women have generally been viewed as “the principal agents of fertility control” (p.628) when this is not a reasonable assumption in all contexts. Voas further points out that we have been overlooking a “potentially influential mechanism: the effects of partners’ holding different preferences” (p.628). The economic returns to childbearing (or if you will the flow of child services) could be different for male and female in a partnership, though this is not obviously the case; take, for example, the gain of political power in an area (see Lee & Bulatao 1983), which is likely to result in greater utility for a man in any patriarchal society.

Another point to consider is the possibility that women’s stated intentions do not conflict with their partners in any considerable way, but rather that women lack the ability to form autonomous fertility desires; A study of intentions and outcomes in Ghana (Derose and Ezeh 2005) found that men’s fertility intentions impacted greatly on the formation of women’s fertility preferences. In this context it was necessary for cultural norms to allow women lower fertility preferences before they generally formed them. If this pattern commonly exists in the developing world then the

discrepancy between observed fertility rates and desired family size (from the woman's perspective) may appear smaller than it actually is. In this sort of situation it may be the case that "fertility limitation may promote women's empowerment rather than that women's empowerment precipitates fertility decline" (Derose & Ezeh, p.207). This is very much in line with Voas (2003) who argues that cultural norms are likely to mediate between partners conflicting desires (i.e. in high fertility settings a partner desiring another child will be supported by this, whereas in low fertility settings a partner wishing to limit fertility will feel more legitimized). Furthermore, there is evidence that it is specifically men who "tend to be more pro-natalist in high-fertility areas and less interested in children in low fertility areas [and] either inclination would accentuate the impact of non-matching preferences" (p.633). Demographers focus a great deal on women's preferences when men's are of at least equal interest.

2.9. Caldwell and Intergenerational Flows

Caldwell's overarching thesis is that there are only two economically rational fertility regimes: in one situation there is no economic gain to be made from limiting fertility (so the rational response is to have an "indefinitely large" number of offspring) and that in the other there is economic gain to be made from such limitations (so the rational response is to have *no* children). This argument turns on the direction of "intergenerational flows", which can be towards the parents or towards the children. The explanation he posits for the wide variety of different observed fertility rates is thus that actual fertility is "determined by personal, social and psychological reasons, not economic ones" (Caldwell 1976, p.322). This standpoint entirely ignores the possibility that children might be used as an informal insurance good since it would be entirely possible for lifetime intergenerational flows to be towards the children, but for economically rational parents to desire children nonetheless for the purpose of consumption smoothing into old age and to guard against unexpected shocks. The value of child services depends on the point in parents' lives at which they are delivered. It is not just a question of a discount rate which reduces the present value of future services – it is a matter of the alternatives which are likely to be available at the time the services are delivered. If there are no

formal mechanisms for saving then regardless of the direction of intergenerational flows this makes sense, though I cannot guarantee the existence of such a situation. Caldwell may well disagree with this point since he once argued that 'children fit into a non-introspective society where they behave as their parents behave and where their role is to work when young and to care for the old' (Caldwell 1976 p.135). It is possible that Caldwell thinks having children for insurance purposes is not possible since parents do not actively consider (or "introspect") their options for provision in old age.

Caldwell levelled the charge of ethnocentricity against the vast majority of research carried out in the field prior to and during the 1970s; regrettably this point has been overlooked by many since he reiterated the point as late as 2004. Akin to this is that much of transition theory has been based on the European (or at any rate western) experience. Caldwell & Caldwell 2004 argue that it is a serious mistake to use European experience as a guide for present experiences in the developing world (p. 18), but not so much because there is a fundamental difference in the two processes, rather that they are part of "a *single* global transition" (p.19 – emphasis added). This might be a contentious point but the idea that the "theoretical framework is handicapped by its lack of historical perspective [in the relevant areas]" (Mbacké 1994, p.189) has been echoed by others, especially those demographers from developing world countries. Given the reliance on the European historical experience (admittedly this is in part due to the availability of data) this is an important point; understanding of the specific history of countries being studied is necessary in order to test any theory and thus to develop such theory further, or if necessary, discard it. This is not to say that we should disregard the west in a misguided attempt to achieve objectivity, but that it is paramount that we recognise the twin roles of a countries own history and westernisation in determining the speed and timing of fertility transition:

"The issue is not whether Western social structure is better or even whether it is more suited to modernisation; it is merely that the West has been able to export it because of the overwhelming economic strength it derived from the industrial revolution… The most important social exports have been the concept of the

predominance of the nuclear family with its strong conjugal tie and the concept of concentrating concern and expenditure on one's children. The latter does not follow from the former, although it is likely to follow continuing Westernisation; but the latter must be preceded by the former. There probably is no close relationship in timing between economic modernisation and fertility – and, if true, this may be the most important generalisation of our time. If another culture had brought economic development, a culture with a much less nucleated family system, industrialisation might well have proceeded far beyond its present level in the Third World without reversing the intergenerational flow of wealth" (Caldwell 1976 p.363)

It is in some ways slightly bizarre that Caldwell goes to such lengths to separate westernisation and modernisation when it might – and only might – be true that there is a difference; economic modernisation, meanwhile, is inescapably founded on western economic systems. It is not just the "nucleated family" which the west has exported, but advanced monetary systems as well. Furthermore, we must question whether the nuclear family was a prerequisite for the initial development of industrialisation; if this was the case then Caldwell's argument becomes irrelevant. Of course it is clearly not necessary for a country to adopt industrialisation once it has already been developed elsewhere, but this is a different matter.

2.10. Problems that Remain

It is worth reiterating at this point that the whole basis for studying fertility in this manner rests on an assumption of economic rationality; the precise nature of the decision making process within a household unit affects which version of which theory is the closest to reality and this decision making process is (or at least should be) at the foundations of any of these theories. Do couples make decisions at the beginning of their reproductive lives about the total number of children they desire and if so are these desires robust? Do couples make fertility decisions at the margin? Are these decisions economically rational in any way? Do cultural norms tend to enforce a particular partners view? Voas (2003) puts it thus:

"What do men and women want? How often – beyond the dictates of chance – do people marry others with compatible fertility preferences? And what happens when preferences conflict? Unless spouses are far more similar, or social forces far less influential, than we might expect, conflicting preferences may be a reason why fertility tends to be too high (or too low)" (p.644).

It seems that these fundamental questions have not been sufficiently addressed in the literature, though attempts have been made in the case of certain countries.

The issue of economic rationality lies at the base of all economic theories of fertility transition and needs to be resolved at the outset somehow (perhaps by axiom). However, many other problems are apparent, some perhaps insignificant, others less so:

i. Fertility declines in countries with low scores on development indicators cannot be explained by socio-economic theories.

It has been argued that economic or demand theories of fertility transition cannot explain why countries scoring so badly on standard socio-economic indicators have managed to reduce their fertility rates (take Bangladesh and Indonesia for example). This may be a problem with the scale of analysis. At the macro level it may be hard to find a relationship between fertility and standard measures of economic development. However, this does not mean that a relationship between economic factors and fertility does not exist at the micro level.

ii. The relationship between fertility and development indicators is weaker than predicted.

While some countries have lower fertility rates than their level of development would predict other have remarkably high fertility rates given their level of development. For example Zimbabwe has a fertility rate of 3.7, which is low compared with the average of 5.3 for the whole of Eastern Africa, and yet it ranks 169th (the lowest of any country) on the human development index (HDI). Saudi

Arabia on the other hand ranks 55th on the HDI and has a fertility rate of 3.8 (Population Reference Bureau 2010; United Nations 2010).

It might be, however, that this discrepancy is simply the result of trying to operationalize development in the wrong way – the HDI does not encompass many dimensions of poverty and development hence the widespread interest in the development of a multidimensional poverty index (Alkire and Santos 2010). As Bryant (2007) points out 'statistical agencies do not, for instance, try to measure mobility strategies, the opportunity cost of time spent with children, or the availability of nonfamilial mechanisms for obtaining labour and insuring against risk' (p.105). It is premature to assume that this relationship really is weaker than predicted.

iii. The relationship between fertility and development indicators has shifted due to the diffusion of ideas.

Diffusionist and ideational theories of fertility transition argue this point to show that economic theories do not sufficiently explain empirical patterns (see Bongaarts and Watkins 1996 for an example). However the empirical basis for this has been questioned: 'The most consistent movements in developmental thresholds, which have occurred in North Africa and West Asia, have been upward. Elsewhere there is sporadic evidence of declines, but most declines seem to have been weak' (Bryant 2007, p.122).

iv. The jointness of demand.

Children are generally produced as a result of a sexual act, an act which in and of itself produces pleasure for those involved in it. The jointness of demand refers to the fact that sexual pleasure is demanded irrespective of the demand for children and until we can break this logical tie between these two things measuring the demand for children per se will necessarily involve significant difficulties.

v. The complexity of child services

Essentially child services can be divided into three categories: consumption utility, labour productivity and old-age security (or other types of insurance) (Leibenstein 1957). Quantifying these things is a demanding task and this is especially true given that it is highly likely that there will be significant sex differentials involved (Cain 1983, 1985; Caldwell 1976). Furthermore we may question the extent to which children might exhibit diminishing marginal returns (Cigno 1991).

vi. Competition to child services

It is far from obvious that children are as special and unique as some would argue. Whilst this point has a particularly pressing relevance for the developed world[6] it is also particularly salient to the issue of insurance in a developing world context. The so called land-security hypothesis proposes that families in possession of more land will have fewer children, precisely because land ownership is a good substitute for children in terms of security (Stokes, Schutjer and Bulatao 1986). Cain (1985) opines that there is no real evidence for the land-security hypothesis and gives three reasons why land should not be viewed as a suitable substitute for fertility in terms of security in a risky environment: a) land is not a secure investment, b) land needs some form of management in order to produce a return and c) children provide a variety of benefits in old age (kinship for example). Stokes, Schutjer & Bulatao (1986) viewed it as "an open question whether children are more reliable long-term investments than landownership" (p.309) and little has been done in the last twenty years to end the dispute. Other alternatives to children as insurance have been posited such as mutual support networks, village networks and extended family (Robinson 1986), but Cain vehemently denies that these are suitable substitutes for childbearing. Whether such alternatives are indeed suitable substitutes for childbearing may depend on the societal level at which benefits are transferred. For example, if the unit at which old age security is provided is the village, or parish (as

[6] It has been suggested that there is no reason for a well-endowed couple to have any children at all, or at least not from an economic perspective when children are so costly and provide so few returns while other consumption goods are so widely available.

in early modern England) then it might be rational for a person to invest in the children of the parish as a whole, rather than in their own children. In certain cases it might therefore be rational for a couple to support others in bearing and bringing up an additional child rather than to have an extra child themselves. Clearly the existence (or absence) of good substitutes for child services is an important factor and one that requires further research.

This issue is covered in greater depth in Chapter 4 where the issue of landholding is considered more closely along with a more extensive review of the relevant literature.

vii. Conceptualising the supply of children

The supply of children (where it is included in a framework) is often seen as a predominantly biological restraint. In the Easterlin model transition involves the movement from a supply constrained environment to one where there is excess supply, but Easterlin himself concedes that the supply function in this model tells us virtually nothing about observable fertility, especially in transitional societies. However, children can be acquired from sources outside the household by means such as adoption and therefore a market can theoretically exist for children, and does exist in the real world (though it is rather minor). A further complaint levelled (particularly at Easterlin) is that 'no large, complex society seems to have experienced sustained overall "natural fertility", or a situation in which fertility was supply constrained' (Robinson 1997, p.68). However, this is disingenuous of Robinson since Easterlin states that "fertility in preindustrialised societies seems to be strongly determined…by a network of *sociological* and biological factors. Freedom of choice [by individuals] is almost absent. The couples have the number of children that biology and *society* decide to give them" (Easterlin & Crimmins 1985, p.5 – emphasis added). No framework suggests that a premodern society should actually experience natural fertility if this is defined as couples continually attempting to procreate as often as possible(as figure 2 shows). Regulation costs are included in Eaterlin's model (though there is ample scope for improvement in this area). Perhaps the terminology is confusing and it would make sense to include

societal constraints in the supply function. Furthermore it may make life easier to speak not of supply constrained environments but of the beginning of transition as the point where people's latent demand becomes effective or control at an individual level becomes feasible. Put succinctly, natural fertility may be most usefully defined as "the pattern and level of fertility that results when couples do not adjust their behaviour depending on the number of children already born" (Van de Kaa 2009, p.13); it is certainly the case that this type of regime was experienced in the past and it is this type of regime which a pre-transitional country experiences.

Whilst I don't think there is a problem with conceptualising supply in the way that Robinson does I do think that there may be an interesting avenue of research in terms of the societal constraints potentially imposed in premodern societies; this may well relate strongly to the issue of whose fertility preferences are carried through.

viii. Defining the costs of children

The following is a list of costs that a standard economic approach to fertility would include: joint home-time expended on the child (including market work lost by the mother during pregnancy); maintenance (including food, shelter, clothing etc.); education; entertainment costs[7]; opportunity costs in terms of wage rates; expenditures on improving quality (Becker 1991; Cigno 1991). The majority of the list is problematic mainly because of the high empirical demands that testing such a theory involves, but the inclusion of quality in the list makes this task virtually insurmountable.

ix. The Cost of not having children (or non-children)

When weighing up the utility of childbearing there has been a tendency to ignore the fact that not having children almost certainly also incurs costs. The use of contraception incurs a wide variety of costs including behavioural constraints such as moral/social acceptability, education/search costs, objective costs such as time-

[7] Obviously entertainment costs are likely to be substantially lower in the developing world if not negligible.

distance costs, monetary cost, storage and disposal and revisit costs and objective costs such as loss of privacy and impairment of sexual enjoyment (Robinson & Cleland 1992, p.117). These costs are not limited to contraceptive costs; there are the opportunity costs of not having children, for example. Suppose, for the sake of simplicity, that the net direct monetary costs of children are zero i.e. the costs and benefits of having children balance exactly. There are then the non-monetary costs as described by the New Home Economics School. If a couple decides not to have children, they lose these non-economic benefits, which therefore need to be set against the opportunity costs of lost income occasioned by having children. There are also the potential costs of alternative investments to provide substitutes for child services.

Such costs could, perhaps, be incorporated into theory, but to test them empirically would require data that simply does not exist. One suggested amendment to theory is to include contraceptive costs in the demand function, since it is argued that the cost of regulation will affect demand (Robinson 1997; Robinson and Cleland 1992).

x. Defining child quality

See section 2.6 for a full discussion of the child quality issue.

2.11. Research Implications

The key question, then, is what needs to be done in order to develop, test and modernise economic theories. There is the issue of measuring the utility derived from children (quantity and/or quality) and, if we were to take a Caldwellian approach then we would need to measure flows in the other direction as well. However, existing survey results are unlikely to allow full measurement of these flows; Caldwell (1976) argues that "A good study of a single village would be worth a great deal; defective work on a nation could be dangerously misleading" (p.365), though he is, of course, an anthropologist. A similar point might be made about research into preference formation. In order to understand who makes decisions on fertility levels within a family it would be necessary to compile longitudinal data

detailing fertility preferences of people from before any partnerships are formed through the full childbearing period looking at how and why preferences changed and what outcomes were observed. Furthermore, while one such study would be invaluable, studies of this sort in a variety of countries would be necessary in order to make any generalisations.

In relation to the list of 10 problems above, there are several obvious research mandates. In relation to ii and iii more needs to be done to draw a clear distinction between what economic theories predict and what ideational theories predict. Potter, Schertmann & Cavenaghi (2002) were of the opinion that despite finding a "strong and consistent relationship between the decline in fertility and measurable changes in social and economic circumstances" this did not prove economic theories of fertility to be the correct paradigm and argued that their findings had "little bearing on the relative importance of material versus ideational change." Furthermore they stated that "the indicators [used are] likely to be markers for both types of change and these two types of change have a complementary influence on fertility" (p.740). This implies that their study on fertility transition in Brazil using Brazillian censuses did not choose the independent variables used carefully enough, though levels of female education, female labour force participation and infant mortality are all sensible choices in and of themselves the addition of the proportion who were catholic seems to be a variable that refers mainly to ideational change. Furthermore the analysis was not carried out at the household level, but rather at a "microregion" level. Their pessimistic view about the possibility of testing economic and ideational models of fertility empirically is probably a result of their method. The only robust conclusion they make in relation to theory that "once the transition has begun, ideas are spread independently of development" (p.759) which is proposition iii in our list; they conclude that their analysis disproves this. I would argue that in order to conclude this definitively other countries would need to be analysed and that an improved set of covariates would need to be used. That said, Bollen, Glanville & Stecklov (2002) found that the choice of a specific economic status proxy was only important if the focus was on the effect of economic status, but "if the focus [is] on variables representing non-economic status, the estimated effects will be more robust" (p.94). Though, to say that we can use an economic proxy variable to represent something

non-economic and it does not matter which economic proxy we use in such a situation since the "estimated effects will be… robust" is somewhat troublesome since the interpretation of such proxies is still rather questionable. Thus the Brazilian analysis may well be sound grounds on which to refute problem iii. Nonetheless more research is needed.

Precisely which covariates would be sensible is again a matter for further research: what data would we require to make a full cost-benefit analysis of children? How should we include regulation costs – as part of the demand function (see Robinson 1997), the supply function or separately (see Easterlin & Crimmins 1985)?

2.12. Overall Conclusions

The result of this literature review has been to identify clearly where gaps in the literature on economic theories of fertility transition lie and to consider what kind of research could be done in order to plug these gaps.

Many areas of research require large amounts of high quality data and preferably panel data. Data of this sort is not readily available; the research mandate at the present time is, therefore, to work out what can be done with available data. While testing an overarching economic theory of fertility that will be applicable to all settings is probably not a realistic enterprise, it is possible to test individual hypotheses that relate economic circumstances to fertility. By looking at how economic circumstances might affect fertility in specific settings it should be possible to list concrete and verifiable hypotheses which can be tested using available data. If this task is undertaken in a variety of settings it will be possible to compile a list of which economic-fertility hypotheses – if any – hold in certain settings and from this it may be possible to make advances in a more general economic theory of fertility transition. At a less general providing concrete proof of any relationship between economic variables and fertility would support the need for further research in this area and help refute the naysayers who dislike the idea that fertility decisions might be made with a modicum of economic rationality.

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CHAPTER 3

FERTILITY DATA AND TRENDS IN NEPAL

3.1. Introduction

In the mid 1970s the Nepal Fertility Survey was conducted, providing the first national estimates of fertility levels in Nepal, a country which had been cut off from the world until 1956; the Total Fertility Rate (TFR) was estimated to be 6.3 (Ministry of Health 1977). By the early 1990s the TFR was estimated to be 5.3 in the Nepal Fertility, Family Planning and Health Survey (Nepal Family Planning and MCH Project 1993). The precise timing of the onset of fertility decline in Nepal is an area that has been hotly debated with estimates ranging from the early 1970s (Collumbien, Timæus and Acharya 1997) to the late 1980s (Shah and Cleland 1993).

Within this chapter recent fertility trends in Nepal are explored, focussing on levels, age specific rates, caste/ethnicity, regional differentials and son preference in order to provide a broader context for later chapters; the quality of fertility data from recent surveys is also studied. Studying the quality of the data available is paramount. As one expert warns: "notwithstanding widespread belief to the contrary, demographic measurement is not easy" (Potter 1977, p.335); furthermore "whether one uses data to make decisions affecting policy or action, or to draw conclusions affecting scientific knowledge, a failure to face up realistically to the difficulties of measurement can only lead one astray" (Seltzer 1973, p.5).

In order to study the nature of the relationship between economic factors and fertility transition (or, indeed, fertility more generally) it is necessary to have data containing information on both fertility and economic circumstances. In the developing world, the best source of information including both these things is the World Bank's Living Standards Measurement Study (LSMS). The LSMS was initiated in 1980 with the intention of "providing policy makers with data that [could] be used to understand the determinants of observed social and economic outcomes" (World Bank 2009). Since the project began over 70 LSMS surveys have been carried out in more than 40 countries. In principle this provides a wide range of opportunities for researching the relationship between economic variables and fertility, however, many LSMS surveys do not contain full birth histories, which provide the most comprehensive and valuable information for evaluating fertility. Additionally some LSMS surveys include a panel element, which is likely to be especially useful for helping to disentangle issues of causation. In terms of recent LSMS surveys including full birth histories and a panel element there are very few options: Nepal or Vietnam. Nepal is a more pertinent choice for research on the nature of fertility transition due to its mid-transitional status. Vietnam has been experiencing replacement level fertility for some time now and is therefore less salient to the issue of fertility transition than Nepal where fertility transition has been underway since the 1980s and has sped up spectacularly over the last decade or so (Collumbien et al. 1997; Karki and Krishna 2008).

Five national level sample surveys including full birth histories have been conducted in Nepal since 1996: two Nepal Living Standards Surveys (the NLSS I and the NLSS II) which were carried out as part of the World Bank's Living Standards Measurement Study (LSMS) and three Demographic and Health Surveys (the NDHS 96, NDHS 01 and NDHS 06). These surveys occurred respectively in 1996 (NLSS I and NDHS 96), 2001 (NDHS 01), 2004 (NLSS II) and 2006 (NDHS 06). There was also a census conducted in 2001, but fertility data is only available at district level[8] so it is not possible to use this to compare fertility as such.

[8] A small amount of data is also available at Village District Community (VDC) level.

3.2. Introduction to the Data

3.2.1. The Nepal Living Standards Surveys

The NLSS (conducted as part of the LSMS) has been conducted twice by the Nepali Central Bureau of Statistics (CBS) and consists of two cross-sectional samples and a panel sample: 3,388 households were surveyed in the NLSS I of which 1,232 were interviewed again for the panel section of the NLSS II. The NLSS II further sampled 4,008 households for a separate cross-sectional sample. The sample in both surveys was selected using a two-stage stratified sample – 12 households in each primary sampling unit (PSU), of which there were 275 in the NLSS I and 334 in the NLSS II. The households sampled for the second round of the panel survey were a simple random sample of those households in the NLSS I.

3.2.2. The Nepal Demographic and Health Surveys

The three NDHSs that have been conducted in Nepal are all standard Demographic and Health Surveys (DHSs), which are nationally representative household surveys that provide data for a wide range of monitoring and impact evaluation indicators in the areas of population, health, and nutrition. DHSs are often the best source of information on demographic indicators available for developing world countries. The DHS Survey methodology has the advantage of being widely used and tested, though this is no reason to assume automatically that the data is correct.

3.2.3. Assessing Data Quality

One of the aims of this chapter is to study the quality of fertility data in the NLSSs and the NDHSs. By comparing the fertility data in all five surveys it is hoped that the data in the NLSS surveys will be proved to be of sufficient quality to use it in analysis and be reasonably confident of any results that are gained from that analysis. It is of paramount importance to use the NLSS surveys since they provide extensive information on economic activities while the NDHS surveys, like all DHSs, provide very little in the way of economic information. In the NLSSs there is information on income (and all its constituent parts) as well as consumption, while in the NDHSs one would have to rely on wealth quintiles constructed on the basis of asset ownership using a principal component analysis. Thus, in order to look at economic

theories of fertility transition and the economic value of children the NLSS surveys are by far the superior choice.

It is not assumed that the NDHSs are correct, but since it is more common to use DHSs to assess fertility and the LSMS project is not often used in this way it will be instructive to study the validity of the LSMS fertility data by comparing this data with that from the DHS. It is highly unlikely that the five surveys would give both a consistent and incorrect picture. Thus, we are looking for internal consistency in order to verify the data.

The surveys are compared in a variety of different ways – looking at the total fertility rate (TFR), age specific fertility rates (ASFRs) and children ever born (CEB) by age group and in various different time periods. Some basic Poisson models are also compared that study the difference in fertility by caste/ethnicity and area of Nepal.

Ultimately it is shown that the fertility data in the NLSS II is of sufficient quality to proceed with certain analyses, while the fertility data in the NLSS I is of less robust quality. It is also concluded that there may be problems with the fertility data in the NDHSs as well as that in the NLSSs.

3.3. Population Age-Sex Structure

Before turning to look specifically at fertility it is instructive to look at the overall age-sex composition of the Nepali population, since this allows the comparison of survey data to the Census of 2001 and also provides an initial idea of data quality. Figures 3.1-3.6 show population pyramids for the two NLSSs, the three NDHSs and the Census.

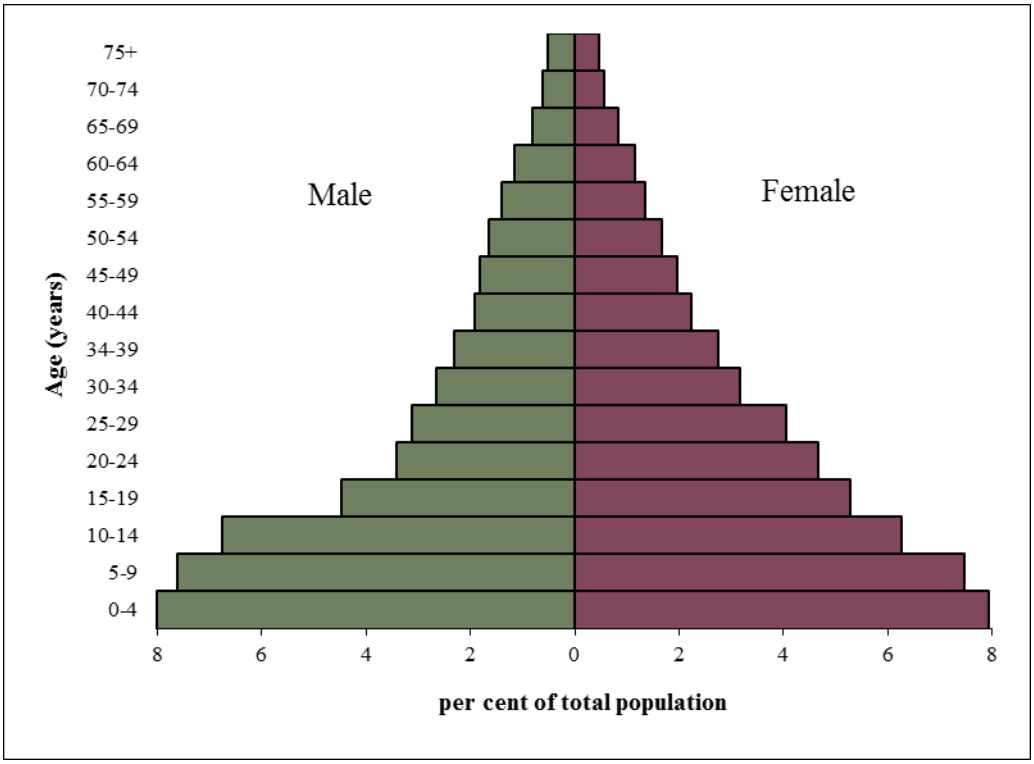

Figure 3.1 Population Pyramid of Nepal in 1996 from the NDHS 96 (Pradhan et al. 1997)

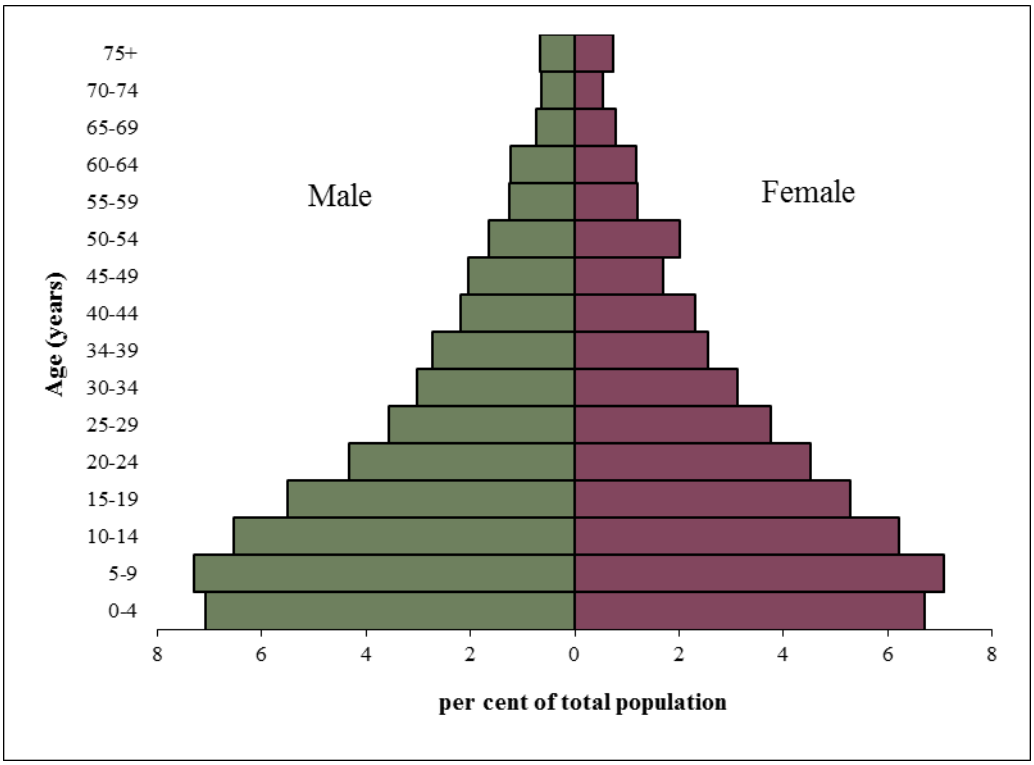

Figure 3.2 Population Pyramid of Nepal in 1996 from the NLSS I (Central Bureau of Statistics (CBS) 1996)

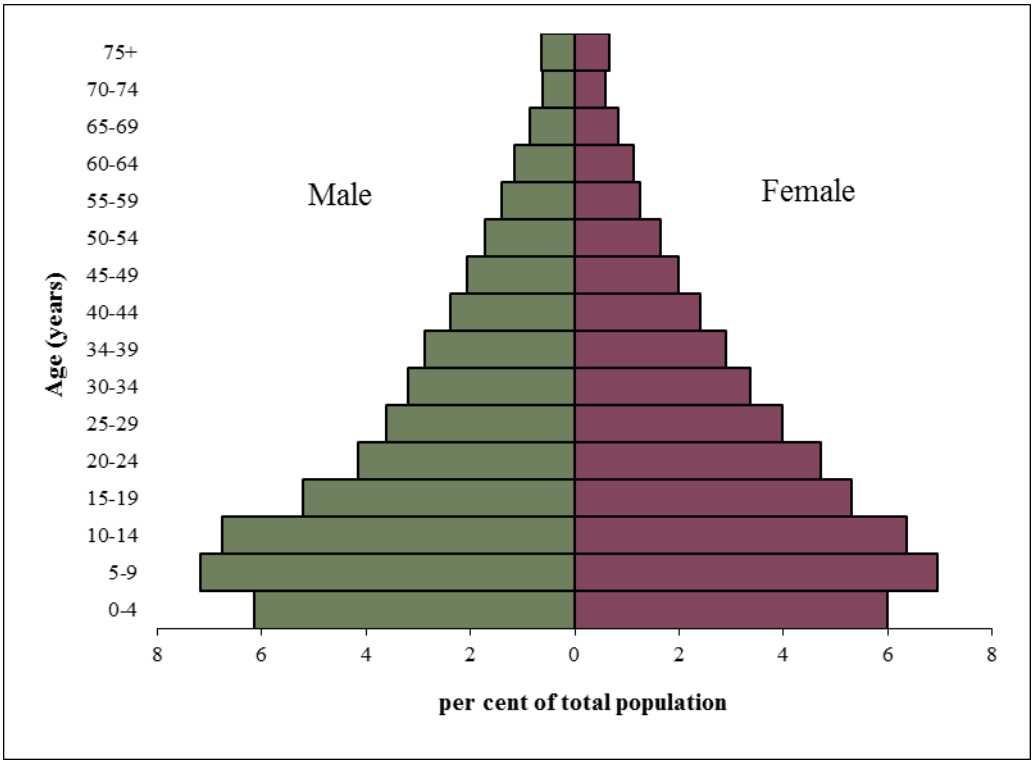

Figure 3.3 Population Pyramid of Nepal in 2001 from the Census (Central Bureau of Statistics (CBS) 2001)

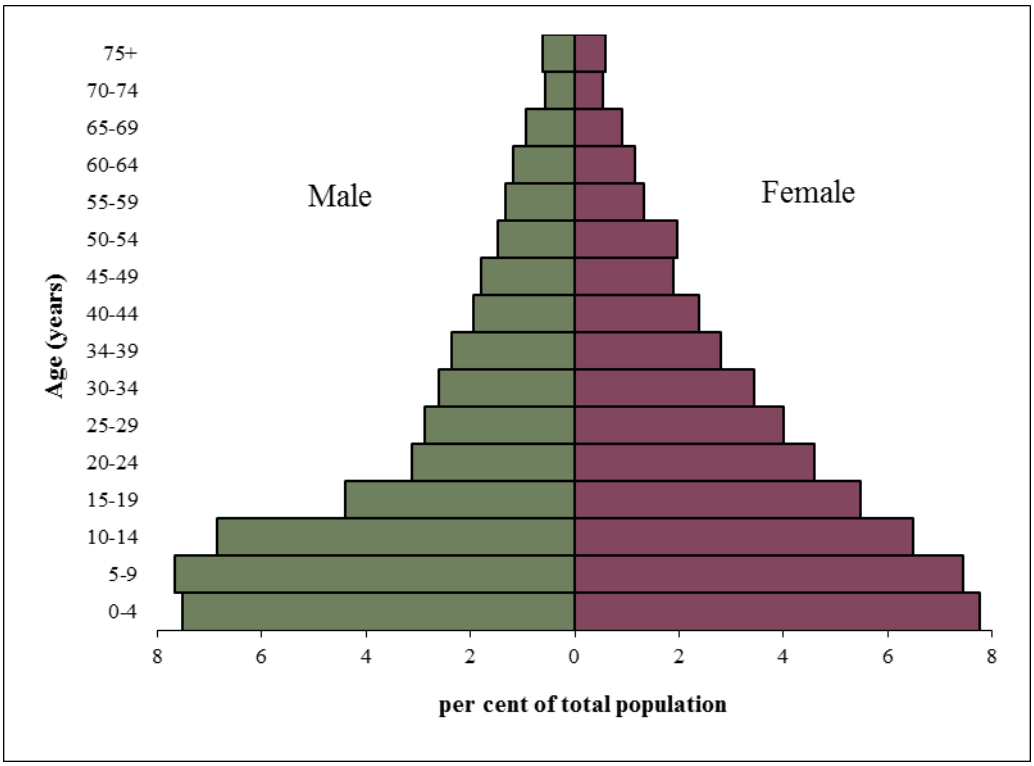

Figure 3.4 Population Pyramid of Nepal in 2001 from the NDHS 01 (Ministry of Health [Nepal] 2002)

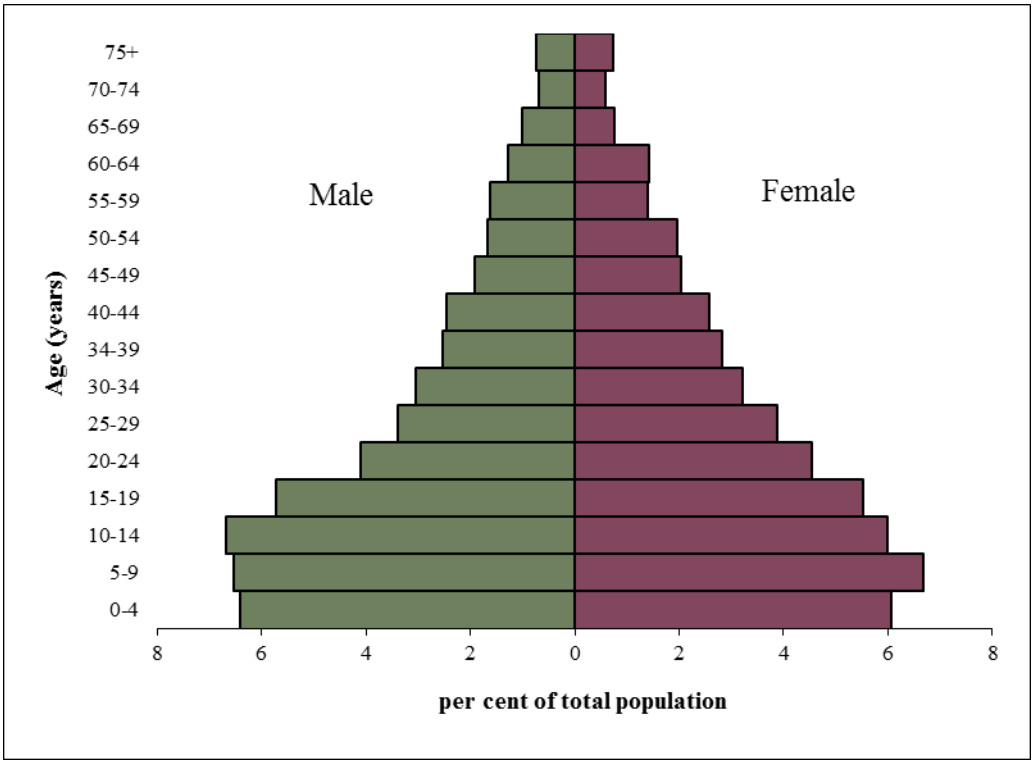

Figure 3.5 Population Pyramid of Nepal in 2004 from the NLSS II (Central Bureau of Statistics (CBS) 2004)

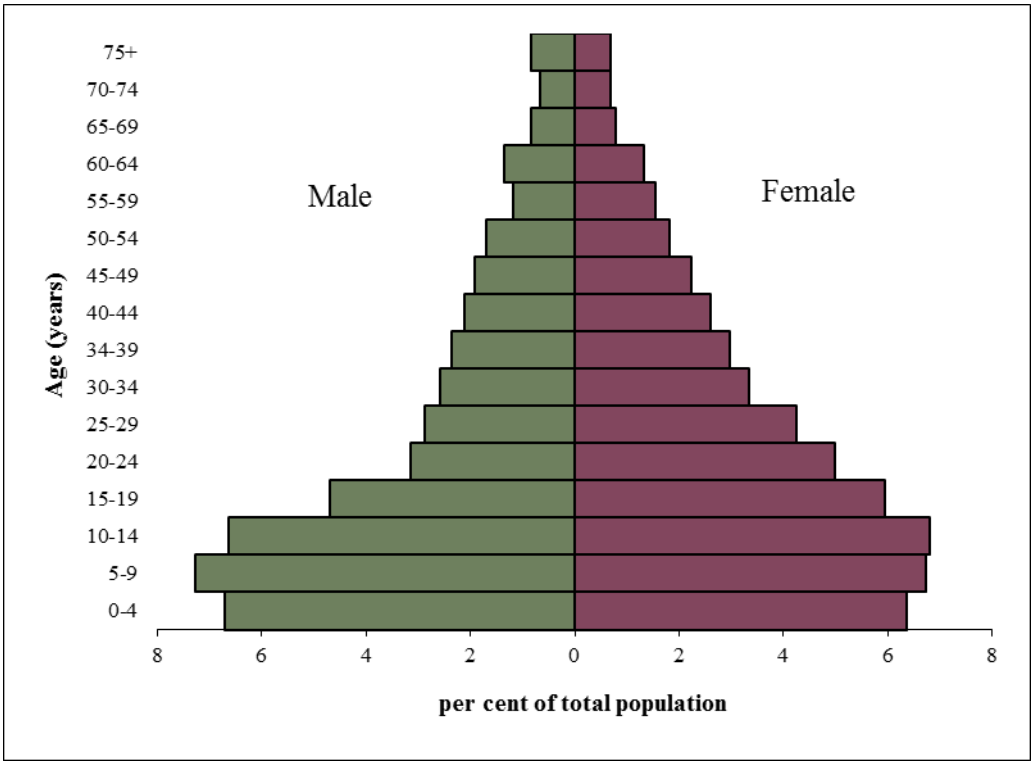

Figure 3.6 Population Pyramid of Nepal in 2006 from the NDHS 06 (Ministry of Health and Population (MOHP) [Nepal] 2007)

The first thing to note is that all the surveys (apart from the NLSS I) appear to under enumerate men over the age of 15 to some extent and certainly over the age of 20 in comparison with the census data. While it cannot be assumed that the census is correct it is curious that the age profile of women in the surveys looks so similar to the Census and that of men is lacking. The NDHSs actually take a smaller sample of men by design while the NLSSs do not. That said, the DHS provides a household recode with information on all members of the surveyed households so this should not make a difference to the population pyramids. Furthermore, weighting was applied to all the surveys to account for sampling issues. These weights, however, are household level weights so this implies that the apparent under enumeration of men is occurring in the individual households. Furthermore, given that the under enumeration appears to be confined to working age men it seems likely that this is a result of the mass scale internal migration that occurs in order to find work, which would impact less on a census than on a household level sample survey. A further factor is that LSMS and DHS surveys both have an ambiguous definition of the household unit. It is assumed implicitly that people will only have one household, but in a country like Nepal where seasonal labour migration is the norm this assumption will lead to the under enumeration of people who could be ascribed to multiple households i.e. labour migrants (Randall, Coast and Leone 2009). It is not that these men do not have strong connections with the surveyed households; indeed they are the husbands, brothers, fathers and sons of the enumerated household members, but they do not sleep in the same dwelling for some (or most) of the year. The 2008 Nepal Labour Force Survey (NLFS) found that 19 per cent of households had at least one absentee living within the country, the majority of whom were working adult males (Central Bureau of Statistics (CBS) 2009). These men often live in collective households when working and there is also a substantial proportion working as porters[9] without a fixed abode explaining how they manage to be missed from surveys.

[9] At least 100,000 Nepalis work as porters in the tourist industry every year, which is the most visible form of this occupation, but most goods are transported almost exclusively by porter (with the addition of yaks, mules and similar animals) in many hill and mountain regions.

The NLSS I population pyramid has some particularly interesting features. There is an excess of women in the 50-54 age group, which implies that women may have been shifted here from the 45-49 category. This is likely since women aged 15-49 have to complete questions about their fertility, while those over 50 do not. There is also some evidence of this in the NLSS II and the NDHS 01, but it is not so pronounced.

In terms of evidence for fertility decline, the age structures from the various sources provide different answers. The NLSS I indicates that decline had started by 1996 as is evidenced by a distinct narrowing at the base of the pyramid, while the NDHS 96 does not show any such narrowing at the base; this is surprising since the two surveys were conducted virtually concurrently. It is possible that the lack of children under 5 in the NLSS I was due to the anthropometrics module, which was only relevant for children under 5. In the NLSS II this was replaced with modules on child labour and migration, which were only asked of people aged 5 or over (Bontch-Osmolovski and Glinskaya 2004).

The NDHS 01, like the NDHS 96 does not show substantial narrowing at the base, whereas the 2001 census indicates that the number of people in the 0-4 age group was substantially less than the number in the 5-9 age group. It is only in the NDHS 06 that a substantial narrowing at the base can be seen for both males and females, but the decline appears to have started earlier for females. The NLSS II, on the other hand, shows this pattern only for females; for males the narrowing appears to have started at an earlier date because the 5-9 age group is smaller than the 10-14 age group and in turn the 0-4 age group is smaller than the 5-9 age group.

To conclude, data for men in all surveys is potentially suspect due to an ambiguous definition of the household, which may not have been applied consistently in different surveys or even across different households in each survey; that said, it is data from women of child bearing age that we are concerned with and data on children. There is some evidence that older women may not have answered questions on fertility by being shifted out of the relevant age category and this is most visible in the NLSS I. It is unclear why the Census indicates such a clear

narrowing of the base (i.e. fertility decline) while the three surveys conducted in 2001 or later do not show such a substantial decline. It may be that the census failed fully to enumerate recent births, though it is not clear why that might be. In general, though, the data for women and children looks reasonable especially in the NLSS II and NDHS 06.

3.4. Total Fertility Rates

Figure 3.7 shows the trend in the total fertility rate (TFR) for married women aged 15 to 39 years over time for all five surveys. The TFR was calculated from the survey data by firstly calculating age specific fertility rates (ASFRs) for five year age bands (15-19 years, 20-24 years, 25-29 years, 30-34 years and 35-39 years):

$$ASFR = \left(\frac{\text{births to women aged } x-(x+4) \text{ in years } y-(y+4)}{\text{woman years of exposure}} \right) \times 1{,}000$$

$$TFR = \frac{\Sigma \text{ASFR} \times 5}{1{,}000}$$

The 15-39 year age range was used to allow comparisons between the five surveys over a longer period of time and four year time periods were used to avoid problems of misreporting that are associated with other time periods. Misreporting is commonly a problem when extra questions are asked about children who are below a certain age. In the NLSSs extra questions were asked about children under 3 and children under 5, while in the NDHSs extra questions were asked about children under 3. There is a tendency for births to be shifted outside of the window where extra questions may be asked, although in the NLSSs there is invariably an upward kink in fertility reported nearest to the survey. The NDHSs do not display a parallel upward shift and thus there are two options here – firstly that births are being shifted to nearer the survey and secondly that misreporting is lower for births that occurred nearer to the survey. Given that the fertility reported in the NLSSs is substantially lower than that reported in the NDHSs it seems likely that the problem is omission of births that did not occur in close proximity to the survey date. Indeed, given that the

NDHSs indicate a much steeper decline in fertility than is shown by the NLSSs it seems that such omissions increase as the time between the birth and the survey increases. This is a common phenomenon; the children being omitted tend to be those who do not live in the household and those who have died meaning that that omissions increase with the age of the mother hence more omissions will be made concerning births that happened a longer time before the survey (United Nations 1983).

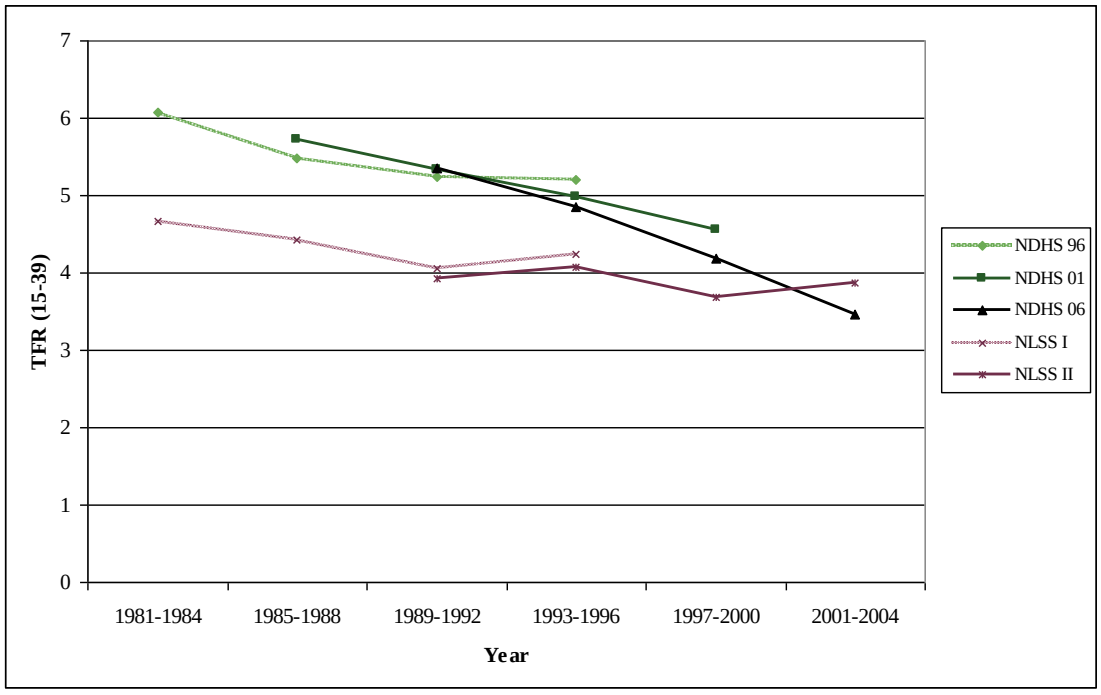

Figure 3.7 Comparison of the trend in total fertility rate (15-39) in 1981-2004 estimated from five surveys in Nepal

All five surveys show a steady downward trend of a similar magnitude, for the whole period studied. However, the two NLSS surveys show a lower overall level of fertility than the three NDHSs. For the period 1981-1984 the NDHS 96 estimated the TFR (15-39) to be 6.07 while the NLSS I data gives 4.66 as the equivalent estimate leaving us with a discrepancy of 1.41. The three NDHSs meanwhile are reasonably consistent between one another.

Overall the trends are strikingly similar while the absolute level reported by the DHSs and the LSMSs is not. Having established this it is necessary to understand precisely where in the data this discrepancy arises from, since this determines which

parts of the data (if any) we are able to use for analysis and also what type of analysis it is possible to conduct.

3.5. Age-Specific Fertility Rates (ASFRs)

Since the NLSSs generally report lower fertility than the NDHSs it must be the case that the NDHSs are over-reporting fertility or that the NLSSs are underreporting fertility. Over-reporting is improbable since it would be highly unlikely that women would make up non-existent children replete with fake dates of birth and other such information.

In order to establish the precise nature of the probable underreporting in the NLSSs it will be instructive to look at the age profile of fertility rates; these can be seen in Figures 3.8-3.9.

As with the TFRs the age profile of fertility rates is very similar in all five surveys, but both NLSSs have a generally lower set of rates when compared to the NDHSs. It should be noted that the estimates for 15-19 year olds are not particularly consistent.

In general the shape of the age-specific fertility schedule estimated for all five surveys look reasonable. However, the NLSS I data show a worryingly low ASFR for 30-34 and 35-39 year olds in 1993-1996. This makes the NLSS I data look suspect since the sample size is not small (the estimates were based on 1788 and 1455 years of exposure respectively) and the period in question is extremely close to the survey date so recall error should not be a substantial problem. The shape of the age-specific fertility schedule in the NLSS II, however, looks reasonable with no obvious anomalies apart from the ASFR of 35-39 year olds in 1989-1992, but this was based on a relatively small number of years of exposure.

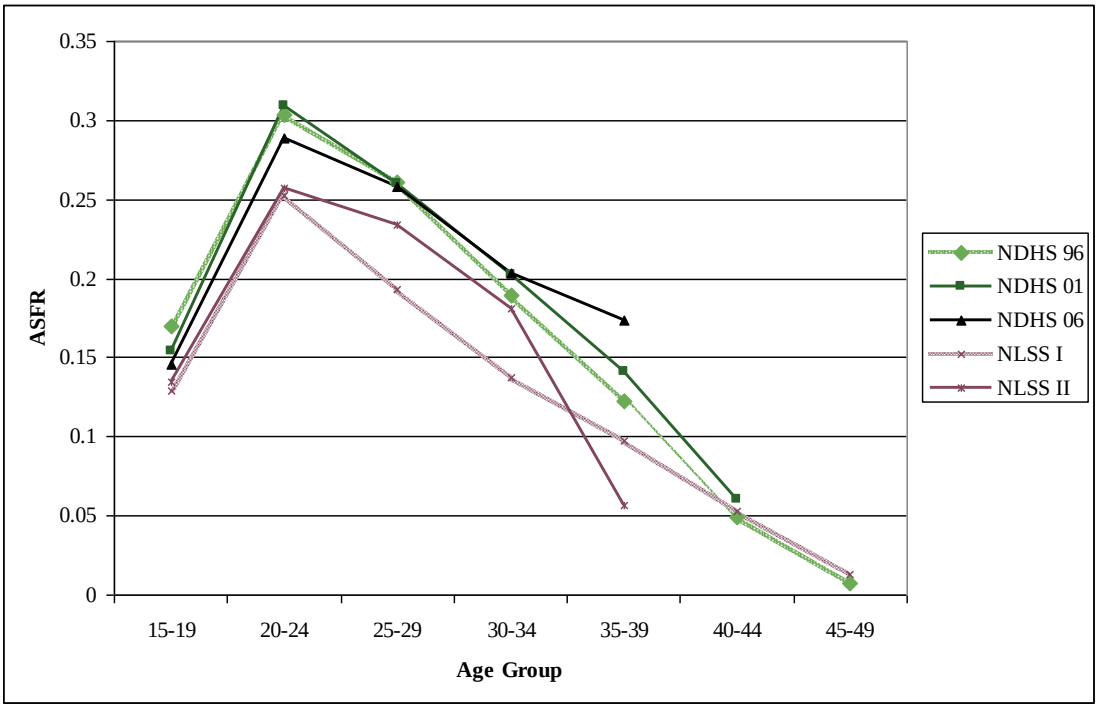

Figure 3.8 Comparison of age specific fertility rates in 1989-1992 from five surveys in Nepal

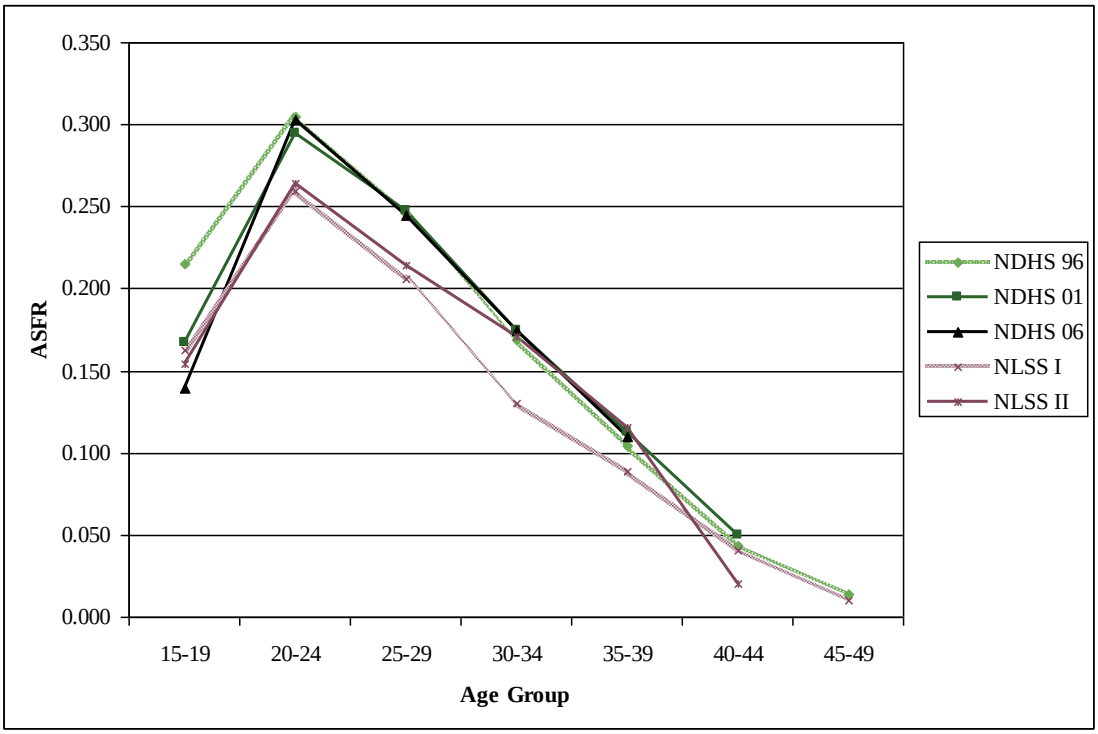

Figure 3.9 Comparison of age specific fertility rates in 1993-1996 from five Surveys in Nepal

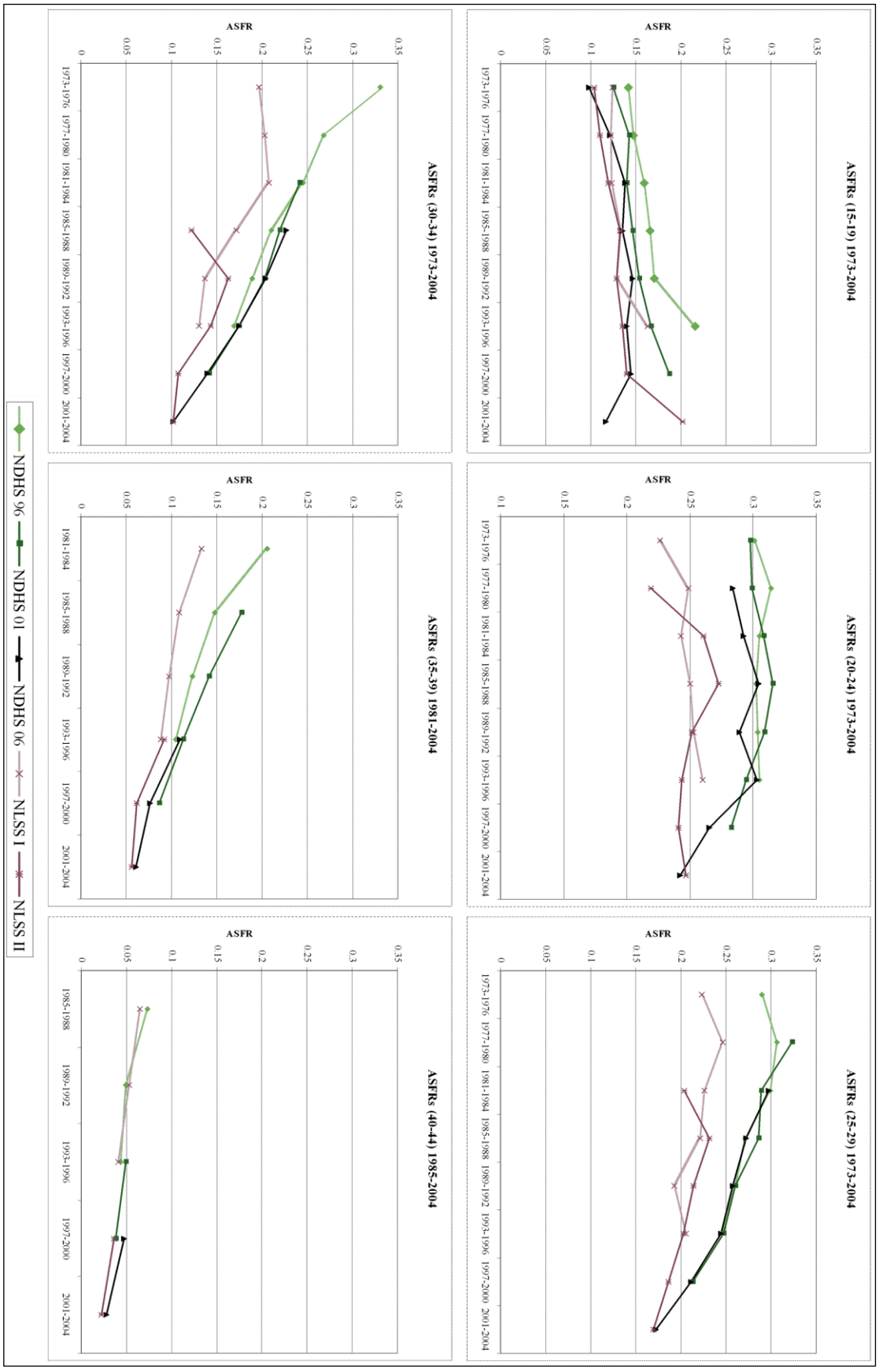

Figure 3.10 Comparison of age specific fertility rates for five surveys in Nepal, 1973-2004

Figure 3.10 shows the time trend in ASFRs for all surveys. In terms of the overall trend fertility appears to have dropped substantially for women aged 25-39 years, while fertility in the youngest age group (15-19 years) appears to have risen slightly. The trend for 20-24 year olds is not clear with the NDHS 06 indicating a substantial decline after 1996 and the NLSS II indicating a decline after 1988 followed by a levelling off leading to a slight increase in 2001-2004. In general the NLSSs show lower levels than the NDHSs. The NLSSs also have a tendency to show an increase in fertility in the most recent period before the survey. In some cases this is quite substantial and pronounced, such as the ASFR for 15-19 year olds estimated from NLSS II data in 2001-2004. This upward kink could indicate either a shifting of births nearer to the survey or that fertility was being underreported more the longer the recall period between the birth and the survey. This explanation fits the pattern of the data especially well for 20 to 39 year olds; the gap between the estimates of the ASFRs from the NLSSs and the NDHSs is wider the further away from the survey the estimates are from. The NLSS I fails to converge with the NDHSs to a very great extent, but in general the NLSS II is closer to the NDHS 06 when the births concerned are closer to the survey date. This indicates that recall bias may be a serious problem with the NLSS surveys.

3.6. Exploring the Underreporting of Fertility in the NLSSs

3.6.1. Sample

The five surveys are not necessarily directly comparable due to sampling differences and it will, therefore, be necessary to adjust for this in order to consider whether the apparent underreporting in the NLSS surveys is a by-product of the sample design or if it is genuine underreporting. Figure 3.11 shows that there are some differences in the sample used by the five surveys which may naturally lead to the NLSS surveys estimating lower fertility levels than the NDHSs. The NLSS surveys over sample the urban Hill region, and more specifically they both over sample the Kathmandu valley, which is the most developed area of Nepal and the area where fertility is likely to be the lowest.

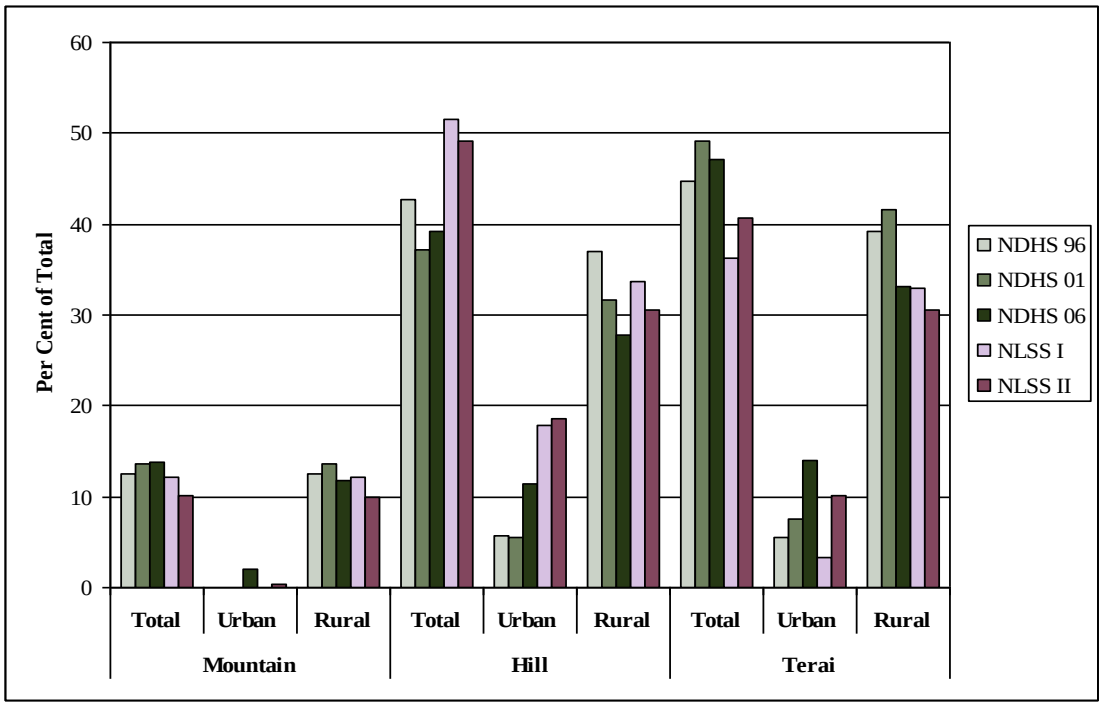

Figure 3.11 Sample Distribution by Ecological Zone and whether Urban or Rural

URBAN/RURAL DIFFERENTIALS

The NLSS surveys over sampled urban areas (see previous section) and while the weighting should account for this it still makes sense to look separately at the nature of the urban and rural sample in the two surveys.

As you can see from Figures 3.12, 3.13 and 3.14 there is underreporting in the NLSS surveys in both the rural and urban samples, with the NLSS I showing particularly marked problems. As you can also see the urban sample yields some extremely strange results. Interestingly, underreporting seems particularly marked in the urban sample of the NLSS I. The NLSS II figures are again marked by the fact that fertility appears to increase in the most recent period before the survey and this is an especially prominent feature of the urban sample.

In general the rural sample tells a reasonably consistent story, though there is still clear underreporting. The urban sample, however, looks extremely suspect with the NDHS 96, NLSS I and NLSS II all showing an extremely odd looking set of ASFRs for the period from 1993 to 1996 (Figure 3.14). For example the NLSS II suggests an older fertility schedule than we would expect while the NDHS 96 suggests a much younger one with 15-19 year olds experiencing the highest ASFR of any age group.

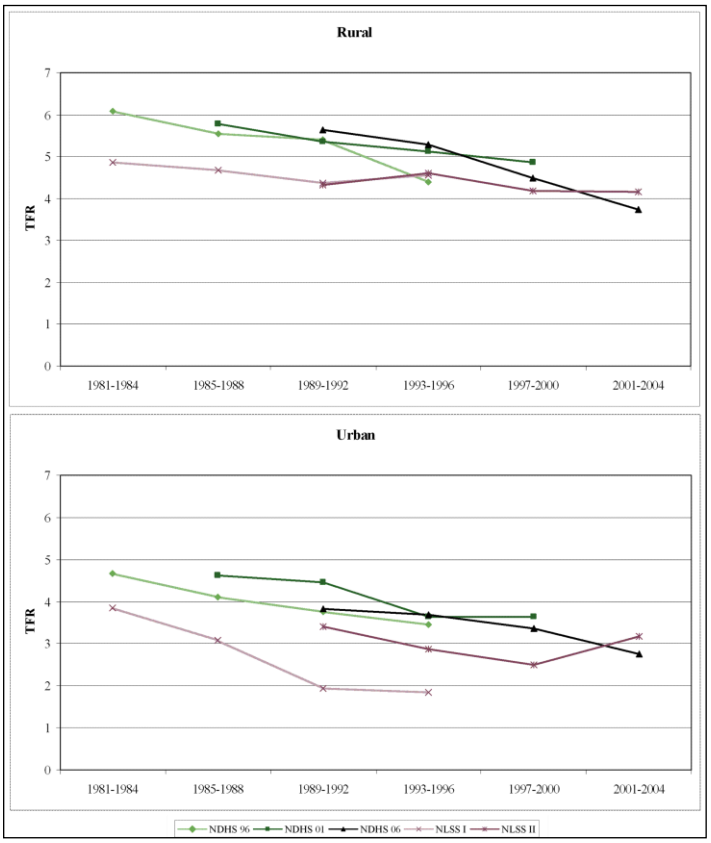

Figure 3.12 Comparison of Urban and Rural Total Fertility Rates (15-39), 1981-2004

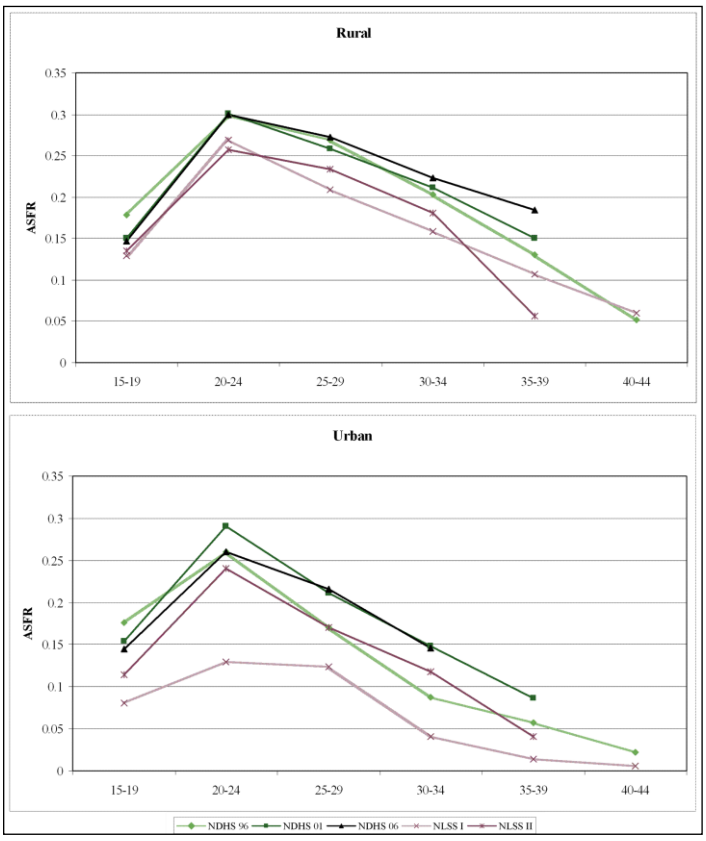

Figure 3.13 Comparison of Urban and Rural Age Specific Fertility Rates, 1989-1992

This comparison seriously raises the question of whether the urban fertility data from these surveys should be used at all. It may be that the strange age profile indicated is the result of small sample sizes, but it may also be that there were problems with the urban element of the surveys (the questionnaires were different for urban and rural populations so this is not an outlandish possibility).

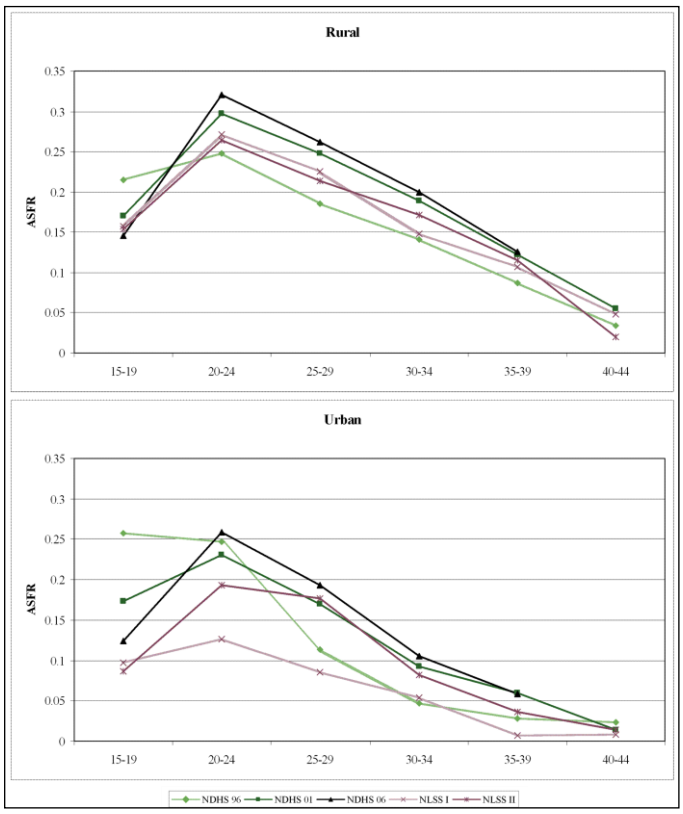

Figure 3.14 Comparison of Urban and Rural Age Specific Fertility Rates, 1993-1996

3.6.2. Possible Non-Response in the NLSSs

Having studied the possibility of sampling differences and found that, in general, the NLSS still indicates lower fertility than the NDHSs we must consider the possibility that certain women simply did not respond to the fertility questions. This would be confirmed by an excess of parity zero women. We can check this by looking at the pattern of children ever borne (CEB) to women in the surveys, which is done in the proceeding sections.

3.7. Comparison of Children Ever Borne Data

There is a very clear excess of women of parity zero above the age of 15 in the NLSS I (Figure 3.15). There is also an excess of women at parity zero in the NDHS

06 amongst women aged 15-24 when compared to the NLSS II indicating that there might be a problem with under reporting in the NDHS 06.

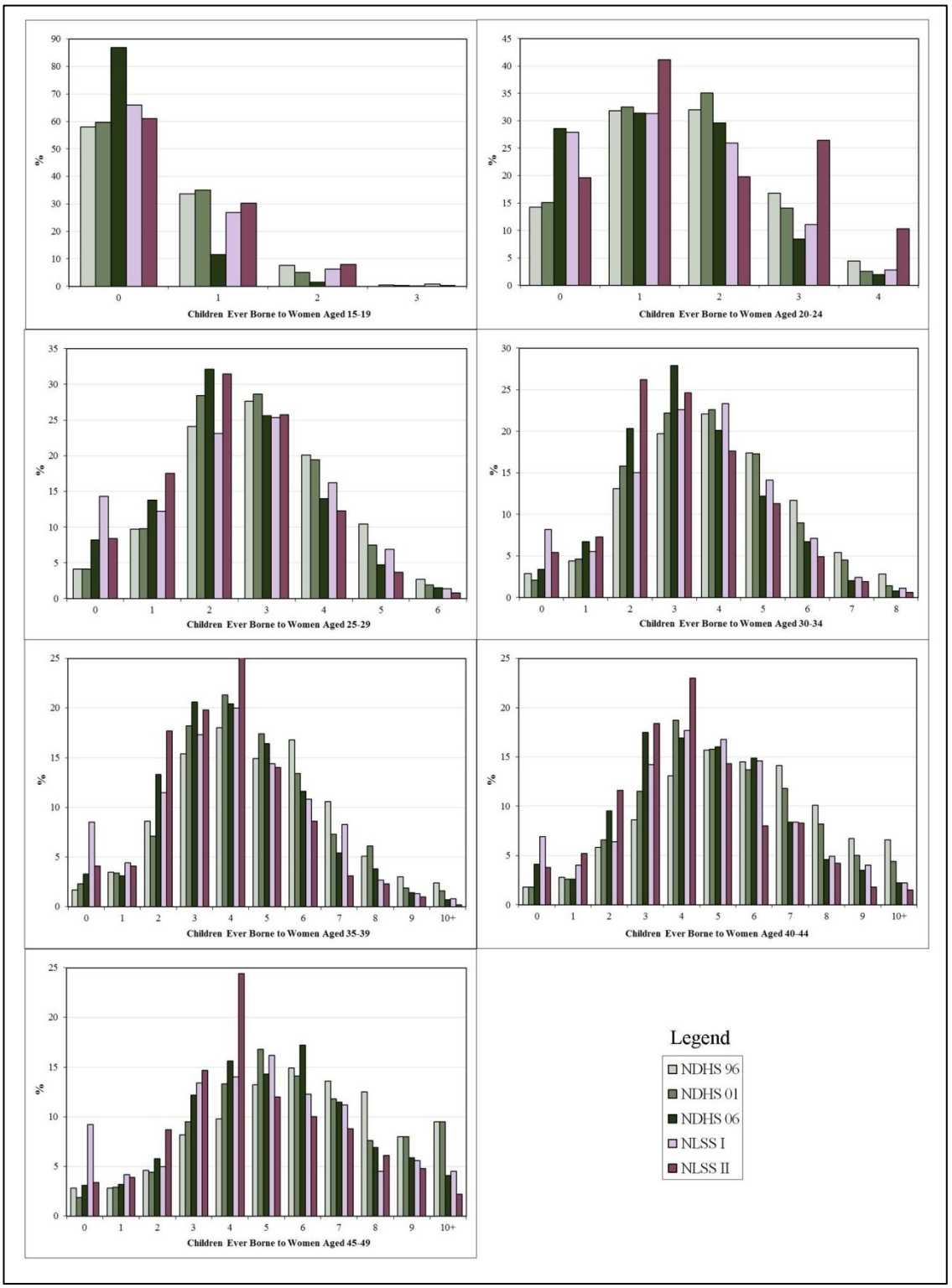

Figure 3.15 Children ever borne by age of mother

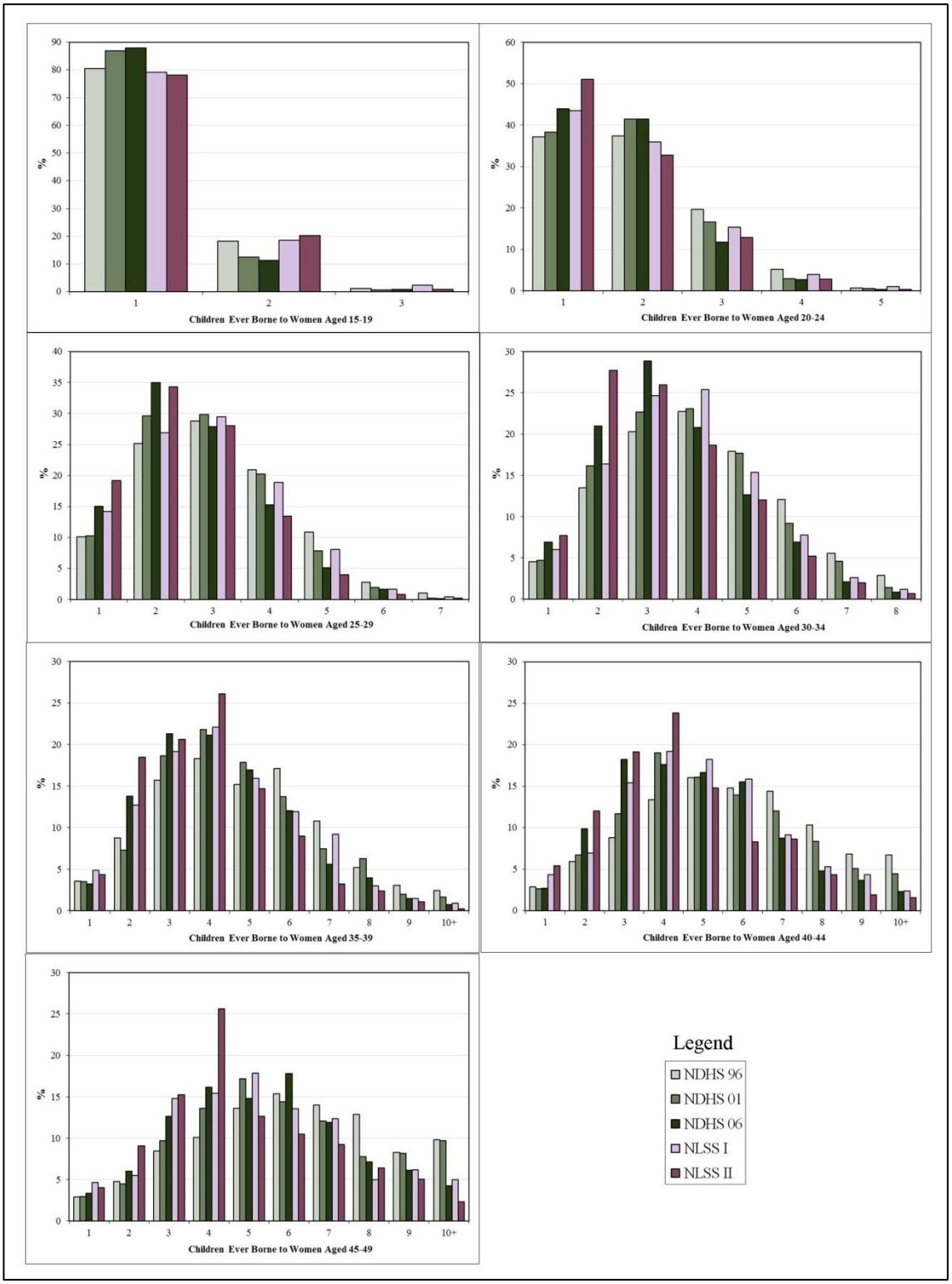

Figure 3.16 Children ever borne to women who reported having at least one child by age of mother

When women of parity zero are excluded from the analysis (Figure 3.16) the five surveys report a far more consistent story. In particular if we look at the NDHS06 and the NLSS II (since the CEB reported refer to women of roughly the same age reporting their fertility at roughly the same time) they are extremely consistent for parities one to three; there is, however, an inexplicable excess of women at parity four in the NLSS II combined with a dearth of women at higher parities (particularly 6-8). The NLSS I indicates an even more substantial lack of higher order births (especially at older ages) combined with an excess of lower order births when compared to the NDHS 96 and even the NDHS 01. Again, this suggests that the NLSS I may not be reliable. The NLSS II meanwhile looks reasonable for lower order births only.

3.7.1. Parity Progression Ratios

Parity Progression Ratios (PPRs) have been calculated for birth orders 0 to 9 for all five surveys. PPRs are of importance since they are an indication of how families are constructed with a_0 simply being the proportion of women who become mothers and a_1 being the proportion of women with at least 1 child who continue to have more children. These were calculated as follows:

$$PPR = a_x = \frac{\text{women with at least } x+1 \text{ children ever borne}}{\text{women with at least } x \text{ children ever borne}}$$

As you can see from Figure 3.17 these are very similar for all the surveys, but particularly for the NDHS 06 and NLSS II. The exception is a_0, which looks to be much too low for the NLSS I in particular (0.81 as opposed to 0.91 in the NDHS 96 and NDHS 01). This explains the lower level of fertility generally seen in the NLSS I data.

There are some other suspect PPRs; a_4 in particular looks too low for the NLSS II – it is 0.548 compared with 0.655 for the NDHS 06. This difference is substantial – for every 1,000 women with four children ever born more than 10% of them (107) would have at least one more child if the NDHS 06 PPR applies rather than the NLSS II PPR. This implies that it may be a bad idea to analyse the progression from the fourth to the fifth birth or any other higher order transitions; it also suggests that

analysing total fertility in the NLSS II could be problematic. That said, a_1, a_2 and a_3 all look reasonable.

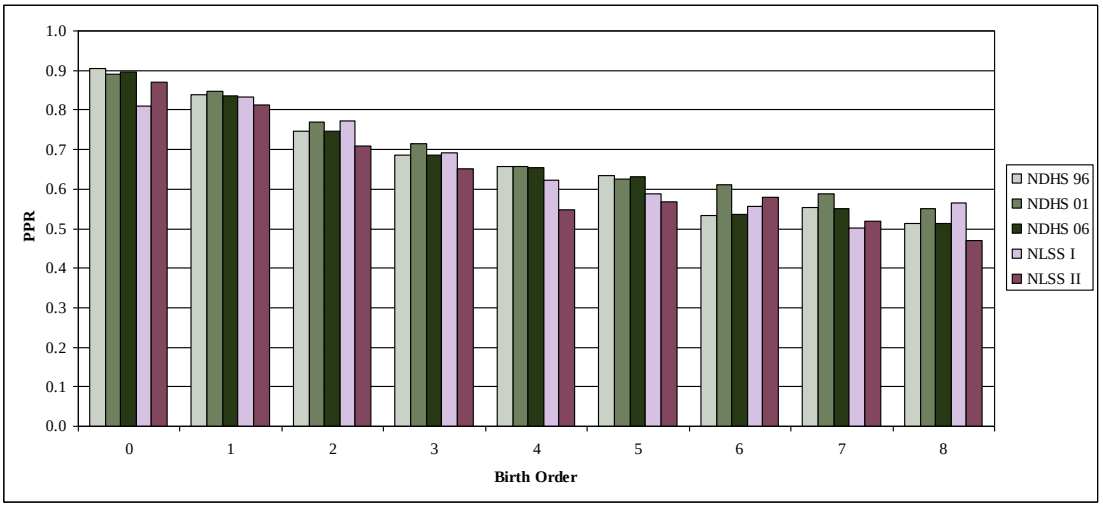

Figure 3.17 Parity Progression Ratios for Five Surveys in Nepal

3.7.2. Conclusions

In this section data on children ever borne in the five surveys has been studied. We concluded that the NLSS surveys both have an excess of women at parity zero, but that when these women are taken out the NLSS II data for women of parities 1-3 resembles the NDHS 06 data to a very great extent. The fertility data in the NLSS I remain problematic in many areas.

3.8. Poisson Models

The Poisson distribution is used to model the occurrence of count data (i.e. data in the form of positive integers) or rare events. It is reasonable to regard births as rare events and therefore the Poisson distribution may be applied to the analysis of fertility. There are some slight objections to this since births do violate some of the assumptions of the Poisson model; a woman cannot generally experience another birth for at least 9 months after she has one and thus the probability of an event (that is a birth) over any time period is not constant. However, the model is generally a good one and has been used regularly (if not frequently) in the demographic literature on fertility (Cain 1984; Cleland and Rodriguez 1988).

A Poisson model allows us to look at the overall level of fertility while including explanatory variables and estimating the effect of those explanatory variables on the

fertility rate. The dependant variable for this type of model is the number of births (b_i) that woman *i* has during a certain window of time. The probability that the observed number of births is equal to B_i (where B_i is a non-negative integer) is then assumed to follow a Poisson distribution with mean λ_i:

$$\Pr(B_i = b_i \mid \lambda_i) = \frac{e^{-\lambda_i} \lambda_i^{b_i}}{b_i!}$$

3.8.1. Caste/Ethnicity

Nepal has a well-entrenched caste system with 103 ethnic or caste groups listed in the 2001 census. While the caste system is technically a part of the Hindu religion and only 80% of Nepalese reported being Hindu most other Nepalese are also within the caste system with the obvious exception of Muslims and a few other minority groups. These 103 castes and ethnicities can be grouped together (as shown in Table 3.1) in order to provide us with large enough sample sizes in order to conduct some sort of analysis.

Table 3.1 Caste/Ethnic Groups with Regional Divisions and Social Groups from the 2001 Census (Bennett, Dahal and Govindasamy 2008, p.3)

	Main Caste/Ethnic Groups (7)	Caste/Ethnic Groups with Regional Divisions (11) and Social Groups (103) from 2001 Census	
Caste Groups	*1. Brahaman/Chhetri*	1.1	**Hill Brahman** Hill Brahman
		1.2	**Hill Chhetri** Chhetri, Thakuri, Sanyasi
		1.3	**Tarai/Madhesi Brahman/Chhetri** Madhesi Brahman, Nurang, Rajput, Kayastha
	2. Tarai/Madhesi Other Castes	2.1	**Tarai/Madhesi Other Castes** Kewat, Mallah, Lohar, Nuniya, Kahar, Lodha, Rajbhar, Bing, Mali Kamar, Dhuniya, Yadav, Teli, Koiri, Kurmi, Sonar, Baniya, Kalwar, Thakur/Hazam, Kanu, Sudhi, Kumhar, Haluwai , Badhai, Barai, Bhediyar/ Gaderi
	3. Dalits	3.1	**Hill Dalit** Kami, Damai/Dholi, Sarki, Badi, Gaine, Unidentified Dalits
		3.2	**Tarai/Madhesi Dalit** Chamar/Harijan, Musahar, Dushad/Paswan, Tatma, Khatwe, Dhobi, Baantar, Chidimar, Dom, Halkhor
Adivasi/Janajatis	*4. Newar*	4	**Newar** Newar
	5. Janajati	5.1	**Hill/Mountain Janajati** Tamang, Kumal, Sunuwar, Majhi, Danuwar, Thami/Thangmi, Darai, Bhote, Baramu/Bramhu, Pahari, Kusunda, Raji, Raute, Chepang/Praja, Hayu, Magar, Chyantal, Rai, Sherpa, Bhujel/Gharti, Yakha, Thakali, Limbu, Lepcha, Bhote, Byansi, Jirel, Hyalmo, Walung, Gurung, Dura
		5.2.	**Tarai Janajati** Tharu, Jhangad, Dhanuk, Rajbanshi, Gangai, Santhal/Satar, Dhimal, Tajpuriya, Meche, Koche, Kisan, Munda, Kusbadiya/Patharkata, Unidentified Adibasi/Janajati
Other	*6. Muslim*	6	**Muslim** Madhesi Muslim, Churoute (Hill Muslim)
	7. Other	7	**Other** Marwari, Bangali, Jain, Punjabi/Sikh, Unidentified Others

Figures 3.18 and 3.19 show Poisson models fitted to predict age specific fertility by caste/ethnic group using the NLSS II data and the NDHS 06 data.

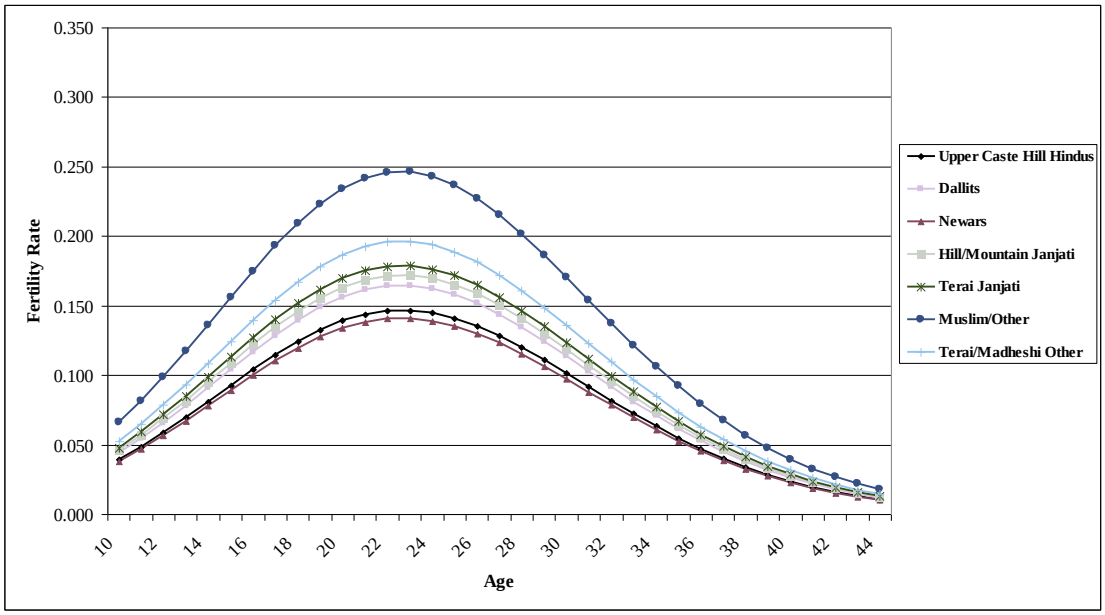

Figure 3.18 Age Specific Fertility Rates by Caste/Ethnicity from Poisson model using the NLSS II

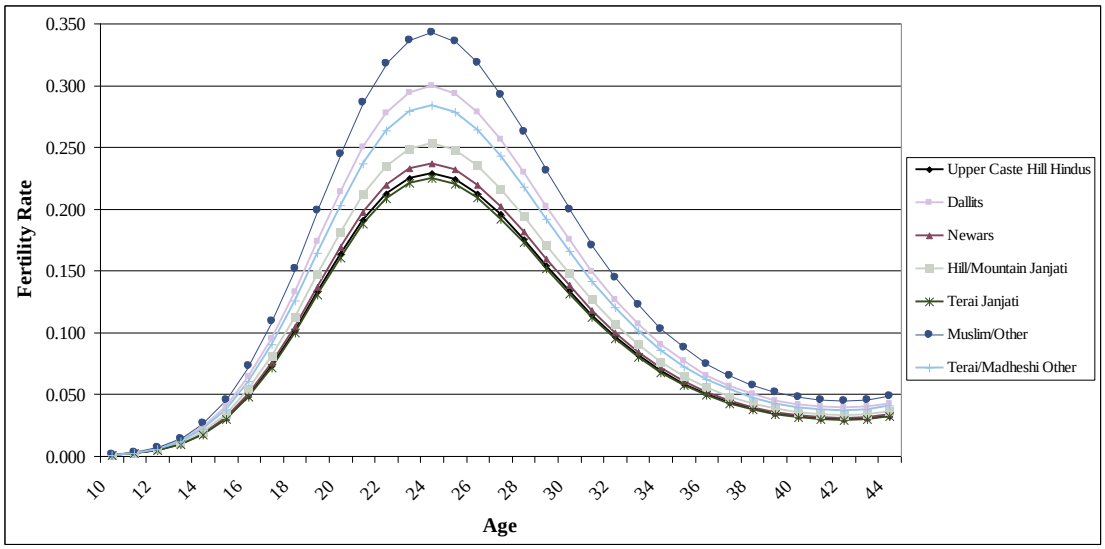

Figure 3.19 Age Specific Fertility Rates by Caste/Ethnicity from Poisson model using the NDHS06

Both surveys indicate that Muslims and Dalits have high fertility while Newars and Upper Caste Hill Hindus have lower fertility, which is as we would expect given the relative social standing of these groups. Dalits are those "communities who, by virtue of caste-based discrimination and untouchability, are most backward in the social, economic, educational, political and religious spheres and are deprived of

human dignity and social justice." (United Nations Development Programme 2004, p.57). Newars and Upper Hill Caste Hindus generally enjoy a higher social standing than other groups and most political figures are drawn from these groups. The only major discrepancy between the two surveys is that the Terai Janjati group are predicted to have the lowest fertility of any group on the basis of the NDHS 06 data, while they are predicted to have the third highest fertility in the NLSS II data. The other Janjati groups (those from the mountains and the hills) are predicted by both surveys to have fertility in the middle of the range. It would be surprising if the socially disadvantaged Janjati group genuinely have fertility rates as low as the Newars, Brahmins and Chhetris since "Social exclusion and discrimination [is common] against Dalits, Janajatis, Muslims and Madheshis" (Bennett et al. 2008, p.4); this is potentially a problem for the NDHS data.

The NDHS model also has the curious feature of appearing to predict a rise in fertility for women at older ages (roughly those aged 42 and above); this is not a genuine rise, but rather a feature of the functional form of the model used, which included terms for age squared and age cubed.

3.8.2. Regions of Nepal

Nepal boasts a wide range of landscapes from some of the most arid and harsh mountainous territory on earth in the form of the "himal" to the semi-tropical "tarai". The country is ruled from the Kathmandu Valley, which fosters the majority of the country's links with the outside world as well as the only Universities and the majority of the urban population. However, for many rural areas of the country the Kathmandu Valley is as far removed culturally, topographically and demographically as any foreign country. Indeed, technically Mustang (bordering with Tibet) was a separate country annexed by Nepal with its own monarch until October 2008. Many regions of Nepal have more communications with and more in common with Tibet (in the North) or India (in the south) than they do with Kathmandu. The level of development in the Country's 75 districts is also highly variable – when Thapa (1995) calculated the Human Development Index (HDI) separately for each of the districts he found an enormous range, from Lalitpur (in the Kathmandu Valley) with an HDI of 0.624 to Mugu (in the Mid-Western Mountains) with an HDI of just

0.012. To put this into perspective Lalitpur would be comparable with South Africa where the HDI was last calculated as 0.683, while the HDI of Mugu would be substantially lower than even the least developed countries on the planet – the HDI of Zimbabwe, ranked lowest in terms of the index, was last calculated to be 0.140 (United Nations Development Programme 2009). That said, these calculations were made in 1995 when the HDI of Nepal was 0.334 according to Thapa and 0.343 according to the UN, whereas the United Nations currently estimates the HDI to be 0.428. Nepal has made large gains in certain areas in the past 15 years (notably in health and education), but the variation between districts is still substantial. The literacy rate calculated from the 1971 census ranged from 4.1 per cent in Bajura to 38.3 per cent in Kathmandu (a range of 34.2 percentage points) while the literacy rate calculated from the 2001 census ranged from 27.1 per cent in Humla to 77.2 per cent in Kathmandu (a range of 50.1 percentage points). While there has been a great deal of development in Nepal over the last fifteen years regional inequalities are vast. Take the contraceptive prevalence rate for example, which ranged from a high of 91.9 per cent in Bhaktapur to just 7.8 per cent in Kalikot (which was far from unusual in the Mid-Western and Far-Western Mountains) when it was last estimated in 2001 (Nepal Department of Health 2002).

The overall point is that talking of Nepal as a whole belies a great deal of regional variation, which it would be remiss to ignore. For this reason Poisson models were used to look at the regional variation in fertility in both the NDHS 06 and the NLSS II. The results are displayed graphically in Figures 3.20 and 3.21.

As expected, the NDHS 06 shows generally higher levels of fertility than the NLSS II. The regional variation indicated by the two surveys is relatively similar with the highest fertility in both surveys being in the Eastern Hills and the lowest being in the Central Terai, closely followed by the Central/Western Hills. There is a discrepancy in the ranking of the Mid-/Far-Western Hills; the NLSS II indicates that this region has fertility higher than virtually any other, while the NDHS 06 ranks this region near the lower end of observed fertility. One possible explanation is that the NLSS II experienced problems in this region due to ongoing violence caused by the Maoist insurgency, which was at its most violent during the survey period. Data

could not be collected from several PSUs. Fieldwork for the NDHS 06, on the other hand, was carried out during 2006 by which point peace talks were underway and therefore the sample was unaffected.

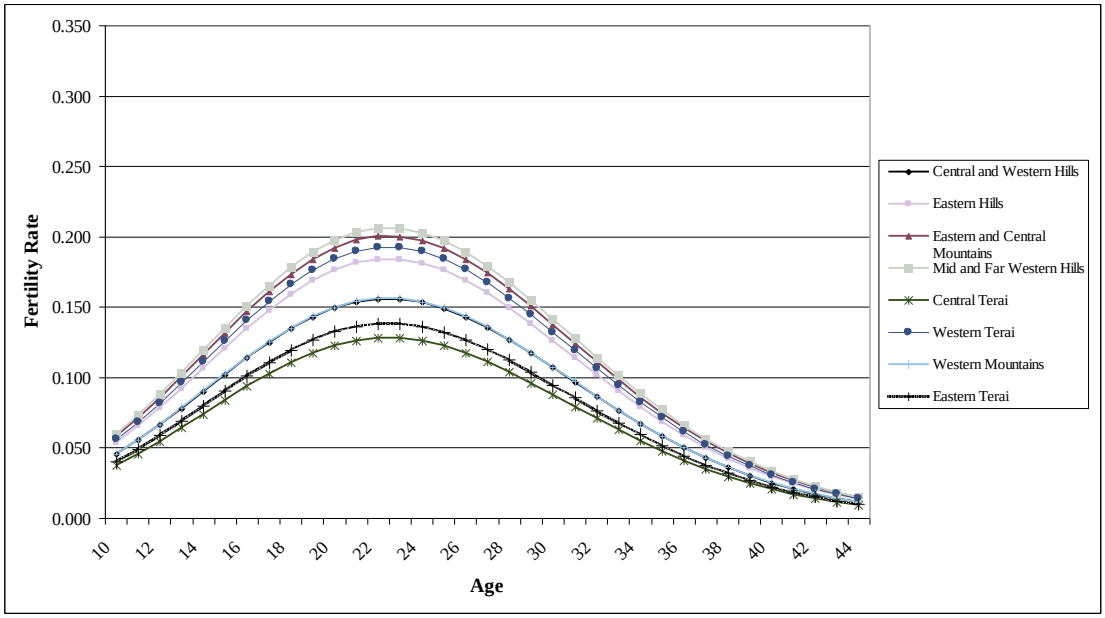

Figure 3.20 Age Specific Fertility Rates by region from Poisson model using the NLSS II

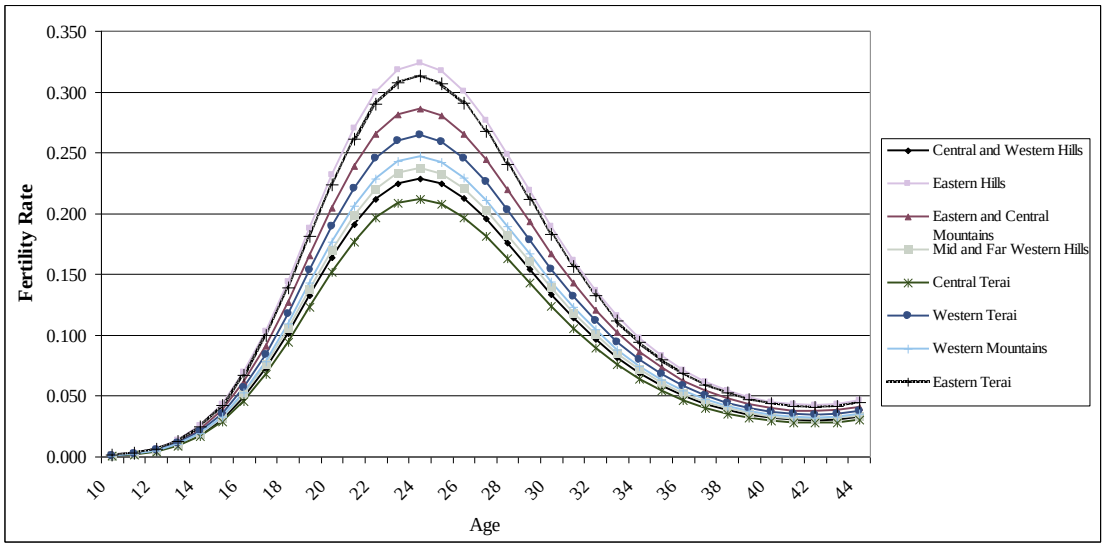

Figure 3.21 Age Specific Fertility Rates by region from Poisson model using the NDHS 06

3.9. Comparison of Children Ever Borne Data Using the Poisson Model

3.9.1. Method

Suppose a survey asks women of different ages between 15 and 49 years last birthday to report the number of children they have ever borne. Now, consider the responses of women aged x to (x+5) years (where x=15, 20, 25, 30, 35, 40, 45) who may be regarded as having an average age of (x+2½) years. Assume also that births to these women have occurred at an average rate of λ per year over the age range 15 years to x+2½ years. Then, under the Poisson model, the probability that a woman in the age group will report b children ever born is given by

$$\Pr(B=b)=\frac{\exp\left(-\lambda(x+2\,{}^1\!/_2-15)\right)\left(\lambda(x+2\,{}^1\!/_2-15)\right)^b}{b!},$$

where $\lambda(x+2\,{}^1\!/_2-15)$ is the average number of children that a woman aged x+2½ would have if she had experienced the annual fertility rate of λ.

In the survey we can find the proportions of women who have b children ever borne (b = 0, 1, 2, ...). Let the proportion of women who have b children be P_b. Then we can write:

$$P_b=\frac{\exp\left(-\lambda(x+2\,{}^1\!/_2-15)\right)\left(\lambda(x+2\,{}^1\!/_2-15)\right)^b}{b!}$$

Multiplying both sides of this equation by b! and taking natural logarithms gives:

$$\ln(P_b b!)=-\lambda(x+2\,{}^1\!/_2-15)+b\ln\left(\lambda(x+2\,{}^1\!/_2-15)\right),$$

and if we denote $-\lambda(x+2\,{}^1\!/_2-15)$ by the symbol β_0 and $\ln\left(\lambda(x+2\,{}^1\!/_2-15)\right)$ by the symbol β_1 we can re-write this equation as

$$\ln(P_b b!)=\beta_0+\beta_1 b$$

and a plot of $\ln(P_b b!)$ against b should be a straight line with a slope equal to $\beta_1 = \ln\left(\lambda(x+2\,1/2-15)\right)$ and an intercept equal to $\beta_0 = -\lambda(x+2\,1/2-15)$.

The value of the annual age-specific fertility rate λ can then be estimated either from the slope of the straight line or its intercept. Using the slope, then since

$$\beta_1 = \ln\left(\lambda(x+2\,1/2-15)\right),$$

we have

$$\lambda(x+2\,1/2-15) = \exp\beta_1$$

and

$$\lambda = \frac{\exp\beta_1}{x+2\,1/2-15} = \frac{\exp\beta_1}{x-12\,1/2}.$$

If we were to use the intercept then we would have

$$\beta_0 = -\lambda(x+2\,1/2-15) = -\lambda(x-12\,1/2)$$

$$\therefore \lambda = \frac{-\beta_0}{x-12\,1/2}$$

Thus, a way of comparing the data on children ever borne reported in the 2006 NDHS and the 2004 NLSS is to plot $\log_e(P_b b!)$ against b for different age groups 15-20, 20-25, 25-30, 35-40, 40-45 and 45-49 years for both surveys and compare the results. If the children ever borne data from the two surveys are similar, then the two plots should be straight lines with the same slope and intercept. The value of λ for a given age group in each survey can be estimated by measuring the gradients of the two lines for that age group.

3.9.2. Results

Figure 3.22 shows $\log_e(P_b b!)$ plotted against b for the seven age groups mentioned in the previous section. From these plots we can see that the youngest two age groups may have problematic data. The 20-24 year olds have a very odd looking fertility profile: the plot is nowhere near the straight line we would expect for either the NDHS06 or the NLSS II.

This method points to there being a problem with an underreporting of childlessness; this is the case for both surveys (as is evidenced by the much shallower gradient between 0 and 1 children ever born) but the NLSS II shows more of an upward kink than the NDHS06 in general; this is especially visible in the 25-29, 30-34 and 35-39 year age groups. The effect this has on estimates of λ can be viewed in Table 3.2. The estimate of λ is smaller for every age group when estimated using β_0, when in theory the estimate of λ using either β_1 or β_0 should be the same. This is what we would expect given our findings in section 3.7 concerning the raw children ever borne data.

Table 3.2 estimates of λ using β_1 and β_0 [10]

	λ **from** β_1		λ **from** β_0	
	NDHS06	**NLSS II**	**NDHS06**	**NLSS II**
15-19	0.105	0.212	0.056	0.052
20-24	0.150	0.146	0.167	0.124
25-29	0.203	0.179	0.200	0.150
30-34	0.194	0.189	0.194	0.149
35-39	0.208	0.186	0.152	0.116
40-44	0.177	0.163	0.116	0.101
45-49	0.164	0.157	0.107	0.094

Reassuringly, though, the graphs for the age groups aged over 25 all exhibit a relatively straight line and one that is virtually identical for the two surveys when looking at those women who have had at least one child. Furthermore, the estimates

[10] The estimates of λ from β_1 were made using data for b=1 to b=7 i.e. ignoring b=0

of λ from the slopes (calculated using data for *b*=1 to *b*=7 i.e. ignoring *b*=0) are similar for those in the 20-24 year age group and above as can be seen in Table 3.2.

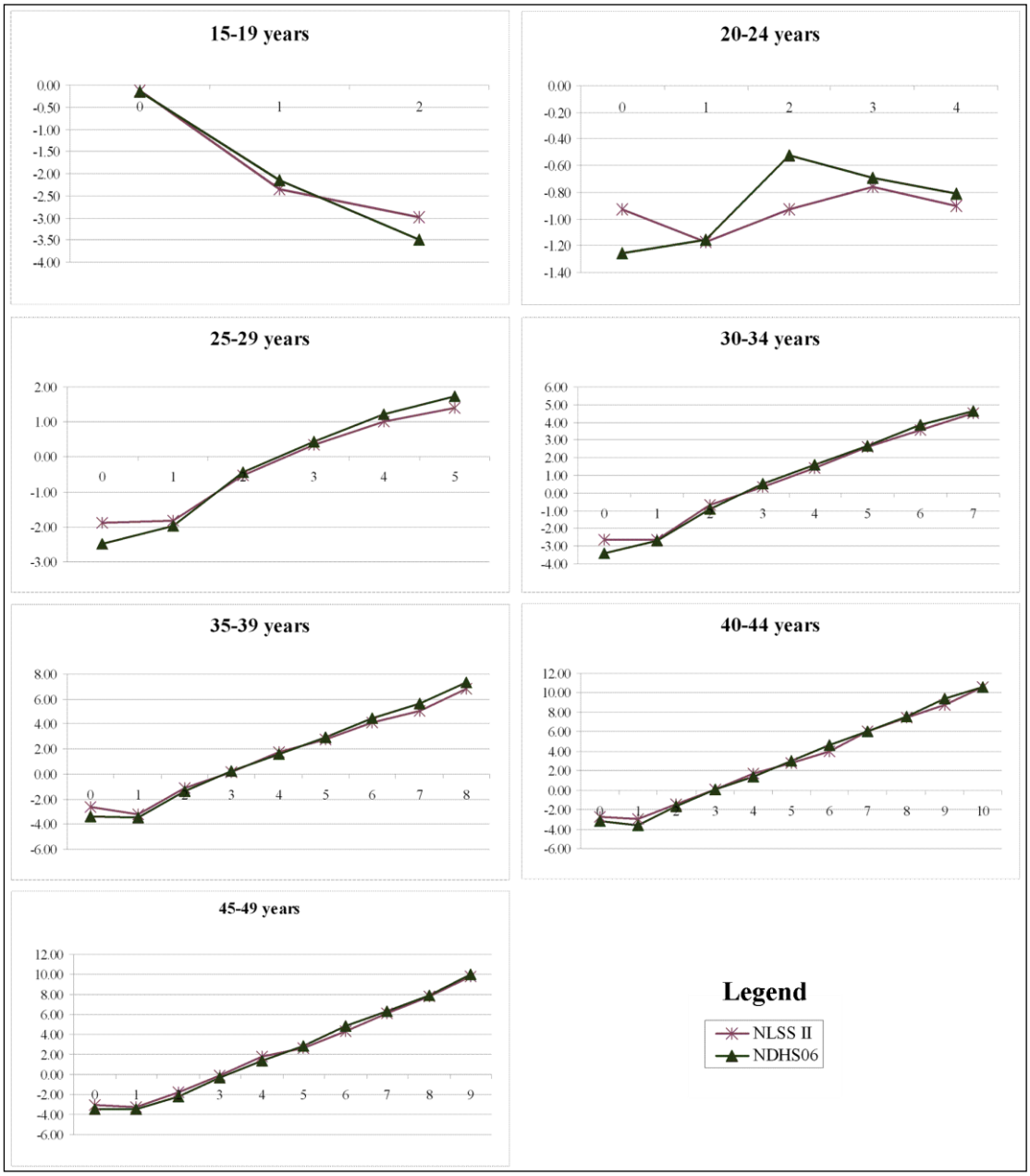

Figure 3.22 Plots of $\ln(p_b b!)$ against b for five year age groups

3.10. Son Preference

It is well known that son preference is common in South Asia, though the majority of research on this topic has been conducted in India. Nonetheless, Nepal has been considered to have considerable levels of son preference since the World Fertility Surveys of the 1980s first allowed large scale studies of this phenomenon (Cleland, Verall and Vaessen 1983). Son preference is especially salient to this thesis since the economic returns for sons and daughters are likely to differ quite considerably; sons are more likely to be able to assist their family financially both because of their higher earning power and because girls traditionally become part of their husbands family once they marry and are thus more likely to provide such assistance as they can afford to their husband's family. If all this were not enough to persuade people of the economic advantage of having sons over daughters then there is also the impact of dowry payments to consider (Das Gupta 1991).

The overall sex ratio in Nepal was found to be 99.8 males per 100 females at time of the 2001 Census and the sex ratio at birth was around 107, which is very close to the expected sex ratio at birth of 105 (Central Bureau of Statistics (CBS) 2010). However, the sex ratio at last birth of those women who had completed childbearing in the five surveys was found to range from 139 in the NDHS 01 and the NLSS II to 157 in the NDHS 06. This implies that stopping behaviour is determined by whether or not a boy has been born – these kinds of sex ratios could only be achieved if couples are choosing to either cease or continue childbearing on the basis of the sex of their previous child. It has been estimated that son preference in Nepal raised the TFR by more than 6% in 1996 and it was further argued that further progression of fertility transition this figure is likely to increase (Leone, Matthews and Zuanna 2003).

There are two common distinct versions of son preference in the literature and they have different implications for fertility. So called lexicographic preferences make the assumption that a certain number of sons are desired and that the aim is to reach that number of sons regardless of the number of daughters that might need to be produced in order to reach that goal. More recently those studying son preference have added in the idea that there may still be an upper limit to the number of children

that couples are prepared to produce in order to achieve the desired number of sons (Basu and de Jong 2010), but the resulting pattern of fertility will not differ dramatically assuming the maximum number of children is not very low. This kind of son preference commonly underpins analyses in developing world contexts and has been explicitly defended in the South Asian context (Cain 1984). The other common type of son preference is generally referred to as sequential and the definition of this is that for any given sex composition of current children an additional son is to be preferred over an additional daughter. Unlike lexicographic preferences sequential preferences do not necessarily increase fertility.

The proceeding sections examine the phenomenon of son preference looking at both its extent and its effect on fertility.

3.10.1. Parity Progression Ratios dependant on sex composition of previous children

Parity Progression Ratios in a country without son preference should not show systematic differences for women whose previous births were mainly male and women whose previous births were mainly female. There may be a tendency for PPRs to be higher for women whose previous births were all of one sex since a lack of son preference does not imply a lack of preference with regard to overall sex composition and women may prefer to have a balance of sons and daughters.

Several problems have been noted with the use of PPRs to look at son preference and consequently their use has become less common in recent years (Haughton and Haughton 1998). Data will be right censored unless the sample is restricted to those who have completed their childbearing years; unfortunately restricting the sample to women who have completed their childbearing is likely to be problematic when working with survey data since this can very quickly result in very small sample sizes. It has also been argued that PPRs underestimate sex preference due to diversity in individual preferences. Furthermore a woman who stops childbearing may not do so because she has achieved her desired sex composition but because the fear of having another child of the "wrong" sex is too great to continue. Conversely, a woman may continue childbearing even though the sex composition of her previous children is not undesirable (Bennett 1983).

Table 3.3 Parity Progression Ratios Dependant on Sex Composition of Previous Births

	sex composition of previous children	DHS 96		DHS 01		DHS 06		NLSS I		NLSS II	
		N	*PPR*	*N*	*PPR*	*N*	*PPR*	*N*	*PPR*	*N*	*PPR*
a_1	**M**	4069	0.848	4218	0.854	4419	0.839	2379	0.842	1954	0.806
	F	3410	0.846	3554	0.842	3372	0.810	1969	0.858	1719	0.819
a_2	**MM**	1779	0.781	1880	0.744	1910	0.690	1143	0.797	807	0.637
	FM	1546	0.784	1597	0.766	1490	0.705	713	0.707	713	0.707
	MF	1672	0.791	1721	0.789	1796	0.730	768	0.706	768	0.706
	FF	1338	0.797	1396	0.788	1243	0.772	816	0.859	695	0.796
a_3	**MMM**	652	0.721	689	0.691	604	0.616	474	0.770	247	0.628
	FMM	625	0.725	637	0.686	515	0.647	254	0.583	254	0.583
	MFM	661	0.702	682	0.692	592	0.650	254	0.539	254	0.539
	MMF	737	0.745	710	0.696	713	0.631	267	0.596	267	0.596
	FFM	555	0.769	547	0.739	504	0.667	302	0.682	302	0.682
	FMF	587	0.724	587	0.743	535	0.679	250	0.724	250	0.724
	MFF	662	0.758	676	0.747	719	0.715	288	0.677	288	0.677
	FFF	511	0.763	553	0.749	456	0.730	343	0.828	251	0.777
a_4	**4M**	238	0.693	224	0.652	172	0.634	202	0.718	76	0.526
	3M, 1F	968	0.698	888	0.675	708	0.627	540	0.637	297	0.488
	2M, 2F	1393	0.696	1406	0.639	1186	0.612	817	0.676	532	0.481
	1M, 3F	893	0.707	903	0.662	843	0.663	533	0.713	380	0.647
	4F	188	0.739	217	0.682	177	0.684	128	0.828	91	0.703
a_5	**5M**	92	0.696	63	0.603	57	0.561	66	0.803	21	0.571
	4M, 1F	400	0.673	390	0.615	269	0.546	248	0.641	92	0.500
	3M, 2F	805	0.677	683	0.606	542	0.637	458	0.666	215	0.558
	2M, 3F	828	0.649	778	0.635	640	0.600	451	0.588	248	0.573
	1M, 4F	378	0.709	398	0.666	385	0.655	256	0.668	140	0.543
	5F	77	0.792	78	0.564	66	0.667	48	0.688	35	0.857
a_6	**6M**	35	0.400	20	0.700	14	0.571	31	0.742	7	0.714
	5M, 1F	162	0.679	131	0.597	85	0.576	113	0.602	23	0.435
	4M, 2F	400	0.640	313	0.597	236	0.538	239	0.603	98	0.602
	3M, 3F	518	0.612	469	0.627	354	0.520	269	0.587	124	0.556
	2M, 4F	429	0.625	370	0.611	316	0.494	206	0.597	109	0.569
	1M, 5F	169	0.633	168	0.571	177	0.548	98	0.714	52	0.635
	6F	31	0.677	24	0.458	22	0.500	30	0.767	13	0.615

Table 3.3 shows PPRs calculated from all five surveys up to a_6 for the different sex composition of previous children. You can also see the number of women in the

sample, for which the PPR was calculated. There seemed little point in calculating PPRs above a_6 since the sample sizes would be so small; indeed, only 7 women in the NLSS II had 6 sons, meaning that the estimated PPR of 0.714 has a very wide confidence interval around it.

In general there is evidence of higher PPRs amongst women with only daughters when compared to those with only sons for a2, a3 and a4. However, at higher orders this trend is not visible. It may be that the small sample sizes are the issue, or it may be that stopping behaviour is not thought through so carefully at higher orders i.e. women continue to bear children irrespective of the sex composition of their previous children.

Given that in a Hindu society one or two sons are considered necessary for religious reasons (Brunson 2010), it makes sense that sex preference is more visible at lower parities. Just 5.7% of couples with 4 children will fail to have any boys and that figure slips to 2.8% for couples with 5 children. Furthermore the likelihood of having had at least two sons is extremely high for women of higher parities: 70.6% for women with 4 children, 82.7% for women with 5 children and 90.2% for women with 6 children.

3.10.2. Sex Ratio at Last Birth

There have been a variety of problems noted with using PPRs to study son preference. One possible method of looking at this issue is to study the sex ratio of the last birth for those people who have completed childbearing. In the DHS surveys this was done by including only people who wanted no more children or who were sterilised. In the NLSS surveys there was no question about whether the participants wanted more children, but there were questions on ideal family size, thus women were deemed to have completed childbearing if they had at least the number of daughters and number of sons that they said they wanted or if they were sterilised. Obviously, this means that the two samples are not strictly speaking directly comparable, though the NLSSs and NDHSs should be comparable within themselves.

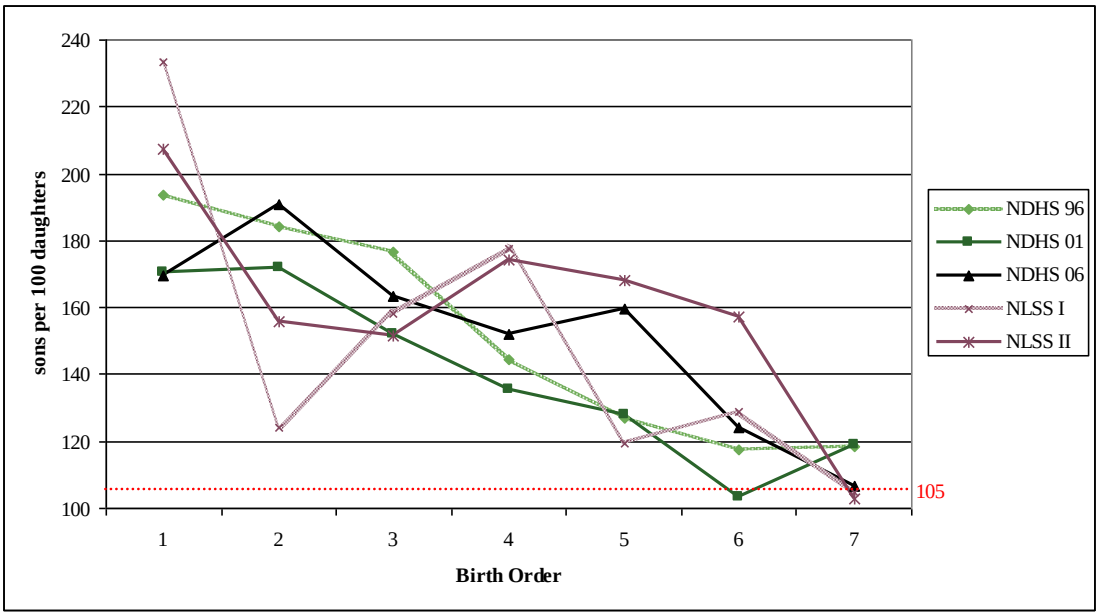

Figure 3.23 Sex ratio at Last Birth from Five Surveys

Figure 3.23 shows the sex ratio at last birth for women of parities one to seven estimated from all five surveys. A reference line is provided at 105 sons per 100 daughters to show where the biologically expected ratio would fall. For women who are classified as having completed their childbearing at parity one the sex ratio was estimated to be between 169 and 233. The size of the sex ratio generally appears to decrease with the order of the last borne child, with three of the four surveys estimating the sex ratio to be below 110 for women whose parity was seven. This makes sense intuitively since women having larger numbers of children are less likely to be using contraception or making conscious choices about their childbearing. This is also consistent with the trends that could be seen in the PPRs.

3.10.3. Son Preference at Different Parities

The sex ratio at last birth is one method for looking at the effect of son preference, but there will obviously be some variation in numbers of sons and daughters born in a population. Using a chi-squared test it is possible to assess whether an observed pattern of sons and daughters is out of the ordinary, or not, for each parity.

The method is relatively simple. The first step is to calculate the probability of having a certain combination of sons and daughters given that the total number of children is k. This is calculated for all parities up to k=10. It is assumed that the

natural sex ratio is 105 sons for every 100 daughters. Thus, the probability of having two daughters given that k=2 is $(100/205)^2$, while the probability of having one son and one daughter is (100/205x105/205)+(105/205x100/205).

Suppose that the probabilities of having a certain number of sons and daughters for women of parity k are given by $p_1, p_2, \ldots, p_k$. The observed frequencies (obtained from survey data) are given by $m_1, m_2, \ldots, m_k$. The test statistic can then be calculated as follows, where N is the sample size:

$$\chi_s^2 = \sum_{i=1}^{k} \frac{(m_i - Np_i)^2}{Np_i}$$

This is essentially a measure of the extent to which a sample deviates from expectation and it asymptotically approaches a chi-squared distribution. It is then possible to obtain a p-value for this test statistic, which is the probability that the observed deviation from the expected values is due to chance only.

Table 3.4 shows the p-values for parities one to ten for all five surveys. There is evidence that the distribution of births observed for women with either two or three children is not consistent with the expected sex ratio at birth of 105 sons to every 100 daughters. The p-value for every survey is less than 0.01 indicating that it is highly unlikely that the frequencies of males and females observed in these surveys would have occurred if there was no son preference being practised. Son preference is less consistently observed at other parities and for parities eight and above only one of the five surveys provided evidence that son preference was being practised. Intriguingly data from the NDHS 06 supported the hypothesis that son preference was being practised for women of parities two to eight; being the most recent survey this indicates that son preference may not be diminishing with the fertility rate.

Table 3.4 P-values for a chi-squared test of son preference on data from five surveys on women with up to ten children

Parity	*NLSS I*	*NLSS II*	*NDHS 96*	*NDHS 01*	*NDHS 06*
1	**0.00**	0.07	0.06	0.44	0.27
2	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
3	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**
4	**0.00**	**0.00**	0.35	**0.03**	**0.01**
5	0.45	**0.03**	0.05	0.17	**0.00**
6	**0.03**	0.18	**0.01**	**0.00**	**0.00**
7	**0.00**	0.13	**0.01**	**0.00**	**0.00**
8	0.24	0.42	0.27	0.58	**0.00**
9	0.24	**0.00**	0.13	0.24	0.11
10	0.62	0.19	0.09	0.71	0.52

Note: Figures in bold are less than 0.05

3.10.4. The Effect of Son Preference on Fertility

If women are continuing to have children until they have a certain number of sons rather than a certain number of children regardless of their sex then this implies that son preference must be causing the fertility rate to be higher than it would otherwise be. It is possible to estimate the effect of son preference on the fertility rate using PPRs again (Leone et al. 2003).

The method that is going to be used makes the assumption that sex selective abortion is negligible (not an unreasonable assumption in the Nepali setting) and utilises the data on the sex of children at each parity. Data is only used for those women who are deemed to have stopped childbearing (as described in section 3.10.2). The idea behind this method is that, in the absence of son preference, stopping behaviour will not differ by sex of the last born child and thus the proportion of sons who are last born out of all sons of that parity will be the same as that for daughters.

Assume:

B_x = Births of order x

${}_L M_x$ = male births of order x to women who remained at parity x

${}_L F_x$ = female births of order x to women who remained at parity x

${}_{NL} M_x$ = male births of order x to women who had births of orders greater than x

${}_{NL} F_x$ = female births of order x to women who had births of orders greater than x

Now we can express the number of births of order x+1 as the sum of male and female births that are not the last births of order x:

$$B_{x+1} = {}_{NL}F_x + {}_{NL}M_x \tag{1}$$

Furthermore we can express the number of births that are of order x as the sum of all births, which can be decomposed into the sum of all male and female births as follows:

$$B_x = {}_{NL}F_x + {}_{NL}M_x + {}_{L}F_x + {}_{L}M_x \tag{2}$$

Thus, from equations 1 and 2, the parity progression ratio can be expressed as:

$$\frac{B_{x+1}}{B_x} = \frac{{}_{NL}F_x + {}_{NL}M_x}{{}_{NL}F_x + {}_{NL}M_x + {}_{L}F_x + {}_{L}M_x} \tag{3}$$

Now, in the absence of any sex preference it can be assumed that:

$$\frac{{}_{NL}M_x}{{}_{L}M_x} = \frac{{}_{NL}F_x}{{}_{L}F_x}, \tag{4}$$

Or in other words the decision to have another child is not dependant upon the sex composition of previous children and thus stopping behaviour is the same irrespective of the gender of children that are born. Substituting equation 4 into equation 3 we then get:

$$= \frac{\frac{{}_{NL}M_x + {}_{L}F_x}{{}_{L}M_x} + {}_{NL}M_x}{\frac{{}_{NL}M_x + {}_{L}F_x}{{}_{L}M_x} + {}_{NL}M_x + {}_{L}F_x + {}_{L}M_x} \tag{5}$$

$$= \frac{{}_{NL}M_x\left(\frac{{}_{L}F_x}{{}_{L}M_x}+1\right)}{{}_{NL}M_x\left(\frac{{}_{L}F_x}{{}_{L}M_x}+1\right)+{}_{L}M_x\left(\frac{{}_{L}F_x}{{}_{L}M_x}+1\right)} \quad (6)$$

Hence the PPR in this situation will be:

$$= \frac{{}_{NL}M_x}{{}_{NL}M_x+{}_{L}M_x} \quad (7)$$

The TFR can then be estimated using the PPRs and where $a_{0=1}$ since all parous women will have at least 1 child and it is not possible to study the gender specific stopping behaviour of non-parous women:

$$TFR = a_0 + (a_0 \times a_1) + (a_0 \times a_1 \times a_2) + (a_0 \times a_1 \times a_2 \times a_3) + (....)...$$

Figure 3.24 shows the estimated TFR in the absence of son preference calculated using the method just described set against the TFR estimated from the PPRs that actually occurred, but still taking $a_{0=1}$ since this makes the two estimates comparable. These figures are shown for all five surveys, for the urban and rural samples as well as for all women in the surveys. Figure 3.25 shows the absolute difference in the TFR estimated with and without son preference. Table 3.4 shows the percentage difference in the estimates.

Table 3.5 The Estimated Effect of Son Preference on the Total Fertility Rate

	NDHS 96	*NDHS 01*	*NDHS 06*	*NLSS I*	*NLSS II*
All	4.88	3.67	4.61	4.52	7.00
Urban	5.87	5.70	1.00	5.18	8.30
Rural	3.70	3.48	4.83	4.34	6.56

The NLSS II consistently showed the largest differences, with the figures indicating that fertility was 8.3% higher in urban areas due to son preference. Interestingly all the surveys apart from the NDHS 06 indicated that son preference made more difference in urban areas than rural areas in percentage terms and in absolute terms (Figure 3.25) the differences were very similar in the NLSSs and again higher for urban areas for the NDHS 96 and the NDHS 01. It is not clear why the NDHS 06 indicates such a lack of son preference in urban areas and this finding is at odds with all the other surveys meaning that either four surveys have under enumerated girls or the urban sample for the NDHS 06 is special in some way.

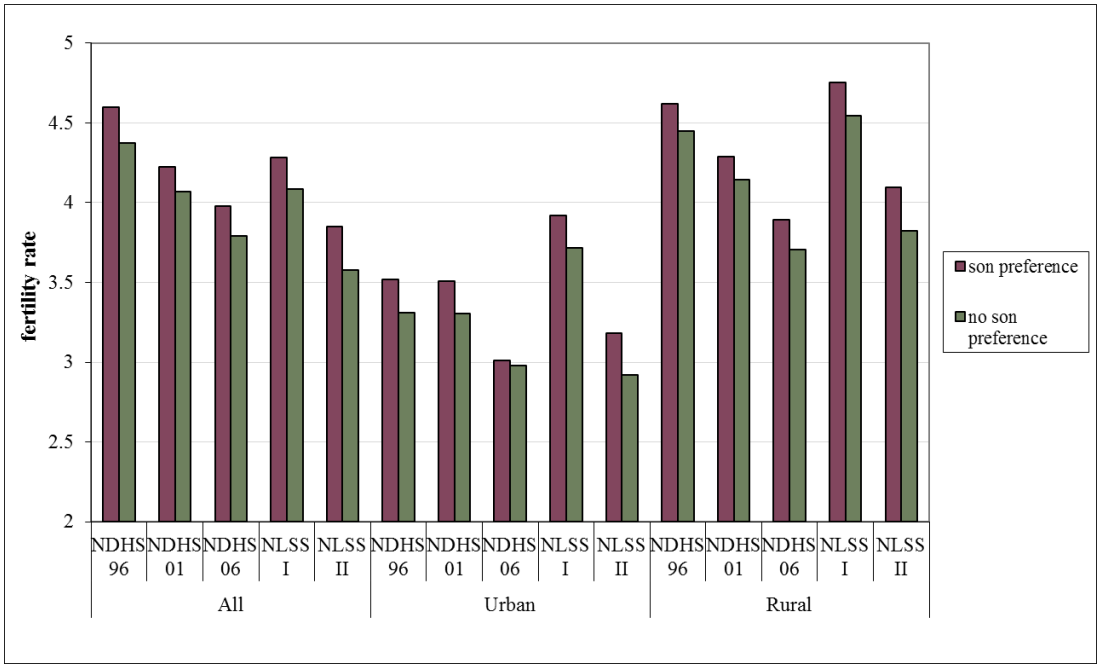

Figure 3.24 The effect of son preference on completed fertility

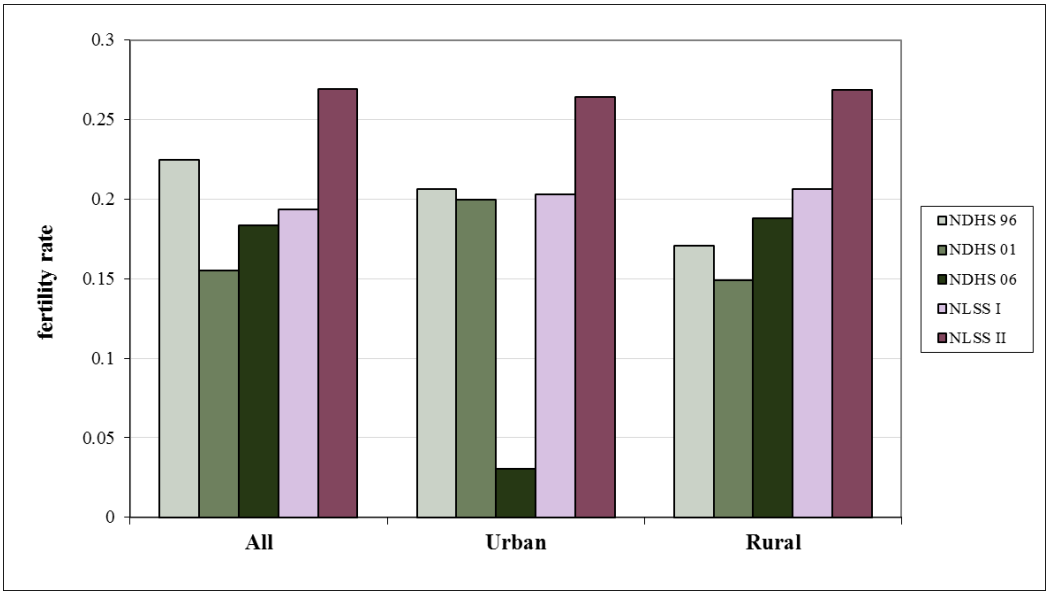

Figure 3.25 The Absolute Difference in Fertility Depending on the Existence of Son Preference

3.11. Conclusions

In this chapter a variety of techniques have been used to look at patterns of fertility in Nepal since the early 1980s. It has been shown that fertility varies by caste/ethnicity and region and that son preference is still present in Nepal potentially causing the total fertility rate to have been up to 8% higher than it might otherwise have been in recent years.

The five recent surveys with full birth histories were looked at in order to compare the quality of the data. While there is evidence that fertility was underreported in the NLSSs (especially the NLSS I), there are parts of the data which look sound. Data on births in rural areas, of orders two or more and to women aged 25 or over seem to be good. The data on parity progression also looks to be usable. The data seems to be particularly sound for progression from first birth through to fourth birth, particularly for women aged 25 and over. Therefore survival analysis studying birth intervals for births of order 2 or greater would only be using that part of the data which looks most sound.

The urban data looks particularly problematic (though small sample sizes make it hard to properly verify this). Therefore, unless there is an extremely strong theoretical reason to include these women they should be excluded from analyses. There is a clear excess of women at parity zero and this looks to be a problem in the NDHSs (though to a much lesser extent) as well as in the NLSSs. This is combined with the omission of higher order births (especially those of order five and above) in the NLSSs. Therefore, studying the

overall level of fertility may be problematic. However, studying changes in level is perfectly sensible as long as the level itself is not the issue.

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CHAPTER 4

ARABLE LANDHOLDING AND THE DEMAND FOR CHILDREN

4.1. Introduction

The notion that fertility decisions may be related to arable landholdings (that is land suitable for cultivation) in agricultural areas of the developing world is long established and intuitively appealing given the centrality of landholding to rural life. However, there has been widespread disagreement about the importance of this link and even its existence. Very little has been done to rectify the situation in recent years.

It is postulated that the lack of consensus is due to the methods used in previous attempts to solve this problem and evidence for this is provided by the literature review within this chapter. Put simply, there is no conclusive evidence on either side of the argument. This chapter seeks to redress the gap using evidence gathered from Nepali survey data. Through the employment of survival analysis and panel data the method used avoids the majority of problems that beset earlier attempts.

The results confirm that there is a relationship between landholding and fertility, and also between landholding and son preference. Given the methodology used this is strong support for the hypothesised causality. The results also provide support for the more general notion that fertility decisions are at both the individual and population level are, on average, made rationally.

4.2. Hypotheses

There are two major separable dimensions to land – the ownership of land and the amount of land available to cultivate. It is hypothesised that the relationship between landholding and fertility operates via separate causal pathways for these two dimensions: one of these relates to fertility as insurance while the other is concerned with the use of children to help cultivate land.

4.2.1. The land-security hypothesis

The first hypothesis (referred to as the land-security hypothesis from now on) is linked heavily to the idea of children as an informal insurance good and is concerned with owned land. It might be economically rational to have a large number of children in an environment of harsh risk, even if intergenerational transfers do not flow from child to parent, since children provide insurance. In other words in the event that parents cannot purchase any formal insurance they can produce their own through their offspring. In many developing world countries old-age and widowhood are likely to bring poverty due to a lack of necessary institutional arrangements (pensions, credit/savings markets, social security etc.). There are also a variety of other sources of risk including natural disasters for example. Children can provide for elderly parents when there are no sensible alternative mechanisms for providing old-age security and, indeed, "in the absence of institutions that provide various kinds of insurance and permit the reallocation through savings of resources to old age, children may…be the best deal around, although the extent to which such assets as land or livestock fulfil the same functions in agricultural society is unclear" (Lee 2000, p.47). Whilst Caldwell (2005) argues optimistically that "There is a near consensus on the premodern insurance value of children. Childless parents… faced almost insurmountable problems in converting surpluses from their young adulthood into support for their old age. Financial institutions evolved relatively recently and most ignore the poor and illiterate" (p.735).

This idea is mainly attributed to Mead Cain (1981, 1983, 1985, 1986a, 1986b, 1991) though he was not its original instigator; he was, however, its most enthusiastic proponent during the 1980s and 1990s.

The land-security hypothesis holds that landownership is also able to provide security in old age or in the case of other "events that threaten normal consumption streams" (Cain

1981, p.435) and that if a couple owns a sufficient amount of land then they will not need the insurance provided by having many children. Or, rather than a threshold effect it may simply be that children and landholding may be used as straightforward substitutes for one another when being used as a form of insurance. This hypothesis does not, however, suggest that fertility rates can be reduced by simply arranging agricultural land-ownership in such a way as to make everyone more secure; it is an individual level hypothesis – a point which is often neglected. There are also many institutional factors which need to be considered before allowing that the hypothesis might be viable in any specific setting.

First there must be a non-natural fertility regime i.e. fertility must be a conscious decision on some level. It may be the case that conscious decisions are not made at every parity; parents may have two children before they begin making conscious decisions about contraception and future childbearing. At some level, though, fertility must be within the realm of conscious choice.

Second, it must be possible to gain security from land-ownership; this means that it must be possible to make money through rentals, sharecropping or other arrangements – in other words, it must be possible to live securely off your own land possibly with the use of labour that is hired in. Therefore it is important to understand the institutional arrangements surrounding the market for agricultural land before blithely accepting that a correlation might indicate genuine causation.

Third, the possibility of other mechanisms explaining any correlation between size of landholdings and fertility needs to be discounted. For example Cain (1986b) argues that the relationship can be explained away by "systematic differences in fecundability stemming from different periods of spouse separation" (p.316). However, it should also be noted that this refers to an analysis of rural Bangladesh when it was still experiencing a natural fertility regime. Cain's argument is that such explanations could easily hold true in areas where a non-natural fertility regime exists. So, while the actual analysis of Bangladesh is irrelevant to our hypotheses, there is the possibility that there are alternative causal paths leading to a correlation between landholding and fertility.

A final point is that the land-security hypothesis may refer to children overall or it may refer to just sons since there are many settings where daughters cannot provide security in

later life. Thus, depending on the context, the land-security hypothesis may imply a relationship between owned landholding and son preference.

4.2.2. The land-labour demand hypothesis

The second hypothesis (referred to as the land-labour hypothesis from now on, though the longer phrase is generally used in the literature) is concerned with the idea that a larger area of land available to be cultivated by a family will lead to higher fertility since children are the cheapest and securest (and sometime the only) form of additional labour available to them. Families with access to larger agricultural holdings are, it is hypothesised, able to use additional family labour more profitably. It is also possible, when we are considering very small landholdings, that women may be forced to find work away from the family farm if that farm is below a certain size and thus an increase in farm size would allow the woman to stay at home and thus decrease the cost of child rearing. This hypothesis is not confined to owned land, but relates to any and all land that a household is likely to be able to use for purposes of cultivation over a sustainable amount of time.

However, there are complications: the state of the labour market, the produce market and the land market will all have intermediary impacts on the effect of arable landholdings on childbearing decisions. As the labour market improves the advantages of family labour will diminish, while if the produce market is good then the profitability of employing extra labour will increase meaning a greater return to family labour. The land market also needs to be relatively stable and fixed otherwise it would be more logical for land to adjust to family size.

The possibility that landholding may adjust to family size is known as the reverse causation hypothesis and its plausibility depends greatly on the country context and the precise nature of the market for land. It seems reasonably implausible in a country where the majority of land is acquired as inheritance.

The relevance of this hypothesis is also restricted to areas where the agricultural process is not highly mechanised since in this situation the marginal returns to labour will diminish fast with increasing farm size. Also, of course, if increasing farm size were associated with increasing use of labour-saving machinery and opportunities to use non-family labour then the marginal productivity of children would again decrease with

increases in farm size. In both instances it would no longer be expected that the extent of agricultural landholdings would bear a positive relationship with childbearing.

4.2.3. Complications and the Income Effect

Clearly the two hypotheses already discussed work in opposite directions; the land-labour hypothesis states that fertility and land are complements while the land-security hypothesis states that they are substitutes. The other fundamental difference (which is crucial in order for us to be able to test these hypotheses) is that they refer to different types of landholding; the land-security hypothesis relates to land that is owned whilst the land-labour hypothesis relates to all forms of arable land available to a family that is operational (including any communal land). The challenge is to disaggregate these two effects and to test them separately; this is a challenge which is yet to be met successfully even though in theory (and hopefully in reality) it is more than practicable.

The relationship is further complicated by the possibility that any association may actually reflect a pure income effect. The meaning of "pure income effect" in this context is the change in the demand for children directly attributable to a change in income. Lee & Bulatao (1983) suggested that this was the most likely reason for the positive relationship which was observed in 11 of 13 studies reviewed by Mueller & Short (1983, p.618-19). In most of these 13 studies the measure of fertility is children ever born (CEB) while the landholding variable was simply the total amount of land owned (though this was sometimes restricted to operational landholding). Lee & Bulatao argue that "This positive association may indicate that the pure income effect on the demand for children is strong enough…so that the net effect…is positive [and] because in these settings there are fewer opportunities for investing in child quality" (p.267).[11] This possibility makes it important to control both for income and the level of investment in child quality and the failure of most studies to do both (or indeed either) is one of the reasons why these hypotheses remain both contentious and neglected.

The matter is further complicated by the fact that motives cannot be directly observed; unfortunately, since it is the intensity of these childbearing motivations that are of interest,

[11] By "these settings" the authors meant the developing world.

it is necessary to devise some way of establishing them from the data available. Nugent (1985) argues that the solution to this problem is to "proceed indirectly by identifying a priori circumstances that could be expected to influence the intensity of the motive… one would have to observe fertility behaviour in circumstances differing in the intensity of the old-age [and labour] motive while holding other factors as constant as possible" (p.75-76). It is with this in mind that this paper proceeds to look at the relevant literature and ultimately consider how to construct a model that will test both hypotheses.

4.3. Literature Review

Early papers purporting to prove a relationship attempt this proof using very simple techniques. Tuladhar et al. (1982) simply present the difference in family size by farm size in Nepal, controlling only for age of women. The study tells us virtually nothing about the landholding-fertility relationship, although fertility is higher for those women whose husbands have the largest category of landholding. A similar technique was earlier used by Hawley (1955) for data from the Phillipines, although he also controls for women's education and the positive relationship between operational landholdings and fertility is much clearer. Hawley (1955) also presents data illustrating that farm tenants generally have smaller families than farm owners (p.24), which could be taken as support, albeit tentative, for the land-security hypothesis. Farm tenants were also found to have larger families than farm labourers indicating support for the land-labour hypothesis. However, the only control used is the age of the wife and moreover this study is based on data from 1952 - long before the beginnings of a fertility transition - it is not sensible to use this study in support of any hypotheses where deliberate fertility control is a necessity.

A more fundamental problem with the techniques employed in both papers is that the relationship illustrated could simply be between income and fertility. Unless income is controlled for separately then there is no evidence to support this correlation reflecting anything other than a pure income effect.

Another technique used was to study the relationship between population density and fertility as Firebaugh (1982) did in a study of 22 farm villages in India. He took the Crude Birth Rate (CBR) as the dependant variable in a regression which controlled for literacy and caste as well as population density. He found that "population density had an inhibiting effect on fertility" (p.481). Density could be related to the land-labour

hypothesis because in areas with a higher population density there is less probability that extra child labour will yield returns. It is a tentative link though; furthermore, despite Firebaugh's enthusiasm concerning his results the predicted effect of density upon the CBR was actually found to be rather small (an increase in density of 11.2 per cent was associated with a decrease in the CBR of 2.7 per cent). Furthermore the CBR is a problematic dependant variable since it is misleading for comparison between populations in the event of differences in age composition; indeed, it was only used due to the aggregated nature of the data. The use of aggregated data is extremely problematic of itself: "it is not justifiable to draw conclusions at the individual level from data collected at a more aggregated level" (Thomas 1991, p.387). The point is that conclusions cannot be inferred about the hypotheses on the basis of this type of analysis; the hypotheses concern individual level decisions while the data provides information at a group level.

Further evidence comes from Good et al. (1980) who found that those who did not own land desired more children (3.51 as opposed to 3.14 – p.317). The difference, of less than half a child is too small to draw any conclusions. Controls were in place for a variety of social status measures, but ultimately the evidence is flimsy.

Schutjer et. al. (1983) used data from Egypt and also Thailand (see Cain 1985, p.7) and ran a regression analysis with children ever borne as the dependant variable and farm size, land ownership and some basic controls (income, education and age) as the independent variables. They found that the effect of the variable for land ownership was negative and statistically significant at the 5 per cent level. The variable for land ownership used was, however, problematic since they used the ratio of cultivated land to owned land. This does not test directly for the land-security hypothesis since it is the amount of land owned that is important. Stokes et al. (1986) explain their use of this variable by arguing that "the amount of land owned would be expected to bear a positive, not negative, relationship to fertility, consistent with the land-labour demand hypothesis" (p.308). However, data allowing, it would be possible and preferable to use variables for the amount of land owned and the amount of land operated separately; this seems like a more sensible solution than that proposed by Schutjer et al. (1983) and Stokes et al. (1986).

Cain (1985) argues that even were the research to be redone with the use of more sensible variables then it would not be tenable to support the land-security hypothesis since

land is not a good substitute for children; his arguments are that land must be managed in order to give returns, that children provide other benefits and that land is an insecure investment. However, a variety of research has argued that children are also an insecure investment and that parents are fully aware of this (Subedi 2006; Vlassoff 1990; Vlassoff and Vlassoff 1980). The argument that children provide other benefits cannot be discounted, but it was never suggested that landholding could be a complete substitute for childbearing, merely that decreased security from lack of landholdings would increase desire for children (particularly sons).

The possibility of reverse causation has also been mooted as an objection: in a country where land markets are relatively flexible (at least in comparison to the commitments entailed with having children) it is possible that people adapt the size of their landholdings (rented or owned) to fit with the size of family that they presently have. The question is whether the absence of credit and savings opportunities and a well-defined, regulated property market would prevent any causal relationship from existing in this form. A large amount of land may increase a couples' need for farm labour, but it could also be the case that having a large number of children increases a couples' desire for landholdings. Furthermore, this relationship could easily be reciprocal.

Clay et al. (1992) attempted to test, among other things, which direction the causation might work using data from Rwanda. They used a two-stage-least-squares regression with farm size and family size as the two endogenous variables and eight other relevant exogenous variables. They found that farm size had a strong positive effect on fertility, whilst the reverse was not true. Interestingly this paper also found that farm size failed to have an effect on desired number of children and the authors argued that the mechanism explaining the strong correlation they found between farm size and fertility was on the supply side (though they failed to explain precisely how this might work). Clay et al. further attempted to look at the different relationship of land rented and land owned with fertility, and report that their results are suggestive of a difference but are nonetheless inconclusive. This paper goes further than previous ones and the results of the two-stage-least-squares regression indicates that farm size affects fertility and not vice versa. The main problem with these findings is that the contraceptive prevalence rate in Rwanda was just 2 per cent at the time of the research, which is why the authors favoured a supply side

explanation. Again, while the findings are interesting, they tell us nothing about *conscious* fertility decisions.

The evidence surveyed thus far is consistent with the hypothesis that any correlation between landholding and fertility reflects a pure income effect. Mueller & Short (1983) claimed that "in rural areas, land is a good proxy for permanent income [and] the land effect is more consistently positive than the income effect" (p.630). They do, however, accept that this land-fertility relationship wherein a "striking consistency was found" (Lee and Bulatao 1983, p.267) could easily reflect mechanisms other than the income effect and they call for more research to be done in this area. The relationship was still under fierce debate up until the early 1990s when Cleland (1993) stated that the "evidence is inconclusive" and thereafter showed no further interest in the topic. This attitude has persisted amongst a great deal of demographers ever since. While Thomas (1991) agrees that "the statistical evidence in support of the two land-fertility hypotheses, based on *14* sets of data, is inadequate" (p.389) this does *not* lead him to conclude that this line of research should be ceased, but rather that any new attempts should look very carefully at where previous research went wrong.

Vlassoff & Vlassoff (1980) attempted to look at the land-security hypothesis through extended interviews in an Indian village. In this study respondents were asked if they ever reflected upon what would happen to them during old age: the authors argue that their results do not support the existence of an old-age security motive since more than half of the respondents claim not to have thought about their own old-age. However this belies the fact that 44 per cent of all respondents said that they *were* worried about old-age security. What is more - they say that "thoughts about senescence were more prevalent in older age groups and among the economically disadvantaged" (p.491), which is precisely what would be expected if the land-security hypothesis were correct. It is particularly important that worries about old-age support are most apparent amongst those with a lower income. They were found to be particularly concerned about whether their sons would support them and be obedient: "Optimism concerning security in old age was linked as closely to landholding as to the presence of sons." (Vlassoff & Vlassoff 1980, p.498). Again, this seems to be evidence *for* the land-security hypothesis, though the authors themselves meant, by this, to belittle the old-age security motive for fertility.

One of the major failings of this study was the decision to interview men alone. If (and this is a big if) this study indicates that men do not consider old-age security as a fertility motive then this certainly does not mean that their wives feel the same. Women are much more susceptible to the problems of old age – particularly through widowhood – and are more likely to have to rely on sons for a longer period of time than their husbands. Indeed Datta & Nugent (1984) view the Vlassoff & Vlassoff paper as "merely serv[ing] to indicate that the motive could be expected to be more important for women than for men" (p.509). This is a point which is partly accepted by Vlassoff (1984) since it is admitted that the study has nothing to say on the motivations or position of women. Indeed Vlassoff (1990) concentrates a study of old-age security motives in rural India exclusively on widows for precisely these reasons. She found that those widows living alone had, on average, the most money per day (8.16Rs per day compared with 5.75Rs for those living with married sons). Those widows who lived alone mainly supported themselves and were predominantly childless due to the fact that their husbands had died when they were very young (and in some cases before the marriage had been consummated). In this situation "there was no question of the widow remarrying" (p.16). Thus this group is rendered irrelevant to the question of fertility motives since the majority did not have the option of bearing children. While it is true, as Vlassoff (1990) points out, that "this finding does not bear out the contention that those supported by sons in old age are better off financially than those without male offspring" (p.17) it still does not have any bearing on fertility motivations. Women who were put in a position that prevented them from having a family of their own would have to find other means of supporting themselves and the fact that they managed this successfully does not mean that they would not have preferred the more traditional route of bearing sons had this been an option for them. A further major failing is that barely any widows in the study could actually be described as elderly. Vlassoff (1990) also claims that the old-age security motivation was improbable in this specific setting because the widows in their study claimed that they had not controlled their own fertility voluntarily; if this is the case then the whole study becomes essentially irrelevant for this discussion since it is looking for causal relationships in a place where theory does not predict any.

Vlassoff (1984) argues that an old-age security motive will only exist if the level of fertility is "low enough to imply on average begetting only one son" (p. 511). The precise level of fertility this refers to will depend on infant and child mortality but it is likely to

imply a TFR greater than 2.1 and lower than 3.0. Furthermore it will only be observable among families yet to have a son. This seems very restrictive, but the point that the effect may only have any substantive effect for specific parities is a salient one and one to which we shall return. This further reinforces the fact that the studies by Vlassoff & Vlassoff (1980) and Vlassoff (1990) might have been asking the right questions but not in the right places. Their failure to find the relevant relationships is therefore, for want of a better word, unsurprising; as Cain (1991) points out: "Vlassoff must sharpen her focus: concentrate on widows aged 60 and older: possible confounding factors need to be controlled" (p.521). Vlassoff (1991) counters that she never claimed to have found that economic considerations were irrelevant but "rather that the value of sons transcends economic considerations" (p.530); it seems to me that these two things amount to much the same thing. She further states that "Cain's reservations about fertility motivations are well taken" (p.533) thereby admitting that her research was fundamentally flawed with respect to the land-security or land-security hypotheses.

Recent attempts to look at the relationship between landholding and fertility have been, for the main part, wasted opportunities. Ghimire & Hoelter (2007) looked at the relationship between first birth timing and land use in an area of South-Central Nepal (the Chitwan Valley). The first problem with their method is the use of first birth timing, which is not a sensible dependant variable because in Nepal marriage is virtually universal (although the age at marriage is increasing (Karki and Krishna 2008)) and once a couple is married they will be expected to bear children with very little delay. The gap between marriage and first birth will depend, almost exclusively, on biological and social mechanisms that lack any deliberate consideration on the part of the couple involved. A couple is unlikely to exercise deliberate control over their fertility until they have already had at least 2 children; the mean ideal family size in Nepal was reported as 2.7 in the 2001 Demographic and Health Survey (Ministry of Health [Nepal] and New ERA and ORC Macro 2002) and 2.4 in the 2006 Demographic and Health Survey (Ministry of Health and Population (MOHP) [Nepal] and New ERA and Macro International Inc. 2007). On the basis of the hypotheses landholding is not expected to affect first birth timing. It would therefore be substantially more effective to look at the transition from second to third and third to fourth birth in this kind of setting (which is precisely what is done in this paper).

A further problem with Ghimire & Hoelter's paper was that they simply took the proportion of land used for agriculture and public infrastructure in each neighbourhood and looked at the relationship between these variables and fertility; this would be unlikely to illustrate the real relationship between landholding and fertility even if a sensible measure of fertility were used. The proportion of agricultural land in a community does not, of itself, have any theoretical relationship to the level of security a family is likely to feel nor does it have any particular bearing on the value of child labour. The authors found the proportion of agricultural land did, in fact, have a significant effect on first birth timing, but in the absence of any sensible theory it is unclear what this result means. The authors argue that "higher proportions of agricultural land should motivate young women for early childbearing through higher returns to child labour" (p.314) since "opportunities for child employment are not limited to household operational landholding but also apply to the local community" (p.293). While it is true that in Nepal the opportunities to gain useful work from children are not limited to an individual family's land due to the existence of communal land, it has been argued that rich families are far more able to take advantage of any such communal resources (Macfarlane 2003, p.46). In other words, land ownership is likely to be a good proxy for the utility a family can gain from any communal land and it would be unwise to surmise that all families have equal opportunities to take advantage of the commons.

An anthropological study of another area in Nepal (Lamjung in the Western Hills) by Subedi (2006) found that, "parents intend to depend on children and that there is a sense of moral obligation for adult children to take care of their parents in old age" (p.75). This study looks at pensions as an alternative means of old-age support as well as landholding. Unfortunately, the comparison is made between those who depend on land alone and those who also have an income of some form (i.e. a pension). No difference was found between these two groups, but then the hypotheses would not necessarily predict one. No effort is made to distinguish between the quantity or type of landholding or the level of support provided by the other income, which is a major failing. Subedi comes to the conclusion that "social security benefits played no role in fertility transition" (p.76) but nonetheless he is convinced that old-age security is a pervasive motive for childbearing. The question raised by this article is whether the individuals involved would consider any means of old-age security provision other than children as sufficient in order to limit fertility; to answer

this question it would be necessary to compare those with some means of old-age security other than children and those with *no* means.

Nothing in Subedi's study disproves the hypotheses, whilst the setting described is one in which children are seen as a source of old-age security, contraception is used and it appears that people are aware of their own childbearing decisions; furthermore, there are no "traditional extrafamilial welfare institutions…[and] no profitable and reliable means of accumulating financial assets" (p.74). Therefore, this is the perfect setting to look for evidence of the land-security hypothesis.

The landholding-fertility relationship has long been neglected in mainstream demography, despite the fact that there is a dearth of proper evidence on the topic. Admittedly, trying to separate the land-labour and land-security hypotheses is not easy, but previous attempts have failed for reasons that are rectifiable. The hypotheses have often been tested in settings where a natural fertility regime persists and while a correlation has been found in these settings, such a correlation is not pertinent to the testing of the hypotheses.

In order to establish whether these hypotheses hold it is first necessary to test the relationship between different types of landholding and fertility; this needs to be done with *all* the relevant controls in place and in a setting exhibiting the kind of fertility regime where the hypotheses would be expected to hold according to the theory – this is what the analysis in this paper attempts to do. If the hypotheses are supported by data in the right setting then it would be necessary to establish, through fieldwork, if the mechanism causing the relationship is actually the hypothesised one or if there are other factors at work. There is no reason why we should not ultimately find answers through this course of action and it is perplexing that so few people have tried in recent years.

4.4. Data and the Nepali Setting

Testing the hypotheses outlined in section 4.2 requires data on land ownership, land occupancy, land use and income in addition to fertility data and a range of other demographic and socio-economic variables. Data sets including all this information are a rarity in the developing world. Nepal is a sensible choice for testing these hypotheses since it is one of a small number of countries where a recent Living Standards

Measurement Study (LSMS) survey has been carried out with the inclusion of full birth histories for the women surveyed. The LSMS data is essential because there is extensive and detailed information on both landholding and income. Demographic and Health Surveys (DHSs) are more commonly used to analyse the determinants of fertility, but they lack detailed information on landholding; only questions about agricultural land ownership are asked in the Nepal DHS making it impossible to distinguish between those who cultivate their own land and landlords who benefit from sharecropping or other similar arrangements. The second impediment to using DHS data is the fact that very little data is collected on economic status and specifically income; the current method of choice for approximating socioeconomic status using DHS data is the construction of a wealth index (Bollen, Glanville and Stecklov 2001). However, the wealth index does not measure income (which is of primary importance for testing the landholding-fertility hypotheses); at best the wealth index measures (amongst other things) past wealth, inherited wealth, social aspirations, social status, societal norms in the area and past income. The wealth index says a little about all of these things, but fails to capture any of them exclusively or completely. The justification provided for users of DHS to explain the wealth index states that "it represents a more permanent status than does either income or consumption [and] in the form that it is used, wealth is more easily used" (Rutstein and Johnson 2004, p.4). While it may be the case that constructing a wealth index requires substantially less data than constructing income, it is income which is theoretically relevant to the hypotheses and thus using DHS data would be likely to lead to faulty conclusions on two counts.

The analysis in this paper is based on data from the 1996 Nepal Living Standards Survey (NLSS I) and the 2004 Nepal Living Standards Survey (NLSS II), both of which follow the methodology of the World Bank's Living Standards Measurement Study.

The primary analysis uses the NLSS II wherein a two stage stratified sampling scheme was used and a total of 3,912 households were enumerated from 326 Primary Sampling Units (PSUs). The PSUs were spread throughout the majority of Nepal (see Figure 4.1) and provide a nationally representative sample with the exception of the far-western development region where the maoist insurgency (since resolved) prevented 96 households from being enumerated. The red points on the map indicate PSUs that could not be visited due to the security situation. The district of Achham in the Far-Western region was the only district that was not represented in the survey due to the insurgency. Mustang was the

only other district not represented in the survey, but this was simply by chance since Mustang has a very small population.[12]

The analysis is based exclusively on the rural sample from the NLSS for two reasons: firstly, the two hypotheses being tested are not relevant to a city setting such as Kathmandu, Bhaktapur or Banepa (all in the Kathmandu Valley, where the majority of the urban sample was taken from – as can be seen from figure 4.1). Secondly, it has been found that the quality of the fertility data amongst the urban sample is potentially suspect (see Chapter Three). Moreover, at least 80 per cent of the Nepali population gather their main income through agriculture and this figure is not declining at any great speed.

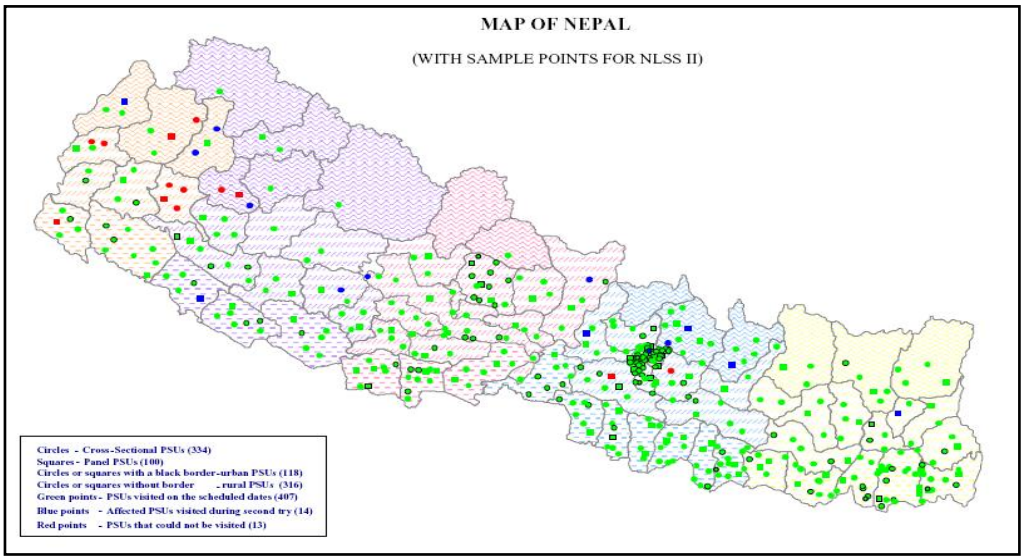

Figure 4.1 Map of Nepal Showing the Primary Sampling Units for the NLSS II

The small amount of panel data available was also used. 1,232 households who were initially interviewed for the NLSS I were also interviewed for the NLSS II. The sample size for the panel is, thus, substantially smaller than that of the cross sectional sample. Nonetheless, the panel is a highly useful tool for considering the plausibility of a causal relationship. It allows us to analyse the stability of household landholdings and household income over time and the relationship between these variables and subsequent childbearing. The comparison of analyses from the panel and cross-sectional samples allows us to edge closer to proving the causal relationship we are searching for.

[12] According to the 2001 Census just 14,981 people were living in Mustang at the time of enumeration. Manang was the only district with fewer residents (9,587). 231,285 people (or 1 per cent of the population) lived in Achham.

The research done by Subedi (2006), which was discussed in the previous section, indicates that people in modern day, rural Nepal would be expected to be affected by security motives and labour motives for childbearing. Ghimire & Hoelter (2007) have provided some of the only recent evidence for the landholding-fertility hypotheses and the fact that this research is from Nepal makes the setting even more relevant.

Nepal is a small landlocked country bordered by China's Tibetan Autonomous Region (TAR) to the North and India on all other sides. The population size is more than 29 million, the Total Fertility Rate (TFR) was estimated to be 3.1 by the 2006 Demographic and Health Survey (DHS), the Contraceptive Prevalence Rate (CPR) was estimated to be 48 per cent and 40 per cent of the population is aged 0-14 years. Nepal is a diverse country with three distinct ecological zones running east to west along the length of the country. These consist of the Terai (or plains) which are a hot and humid region in the south of Nepal, the Hills and the Mountains that are at such a high altitude that subsistence agriculture is often not viable. At least 103 ethnic groups co-exist with only 49 per cent of the population speaking Nepali as its mother tongue. For these reason it is clear that the data provide sufficient variety in the intensity of motivations in order to test the hypotheses stringently (as stipulated by Nugent 1985).

4.5. Conceptualising the Theoretical Relationship between Landholding and Fertility

This paper uses survival analysis to study the transition of couples from second order children to third order and from third order to fourth order. The reasons for concentrating on this part of the fertility schedule are twofold. First and foremost, these are the parities at which economic factors are expected to impact on contraceptive decisions in Nepal. There is little room for economic factors to operate at lower parities, as most couples desire to have at least two children; on the other hand, a substantial proportion of couples who have four or more children are not using contraception even though they express a desire not to have further births (Dahal, Padmadas and Hinde 2008). If landholding does have an impact on fertility then this is where that effect should be apparent. The second reason is that the quality of the NLSS fertility data is questionable for the lowest parities; there also appears to be underreporting of births that are of a higher order than four (see Chapter Three); thus the data looks sound for the transitions between the second and third birth and the third and fourth birth, but less so for other transitions.

The next issue that must be addressed is how the hypotheses are expected to impact upon individual fertility decisions amongst couples who have different types and levels of landholding and different income levels.

For any individual couple the two land-fertility hypotheses may result in either harmonious or competing childbearing motivations. A relatively wealthy couple who have a lot of land available to them to cultivate, but who do not own that land should theoretically desire more children on the basis of the land-security hypothesis and the land-labour hypothesis. Those who cultivate large amounts of land and also own that land will have competing motives according to the hypotheses since the land-security hypothesis suggests that they will desire fewer children while the land-labour hypothesis suggests that they will desire more children. Landless families will also have competing aims since they will desire the security of more children, but will not be able to make use of the extra labour that a large number of children provide; the landless are also likely to be constrained by their income in terms of the number of children they can actually afford.

It is, however, possible to disaggregate the effects of the land-labour and land-security hypotheses in situations where couples have competing motivations by controlling for the sex composition of previous children. Those couples who desire children for security reasons should exhibit a strong sex preference since daughters are rarely able to provide security; the difference between couples with two sons and two daughters as their first borne should be marked. Son preference is expected to be most marked amongst landless couples since those who occupy land they do not own will still desire children of both sexes to assist in cultivation of land and general labouring. A landless couple's main motivation for childbearing is expected to be security on the basis of the hypotheses; landless couples have little use for daughters.

Couples whose fertility decisions are dominated by the labour motivation should not exhibit such a marked sex preference since females can provide as much labour as their male counterparts in childhood. Even allowing for some son preference built into the fabric of Nepali culture it should be possible to see a distinction here.

It is still necessary to account for the possibility that any land-fertility relationship merely reflects a wealth or income effect. It is also necessary to account for the fact that a wealth/income effect may confound the results, even if the land hypotheses are true. By

the wealth/income effect we mean that wealthier couples are able to afford more children and therefore a positive relationship between size of landholdings and fertility may reflect this rather than be evidence in support of the land-labour hypothesis. The best solution to this problem is to control for income sources available to the household since the NLSS includes this data. Furthermore, since those owning land tend to be wealthier than those who simply occupy land and the land-security hypothesis tells us that such people should desire fewer children, then a negative relationship between land ownership and fertility is strong evidence for the land-security hypothesis. A possible counter argument to this is that those who own large amounts of land and have fewer children have simply invested in quality over quantity. While we can (and will) control for this through consumption and education this does not sufficiently solve the problem, since child quality is an elusive concept and extremely difficult to quantify. Education and consumption indicate the general level of investment that a couple is likely to wish to bestow upon their children and thus they roughly indicate preferences for child quality. Child quality will also partly be determined by sex in rural Nepal since in general only sons are able to provide old age security; daughters leave their parent's household when they get married and provide no economic benefit to their parents from then on. Furthermore, dowries are common amongst most caste/ethnic groups in Nepal and can represent a large portion of a family's income and savings; indeed, the payment of dowries has been found to cause poor families to take loans, sell property and risk destitution (Deolalikar and Rao 1998; Samuha-Nepal 2001), while failure to pay a sufficient dowry on demand has on occasion resulted in physical violence and even death at the hands of the groom's family (Suran et al. 2004).

Figure 4.2 summarises how the hypotheses predict each type of landholding will affect both overall fertility and son preference. There are some cases where the hypotheses provide conflicting preferences, but there is always a clear theoretical direction predicted for one of the relationships. The income effect provides a further conflicting motivation. It seems probable that those with lower income will have higher son preference because of the higher returns to sons; a family with a low income will stand to benefit from a son as sons can provide support physically and financially from an early age as well as bringing a daughter in law into the family along with a dowry. Daughters, on the other hand, have little opportunity to provide support for their own family before they are married off and join their husband's family incurring a dowry, which tends to happen at an even earlier age amongst poorer families (Dahal 1996). Using the predictions from Figure 4.2 and by

differentiating between households with access to the different types of landholding it is possible to test the two fertility-landholding hypotheses. Testing the hypotheses in this manner requires a setting where there is variation in access to the different types of landholding – section 4.6 shows that this is the case.

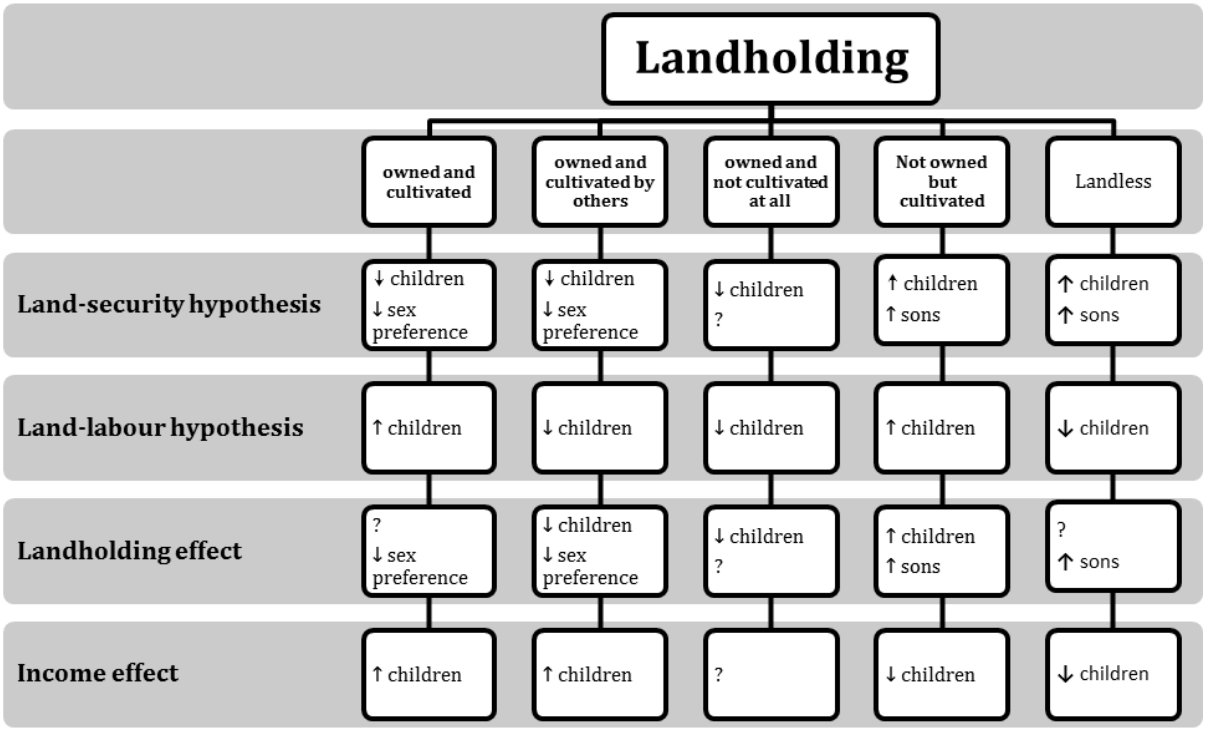

Figure 4.2 Schematic diagram to show the effect of the hypotheses on fertility for those with different types of landholding

A further complication comes from the existence of communal land. Communal land provides more opportunities for the useful employment of children and therefore it has implications for the land-labour hypothesis. There are two ways of dealing with the problem: either area can be controlled for, or a variable for the amount of communal land available can be included. It would undoubtedly be interesting to see if communal land availability has an effect on childbearing decisions, but the NLSS does not include full information on such land.[13] This has the potential to confound the results. However, it is likely to be the case that those who already have large amounts of land have the resources to make use of communal land better than those who are landless or rely on sharecropping (Macfarlane 2003). It could therefore be the case that the existence of communal land actually makes the land-labour and land-security hypotheses clearer.

[13] See Biddlecom et al. (2005) for one attempt to look at possible links between communal land and fertility in Nepal.

4.6. Landholding in Nepal

The majority of people in Nepal are engaged in agriculture in some way, with more than 80 per cent living in rural areas. In the previous section the different types of landholding were discussed with reference to their theoretical impact on fertility through the landholding hypotheses. In this section the distribution of landholding in Nepal will be looked at in detail.

4.6.1. Landholding Questions in the Nepal Living Standards Surveys

Respondents in the NLSS surveys were asked to make a list of all the plots of agricultural land that the household owned and a separate list of all the plots of agricultural land owned by someone else that the household cultivated through sharecropping-in, renting-in or mortgaging-in. The respondents were then asked what the household had done with each of the plots that they owned in the dry season and the wet season. The possible responses were: cropped yourself, sharecropped out, fixed rent out, mortgaged out, left fallow and other. The plots of land were then divided into their different respective types of "owned and cultivated", "owned and cultivated by others", "owned and not cultivated at all" and "not owned but cultivated". Plots of land that were sharecropped out, rented out or mortgaged out, were combined to form the "owned and cultivated by others" category. Only plots left fallow in both the wet season and the dry season were counted as "owned and not cultivated at all". For plots where the use was described as other for one season it was assumed that the use would not be dissimilar to the season where another answer had been given and thus these plots were categorised on the basis of the answer that was given for the other season – there were no plots where the use was described as "other" for both seasons. If plot use was missing for one season then the answer for the other season was used. There were some plots of land that were cropped by the household in one season and sharecropped or rented out in the other season; these plots were therefore assigned to both relevant categories.

The overall distribution of owned land usage is shown in Figure 4.3. The vast majority of plots were cropped by their owners. In the dry season a substantial proportion of plots were left fallow – the vast majority of these were cropped by the owners in the wet season,

though some were also sharecropped out. Between the two surveys there was an increase in sharecropping and a decrease in plots that were left fallow. A survey carried out in Mid-Western Nepal soon after the NLSS II found that the main reasons for leaving land fallow were a lack of irrigation, the maoist insurgency (i.e. the security situation) and a lack of family members needed to tend to the land (INSEC 2007). Since the security situation worsened between the two NLSSs and fertility fell it seems fair to say that increased investment in irrigation was the cause of the reduction in land being left fallow – this is backed up by the fact that a substantially larger difference can be seen for dry season usage when compared with wet season usage when irrigation systems are less important. Furthermore, subsidies from the Asian Development Bank were available to help households classed as marginally landless to install drip irrigation during the period (Shrestha 2004).

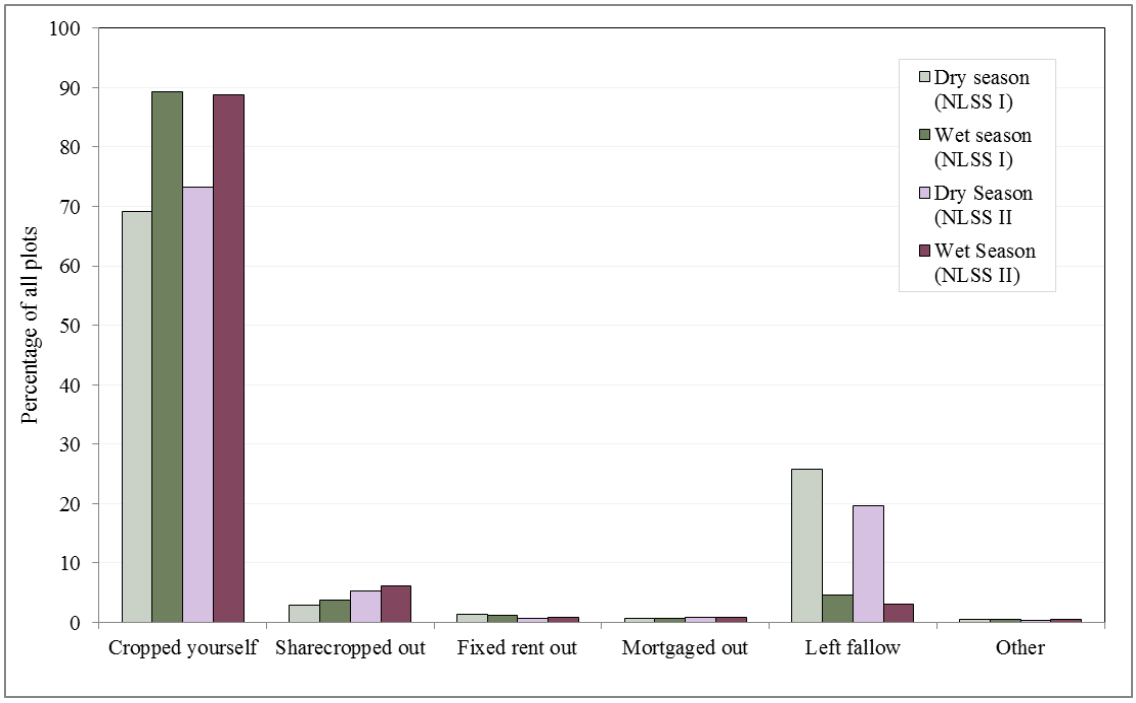

Figure 4.3 The usage of plots of owned agricultural land in the wet and dry seasons in the NLSS I and NLSS II

How then was access to the different types of land distributed in the NLSS surveys? Figure 4.4 shows the distribution of access within all rural households surveyed for the NLSS II and among women with at least two children living in rural areas (i.e. those women who will be included in the cross sectional analysis of the NLSS II). The vast majority (72.8 per cent of rural households) had access to land that they both owned and cultivated. A fifth of households cultivated land that they did not own and 14.2 per cent of

households did not have access to any agricultural land at all. Twelve per cent of households owned land that was being cultivated by others and thus earning the household some form of income, be that monetary or in the form of crops. The distribution of access was slightly different for women with two or more children: they were more likely to own and cultivate land, but also more likely to cultivate land that they did not own, while they were less likely to be letting out land to others. Overall the differences are not large.

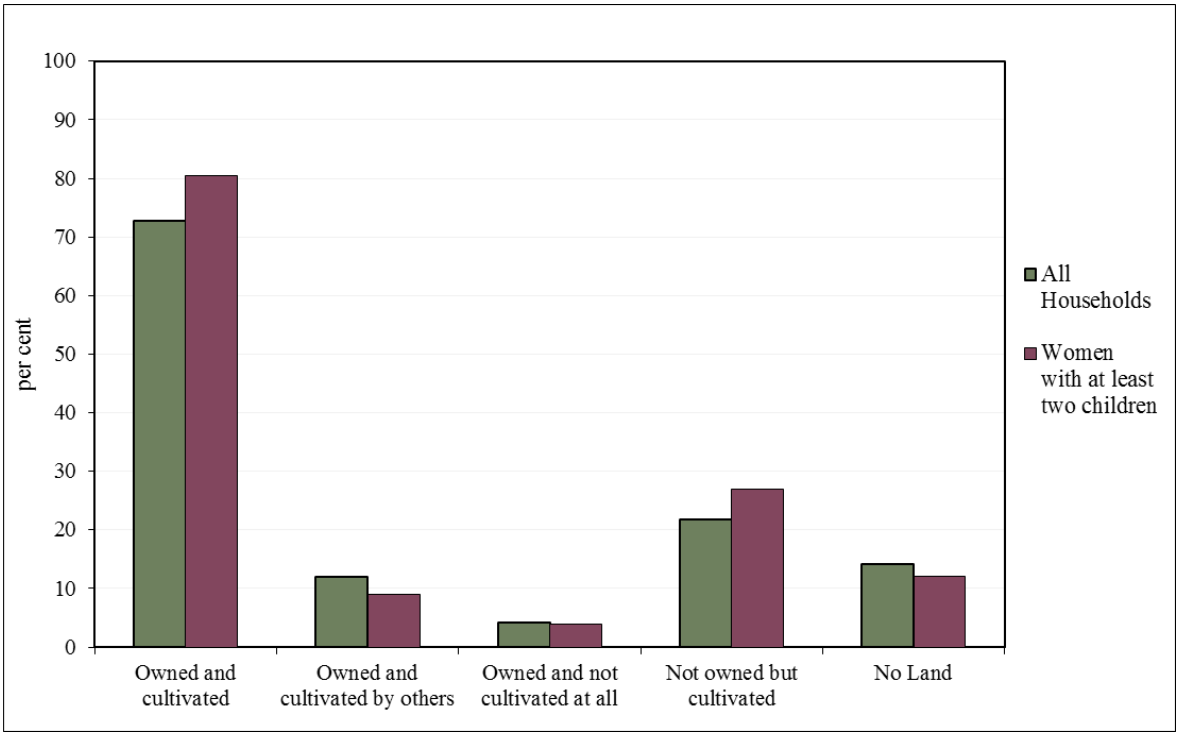

Figure 4.4 Access to different types of landholding for all households and women with at least two children in rural areas in the NLSS II [14]

It is clear that many households have access to more than one type of landholding. Table 4.1 shows the number of households and the number of women with more than two children who have access to each combination of landholding. There are sixteen possible categories in total and at least one rural household belongs to each category. The most common category is for those householders who just own and cultivate their own land (over 50 per cent of households). A further 20 per cent of households have this type of land but also cultivate land that they do not own; this is probably due to their owned landholdings being of insufficient size to subsist on. Just over ten per cent of households do not have any type of landholding. All the other categories are relatively small though it

[14] Households/women can have access to more than one type of landholding and thus the first four categories are not mutually exclusive. Those with no land cannot, by definition, have access to any of the other types of landholding.

is worth noting that five per cent of households do not cultivate any land, but own land that is cultivated by others; these households are in a very secure position relatively speaking. A further six per cent of households own sufficient land that they cultivate some of it themselves and have some of it cultivated by others.

Table 4.1 The distribution of access to different types of landholding in the NLSS II for rural households and for women with at least two children in rural areas

Owned and cultivated	Owned and cultivated by others	Owned and not cultivated at all	Not owned but cultivated	Households		Women with at least two children	
				N	%	N	%
-	-	-	-	268	10.6	223	12.0
✓	-	-	-	1275	50.6	937	50.5
-	✓	-	-	137	5.4	45	2.4
-	-	✓	-	10	0.4	1	0.1
-	-	-	✓	90	3.6	85	4.6
✓	✓	-	-	152	6.0	93	5.0
✓	-	✓	-	59	2.3	46	2.5
✓	-	-	✓	466	18.5	383	20.6
-	✓	✓	-	9	0.4	3	0.2
-	✓	-	✓	3	0.1	3	0.2
-	-	✓	✓	2	0.1	1	0.1
✓	✓	✓	-	11	0.4	7	0.4
✓	✓	-	✓	16	0.6	15	0.8
✓	-	✓	✓	20	0.8	14	0.8
-	✓	✓	✓	1	0.0	1	0.1
✓	✓	✓	✓	1	0.0	0	0.0

4.6.2. Stability of Landholding

Using the panel data it is possible to study the stability of landholding over time; in particular it is possible to see the extent to which landholding changed over the eight year period from 1996 to 2004. This is important because if plots of agricultural land are easily obtained and easily sold, then it would make more sense for landholding to adjust to fertility and any significant results from the cross-sectional analysis could then be caused by reverse causation. Figure 4.5 shows cross tabulations of access to each of the four land types for households that were part of the panel sub-sample.

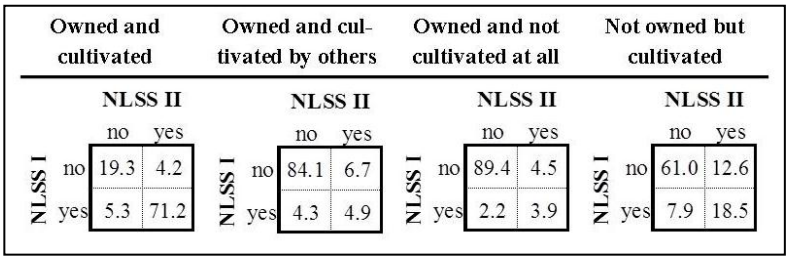

Figure 4.5 The percentage distribution of households with access to each type of land in the NLSS I and NLSS II for the panel sub-sample

The key point is that access to each of the types of landholding is relatively stable. The three types of owned landholding were most stable, which is not surprising since the land market in Nepal is not active – for these categories between 6.7 per cent and 11 per cent of households either gained access or lost access to these types of land. 20.5 per cent of households either gained or lost access to land that they cultivated but did not own; substantially more households gained access to this type of land than lost it. Of those that lost access the majority owned and cultivated land that they still had access to in 2004 so it may be that the household required less land in 2004 than they had in 1996.

OWNED LANDHOLDING

962 households were included in the panel data of which 715 (74.3 per cent) owned some agricultural land in both 1996 and 2004. 16 per cent did not own any agricultural land at the time of either survey. 60 households lost their land entirely between the surveys while only 33 households who had been landless in 1996 had acquired land in the intervening period. While 80.6 per cent of households owned land in 1996, 77.8 per cent owned land in 2004 – a drop which was statistically significant.[15] The overall trend between the two surveys suggests that losing land is more common than acquiring it.

In order to understand this trend further, owned landholding was categorised into 4 groups: functionally landless (less than 0.01 hectares), small landholding (0.01- 0.5 hectares), medium landholding (0.5-1.5 hectares) and large landholding (more than 1.5 hectares). The functionally landless category combines those who own no agricultural land with those who have such a small amount of land that they cannot hope to subsist on it. In fact all households with less than 0.5 hectares are counted as being marginally landless since it would be hard to produce enough goods to subsist on with this amount of land and it has been estimated that a household in Nepal needs around a hectare before

[15] A paired samples t-test was run and the p-value was 0.005.

they will be able to produce a surplus that will allow them to purchase even basic goods (Alden, Chapagain and Sharma 2009, p.46).

Of the 962 households with data available for both surveys 63 per cent did not change landholding category, while 16 per cent moved to a larger landholding category and 21 per cent moved to a smaller landholding category (table 4.2), again indicating that it is more common to lose land than to gain it. Of those that moved category 86 per cent moved to one of the adjacent categories. Of those households with medium or large landholdings in 1996 3 per cent were landless by 2004 and of those households with any land in 1996 7.7 per cent were landless in 2004. Becoming landless is therefore quite a rare event, especially for those households with more than 0.5 hectares of arable land. That said, a fifth of households had lost some land between 1996 and 2004. Nonetheless, landholding in the earlier time period was highly correlated with landholding in the later time period.

Holdings in 1996 \ Holdings in 2004	LL	S	M	L	
LL	154	24	7	2	187
S	45	212	74	11	342
M	13	71	166	34	284
L	2	16	59	72	149
	214	323	306	119	604

LL = Landless; S = 0.01-0.5 Ha; M = 0.5-1.5 Ha; L = 1.5+ Ha

Table 4.2 Stability of Household Landholding between the NLSS I and NLSS II

In terms of individual plots 2174 plots were held in both 1996 and 2004, while 751 were acquired after 1996 and 875 were lost after 1996. This raises the question as to who is losing land and who is gaining. The Lorenz curves for 1996 and 2004 are shown below (in figure 4.2). The 2004 Lorenz curve dominates the 1996 Lorenz curve indicating that the distribution of arable landholding may have decreased slightly. The Gini coefficient for 1996 was 0.70, while in 2004 it was 0.68. On this basis there was a slight decrease in the inequality of arable landholdings, but it was very slight and during the 8 year period between the two rounds of the NLSS the overall distribution altered very little.

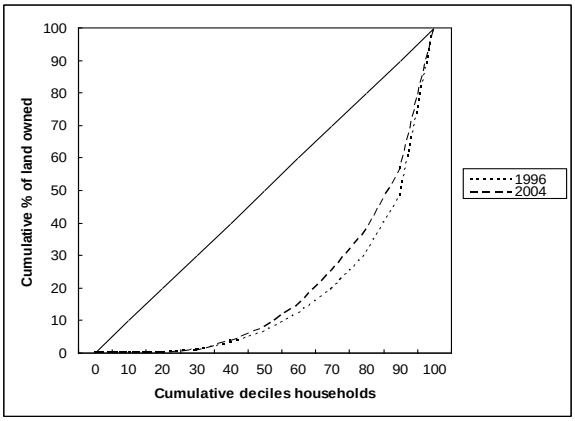

Figure 4.6 Lorenz curves in 1996 and 2004 for distribution of arable land owned by households in the NLSS panel sample

Another important point to note is that the majority of land was acquired through inheritance. 88.9 per cent of all the plots surveyed in the NLSS I were inherited. The NLSS II did not ask how land was acquired by the household, but in the panel sample 66.1 per cent of the plots were inherited prior to 1996 (when the NLSS I was carried out), 8.3 per cent were not inherited and 25.7 per cent were unclassified since they were acquired after 1996. It is clear from this that the vast majority of landholding is passed down through familial connections and thus a couple is likely to have a very good idea concerning the total size of their future landholdings quite early on allowing decisions to be made on that basis.

ARABLE LANDHOLDING CULTIVATED WITHIN THE HOUSEHOLD

Households that cannot subsist on the land they own are sometimes able to cultivate land that they do not own. Thus it makes sense to look at changes in the distribution of total landholding cultivated by households (both owned and non-owned).

For the sake of consistency the Lorenz curves for land cultivated within the household were also calculated (Figure 4.6). The Gini coefficient was 0.70 for the NLSS I and 0.67 for the NLSS II. The only real difference in the distribution of cultivated land to owned land is that fewer households would be classed as landless.

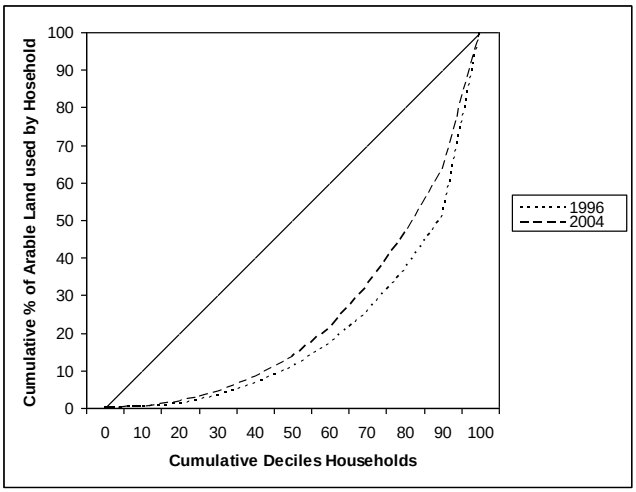

Figure 4.7 Lorenz cures to show the distribution of arable land cultivated by households in the NLSS panel sample

The majority of households with very small areas of owned landholding rent in or sharecrop in some land to provide them with crops to consume and sell. However, very few households who did not own any plots of land were found to be cultivating land. Those households with no arable land are in a poor situation indeed since the purchase of food is expensive and wages extremely low.

4.7. Method

4.7.1. The Cox Proportional Hazards Model

The Cox proportional hazards model is used to study the transition from second birth to third conception and third birth to fourth conception; the reasons for this approach have already been discussed in section 4.5. Models are estimated using cross sectional data from the NLSS II and panel data.

The Cox proportional hazards model (Cox 1972) is a survival model which makes the assumption that covariates will alter the baseline hazard function $h_0(t)$ multiplicatively. It has the advantage that no assumptions need to be made about the shape of the baseline hazard function $h_0(t)$. The key assumption, however, is that the form of the hazard function is the same for everyone – this is the proportionality assumption which gives the model part of its name.

The model itself models the hazard rate for the *i*th subject in the data, where β_x are regression coefficients estimated from the data as follows:

$$h(t|x_i) = h_0(t)e^{(x_i\beta_x)}$$

Given that covariates alter a subject's hazard multiplicatively the model states that for subjects *i* and *z*:

$$\frac{h(t|x_i)}{h(t|x_m)} = \frac{e^{(x_i\beta_x)}}{e^{(x_m\beta_x)}}$$

This will be constant assuming that the covariates are not time varying. The Cox proportional hazards model can cope with time varying covariates but they are not used in this chapter and so will not be discussed here.

All the models estimated were subjected to diagnostics testing the proportional hazards model. Schoenfeld residuals were used to test the proportional hazards assumption and check for outliers or leverage points. A second method was also used to test the proportional hazards assumption; this was to interact the covariates with analysis time and then the natural logarithm of analysis time. The proportional hazards assumption only holds if the interactions have no significant effect. On the basis of these tests the proportional hazards assumption holds for all the models presented.

4.7.2. Description of Covariates

All the covariates used in the models are described below along with the expected sign of the coefficients. The variables of primary interest are the landholding variables. Various controls are also included. It should be noted that various controls were tested during the modelling process and found not to be significant and thus they are not described here or included in the models that are presented in section 4.8; these include caste/ethnicity, consumption, religion, region of Nepal, spousal separation and consumption. The fact that these variables did not have a significant effect on fertility is interesting in itself, but does not impact upon the landholding hypotheses directly so will not be discussed in detail.

LAND OWNED AND CULTIVATED

This is a binary variable to indicate whether the household has any plots of land which it both owns and cultivates. The two landholding hypotheses provide competing motivations for those with this sort of landholding and thus it is not clear on the basis of theory which motivation will be stronger or if they will cancel each other out.

LAND OWNED AND CULTIVATED BY OTHERS

This is a binary variable where 1 indicates that the family has at least a single plot of land which they own but is cultivated by non-household members through sharecropping or renting out or mortgaging out. The hypotheses predict that this type of landholding should have a negative effect on fertility since those with this type of landholding will not demand children for help with agricultural labour or as a substitute for land security.

LAND OWNED AND NOT CULTIVATED AT ALL

Again this is a binary variable where 1 indicates that the family has at least a single plot of land which they own but is left fallow for the whole year. It is expected that this type of landholding will have a negative effect on fertility since children are probably not needed for agricultural labour (unless the plots are fallow due to a lack of labour) and this type of land should provide some extra security. However, the effect may be weak.

LAND THAT IS CULTIVATED BUT NOT OWNED

This is also a binary variable. This indicates whether the family cultivates any land that it does not own – this is through sharecropping, renting and in rare cases a mortgage. Households with access to this type of landholding are likely to demand more children since they have land that requires cultivation (and hence labour), but they also lack security if they do not own the land and thus are likely to have a higher demand for children for the purposes of future security.

COUPLE HAS AT LEAST ONE SURVIVING SON

This variable will be coded 1 if the mother had at least one surviving son when her third or fourth child was conceived (i.e. nine months before the birth) and 0 otherwise. This coefficient will tell us the degree of son preference; it tells us the likelihood of having another child in the event that the woman already had a living son at the point of conception of the next child compared with a woman with no living sons at that point. It is expected that the coefficient will be negative and highly significant since strong son preference is widely acknowledged to be a very important factor in childbearing decisions in Nepal as was shown in Chapter Three (see also Stash 2004 for example).

INTERACTION BETWEEN LAND OWNED AND CULTIVATED, AND SURVIVING SON

The coefficient for this variable will tell us how son preference varies with landholding that is both owned and cultivated by household members. Son preference is expected to be less marked with increased land ownership but due to cultural factors it is still likely to

exist. Therefore this coefficient is expected to be positive but smaller in magnitude than the main effect of having a surviving son – this would indicate that this type of land is associated with lower levels of son preference.

Interaction between land owned and cultivated by others, and a surviving son

The coefficient for this variable will tell us how son preference varies with land that is owned and cultivated by others. This type of land is also expected to be associated with lower levels of son preference since this type of land provides security. Thus the coefficient is likely to be positive.

Interaction between land owned and not cultivated at all, and a surviving son

The coefficient for this variable will tell us how son preference varies with land ownership. It is not clear that this type of land will impact upon son preference since it is not clear how much security this type of land provides, but against a reference category of those without land owning, even fallow plots of land should provide some security and thus if the coefficient for this covariate is significant it is expected to be positive.

Interaction between land that is cultivated but not owned, and a surviving son

The coefficient for this variable will tell us how son preference varies with land ownership. Since those cultivating land they do not own are likely to lack security in general and certainly in terms of landholding the land-security hypothesis predicts that son preference will be higher in this group, hence the coefficient for this covariate is expected to be negative.

Household income

The inclusion of this variable is intended to remove the possibility that associations between fertility and landholding might reflect a pure income effect. In theory greater income allows a family to have more children since their budget constraint is relaxed. However, this depends on whether a family concentrates resources on the quantity or quality of children they desire. A variety of specifications for household income were tested and it was found that the only group that varied significantly was that in the lowest octile of income. Thus a binary variable indicating whether the household is in the lowest income octile is included to control for income. Appendix I describes how income was constructed.

MOTHER'S EDUCATION

Child quality is partially controlled for by use of mother's education. This is a very crude control for child quality, but the nature of the data means that the use of children's education would be too heavily censored to be of any use since many of the children in question were still very young at the time of surveying and consequently were not old enough to have much education even if their parents intended them to continue to be educated for a long time. Child quality is of itself unobservable but education is generally thought to be a good proxy and the mother's education is highly correlated with their children's education. It is expected that increasing levels of education will be associated with decreasing fertility.

DEATH OF A PREVIOUS CHILD

This is a binary variable indicating whether one of the mother's previous children had died by the time of conception or not. This variable controls partially for a replacement effect and partially for investment in child quality since children whose parents did not, or could not provide a good standard of healthcare would be more likely to die. Thus the effect of a previous child dying is likely to be an increase in subsequent fertility.

AGE AT BIRTH OF THE SECOND OR THIRD CHILD

This variable simply controls for the age of the mother to allow for the variation in fecundity throughout a woman's reproductive lifespan.

BIRTH DATE OF MOTHER

This variable controls for the fact that women born at different times in Nepal would be subject to different exogenous influences on their fertility as the fertility transition progressed in the country.

4.8. Results

4.8.1. Cross-Sectional Analysis

The results of the survival analysis for the cross-sectional NLSS II data are presented in Tables 4.3 and 4.4. Three models are presented in each table to show how the effects of landholding vary with the inclusion of other covariates. The first model includes only the main effects of the four landholding variables. The second model shows the main effects of the landholding variables and the son preference variable, and includes the interactions between the landholding variables and the son preferences variable. The final model

includes all the covariates from the previous models and all the controls discussed in section 1.7.2. A variety of other controls were tested, but were found not to be significant or have an effect on the results presented here and thus they have not been included.

Land owned and cultivated by the household acts as predicted by the hypotheses. In the first model this variable appears to have a positive effect on the chances of having a third or fourth child, but this effect is substantially reduced in the second model and marginally significant ($p=0.09$) for the transition from second birth to third conception and not significant at all for the transition from third birth to fourth conception. Given that the two hypotheses provided conflicting motivations for those with access to this type of landholding the lack of a significant effect in the more extensive models is reassuring. Even more reassuring is the fact that the interaction with having a living son has a positive and highly significant coefficient indicating that son preference is much less marked for mothers with this type of landholding. This is the case for both the transitions modelled.

Land owned and cultivated by others had a significant main effect in the models looking at the transition from third to fourth birth, but not those looking at the earlier transition. The interaction with having a living son was not significant in any of the models. Despite the lack of significance the coefficients for this type of landholding indicate that the main effect is negative (as predicted by the hypotheses) and the interaction term suggests that this type of landholding reduces son preference. This is not strong support for the hypotheses, but suggestive nonetheless.

Land that was owned and left fallow was not significant as a main effect in any of the models, but the interaction with having a living son was; furthermore, the estimated coefficient was substantially larger than any of the other interactions indicating that this type of landholding may reduce son preference more than the other two types of owned landholding. The theoretical reason for this is relatively weak, since it is not clear that this type land would provide much security. That said, those who own fallow plots of land are likely to feel substantially more secure than those without access to land. Thus I would argue that this is support for the land-security hypothesis.

Table 4.3 Cox proportional hazards model for the transition from the second birth to the third conception using cross sectional NLSS II data

	hazard ratio		hazard ratio		hazard ratio	
Land: owned and cultivated	1.488	***	1.178	+	0.990	
interaction with living son			1.408	***	1.384	**
Land: owned and cultivated by others	0.876		0.827		0.809	
interaction with living son			1.060		1.102	
Land: owned and not cultivated at all	1.127		0.780		0.800	
interaction with living son			1.807	*	1.624	+
Land: not owned but cultivated	1.179	***	1.209	*	1.185	*
interaction with living son			0.945		0.924	
Living son			0.528	***	0.549	***
Previous child died					1.214	**
Age at birth of 2nd child					0.958	***
Birth date					1.025	***
Education *(ref: none)*						
Primary					0.909	
Some secondary					0.546	***
Completed secondary/Tertiary					0.388	***
Low income household					0.769	***

N.B. P-VALUES ARE INDICATED AS FOLLOWS: + P<0.1 * P<0.05 **P<0.01 *** P<0.001

The final type of landholding is land that is cultivated but not owned. This was the only type of landholding where the main effect was consistently significant in all models. This type of landholding has a positive effect on fertility which supports the land-labour hypothesis. The interaction term was marginally significant in one of the models (p=0.08) and the coefficient was negative indicating that those with this type of land may have slightly stronger son preference, however the evidence for this is weak. Given that the reference category is mothers belonging to landless households this is not surprising. One would expect those who own land to have less son preference than those who do not, but it may be fair to assert that the future security prospects of those without land and those cultivating land they do not own will not be substantially different and thus the strength of their son preference is unlikely to differ substantially.

Table 4.4 Cox proportional hazards model for the transition from the third birth to the fourth conception using cross sectional NLSS II data

	hazard ratio		hazard ratio		hazard ratio	
Land: owned and cultivated	1.298	**	0.885		0.961	
interaction with living son			1.640	**	1.403	*
Land: owned and cultivated by others	0.766	*	0.627	*	0.644	+
interaction with living son			1.114		1.212	
Land: owned and not cultivated at all	0.967		0.630		0.602	
interaction with living son			1.712		1.830	+
Land: not owned but cultivated	1.256	***	1.418	**	1.410	**
interaction with living son			0.858		0.771	+
Living son			0.396	***	0.498	***
Previous child died					1.300	***
Age at birth of 3rd child					0.959	***
Birth date					0.997	***
Education *(ref: none)*						
Primary					0.694	***
Some secondary					0.351	***
Completed secondary/Tertiary					0.248	***
Low income household					0.964	*

N.B. P-VALUES ARE INDICATED AS FOLLOWS: + $p<0.1$ * $p<0.05$ ** $p<0.01$ *** $p<0.001$

Income did not have as much of an effect as might have been expected. Various parameterisations of this variable were explored and the only part of the distribution that appeared to have an effect on fertility was the very bottom end, with those in low income households having lower fertility. The inclusion of income was important in order to answer any criticisms that significant landholding effects were actually income effects. A quick comparison of the models with and without income included will suffice to show that income did not affect the coefficients of the landholding variables very much.

The controls included all behaved as expected with fertility decreasing amongst older women and those from later cohorts while increasing female education had a negative effect. Mortality of previous children was also highly significant. This, however, masks the fact that several covariates that might have been expected to be significant were dropped from the models due to the fact that they had very little explanatory power once sufficient economic variables were included – caste/ethnicity was not significant however the variable was categorised and region was also found to be non-significant. While this is not directly relevant to the main hypotheses, this is indicative of the great explanatory power of the variables that were included.

4.8.1. Panel Data Analysis

As discussed in the previous section, analysis of the NLSS II strongly supports both the land-security and the land-labour hypotheses. However, the use of current landholding and income variables to study prior fertility raises questions about the precise nature of the relationship. In this section the results from analyses conducted on the NLSS panel data are presented; landholding information from the NLSS I was used while the fertility data from the NLSS II provided information on births that occurred subsequently. Due to sample size (738 women) it was not possible to reproduce the model from the cross-sectional analysis. Indeed it was necessary to drop the majority of covariates. It was, however, possible to show that the landholding variables would be likely to have the same relationship with fertility prospectively as they bore retrospectively according to the analysis of the NLSS II.

The models looking at the transition from third child to fourth conception were also estimated but the sample size (545 women compared with 738 for the earlier transition) was too small to see significant results and consequently they are omitted.

The results are strikingly similar (Tables 4.5 and 4.6). The dependant variable used is the transition from second birth to third conception and this is restricted to women who had their second birth after the NLSS I data was collected in order to ensure that childbearing decisions that could have been based on socio-economic circumstances at the time of the first survey are being modelled. Controls were included for age at birth of second child, birth date of the woman and existence of a living son – none of these variables were time variant. The controls were all highly significant and suggested the effects that were expected; age depressed likelihood of having a third child as did being in a younger generation and having a living son as the first or second child. The sizes of all these effects were very similar to those found in the cross-sectional analysis.

Most of the landholding variables are not significant in this model – in fact only two remain significant after controls are included; these variables are the interaction between land owned and cultivated and son preference, and the main effect of land that is cultivated but not owned. The cross-sectional model of the second birth to third conception using NLSS II data only showed one other significant landholding variable suggesting that using

landholding variables from the cross-sectional data probably did not lead to faulty conclusions.

Table 4.5 Cox proportional hazards model of the progression from second birth to third conception using NLSS panel data

	hazard ratio		hazard ratio		hazard ratio	
Land: owned and cultivated	1.191	+	.879		.893	
interaction with living son			1.472	+	1.497	*
Land: owned and cultivated by others	.789	+	.930		.837	
interaction with living son			.817		.864	
Land: owned and not cultivated at all	.860		.895		.831	
interaction with living son			1.060		1.046	
Land: not owned but cultivated	1.167	+	1.187	+	1.240	+
interaction with living son			.967		.902	
Living son			.445	***	.464	***
Age at birth of 2nd child					.996	***
Birth date					.998	***

N.B. P-VALUES ARE INDICATED AS FOLLOWS: + P<0.1 * P<0.05 **P<0.01 *** P<0.001

There is no significant main effect of land that is both owned and cultivated, but those who had access to this type of land at the time of the NLSS I had much lower levels of son preference than any other group. Women without access to any land were 54 per cent less likely to have a third child if they had a living son than women without a living son. Women living in a household that owned and cultivated land were just four per cent less likely to have a third child if they had a living son compared with women without a living son. Thus, visible evidence of son preference for women with access to land that they owned and cultivated is slight, especially when compared with other groups. This is indicative of support for the land-security hypothesis because women with access to this type of land are not so dependent on sons for security and thus would be expected to exhibit lower levels of son preference.

Land that was cultivated but not owned was found to have a positive effect on fertility but no effect on son preference. Women with access to this type of land at the time of the NLSS I were 24 per cent more likely to have a third child than landless women. This lends support to the land-labour hypothesis because women within households that have land to cultivate that they do not own will need more labour to help them till that land when compared with women living in households that are landless.

While it is unfortunate that the sample sizes were too small to do much more in depth analysis these results indicate strong support for both the hypotheses. Certainly, the covariates that are significant are precisely those that would be expected if the hypotheses were true and it is hard to imagine a much stronger case given the data available.

4.9. Conclusions

There is clearly a relationship between landholding and fertility in modern day mid-transition Nepal. This relationship holds when large numbers of controls are included that the dissentient majority might expect to remove the landholding fertility relationship. In reality, when controls were included for all those things that are thought to affect fertility and could mediate the landholding fertility relationship, the predicted effect of the landholding variables remained robust.

It was also possible to look at the effect of landholding on subsequent fertility using panel data, which tends to discount the possibility that the observed relationship was the result of a third set of factors affecting both landholdings in the present time and fertility that has already occurred. In other words it seems unlikely that landholding adjusts to fertility, especially given the relative inactivity of the market for agricultural land in Nepal. Most land is inherited and thus decisions regarding fertility can quite easily be made on the basis of landholding. Indeed, it could be argued that couples will make decisions about childbearing based on knowledge about their future likely landholdings meaning that using cross-sectional data is no less problematic than using panel data.

The analysis carried out in this paper proves that there is a need for further work in this area. The land-security and land-labour hypotheses are far from being out-dated ideas that explained spurious relationships in pre-transitional societies not requiring explanation via rational choice.

One of the most interesting conclusions to come from this analysis and the opportunity to take a fresh look at the land-labour and land-security hypotheses is that landholding appears to have as much of an effect on son preference as it does on the overall level of fertility. Son preference is highly prevalent in Nepal (as Chapter Three showed) and does not show any sign of waning. Women in households that owned and cultivated their own land had markedly lower levels of son preference than other groups, which suggests that

redistributive land reform might help reduce levels of son preference. The experience of some Indian states suggests that further development might see son preference become more marked since the demand for children seems to fall much more quickly than the demand for sons (Das Gupta and Bhat 1997). Therefore a fuller understanding of the things which might affect son preference in Nepal is likely to become increasingly important, especially since sex-selective abortion is widely available just across the very porous open Indian border (Tamang and Tamang 2005).

This inquiry is not conclusive; it was limited geographically to the Republic[16] of Nepal and it was limited in scope by the quality of data available. . There may also be other explanations for the empirical relationships exhibited in this chapter, though there are no obvious alternatives. A more extensive panel survey would be highly useful, as would a replication of this kind of inquiry in other regions of the world. It is possible that this relationship exists in this form only in Nepal or maybe only in the Indian Subcontinent; the geographical reach of these effects is an important area for further work. Qualitative work is also necessary in order to fully elucidate the mechanisms through which landholding affects decisions

What this paper has shown, though, is that the land-security and land-labour hypotheses are consistent with the empirical facts in Nepal and if the results of this paper have not proved the hypotheses to be true they have at least shown that they are highly probable. This is a definite step forwards in the search for a model of fertility transition, since these hypotheses (if true) imply that couples are acting rationally on average when making fertility decisions at the margin and that in rural Nepal (and therefore maybe the developing world as a whole) considerations of future security are important as are the economic returns which children may provide as they are growing up.

[16] Nepal is the world's youngest republic. It officially became the Federal Democratic Republic of Nepal on 28th May 2008, before which it was a Kingdom and home to the world's last remaining Hindu Monarchy.

4.10. References

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CHAPTER 5

REMITTANCES AND FERTILITY

5.1. Introduction

The bedrock of the Nepali economy is agriculture; however, it has been estimated that over two million Nepalis are currently working abroad; the value of their remittances (both formal and informal) was estimated to be equal to about 20 per cent of gross domestic product (GDP) by the year 2000 (Seddon, Adhikari and Gurung 2002) and the 2008 National Labour Force Survey (NLFS) found that over 30 per cent of rural households were in receipt of remittances (Central Bureau of Statistics (CBS) 2009b). This is an impressive figure when you consider that according to official estimates agriculture and forestry accounts for just one third of GDP (Central Bureau of Statistics (CBS) 2008); in rural areas forestry, agriculture and remittances account for the vast majority of income. Nepal has one of the highest levels of remittances as a proportion of GDP of any country in the world (see Table 5.1) and remittances flowing through both formal and informal channels are increasing rapidly. Official figures now suggest that formal remittances alone account for 23 per cent of GDP – the fifth highest percentage of any country in the world (World Bank 2010). Given that the majority of remittances are sent through informal channels (Ferrari, Jaffrin and Shrestha 2007) and aren't counted in that figure the real level of remittances is likely to be substantially higher.

It has been argued that the only reason Nepal managed to reduce its poverty rate and increase its Human Development Index (HDI) during the Maoist insurgency was through remittances (Panday 2011). The Maoist conflict cost an estimated 13,000 lives and spread throughout most of the country between 1996 and 2005 when a ceasefire was finally agreed. Thus the Nepal Living Standards Surveys (NLSSs) provide a snapshot of life in

Nepal just before the conflict started and just before it ended – they show that living standards improved during the conflict and that this improvement was substantial in areas with higher levels of remittances. Nepal has benefited from high levels of remittances in the last 15 years, but there might also be a negative side to dependence on this form of income. Remittances allow spending to exceed production in the economy as a whole and this encourages further migration, which in turn leads to an even higher reliance on the benefits that remittances bring and a steady increase in able young men leaving the country. In the long run this situation is likely to lead to stagnation of the countries own economy, a substantial "brain drain" and reliance on outside help (Marchiori, Pieretti and Zou 2008; Martin 1990; McCormick and Wahba 2000).

Table 5.1 The top ten remittance receiving countries by share of Gross Domestic Product (source: World Bank 2010)

Rank	***Country***	***Remittances as a percentage of GDP***
-	World	0.7
1	Tajikistan	35
2	Tonga	28
3	Lesotho	25
4	Moldova	23
5	Nepal	23
6	Lebanon	22
7	Samoa	22
8	Honduras	19
9	Guyana	17
10	El Salvador	16

One of the motives for looking at the landholding-fertility relationship was that agriculture and particularly landholding are such major factors in rural life in Nepal and they have been for many years; other motives included the opportunity to test a defined theory and to try and resolve a long running controversy. Remittances are also of major importance for many modern Nepali families and despite there being obvious theoretical connections between fertility and remittances the subject has not been well researched.

The first substantial flows of labour migrants from Nepal were employed in the army of Ranjit Singh (Maharaja of Punjab) in Lahore during the early nineteenth century (a tradition which provided the nickname of "Lahure" to all Nepalis employed abroad

thereafter (Whelpton 2005, p.42). The British began recruiting "Gurkhas"[17] soon after in 1816 (Ministry of Defence (MOD) 2010). These events marked the end of the expansion of the Gorkhali Empire and the beginning of a long tradition of Nepalis working for foreign armies. Thus the Nepalis have a 200 year old history of sending remittances home. Indeed as much as a quarter of the population were involved in labour migration during the 1960s (Whelpton 2005, p.123).

There is a geographical element to the receipt of remittances with some areas having a far longer history of foreign labour migration and much higher level of remittances. That said, remittances are increasing all the time with the 2008 National Labour Force Survey (NLFS) finding that more than 30 per cent of households received remittances and that the per capita remittance in 2008 for the country as a whole was 4042 NPRs (Central Bureau of Statistics (CBS) 2009a); this is a substantial amount when you consider that the NLFS estimated average monthly earnings to be 5117 NPRs (Central Bureau of Statistics (CBS) 2009b).

5.2. The Theoretical Links between Fertility and Remittances

It has been pointed out as recently as 2009 that there is an almost total lack of studies focusing exclusively on how remittances might affect the fertility rate of home countries (Naufal and Vargas-Silva 2009). There have been studies focusing on the fertility of migrants (e.g. Andersson 2004; Goldstein and Goldstein 1981), studies looking at the determinants of remittances from both a macroeconomic perspective (Adams 2009; El-Sakka and McNabb 1999) and a microeconomic perspective (Wagle 2009), but barely any that test the relationship between remittances and home country fertility empirically. The bulk of the literature concerned with fertility and migration has concentrated on migrants' fertility. The main hypotheses concerned with this link are socialisation, adaptation, selection and disruption. The socialisation hypothesis holds that migrants will be socialised by early experiences and thus their fertility will remain similar to that in their country of origin. The adaptation hypothesis argues that the longer migrants remain in a host country the more the norms of that country will influence their fertility and thus

[17] The word "Gurkha" originates from the name of the hometown of Prithvi Narayan Shah – Ghorka. Prithvi Narayan Shah was responsible for the unification of Nepal via Ghorkali conquests covering most of modern day Nepal as well as large parts of Sikkim.

migrants' fertility will ultimately converge with that of the local population. A multitude of recent papers support the adaptation hypothesis rather than the socialisation hypothesis in relation to international migrants from developing countries including Brockerhoff (1995) on 13 African countries, Umezaki and Ohtsuka (1998) on Papua New Guinea, and Lee and Pol on Mexico, Korea and Cameroon (1993). The selection hypothesis argues that findings in support of adaptation are the result of migrants' self-selection i.e. people who choose to migrate already have values that are more similar to their destination than most people in their place of origin. The support for this hypothesis is limited though (Beine, Docquier and Schiff 2008). Another argument is that reductions in migrants' fertility when they move to a lower fertility regime are the result of disruption and not changes in social or cultural values.

This chapter is predominantly concerned with one hypothesised link between fertility and remittances – this is that households may view children as an important potential source of future security if remittances are a common occurrence and thus children will be more likely to be born for insurance purposes. The potential for remittance income from children will affect childbearing decisions if potential parents think that both the likelihood of receiving remittances and the monetary amount of those remittances are sufficiently high in order to warrant the investment. When a couple makes the decision to have their *n*th child they must weigh up many factors; the argument of this chapter is that a couple will look to their neighbours (i.e. those living in the surrounding community) in order to see what benefits they are likely to receive from older children. A couple living in a community with a long history of international labour migration will be aware of the potential benefits and may change their fertility behaviour accordingly; while a couple living in a community where labour migration is rare is less likely to consider that their offspring will be able to provide the security of remittances later in life. Couples will often make the decision about the amount of children they will have before even the oldest are able to go abroad to earn money and thus they are unlikely to have more children on the basis that an older son is already remitting.

The insurance motivation will not be the only thing affecting the relationship between remittances and fertility. Another possibility is that there are both financial remittances (which affect the attractiveness of children as assets) and ideational or social remittances i.e. the societal norms, ideas and behaviours that a labour migrant will pass on from the

host country to their home country (Levitt 1998). Social remittances are likely to have an effect on the way that monetary remittances affect fertility decisions. If the host country is a low fertility country then the positive effect on fertility of higher monetary remittances may be neutralised by the receipt of social remittances. Fargues (2006) presents evidence that labour migration to host countries with lower fertility than the origin country lowers the fertility of those at the origin while migration to countries with higher fertility than the host country may analogously increase fertility in the origin country. The strength of his evidence is based on just three countries (Egypt, Morocco and Turkey) and consists of presenting the correlation between births and remittances, which was negative for Morocco and Turkey where the majority of migrants went to low fertility countries and positive for Egypt where the majority of migrants went to high fertility countries; clearly this is far from proof of causation, but the results are illuminating. Furthermore, Naufal and Vargas-Silva (2009) argue that "monetary sums reflect the strength of bond between the migrant and the household and can be a good indicator of the level of social remittances" (p.4). If this is really the case then testing the exact nature of the relationship between remittances and fertility will be further complicated. If the best proxy for social remittances is monetary remittances then any analysis looking at the relationship between monetary remittances and fertility might need to take into account the difference between fertility levels in the host country and the home country. However, it is important to note that most labour migrants from Nepal are short term migrants who leave their families in Nepal while they are working and return home regularly. Furthermore the majority of migrants go to the northern states of India where fertility levels are very similar to those in Nepal or to the Middle East where Nepalis are segregated from the local population and mainly live in labour camps, and are thus unlikely to have the opportunity for cultural assimilation with the local population.

Another possibility is that labour migration and remittances will affect the amount of education parents want to provide for their children. If better education will increase the likelihood of a child being able to successfully migrate and also increase the likely size of their remittances, which Marchiori et al. (2008) argue is the case, then it will make sense for parents to balance extra educational costs against the prospect of future remittances. If education affects remittances and education is costly then the relationship between remittances and fertility will again be complicated. There is also the possibility that social remittances will impact on home country education levels making children more costly

irrespective of any returns. In the case of Nepal most labour migration is for unskilled jobs and thus parents would probably not feel it necessary to school their children to a high level in order to ensure future remittances.

One thing that will affect the relationship between remittances and fertility is the motivation behind the remittance on the part of the remitter. There is a wealth of literature on the motivations for remitting, which will not be discussed in great detail here, but broadly speaking there are two categories of motivation for remitting – these are altruism and insurance. The perception of these motivations by those at home making childbearing decisions is important. The altruistic motivation occurs when the donor sends remittances with no expectation of any kind of return. This may be due to strong traditional family bonds where the donor feels cultural pressure to conform (Agarwal and Horowitz 2002). The insurance motivation is slightly more complicated. The insurance motivation refers to the idea that a migrant may want to participate in risk-sharing; labour migrants often have insecure jobs and live in an insecure environment facing the possibility that they may not be able to stay in the host country permanently (amongst other worries) and sending remittances back to their country of origin ensures that they have a stable base to return to or to seek help from in the even that something goes wrong. The migrant's family benefit from these remittances on the understanding that they will provide support if needed.

In order to explain why these two different categories of motivation will impinge on the remittance-fertility relationship let us consider two different situations in which the circumstances surrounding expected remittances change. Firstly, let us consider an expected increase in the income of labour migrants; now, intuitively this makes children a more attractive asset since their earning potential has increased. To put this in context imagine, for example, that the majority of labour migrants in a district of Nepal were poorly paid agricultural labourers working in India, but that the local population are made aware of the opportunities in the Gulf states and the majority of labour migration shifts to this area where unskilled labour brings in a much higher wage. The expected income of labour migrants has increased dramatically. If remitters are motivated by altruism then children will now be a much more attractive insurance option for parents since the returns are much greater. However, if the primary motivation for remitting is insurance for the remitter an increase in their income will make them less likely to remit since they will have less need for insurance. Thus insurance-motivated-remitters are riskier assets in this

situation. Let us take another example – suppose that there is a reduction in the spread[18] of migrant income. A reduction in risk for the migrant essentially makes them better off and thus they will remit more if their motivations are altruistic. If, however, the motivation is need for insurance then the reduction in risk will be associated with a reduction in the need for insurance and thus the migrant will remit less. Table 5.2 summarises the above discussion and illustrates that the motivations of remitters should have an effect on the relationship between fertility and remittances.

Table 5.2 The effect of changes to migrant income on remittances and fertility

	Motivation to remit	Effect on Remittances	Effect on fertility ceteris paribus
Increase in expected migrant income	Altruistic	*positive*	*positive*
	Insurance	*negative*	*negative*
A reduction in the spread of migrant's income	Altruistic	*positive*	*positive*
	Insurance	*negative*	*negative*

5.3. Conceptual Framework

Figure 5.1 shows a conceptual framework describing the links between sons ever borne, son preference and remittances. This framework is specific to the Nepali context, due to its emphasis on sons rather than children ever borne – son preference in Nepal is pervasive and key to understanding how remittances and fertility are linked, but in other contexts gender inequality and son preference might not be such an issue meaning that the conceptual framework would be altered.

The number of sons a woman has will be directly affected by the fertility rate (though, sons ever borne will affect the fertility rate as well) and also by son preference. The number of sons a woman bears will be affected by the level of son preference through sex-selective abortion and sex selective stopping behaviour. There is little evidence to suggest that sex-selective abortion was widespread in Nepal at the time of the last DHS in 2006 and in the absence of sex-selective abortion son preference operates to affect fertility levels and sex composition through differential stopping behaviour, as explained in Box 5.1.

[18] A reduction in spread is essentially a reduction in the riskiness associated with a particular variable (in this case income). It is not the same as a reduction in variance.

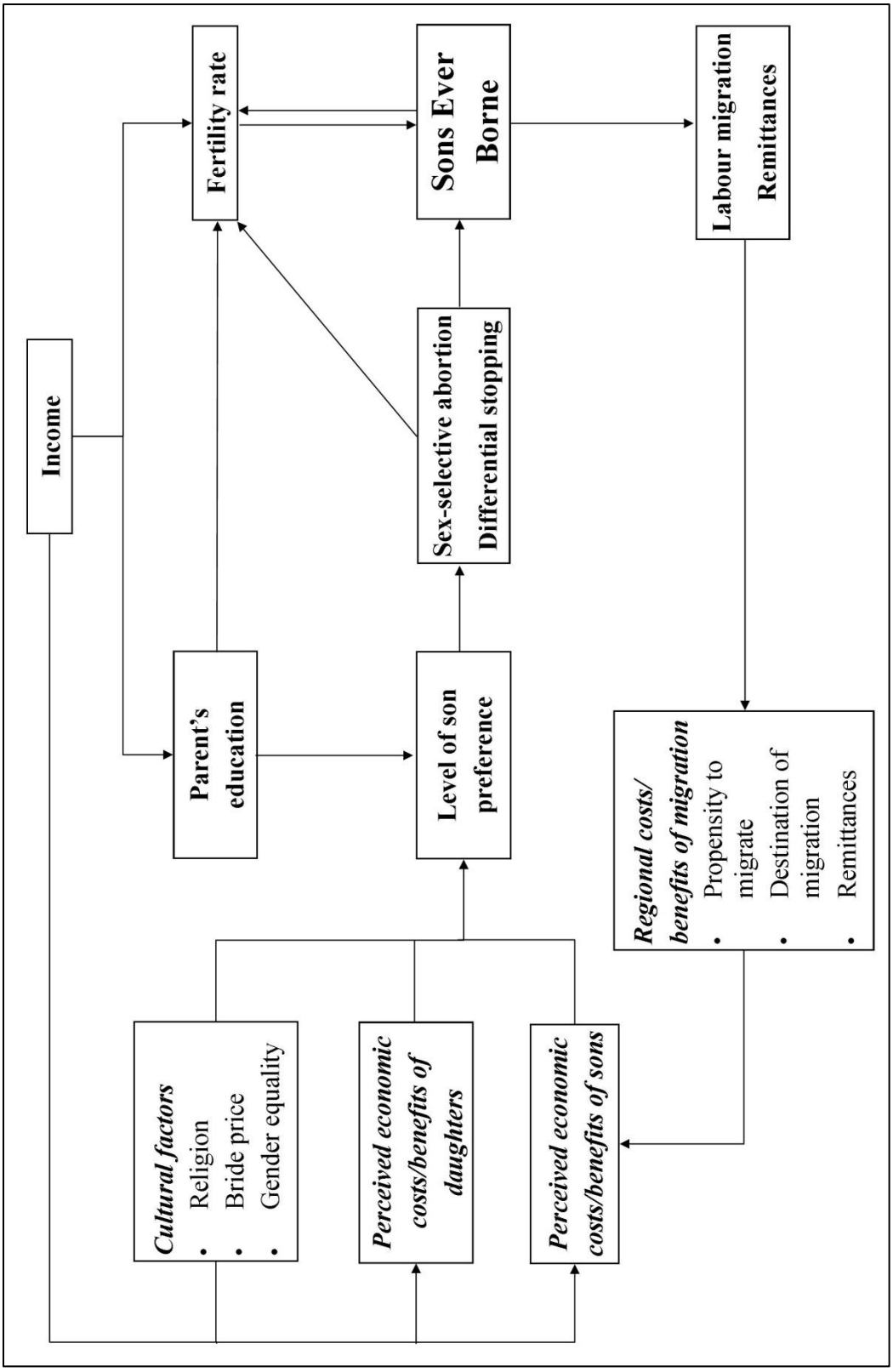

Figure 5.1 Conceptual framework showing the factors affecting sons ever borne

Parental education affects both the strength of son preference and the fertility rate, but there is evidence that it affects these two things in opposite directions; increased education reduces the overall fertility rate, but there is evidence that demand for children falls much more quickly than demand for sons meaning that son preference might actually increase with education in a South Asian context (Das Gupta and Bhat 1997), though it seems likely that with large enough increases in the general level of education gender equality will increase and thus son preference will decrease.

Income has an even more complicated effect on sons ever borne and son preference because it does not affect either directly, but through intermediary factors. Income will affect parental education and the fertility rate directly and through those it will affect son preference and sons ever borne. However, income is also likely to affect the perceived economic benefits of sons and daughters; a family with a higher income can afford higher quality education and healthcare for their children and a higher dowry for any daughters and may feel obliged to provide these things by social pressure, increasing the costs of both sons and daughters without increasing the benefits. Higher income families are less likely to require their children to cultivate agricultural land and while better educated children would be more likely to get high quality jobs it is unclear whether this increases their chances of remitting since more educated children may feel less social pressure to send remittances to their parents.

Various other factors will affect an individual couple's level of son preference. There will be cultural factors such as religion (for example Hindu's want two sons for funeral rites), gender equality and local practices such as dowry. These cultural factors will affect the level of son preference in their own right, but also by affecting the relative economic costs and benefits of sons and daughters.

The economic costs and benefits of sons and daughters are the key to understanding how remittances and fertility are linked. The level of son preference will (to a greater or lesser extent) be affected by the perceived economic costs and benefits of sons and daughters and the relative value of these. In the context of Nepal daughters are costly due to cultural factors since it costs money to feed them, cloth them, school them and keep them healthy, though arguably parents are not obliged to do any of these things to a very great extent. Daughters are married off at a young age and they then incur a dowry and

join the family of their husband meaning that the benefits they may be able to afford their family members as adults will go to their in-laws and not their family of birth. Daughters may be able to help with physical labour on agricultural land and with chores around the house when they are young but this is the limit of the economic benefits they generally offer. In contrast, sons not only stay with their birth family, but they also bring in a dowry and a daughter-in-law when they get married. Remittances affect sons ever borne by affecting the perceived economic benefits of sons. The regional costs and benefits of labour migration will affect the perceived value of sons since couples will look at local levels of remittances and the success of labour migration from the region and from this they will build a picture of the likely economic value of a son.

Thus a variety of factors affect the intensity of son preference and – through differential stopping behaviour – sons ever borne. Sons ever borne will in turn affect labour migration and remittances as they grow up so a region with an increased number of sons may be likely to see increased levels of labour migration and increased levels of remittances, thus affecting the regional costs and benefits of labour migration and the perceived economic value of sons for a new generation.

From this framework it is clear that there are two ways to test whether remittances affect fertility – one could look at the determinants of sons ever borne or one could try and look at son preference more directly. The key determining factors of interest would be the costs and benefits of labour migration in the environs that a couple is making their childbearing decisions.

5.4. The Distribution of Remittances in Nepal

Remittances, like foreign labour migration itself are far from equally distributed throughout Nepal. Those employed in the armed forces of the United Kingdom and India will receive much higher wages than those employed as labourers in India. Likewise, the Gurkhas will receive a pension after their active employment has ceased while those employed as labourers in the Gulf countries will only continue to receive wages while they are actively working.

According to the community data 41 per cent of communities experienced out migration to India while almost 10 per cent experienced out migration to the Gulf States on a regular basis. Unsurprisingly, most donors (90.9 per cent in the NLSS I, 82.4 per cent in the NLSS II and 64 per cent in the 2008 NLFS) send remittances from either within Nepal or India, though there has been a dramatic increase in the number of donors remitting from elsewhere in the last fifteen years. Nepal borders only two countries – India and China – though it is also in close geographical proximity to Bhutan, Bangladesh and Pakistan. There is an open border agreement between India and Nepal hence the large amount of labour migration to India, while the border with China not only straddles several of the world's highest mountains but is also closely guarded by the Chinese due to security issues in the Tibetan Autonomous Region (TAR). There are no reported remittances from China in either the NLSS I or NLSS II. Pakistan and Bhutan are also rare destinations for labour migrants from Nepal. Pakistan, like the TAR, is fraught with security issues. Some remittances were reported to have come from donors in Bhutan in the NLSS I, but in the NLSS II none were reported; this was probably due to the violence that erupted in Bhutan against ethnic Nepalis in the 1990s. Around 100,000 ethnic Nepalis from Bhutan have moved to United Nations refugee camps in Nepal since the early 1990s, which is a very large number considering that Bhutan has fewer than 700,000 residents (United Nations High Comissioner for Refugees (UNHCR) 2010).

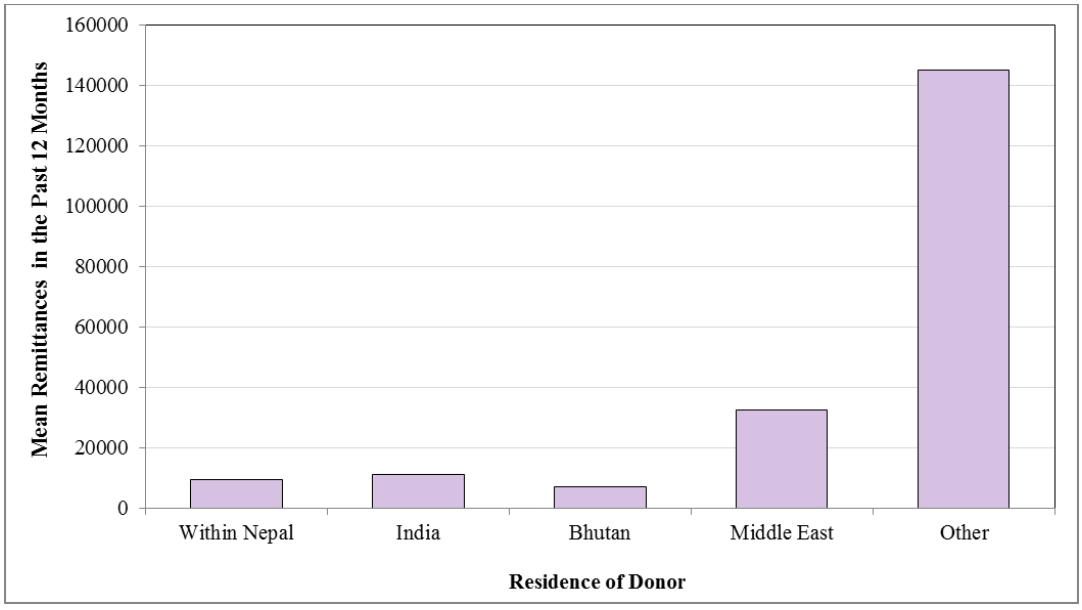

Figure 5.2 Average Value of Remittances sent by Residence of Donor in NLSS I

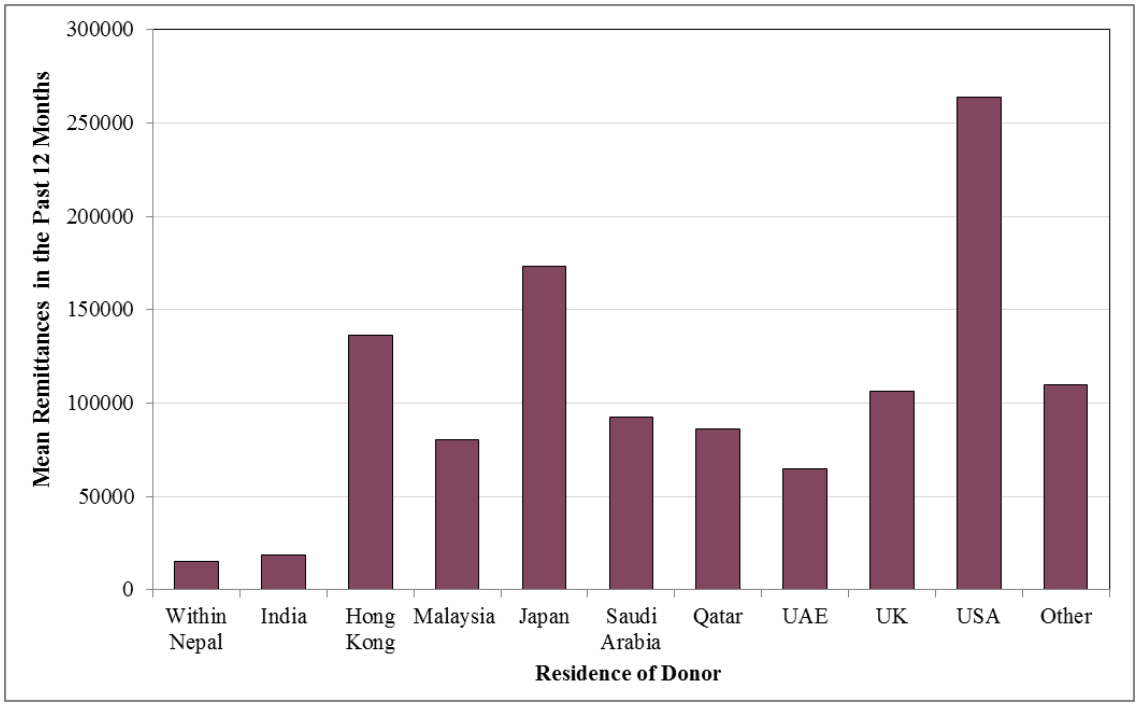

Figure 5.3 Average Values of Remittances Sent by Residence of Donor in NLSS II

Figures 5.2 and 5.3 show the average value of remittances sent by the donor's residence for the NLSS I and the NLSS II. This shows the average amount donors in various countries sent in remittances to individual households. Unfortunately the coding of donors countries is inconsistent between the two surveys, with no differentiation between the different countries of the Middle East in the NLSS I and no information on what "other country" might mean in either survey. However, both surveys show that remittances from donors in Nepal or India tended to be much smaller than those sent from other countries. Data from the NLSS II indicates that remittances sent from developed countries (especially the USA and Japan) are highest on average; however, donors from these countries are not common. Remittances sent from the Middle East increased substantially between the two surveys with NLSS II data indicating that the most common residence of donors from the Middle East was Saudi Arabia with more than five per cent of donors residing here. While 10 per cent of donors were remitting from the Middle East more than a quarter of remittances were sent from this destination meaning that the monetary value of remittances from the Middle East equalled that of remittances sent from within Nepal despite the fact that 50 per cent of donors were residing in Nepal. Indeed the average value of remittances sent by a donor in the Middle East was equivalent to more than the average annual wage in the NLSS II. Four years after the NLSS II was conducted the NLFS showed a dramatic increase in migration to the Middle East with almost 20 per cent of donors remitting from

Qatar or Saudi Arabia and more than 30 per cent of remittances coming from this destination.

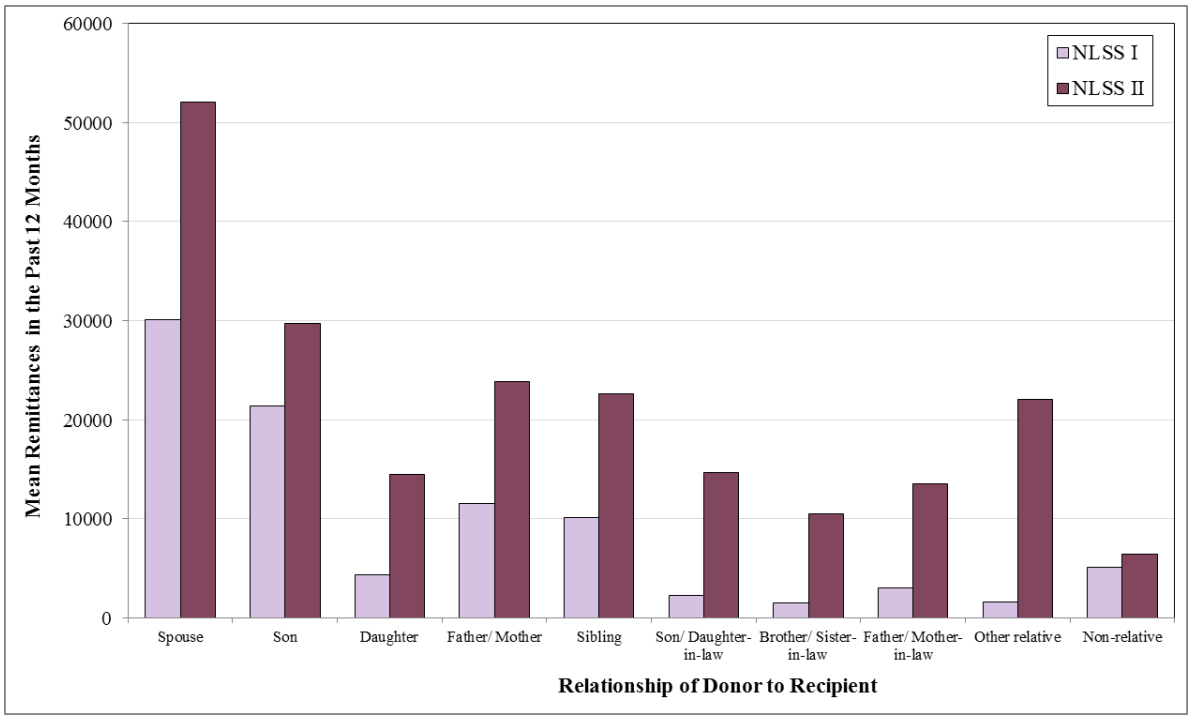

Figure 5.4 Mean Remittances Sent by Relationship of the Donor to the Recipient in the NLSSs

Figure 5.4 show the average size of remittances sent by the relationship of the donor with the household head. Remittances are generally highest when sent by a spouse. In both surveys remittances sent by sons were the second highest. In contrast the average size of annual remittances from daughters was just one fifth that sent by sons in the NLSS I and less than half in the NLSS II.

In the NLSS II 48 per cent of remittances were sent by sons or daughters of the household head while 23 per cent were sent by spouses accounting for 70 per cent of donors between these two categories. In the NLSS I 40 per cent of donors were children of recipients and 17 per cent were spouses. This indicates that between the two surveys it became more common to receive remittances from ones children. These figures may also indicate a move away towards nuclear families since remittances from extended family members became relatively less common. Furthermore, the NLFS showed that 58.3 per cent of remittances were being sent by children and just 10 per cent of remittances were sent by donors who were not spouses or children of the recipient. It is also important to note that the majority of remittances were sent by males – 88 per cent of donors were male in both NLSS, while 91.3 per cent of donors were male in the NLFS.

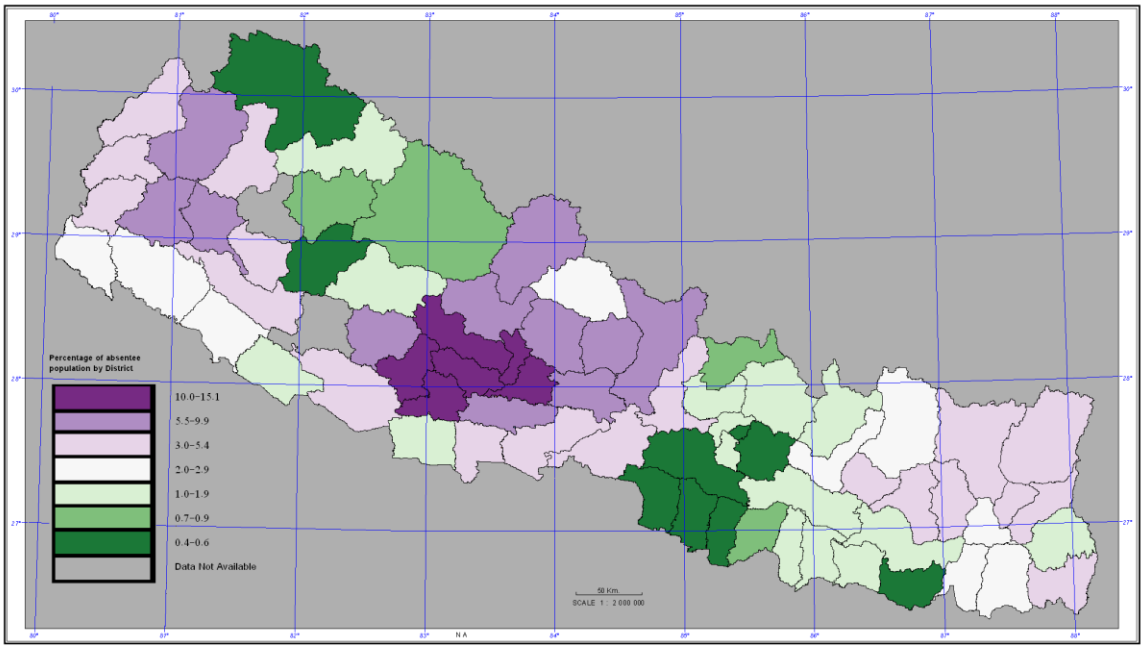

Figure 5.5 Map showing the percentage of normally resident population recorded as absent during the 2001 census

Figure 5.5 shows the distribution of the absentee population (by which I mean the percentage of the normally resident population recorded as absent) by district from the 2001 census. As you can see the percentage of the population absent at the last census varies widely across the country with no clear pattern by either ecological zone or development region. The most popular tourist destinations (the Everest and Annapurna regions) have a relatively high level of absentees as do those regions in the far west which border India. Surprisingly, perhaps, most districts in the Terai that border India do not have a particularly large absentee population, especially in the districts south of Kathmandu. The Kathmandu Valley (Kathmandu, Bhaktapur and Lalitpur districts) has a particularly small proportion of the population recorded as absent, no doubt due to it being the main urban centre in Nepal and generally being the target for rural in migrants trying to find work. Areas in the western hills (districts around Gorkha) that were traditionally recruiting grounds for the Gurkhas have particularly high levels of absentees with between 10 and 15 per cent of the population reported as absent in the last census. This indicates that the historical connection may indeed have a strong effect on current migration patterns.

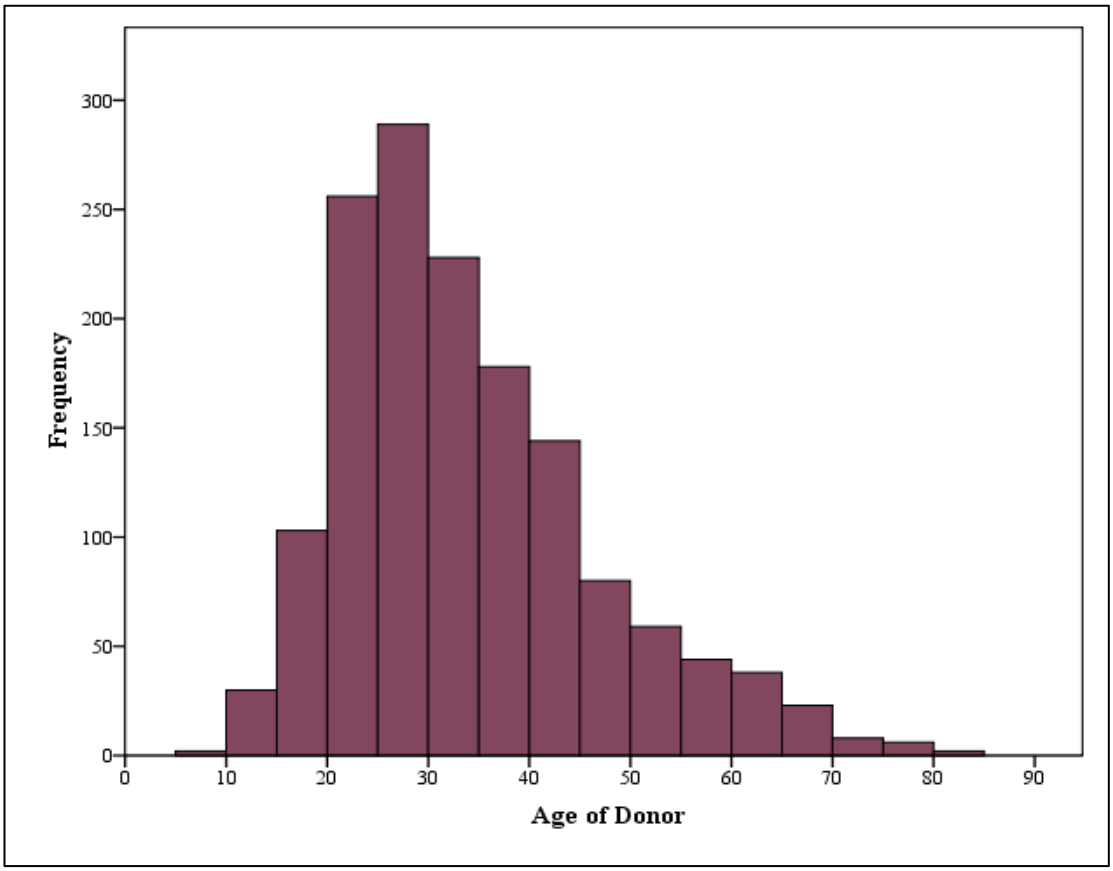

Figure 5.6 Histogram of the Age of Donors in the NLSS II

Figure 5.6 shows the age profile of donors in the NLSS II. This question was not asked in the NLSS I and therefore it is not possible to look at any changes in the age profile of donors that may have occurred between the two surveys. Nonetheless, it can be seen from the histogram of NLSS II data that the average donor is relatively young with donors most commonly being in their twenties. The youngest donors were just eight years old and the oldest donors were over 80, but the vast majority of donors were not over 45 years old. This shows that while children can become donors very young, it is more common for them to wait until they are adults. It is also worth noting that no donor under the age of 18 was reported to be remitting from outside South Asia. The NLFS data shows a similar pattern with very few remittances being sent from outside the sub-continent by those under 15 or over 65 and the majority of donors in the Middle East being in their twenties.

Table 5.3 The distribution of remittances in the NLSSs

Income and Level	NLSS I		NLSS II		
	N	Average Value (NPRs)	N	Average Value (NPRs)	percentage Change
All Families					
Remittance Income	3,606	2,422	3,912	7,802	222.13
Total Income	3,606	41,447	3,912	56,845	37.15
All Individuals					
Remittance Income	22,315	412	24,153	1,598	287.86
Total Income	22,315	7,533	24,153	11,944	58.56
Families in Receipt of Remittances					
Remittance Income	380	21,229	1207	40,657	93.87
Total Income	380	42,377	1207	65,454	54.46
Individuals in Families in Receipt of Remittances					
Remittance Income	2,505	3,611	4,722	8,430	133.45
Total Income	2,505	6,995	4,722	12,817	83.23

Finally, we look at the value of remittances by household. Table 5.2 shows the distribution of remittances in the NLSS surveys. The average value of remittance income and total income is given for both surveys for all households surveyed and just those households in receipt of remittances. As you can see between the two surveys there was a huge increase in average remittance income, especially when compared to the increase in total income. You can also see that for households and individuals in receipt of remittances that income forms the majority of their total income, with the average remittance income for a household being 62 per cent of the average total income. Furthermore the average income of remittance households was 15 per cent higher than the average income of all households. The NLFS found that average remittance income for households in receipt of remittances was 80,462 NPRs, which is almost double the amount recorded in the NLSS II.

5.5. Hypotheses

The hypotheses have already been discussed in section 5.2, but they are set out here in order to be clear about the link between fertility and remittances that is being tested.

Childbearing decisions are made, in part, on the basis of expectations about the future economic value of potential children. Remittances are a very large source of income in the Nepali economy and the majority of remittances are sent by sons. Decisions concerning childbearing must be made before a family knows if an individual child will ever remit, but they can look at the circumstances of others in their local area in order to form their expectations. Thus there is likely to be a link between community level remittances and fertility. The demand for sons should depend on both the likelihood of remittances being sent and the value of those remittances if they are sent. In particular, therefore, the following two hypotheses will be tested:

Hypothesis A: The demand for sons will be higher in communities with large levels of labour migration since this indicates a high likelihood that sons will be able to find work elsewhere when they are old enough.

Hypothesis B: The demand for sons will be higher in communities where the remittances sent back from labour migrants are higher. In particular this will refer to communities where labour migrants tend to find work in countries with higher wages i.e. neither Nepal nor India.

5.6. Method

Multilevel Poisson modelling will be used to model the number of sons a woman has had (see section 3.7 for a further explanation of why Poisson modelling is suitable). Sons have specifically been chosen instead of total children since it is generally males who send remittances; furthermore, the average value of remittances sent by a single male donor in the NLSS II was 33,111 NPRs while the average value of remittances sent by a female donor was 16,685 NPRs meaning that the average remittance sent by a male donor was almost twice as large as that sent by a female donor. Sons are vastly more likely to become remitters than daughters and the remittances they send are substantially larger than their female counterparts. An equivalent model is presented with daughters ever borne as the dependent variable. The reason for running the models twice, once with sons as the dependent variable and once with daughters as the dependent variable is in order to compare the strength and significance of the relationships in the two sets of models, since, as the conceptual framework shows, the expected effect of remittances is mainly on sons.

This test will not be perfect though as childbearing decisions may have been made on the basis of expected remittances, but a mother may still only have (or mainly have) borne daughters. Thus, while their intentions supported the hypotheses the results of the models cannot show this. Nonetheless if the average household makes childbearing decisions on the basis of expected remittances then overall higher levels of remittances should be associated with more sons.

Using sons ever borne as the response variable in a model might seem like a strange strategy at first glance since without sex selective abortion it is intuitively hard to understand how an individual family will be able to manipulate the sex composition of their children. Box 5.1 shows that the use of differential stopping behaviour means that it is theoretically possible to manipulate sex composition without resorting to sex selective abortion.

As already discussed within this thesis there are problems with using the total number of children ever borne since there are issues with underreporting of higher parity births. However, sons ever borne has still been chosen as the dependent variable since using only parity specific data in order to conduct survival analysis (as in Chapter 4 to analyse the landholding-fertility relationship) severely restricts the sample size available; this could become a problem given that only one third of households were reported to be in receipt of remittances and thus restricting the sample size would not allow full use of the already small amount of data. Due to the insufficiencies in the data the results will not be able to accurately predict the size of the effect on fertility, but they should indicate whether or not there is an effect.

A second strategy is also used, which is modelling the proportion of children ever borne who are sons. The purpose of this is to model strength of son preference more directly, which removes the direct link with total fertility. The proportion is modelled using logistic regression.

Multilevel modelling is necessary in this instance because of the clustered nature of the data and because it is community level effects that are of most interest. At the point when the majority of childbearing decisions are being made a family will not have any remittances from its sons since it will either not have any sons or they will be too young to send remittances. Naturally, some decisions regarding higher parity children may be made

at a point after the eldest of a couple's children have been able to go abroad and send back remittances and in this situation the decision to have more children may be related to household remittance income. However, in the majority of cases the only way in which a couple can estimate its chances of success in terms of receiving remittances from sons is through the surrounding community. A couple living in a community where many young men have gone abroad to the Gulf States and are sending back regular remittances will be able to see their neighbours prospering relative to them and this may incentivise them to try and bear more sons. It is not unreasonable to imagine that a couple living in such a community will have more interest in sons than an equivalent couple living in a community where there is no labour migration. Indeed the ratio of sons to daughters in communities with no labour migration recorded in the NLSS II is 0.995 while the ratio of sons to daughters in communities with labour migration is 1.078, though these figures may be the result of reverse causation i.e. communities with more sons will be more likely to experience labour migration. It is also possible that household remittances might affect the decision to have sons since the family will then have direct experience of the benefits that remittances can bring and might decide that sons will be able to continue to send remittances. This situation is most likely experienced when the husband in a couple is sending remittances and thus there might also be a reduction in fertility due to spousal separation (Clifford 2009).

There will be three levels in the final model. Women are situated within communities or VDCs (Village Development Committees) which are the lower administrative part of the Nepali local development ministry. VDCs are situated within Districts of which there are 75 within Nepal. The reason for the three level structure of the model is that data is available from the community survey at VDC level on common destinations and occupations of out migrants, but there is no information on the overall level of labour migration. However, this information was gathered during the 2001 census, but is only available publicly at district level. While this data was collected at a different time to the level 1 and level 2 variables if we view it as a variable that indicates the propensity to migrate from a certain area then this should not be problematic. As explained in the introduction Nepal has a long history of migration and areas that were historically highly mobile remain so today.

Box 5.1 The use of differential stopping behaviour to affect the sex composition of children ever borne

The sex composition of surviving children can be affected by a wide variety of factors— for example couples may provide less food or healthcare to daughters leading to an increased mortality rate amongst daughters (Basu 1989; Das Gupta 1987; Sen and Sengupta 1983). The sex composition of children ever borne, on the other hand, can only be affected by three mechanisms; these are biological mechanisms, sex-selective abortion and differential stopping behaviour. Couples cannot control biological factors and recent research suggests that the sex ratio at birth of about 1.05 varies very little (Garenne and Joseph 2002; Waldron 1983). There is very little evidence of sex-selective abortion in Nepal on the basis of current data since the overall sex ratio at birth is around 1.05; this is in contrast to some states of northern India where sex-selective abortion has become increasingly common as evidenced by sex ratios at birth of up to 1.21 (Arnold, Kishor and Roy 2002). Thus a couple motivated by son preference in Nepal is likely to engage in differential stopping behaviour; evidence for differential stopping behaviour is visible in all three Nepal Demographic and Health Surveys and both Nepal Living Standards Surveys as can be seen in Chapter Three. Differential stopping behaviour is the practice of choosing to stop childbearing once the desired sex composition of children has been reached. Thus, if a couple desires two sons they will continue childbearing until they have two sons; this practice has the potential to affect sex ratios of women at different parities, but it would not necessarily affect the overall sex ratio in the absence of sex-selective abortion (Clark 2000).

To illustrate how differential stopping behaviour can affect the sex composition of children ever borne consider a population where all couples desire one son and they are prepared to continue having children until they have a son at which point they will stop. Then all women who stop childbearing at parity one will have sons, because they would not have stopped childbearing otherwise, and these women will account for 51.2 per cent of the population. All women who stop childbearing at parity two will have one daughter and one son and these women will account for a quarter of the population. If the one son stopping rule were strictly adhered to and all women were able to continue childbearing until they had had one son, but no more, then the resulting distribution of women at each parity (up to ten) would be as shown in Table I. The sex ratios for women who have completed childbearing are shown in Figure I.

Table I Parity distribution of women following different stopping rules

	1 son stopping	2 son stopping	3 son stopping
1	51.22	0.00	0.00
2	24.99	26.23	0.00
3	12.19	25.59	13.44
4	5.95	18.73	19.66
5	2.90	12.18	19.18
6	1.41	6.13	15.60
7	0.69	4.18	11.41
8	0.34	2.72	7.79
9	0.16	1.75	5.07
10	0.08	1.02	3.25
TFR	**1.94**	**3.78**	**5.29**

Suppose that one son was not enough and all couples actually wanted two sons, then the minimum number of children that any couple would choose to have would be two and these two children would both be sons. Table I shows the parity distribution of women in a population where a one son, two son and three son stopping rule is used. The simplifying assumption is made that women will not have more than ten children even if they have not had their desired number of sons and the total fertility rate (TFR) is then calculated from the distributions. A one son stopping rule would result in a TFR below replacement level, while a two son stopping rule would result in a TFR of 3.78, assuming all women could bear as many children as they liked up to ten; a three son stopping rule would result in a TFR of 5.29. The overall sex ratio for women who had completed childbearing would be 1.06 for a population following the one son stopping rule;

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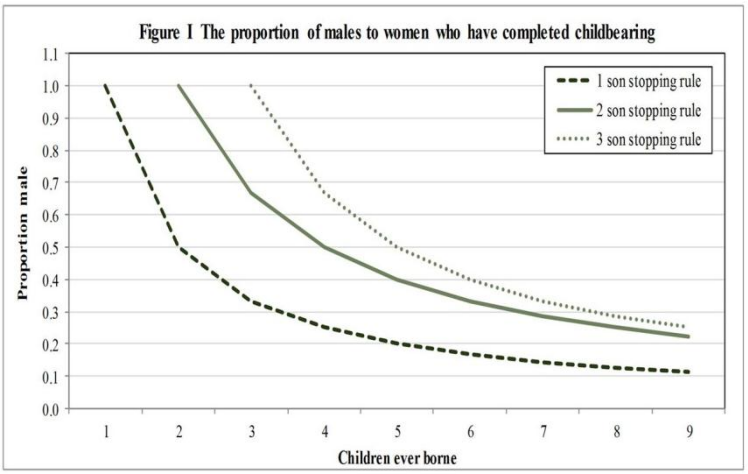
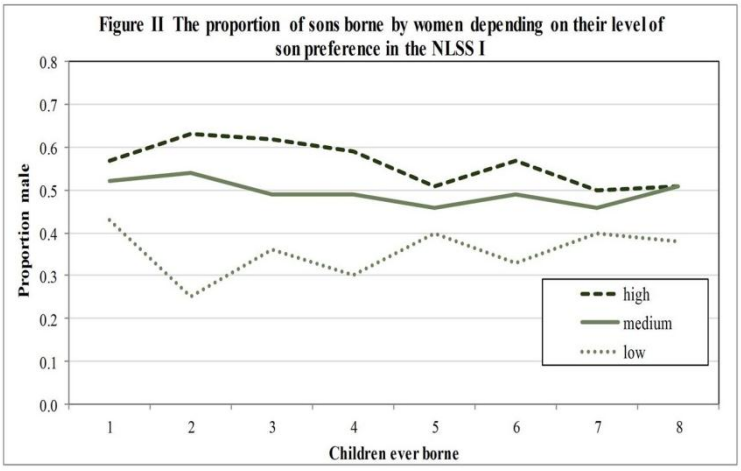
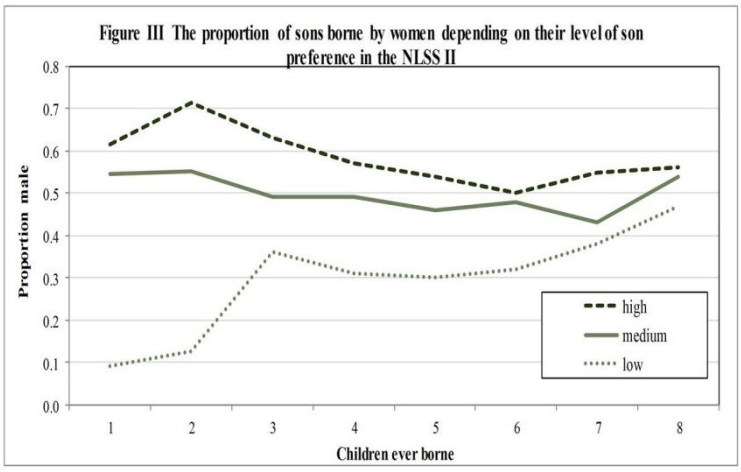


this shows that differential stopping behaviour can alter sex ratios at individual parities without causing the overall sex ratio to vary much from the biologically expected level of 1.05. A two son stopping rule would result in a sex ratio of 1.12 and a three son stopping rule would results in a sex ratio if 1.18.

The significance of this theoretical exercise is to show that it is possible for a couple to manipulate the sex ratio of children ever borne, something which was not thought to be possible until ten years ago. Put simply, the average couple who wants more sons can have more sons even in the absence of sex-selective abortion. The implication of this is that differential stopping behaviour should result in different sex ratios for those with son preference. It would be possible to test this with the use of panel data that askes about fertility preferences and records subsequent fertility, but unfortunately the NLSS panel data is not suited to this since fertility preferences were only asked of women who had started childbearing and the sample sizes are extremely small once the data is disaggregated by parity and stated son preference. Thus the best option available was to use the cross-sectional data from both NLSSs.





Figures II and III show the percentage of children ever borne to women of different parities disaggregated by the level of son preference they stated. Women were asked how many sons they thought was ideal, how many daughters they thought was ideal—women who stated that they thought more sons would be ideal were

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categorized as having high son preference, those who stated they thought equal numbers would be ideal were categorized as having medium son preference and those who thought that more daughters would be ideal were categorized as having low son preference. The two figures show that those with high son preference had a higher proportion of sons for each parity, while those with low son preference had a much lower proportion of sons.

It is obvious that this method is problematic since son preference was stated after the women's' children were born. Therefore it could be argued that stated son preference is the result of children ever borne and not vice versa. However, the majority of women did not state that they wanted the number of children that they had—just one in five women in both surveys said that they thought the number of sons and daughters they actually had was ideal indicating that stated ideal numbers of sons and daughters was not simply the result of the sex composition of the children that women had actually had. Many studies have used respondents' reported ideal number of sons and daughters as a measure of fertility preference (Bhat & Zavier 2003; Clark 2000; Vlassoff 1992). These studies have shown that this reported measure of the demand for sons correlates strongly with other measures of bias against girls and that respondents do not generally provide answers that simply reflect their own household composition. However, such evidence has been country-specific and many concerns still exist about the subjectivity of a reported measure of son preference.

Overall it seems reasonable to assume that differential stopping behaviour has resulted in a higher percentage of sons being born to women with higher levels of son preference and thus it is reasonable model number of sons and number of daughters separately as well as the proportion of children ever borne that are male.

Only the rural data has been used. This is for two reasons. Firstly, the fertility data from urban areas is of suspect quality (as explained in Chapter 3) and secondly labour migration follows different patterns in rural and urban areas, with those in urban areas far more likely to go abroad to study – something which is a rare occurrence in rural areas.

5.6.1. Reverse Causation

Since the hypotheses are being tested using cross-sectional data there is cause to consider the possibility of reverse causation. A family with a large number of sons is more likely to be in receipt of remittance income. Thus any relationship at the individual level between remittance income and number of sons may simply be the product of reverse causation and not a ratification of the hypotheses at all. Guarding against this possibility is paramount and will be done in several ways.

Firstly, women who have sons aged 18 or over are not included in the analysis. Barely any remittances were sent by children from outside South Asia and only small numbers were sent from within the sub-continent. Thus, filtering out women with older sons will

mean that any relationship between sons and remittances that is found cannot be the result of their own sons sending remittances.

Secondly, VDC and district level variables, which should be less susceptible to the problem of reverse causation, are included.

5.6.2. Variables

NLSS II data is used throughout the rest of this chapter. Some of the variables used are self-explanatory, but others are complicated derivatives of several variables from the original NLSS II data. Within this section a description of how each variable was calculated and what it was designed to show or test is given.

INDIVIDUAL/HOUSEHOLD LEVEL VARIABLES

Sons and daughters are the number of children of the relevant sex reported by the woman; squared terms of both these variables are also included in the relevant model to sufficiently account for the relationship between numbers of sons and daughters. Age is the age of the mother in completed years at the time of the survey. Education has been recoded from the data in the survey as people in the survey were asked how many years of completed education they had. This was recoded as none, primary, some secondary (including everyone who had attended secondary school but not completed their School Leaving Certificate – SLC) and SLC/Tertiary indicating anyone with a School Leaving Certificate or a more advanced qualification. Those with a SLC and those with Tertiary education were grouped together due to extremely small numbers of women reporting such high educational attainment.

Household remittances were calculated by summing all the remittances reported to have been received by the family in the past 12 months including the value of remittances received in kind. Remittances are reported in the survey by the household head on behalf of the entire household and their value is given in Nepalese Rupees (NPRs); the final variable is 1,000s of Nepalese Rupees. This will tell us whether there is a relationship between sons under the age of 18 and remittances at the household level.

Income quintile was calculated using total income less any remittances received by the household. Households were then split into quintiles. It is necessary to control for income

since otherwise any relationship between remittances variables and fertility might be picking up an income effect.

VDC LEVEL VARIABLES

The variables at VDC level were calculated from both the community data and the household data. The percentage of adults with any education was calculated from the household data because no estimates were available from the community data apart from current enrolment rates. The proportion of adults within each household who had any education was calculated and from this the VDC level variable was calculated so as to give equal weight to all households (since less educated households tend to have more people it would be biased to calculate the percentage without this weighting).

The other variable at this level is concerned with the existence of out-migrants who were reported to travel to places other than India or a district within Nepal for work. The variable used is a dichotomous variable that equals one if there are any labour migrants from the community who are outside South Asia. Both the community data and the household data contained information about this. The household data contained relatively small sample sizes, with just 12 households interviews per VDC and thus using this data to construct the variable would have been likely to miss communities where out migration to such destinations is actually common. Therefore the community data was used to construct the variable. Within the community data information was collected about each type of work that individuals migrate for and where those individuals migrate to. These figures are unlikely to be accurate since they represent the response of a committee of a few individuals within the community; However, they should indicate something about the perception of levels and destinations of migrant workers from that particular area and the construction of a dichotomous variable should minimise the error arising. This variable is designed to give a proxy for the perceived value of potential remittances. Remittances sent from India and Nepal are extremely small (see figures 5.2 and 5.3), whereas those sent from other destinations tend to be much higher. Thus couples living in communities with experience of migrants going to other countries should also have a higher expectation of levels of future remittances.

DISTRICT LEVEL VARIABLES

The district level variables were both taken from the 2001 census data. This is freely available for the district level from the Nepal Central Bureau of Statistics website

(www.cbs.gov.np). The district level total fertility rate (TFR) and the percentage of normally resident persons who were absent at the time of the census are included. Normally resident members who were recorded as absent included those who were away for reasons other than work, however since only rural areas were included the majority of absentees would have been absent due to labour migration (Central Bureau of Statistics (CBS) 2009b). This variable is designed to test whether the propensity to migrate affects childbearing. A VDC level variable would have been preferable, but this would only have been available as an estimate derived from information on the twelve households that were sampled in each primary sampling unit and thus the error associated with estimates using this data would be extremely large. The census is likely to be a more reliable source in this situation.

5.7. Results

The results are presented in three tables. Table 5.4 shows three Poisson models with number of sons as the dependent variable and table 5.5 shows the same three models but with daughters as the dependent variable. Table 5.6 shows the logistic models of the proportion of children ever borne who were sons. The first model presented is a single level model, and then the further two levels of the model are built in.

5.7.1. Sons Ever Borne

The single level model of sons ever borne shows the expected relationship between the majority of the variables. The older a woman is the more sons she tends to have had, while more educated women tend to have had fewer sons. The link between number of sons and income is monotonic with women from richer households having fewer sons.

The relationship with income is of course of particular interest since this variable is total income apart that from remittances. The effect of household remittance income is modelled separately and unlike the overall effect of household income it is positive. The size of the effect appears to be small, since for every extra 1,000 NPRs (roughly £8.50) the incidence rate ratio is 1.001 implying a 0.1 per cent increase in the number of sons for every 1,000 NPRs received by the woman's household in remittances. If we relate this back to the likely size of remittance income then the average value of remittances received by families in receipt of such income was 40,657 NPRs (roughly £350), which relates to an incidence rate ratio (IRR) of 1.04 or a 4 per cent increase in the number of sons over those

women living in a household with no remittance income. There were also just over 100 households in the NLSS II who reported that they had received 100,000 NPRs (roughly £860) or more in the past year with one household reporting 900,000 NPRs (roughly £7,750). Household remittance income of 100,000 NPRs relates to an IRR of 1.1 and a remittance income of 900,000 NPRs relates to an IRR of 1.9. These figures for remittance income are at the extreme upper end of the distribution and the actual estimate of the IRR is unlikely to be accurate, but these figures show that what looks like a small effect initially can, in fact, become a large effect in certain conditions.

Table 5.4 Three Poisson models of the number of sons ever borne

		Single level model		Two level model		Three level model	
		IRR	SE	IRR	SE	IRR	SE
Household level variables							
Daughters		0.775 ***	*0.033*	0.791 ***	*0.019*	0.773 ***	*0.033*
Daughters squared		1.035 ***	*0.008*	1.028 ***	*0.004*	1.035 ***	*0.008*
Income quintile	*Poorest*						
	Poor	0.845 *	*0.067*	0.923 +	*0.041*	0.848 *	*0.068*
	Average	0.821 ***	*0.063*	0.862 ***	*0.038*	0.832 *	*0.065*
	Rich	0.752 ***	*0.056*	0.832 ***	*0.038*	0.761 ***	*0.058*
	Richest	0.603 ***	*0.053*	0.720 ***	*0.038*	0.614 ***	*0.056*
Age		1.160 ***	*0.028*	1.173 ***	*0.017*	1.161 ***	*0.028*
Age squared		0.999 ***	*0.000*	0.998 ***	*0.000*	0.999 ***	*0.000*
Education	*None*						
	Primary	0.896	*0.072*	0.934	*0.043*	0.900	*0.073*
	Some secondary	0.839 *	*0.075*	0.867 **	*0.046*	0.854 +	*0.080*
	SLC or Higher	0.801 +	*0.106*	0.729 ***	*0.055*	0.814 +	*0.109*
Household Remittances (1,000 NPRs)		1.001 *	*0.000*	1.001 *	*0.000*	1.001 *	*0.000*
PSU level variables							
Labour migration to countries other than India				1.095 *	*0.043*	1.158 *	*0.066*
% of adults with any education				0.997 **	*0.001*	0.998	*0.002*
District level variables							
District TFR						1.036	*0.055*
% absent						1.009	*0.006*

*N.B. p-values are indicated as follows: + p<0.1 * p<0.05 **p<0.01 *** p<0.001*

IRR stands for incidence rate ratio and SE stands for standard error

The relationship with income is of course of particular interest since this variable is total income apart that from remittances. The effect of household remittance income is modelled separately and unlike the overall effect of household income it is positive. The size of the effect appears to be small, since for every extra 1,000 NPRs (roughly £8.50) the incidence rate ratio is 1.001 implying a 0.1 per cent increase in the number of sons for

every 1,000 NPRs received by the woman's household in remittances. If we relate this back to the likely size of remittance income then the average value of remittances received by families in receipt of such income was 40,657 NPRs (roughly £350), which relates to an incidence rate ratio (IRR) of 1.04 or a 4 per cent increase in the number of sons over those women living in a household with no remittance income. There were also just over 100 households in the NLSS II who reported that they had received 100,000 NPRs (roughly £860) or more in the past year with one household reporting 900,000 NPRs (roughly £7,750). Household remittance income of 100,000 NPRs relates to an IRR of 1.1 and a remittance income of 900,000 NPRs relates to an IRR of 1.9. These figures for remittance income are at the extreme upper end of the distribution and the actual estimate of the IRR is unlikely to be accurate, but these figures show that what looks like a small effect initially can, in fact, become a large effect in certain conditions.

What, then, does the estimated two level model add to this analysis? Firstly the coefficients for the variables in the one level model remain a similar size and significance. Secondly, both community level variables have a significant effect on sons ever borne. Higher levels of education in the community are related to a lower number of sons; this is in addition to the contraceptive value of the individual woman's education, though the community effect is much smaller. More interestingly, women living in communities with out-migration to destinations outside of South Asia were found to have almost 10 per cent more sons than women living in communities without experience of such labour migration. This is an interesting result because this variable was designed to indicate that remittances were likely to be relatively large. The initial hypothesis was that sons would be more highly prized only if the likelihood of them becoming a remitter and the size of likely remittances was high enough. Due to the fact that this is a community level variable this is akin to a proxy value for expectations concerning the value of remittances and thus this finding provides support for the hypotheses.

Finally the three level model adds in a variable to estimate the effect of the propensity to be a labour migrant within a district along with the fertility rate of that district. The fertility rate is included since the per cent absent and the TFR are both related to development levels within the district and obviously the fertility level of the district is going to be related to the fertility of individuals within that district. Thus I wanted to discount the possibility that any relationship between sons and the percentage of the

population who were absent was could not be indicative of another underlying variable. Surprisingly, the TFR was not significant, though the relationship between sons and the TFR was positive as one would expect. The percentage absent was not significant either, though the effect was estimated to be positive as the hypotheses would predict. The effect of living in a community with out-migration to places outside South Asia remained significant and the magnitude of the IRR increased, while the effect of district level education disappeared.

5.7.2. Daughters Ever Borne

Table 5.5 shows the results from the same three models as in table 5.4, but with the number of daughters as the dependent variable. Most of the results are very similar to those found in the sons ever borne models. The only notable difference at the individual or household level is that household remittances are no longer significant and the incidence rate ratio is virtually one indicating no evidence of a relationship between the two variables.

No variables in the three level model were found to be significant at the PSU or District level.

The fact that household remittances are related to sons ever borne but not daughters ever borne, despite filtering out sons over the age of eighteen, suggests one of two things. Firstly it may be that households who have experience of remittances adapt their demand for sons accordingly – this would be support for the hypotheses. Secondly, it may be that households with more young sons attract higher levels of remittances because households wish to invest more in sons than daughters and thus need more a higher income, which they achieve through remittances. It may be that husbands are more likely to migrate and remit if they have sons than if they have daughters. Unfortunately, these models do not allow us to distinguish between these two causal pathways.

An equivalent problem exists for the community variable indicating labour migration outside South Asia. It may simply be that communities with higher numbers of sons are more likely to be involved in migration to these places, though this seems less likely since the variable is dichotomous and simply indicates whether the community has *any* experience of out-migration to more profitable destinations. It would seem unlikely that

the effect would be particularly significant unless childbearing decisions were being made on the basis of remittance opportunities.

Table 5.5 Three Poisson models of the number of daughters ever borne

		Single level model		Two level model		Three level model	
		IRR	SE	IRR	SE	IRR	SE
Household level variables							
Sons		0.697 ***	*0.017*	0.703 ***	*0.018*	0.719 ***	*0.030*
Sons squared		1.045 ***	*0.004*	1.042 ***	*0.005*	1.037 ***	*0.006*
Income quintile	*Poorest*						
	Poor	0.950	*0.041*	0.977	*0.044*	0.917	*0.081*
	Average	0.810 ***	*0.035*	0.831 ***	*0.039*	0.920	*0.080*
	Rich	0.740 ***	*0.033*	0.776 ***	*0.037*	0.888 +	*0.076*
	Richest	0.589 ***	*0.029*	0.645 ***	*0.036*	0.675 ***	*0.072*
Age		1.212 ***	*0.018*	1.221 ***	*0.019*	1.207 ***	*0.032*
Age squared		0.998 ***	*0.000*	0.998 ***	*0.000*	0.998 ***	*0.000*
Education	*None*						
	Primary	0.967	*0.044*	0.996	*0.047*	0.856 +	*0.075*
	Some secondary	0.848 **	*0.044*	0.880 *	*0.049*	0.765 **	*0.077*
	SLC or Higher	0.655 ***	*0.049*	0.712 ***	*0.058*	0.637 **	*0.100*
Household Remittances (1,000 NPRs)		1.000	*0.000*	1.000	*0.000*	1.000	*0.000*
PSU level variables							
Labour migration to countries other than India				0.992	*0.044*	1.066	*0.068*
% of adults with any education				0.999 **	*0.001*	0.998	*0.002*
District level variables							
District TFR						1.059	*0.062*
% absent						1.001	*0.007*

*N.B. p-values are indicated as follows: + p<0.1 * p<0.05 **p<0.01 *** p<0.001*

IRR stands for incidence rate ratio and SE stands for standard error

5.7.3. Proportion of Sons

Table 5.6 shows the effect of the covariates used in the previous models on the proportion of children ever borne who are sons – the only covariate not included is the district level TFR because there is no theoretical reason why this should affect son preference, though son preference may well affect the district level TFR.[19]

The first thing to note is that very few things were found to affect the proportion of sons borne. Indeed, many other covariates were tested including religion, caste/ethnicity

[19] The effect of the district level TFR on the proportion of sons was tested anyway and found to be non-significant.

and various measures of development, and none of them were found to be significant. However, two factors were found to be significant and these were mothers with a high level of education (SLC or above) and women living in a community that experienced out migration to destinations other than India.

Table 5.6 Three logistic models of the proportion of children ever borne who were sons

		Single level model		Two level model		Three level model	
		Exp(β)	SE	Exp(β)	SE	Exp(β)	SE
Intercept		1.804	*0.385*	1.635	*0.390*	1.631	*0.39*
Household level variables							
Income quintile	*Poorest*						
	Poor	0.952	*0.062*	0.944	*0.060*	0.945	*0.063*
	Average	1.006	*0.063*	0.999	*0.060*	1.001	*0.064*
	Rich	1.054	*0.066*	1.032	*0.062*	1.034	*0.068*
	Richest	1.056	*0.082*	1.038	*0.072*	1.039	*0.085*
Age		0.968	*0.023*	0.966	*0.023*	0.966	*0.023*
Age squared		1.000	*0.000*	1.000	*0.000*	1.000	*<0.001*
Education	*None*						
	Primary	0.947	*0.075*	0.928	*0.077*	0.929	*0.077*
	Some secondary	0.954	*0.097*	0.939	*0.099*	0.940	*0.099*
	SLC or Higher	1.460 +	*0.212*	1.438 +	*0.213*	1.437 +	*0.213*
Household Remittances (1,000 NPRs)		1.000	*0.001*	1.001	*0.001*	1.001	*0.001*
PSU level variables							
Labour migration to countries other than India				1.103 *	*0.042*	1.103 *	*0.049*
% of adults with any education				1.000	*0.001*	1.002	*0.002*
District level variables							
% absent						0.998	*0.006*

*N.B. p-values are indicated as follows: + p<0.1 * p<0.05 **p<0.01 *** p<0.001*

SE stands for standard error

A woman living in a community with out-migration to countries other than India who has no education and is in the poorest income quintile would be expected to have 64 per cent sons compared to 62 per cent for an equivalent woman living in a community without such out-migration. The difference is small, but given that barely any covariates tested had a significant effect on the proportion of sons borne this finding supports the hypothesis that expectations about future remittances can affect childbearing. The spector of reverse causation must again be raised, but again it seems most likely that the reason for this relationship is that expectations about future remittances can affect levels of son preference. The fact that household level remittances are not significantly related to the proportion of sons suggests that reverse causation might account for the relationship observed with sons ever borne, since the relationship should hold for the proportion of sons

borne if remittance expectations were the cause of the relationship. This is because remittance expectations only affect sons ever borne through the strength of son preference. The fact that community out-migration affects the proportion of sons borne as well as the number of sons borne indicates that the likely causal pathway between out-migration and sons ever borne is through the intensity of son preference and this is why reverse causation is less likely since it is the number of sons – not the proportion – which should affect the likelihood of out-migration.

In the same model a woman with SLC or higher level education would be expected to have 70 per cent sons, whereas a woman with no education would be expected to have 62 per cent sons. This means that the most highly educated women in rural areas tend to have a higher proportion of sons. This tends to imply that the demand for sons does indeed fall slower than the demand for children leading the most highly educated mothers to have the highest proportion of sons.

Overall, therefore, women in communities with out-migration to more profitable destinations (i.e. outside of South Asia) have a higher proportion of sons and a higher number of sons when other factors are controlled for. This supports the hypothesis that the perceived regional costs and benefits of migration affect son preference and through son preference sons ever borne and fertility.

5.8. Conclusions

In this chapter the relationship between remittances and fertility has been studied. This is an area which has been neglected, even though there is a large body of research looking at the relationship between fertility and migration more generally. The NLSS data is unusual in providing detailed information on remittances in addition to complete birth histories and this allowed the relationship to be tested empirically. Unfortunately, the sample size of the panel data meant that only cross-sectional data could be used. This raised the possibility of a reverse causation problem.

The results indicate that there is a relationship between household level remittances and sons ever borne, but not daughters or the proportion of sons. Taking into account that this relationship is not the result of sons remitting (since these cases were filtered out), this finding might lend support to the hypothesised relationship between remittances and

fertility, but since household remittances were not related to the proportion of sons a woman had it seems more likely that this relationship was the result of donors being more likely to remit to a household with more sons.

Sons ever borne were also found to be related to community experience of out-migration to destinations other than South Asia, as was the proportion of sons borne. Daughters ever borne, meanwhile, was not found to be related to this variables. This indicates support for the hypotheses. However, there is still the lingering question of reverse causation since the VDCs with experience of such out-migration might have unusually high proportions of males, which is causing higher levels of out-migration and not the reverse – the conceptual framework actually suggests that both may be occurring. It may be that higher remittances lead to an increased number of sons, which leads to higher remittances, which intensifies son preference even further. Certainly, the fact that the variable is related to both son preference (i.e. the proportion of sons) and sons ever borne supports this hypothesis.

While the results are far from conclusive they show that this is an area which deserves further work and panel data would be ideally suited to this end. Remittances are an important and ever growing source of income in the developing world and if they affect fertility this may have important ramifications.

5.9. References

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CHAPTER 6

CONCLUSIONS

6.1. The Wider Context

Reproduction is one of the most basic things that any species must do in order to survive and this is no less true for human beings. Understanding the determinants of reproduction levels, or rather fertility is a research agenda that has been pursued for at least two centuries. Unlike other mammals, human fertility is not mainly determined by either biological capacity or the physical environment; human fertility is governed by choice. The vast majority of people are aware of contraception, be that modern methods or traditional; while contraceptive failure and lack of access to modern family planning reduces the ability of many people to make a firm choice about the number of children they will bear they generally still retain the ability to make some form of choice. It is these choices which are, in my opinion, at the heart of understanding fertility. This thesis is a contribution to this broader academic debate. Unlike some academic debates, though, the implications of new research findings in this area have the potential to influence the lives of many real people. Population pressure is seen by some as an erstwhile, much debated topic, no longer worthy of attention but many also believe that the population bomb has not been diffused. The population of the world is forecast to reach 7 billion this year, a mere 12 years after the 6 billion milestone was reached. By 2050 the United Nations (UN) forecasts that there will be a further two billion people assuming the medium variant estimate. At a global level there are only two processes that can affect population size: fertility and mortality. Of these it is fertility which we understand the least and which has the biggest potential to affect the size of the world's future population. Indeed if fertility is assumed to remain constant until 2050 then the population of the world could reach more

than 11 billion, which overshoots the high variant UN estimate by over half a billion people and the medium variant by almost 2 billion (United Nations 2008).

There has been a great deal of criticism of economic models of fertility in recent years, but in their absence little progress appears to have been made by demographers. Clearly, there is much more to be done and much more to be learnt about the processes which impact upon fertility at both the individual and the macro level. The dearth of focussed research on economic models of fertility transition in recent years is a missed opportunity. The ultimate goal for fertility research must be the ability to make sensible predictions about future fertility levels; this is currently little more than a pipe dream. More intermediate research goals are to gain an accurate understanding of fertility dynamics that occur at the current time. For this researchers require good quality longitudinal data sets. In the absence of such data, researchers must carefully study the data they do have to see which bits of it are sound and which are not; they must then carefully attempt to only use those parts of the data which are most sound. Within this thesis data quality has been at the forefront of the research agenda. In Chapter 4 (Arable Landholding and the Demand for Children) only the fertility data deemed to be of the soundest quality was used. In Chapter 5 (Remittances and Fertility) more of the fertility data was used, but with full knowledge of the limitations that this implied.

Nepal may seem like an unlikely country to be studying fertility with a view to the worldwide context, but it is an extremely interesting setting and not just because of the availability of panel data and surveys including both full birth histories and a wide range of economic variables. Nepal has undergone a rapid fertility transition without any substantial coercion, unlike its neighbours – demographic giants – India and China. Furthermore, a great deal of that transition occurred against a backdrop of civil war, which is highly unusual. It also has diverse topography and the social heterogeneity that might be expected to accompany a country where tigers roam in sub-tropical rainforests less than 100 miles from woolly yaks that thrive even when temperatures plummet to -40˚C. An international conference on fertility transition in Nepal in 1997 attracted a variety of famous demographers including John Caldwell who stated that “there are many reasons why Nepal is of interest to the demographic theorist” (Caldwell 1998, p.7). At the time of the conference Nepal was the poorest country experiencing fertility transition and while

this is no longer true it would be illuminating to understand why fertility in Nepal was able to fall so substantially.

6.2. Review of Findings

In Chapter One five research questions were identified that sought to explore economic theories of fertility transition and test whether some of the most major factors contributing to the Nepali economy had any effect on fertility. These were addressed over the course of the subsequent four chapters. The findings in relation to these research questions are summarised below:

i. What are the gaps in current economic theories of fertility decline?

In Chapter Two a list of the key problems that remain to be solved within the literature was compiled. These ranged from concerns that relationships at the macro level do not match what we would expect from economic theories of fertility transition, to a broad range of issues with fully conceptualising and quantifying the supply and demand for children as well as the associated costs.

The list of problems with economic theories of fertility transition is, in some ways, overwhelming, but they remain intuitively appealing. The key is to understand, where many have failed to do so, that these theories do not claim that all fertility is the result of rational decisions; clearly rational childbearing decisions are only made in certain circumstances. Also, any actual individual may fail to act rationally due to the fact that they lack certain information or make a mistake despite rational intentions or for any number of other reasons – what matters is that on average fertility is rational.

It became clear that the best way to proceed was to identify a priori the patterns we would expect to see in the data if childbearing decisions were being made rationally; the key is to look carefully at how theory predicts the average household will act and then to test if those predictions bear out when systematically tested using empirical data. Nepal, being a mid-transition country and one with an unusual panel Living Standards Measurement Survey (LSMS), was a good place to do this. Studying agricultural landholding and remittances were obvious choices since agriculture and remittances are the two largest components of GDP (gross domestic product) and between them they account for a very large proportion of household income. Both also have a large historical element to them, meaning that they are not new phenomena but ones which have had time to embed

themselves within the national psyche to the extent that one might expect them to be routinely considered when a household considers its economic position and prospects.

ii. How good is the quality of fertility data available in the Nepal Living Standards Surveys? Is it possible to identify those parts which are sound and also those parts which are not?

LSMSs are not routinely used by demographers to study fertility, despite their wealth of economic information. It was therefore important to test the reliability of the fertility data in these data sets, especially against the more commonly used DHS (Demographic and Health Survey) data.

There was some evidence of underreporting of births in the NLSSs (Nepal Living Standards Surveys), especially in the NLSS I. However, data for women from rural areas, over the age of 25 and of parity two or more looked to be reasonably sound. A strange artefact of the data was the underreporting of births of parity five and above in the NLSS II indicating a tendency for higher parity women to only report four of their children – the reason for this is unclear, though it may be that a subset of women were only asked to list four births. The main problem with the NLSS I data was an excess of women at parity zero – there was no discernible pattern to distinguish women with fertility data from women without so it was concluded that fertility data for some women was missing at random. Given the over reporting of childlessness in the NLSS I and underreporting of higher parity births in the NLSS II it is hardly surprising that fertility rates calculated from these surveys were consistently lower than those calculated from the DHSs. This means that if the NLSS fertility data is used to estimate the effect of covariates on overall fertility, then the magnitude of those effects is unlikely to be accurate.

Data in urban areas looked suspect from both the DHSs and the NLSSs and was not used in subsequent chapters. This made sense on theoretical grounds since agricultural landholding is less important within an urban context and remittances are less common within cities, especially Kathmandu, Lalitpur, Bhaktapur and other areas within the Kathmandu valley where the majority of the urban sample came from.

Overall, the fertility data in the NLSSs looked reasonable in rural areas, though it is important to note that the drawbacks already mentioned mean that fertility tends to be underestimated.

iii. What is the nature, form and extent of son preference in Nepal?

Son preference is an important element of fertility in Nepal, but has been mainly overlooked due, in part, to its geographic neighbours having attention focussed on them – a substantial amount of research on son preference in India exists, while China's one child policy has resulted in extremely skewed sex ratios. Nepal, on the other hand, has an overall sex ratio at birth that is not far from the expected 105 boys to 100 girls (Garenne and Joseph 2002). However, son preference would be expected in a country like Nepal where girls do not stay within their family of birth, but are married into another family where any economic benefits they can provide will go to the family of their husband. It makes little sense in economic terms to raise girls and spend money on their education (and other things) when they will require a dowry in order to get married; given that the median age at marriage for women born in the late 1970s was 16.7 (Caltabiano and Castiglioni 2008) and for women born in the late 1980s it was 17.2 (Puri, Tamang and Shah 2011) there is very little opportunity for the average household to reap any financial rewards from a daughter, especially if she has stayed in education for a long time. Indeed the NLSS II data indicates that the most common reason for girls not attending school was that their parents did not feel it was worth it or that they needed them to help out at home, with 60.6 per cent of girls giving these as the reasons for their non-attendance compared with 32.9 per cent of males (Central Bureau of Statistics (CBS) 2004b). Furthermore, land rarely passes to women and is rarely owned by women, despite recent changes to the law allowing women to inherit land for the first time and government policies to assist women with land ownership issues (Allendorf 2007). In short daughters are unlikely to provide any kind of net economic benefit to their parents and are unlikely to be able to aid consumption smoothing into older ages. In the Nepali context economic theories very clearly imply that daughters will be much less sought after than sons.

Testing the existence and extent of son preference is therefore of key interest for anyone interested in studying whether childbearing decisions are made with any concern for economic returns.

It was found that there is evidence for son preference in both the NLSSs and the DHSs; it is most clearly noticeable among parities two to four. It was also found that son preference has caused the fertility rate to be as much as seven or eight per cent higher than it might otherwise have been. Son preference in Nepal is highly prevalent and appears to

manifest itself mainly in terms of sex selective stopping behaviour (or at least this is where it is visible). It is also significant to note that there is no evidence that son preference is declining, though there is little evidence of sex selective abortion as of yet, which would be evidenced by a more skewed sex ratio at birth. Sex selective abortions are common in the northern states of India (Arnold et al. 2002), which border much of Nepal and a major concern for the Nepalis must be the import of sex selective abortion from across the border.

iv. What is the nature of the relationship between landholding and fertility? Is there evidence for the land-labour hypothesis and the land-security hypothesis?

The nature of the relationship between landholding and fertility has been much debated in previous decades. However, those who have researched the topic have rarely tested the hypotheses together (something which seems necessary given that they both suggest links between landholding and fertility) or had the opportunity to use any panel data; they also routinely failed to disaggregate landholding into its constituent parts despite the fact that the hypotheses imply different fertility decisions depending on the type of landholding available to the family. Furthermore, using predictions about the effect of the hypotheses on son preference was novel and provided a new way to test their veracity.

a. The Land-Labour Hypothesis.

The land-labour hypothesis refers to the idea that a family with more agricultural land available to till itself will require more children to help work that land. Support was found for this hypothesis using both the cross sectional and panel data since women in households that cultivated land they did not own were more likely to have a third and fourth child. Land that is cultivated but not owned needs to be tilled and thus the household will need more labour, but it is not a form of future security since it is only useful for the household if it is tilled by family members.

b. The Land-Security Hypothesis.

The land-security hypothesis refers to the idea that landholding and children are both forms of security against later interruptions to the income stream (e.g. old age or infirmity) and as such they are partial substitutes.

Support was also found for this hypothesis since women in households that owned and cultivated land were found to have lower levels of son preference in both the cross-sectional and panel data; this is relevant because sons are the main source of security other than owned landholding and thus if they are substitutes a woman in a household with owned landholding would be expected to have lower levels of son preference.

v. How are remittances related to childbearing decisions? Do couples living in communities with high levels of remittances have more children ceteris paribus?

Very little research has been conducted concerning remittances and home country fertility. This may be due to the fact that the extent of remittances has grown at an astonishingly rapid rate in recent years and thus data is relatively scarce. Maybe it is also that migration experts have mainly concentrated on the fertility of migrants and not the effect that their migration might have on those at home. The little research that has been done on the fertility of sending communities has focussed upon ideational diffusion. This seems to ignore the key component of this kind of labour migration, which is that it is temporary and conducted mainly with the intention of earning money to remit home. The majority of labour migrants from Nepal who send remittances go over the border to India, or to the Middle East. Culturally and ideationally northern India is not very different from Nepal. The Middle East meanwhile still has relatively high fertility although labour migrants are not allowed the opportunity to integrate with the local community and thus are unlikely to assimilate fertility ideals – Nepalis live in labour camps with other migrants or have jobs as domestic workers. In this context cultural diffusion seems relatively unimportant. Remittances, on the other hand, provide income for a third of household in Nepal (Central Bureau of Statistics (CBS) 2004a).

The roll of remittances in childbearing was tested by looking at the effect of remittances and labour migration on sons ever borne and the proportion of sons borne. It was found that higher remittances at the household level were associated with a larger number of sons ever borne – women with sons aged 18 or over were filtered out and therefore this finding either indicates that the experience of remittances prompts an increase in the demand for sons or possibly that having more sons increases the propensity to receive remittances from other sources. It was also found that living in a community with out-migration to countries other than India (i.e. countries with better paying jobs and

thus higher remittances) were associated with a larger number of sons ever borne and a higher percentage of sons being born. While more research is needed in this area these findings indicate that the promise of future remittances (and thus security) does seem to increase demand for sons and thus affect fertility.

6.3. Policy Implications

The work within this thesis is timely and relevant given the current state of the nation of Nepal; Nepal is still a fragile state which went more than seven of the past twelve months without a Prime Minister or a government; a finalised constitution or a strong democratically elected government with clear policies are both little more than pipe dreams. The constitution, which has been in the process of being drafted since the interim constitution was passed in January 2007, is hoped to be finalised by May 28th 2011 (Centre for Constitutional Dialogue 2010). The interim constitution paved the way for the Three Year Interim Development Plan, which was the last document produced to set out government policy on development issues; this plan stated that further reduction of fertility was important for the development of the country and that the ideal fertility rate would be 2.1 (National Planning Committee 2007). Nepal is at a stage of the demographic transition where it has the opportunity to take advantage of a demographic dividend where falling fertility results in a large working age population relative to children and the elderly. These changes to the age structure provide a one-off opportunity for accelerated economic development which can be seized enthusiastically or squandered; the countries of East Asia were able to capitalise on the demographic dividend when they experienced it in the twentieth century and their success is arguably without parallel (Mason 2003).

This thesis touched upon two issues which have been at the heart of recent debates: landholding and remittances. Landholding has been a contentious development issue in Nepal since the nineteenth century. Land reforms of various sorts have been attempted and invariably failed and indenture remains an ugly reality in Nepal (Adhikari and Chatfield 2008). The fact that landholding appears to be related to fertility is not a primary reason to advocate redistributive land reforms, but it is yet another addition to the list of ways in which landholding affects the everyday lives of the average Nepali. The fact that support was found for the land-security hypothesis indicates that Nepalis see landholding as an important form of security and the fact that many are still denied this security is a cause for concern. Furthermore, those who owned and cultivated their own land exhibited lower

levels of son preference than those who were landless or cultivating land they did not own. Positive signals are currently being sent about redistributive land reform policies being included in the new constitution, with the right to property (essentially meaning agricultural land – housing is a separate item) being included in a list of 12 fundamental rights and directive principles of the state (Committee on the Distribution of Natural Resources 2066)[20].

The work in this thesis has added to a small volume of literature which has looked at the growing importance of remittances for households in Nepal in recent years (Upadhyay 2007; Wagle 2009). It has been estimated that three quarters of remittances still arrive in Nepal through informal channels (Ferrari et al. 2007) and thus the true scale of this phenomenon is not really a known quantity. However, remittances accounted for the majority of household income for the average household that was in receipt of remittances in the NLSS II (see section 5.3) and remittance income had increased by over 200 per cent between the two NLSS surveys compared to a 37 per cent growth in total household income. At such a rate of growth remittances are likely to eclipse agriculture as the largest component of household income very soon. Thus understanding how remittances affect household decisions could be crucial for the future development of Nepal. Furthermore, it has been argued that living standards in Nepal rose during the Maoist insurgency as a direct consequence of remittances; without them Nepal might be a very different – substantially less developed – place (Panday 2011). While remittance flows appear to help development on the one hand, there is also evidence that the potential for remittances increases son preference.

A key finding of this thesis has been the proliferation of son preference and given the economic advantages of having sons over daughters it is, perhaps, little wonder that there is no indication that son preference might be falling; indeed some research indicates that son preference tends to get stronger as fertility declines because the number of sons desired falls much more slowly than the total number of children desired (Das Gupta and Bhat 1997). As has already been mentioned, the worry for Nepalis is that sex selective abortion will become more freely available and that given the vast array of socio-economic and

[20] The year of the reference – 2066 – is not a mistake. Nepal is one of the few countries in the world to use its own calendar. The Bikram Samwat Calendar is roughly 56.7 years ahead of the Gregorian Calendar and thus 2066 relates to April 2009 – April 2010.

cultural props for son preference this technology will become widely used. In 2002 liberal abortion laws were passed in Nepal (Thapa 2004) meaning that it would be relatively easy for sex selective abortion practices to spread unchecked once people are able to afford this service. This might not be an imminent concern given that recent studies suggest that abortion services are still not widely used or accepted culturally (Puri et al. 2007), but medical technology and drugs often find their way into Nepal quickly and without regulation thanks to the open Indian border (Tamang and Tamang 2005); thus, it is important to address the potential problem of sex-selective abortion as soon as possible before it becomes common. There is also evidence that fertility in Nepal is higher due to the practice of sex-selective stopping behaviour and thus addressing son preference is vital. The Three Year Interim Plan made gender and empowerment of women key objectives indicating awareness within the country that gender inequality is a serious problem; it remains to be seen if son preference can be tackled effectively in the region given its cultural backing and the lack of success in northern India.

In terms of fertility itself the key policy lesson is that people do appear to think about childbearing rationally to some extent and therefore if the Nepalese government wishes to continue to pursue its goal of lowering fertility it will need to do so within a broader development context.

6.4. Limitations and Further Work

It will be clear to readers at this point that the limitations of this work are far from insubstantial, which is not surprising given the scale of the topic tackled. However, these limitations are centred on the quality and availability of data. The NLSS is an unusual data set in that it is a panel data set (albeit with only two rounds), including extensive socio-economic information and full birth histories for women aged 15-49. Its drawbacks come in the form of small sample sizes (especially for the all-important panel sub-sample) and relatively poor quality birth history data with understatement of high parity births and overstatement of childlessness. DHS data is excellent in the sense that DHSs have been carried out in so many countries (85 to be precise) with consistent survey questions asked, data coded and formatted to the same standard and distributed relatively freely. The main analyses within this thesis were limited by the size of the panel data sets within the NLSSs and thus mainly relied upon the cross-sectional NLSS II data; thus the establishment of causal links from this work should be done with great caution. A further point is that the

NLSS II was conducted in 2003-04 at the height of the Maoist insurgency and a time of dictatorial rule by the king – Nepal has changed a great deal since the Maoist insurgency in 2005, with the abolition of the monarchy, democratic elections and a dramatically improved security situation. The disruption caused by the Maoist insurgency was substantial and there will be a great deal of interesting research to be done on the demographic impact of the war. While there is no obvious reason that the results presented in this thesis should be invalidated by the timing of the NLSS II, it is important to consider the fact that the survey was conducted at a highly unusual period in Nepal's history.

In order to really understand how fertility intentions are formed and how those intentions translate into a certain number of children what is needed is a well thought through prospective longitudinal panel survey following couples and individuals through the full course of their childbearing years. Ideally this study would include extensive information on socio-economic factors at regular intervals along with fertility intentions and substantial information on all demographic events (i.e. births, marriages, deaths and migration). Of course such a survey would be an expensive and lengthy undertaking. Furthermore, one would need to conduct comparable studies in different areas of the world. However, given the proliferation of the DHSs this prospect is not impossible. Conversely, if a project started looking at 15 year olds next year then they would not have completed their childbearing years until 2047; this is a very long time to wait in order to fully understand the dynamics of childbearing decisions. The world's population is forecast to increase by between two billion and five billion people during this time and given that an understanding of fertility is the safest way to ensure that the increase is at the lower end of that spectrum waiting until such data exists may not be an option.

6.5. Concluding Remarks

As a result of the research within this thesis I can say with some confidence that economic considerations do motivate fertility decisions. This is something which has been overlooked by much of the literature on fertility transition. Fertility as a type of insurance is an idea that has existed for several decades, but proof that people genuinely act as if children are partly an insurance good is thin on the ground. This thesis provides evidence concerning landholding and remittances which suggests that people act with future security and potential returns in mind. The next step is to see if these types of findings exist in other countries, preferably where panel data is available; if they are then the message to

governments in developing countries would clearly be to focus on development, stability and security as well as family planning in order to reduce fertility rates.

Overall, the message of this thesis is that the people of rural Nepal seem to value children for the economic benefits they can bring and their fertility decisions are made partly on this basis. The economic value of sons vastly outweighs that of daughters and son preference will most likely remain prevalent and continue to push up the fertility rate until the enormous societal gender inequalities are addressed. On the basis of this analysis increasing remittances and high levels of functionally landless households mean that fertility in rural Nepal is unlikely to fall to replacement level any time soon.

6.6. References

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APPENDIX I

CONSTRUCTING INCOME

I.I. Introduction

This appendix describes the method used to construct household income. The procedure followed is based on the recommended World Bank methodology and is the same as used to construct the official income figures in the NLSS I and the NLSS II. I constructed income myself due to a difficulty in obtaining the official aggregates. The method described in this appendix is adapted from that described in the NLSS II manual.[21]

Income, in this thesis, is used in the same sense as it is used in most LSMSs to "measure the flow of resources in a household in the past 12 months" (Central Bureau of Statistics (CBS) 2004a, p.30) The main components of this measure are: crop income, non-crop farm income, reported valuation of housing consumption of own dwelling, income from wage employment, income from non-farm enterprises, income from remittances, rental income and income from other sources.

I.II. The Components of Income

I.II.I. Farm Income

a. *Crop Income:* The value of crops was calculated from information in the questionnaire on crops harvested, crops sold and the price obtained for those crops if sold. In order to calculate the gross value of the crops it was necessary to impute the value of many crops. The way in which this was done is described in Box I.1.

[21] http://siteresources.worldbank.org/INTLSMS/Resources/3358986-1181743055198/3877319-1181925143929/NLSSIIReportVol2.pdf

b. *Income from Livestock:* Purchase and sale of cows, buffaloes, goats, yaks, poultry is combined with earnings from selling of milk, ghee, eggs, curd, meat and expenditures on animal feed, transportation of feed, veterinary services. Income from livestock is then calculated as total value of sold livestock minus total value of purchased livestock plus net income in from livestock by-product.

c. *Consumption of home produced non-crop goods:* Home produced non-crop goods are aggregated to produce this figure. This type of good includes milk, ghee, buffalo meat, eggs, chicken etc.

d. *Land rent income:* This consists of payment (both in cash and in-kind) for cultivatable land rented out. Any money paid to a landlord for land that is rented in is deducted from this to give the net land rent income.

Box I.1 An explanation of the imputation of crop prices

- The unit selling price reported by the household is used to valuate the crop harvested, but cases where all the harvested quantity is sold are small. In most records, either a small share or none of the harvested amount is sold in the market. This necessitates price imputations for most harvested crops.
- The price is imputed by taking the average price for each crop at progressively higher levels of aggregation. There are four such levels: ward, district, region and country. Missing prices are first replaced with ward means of those prices that were reported at household level. Actual unit prices and ward-level imputed prices cover one-third of all records. District level imputation values account for the next 23 per cent of all records. The third level of imputation is the group (six geographic groups are defined in the NLSS II for this purpose) and the final level is the national average. 98 per cent of valuations are done through this procedure.
- For the remaining two per cent of records ad-hoc adjustments arere made if information is available for similar products i.e. the price of oranges is applied to sweet limes. If no suitably similar product is available then cases are dropped.

I.II.II. Wage Income

The survey asks respondents to detail each wage employment activity and then information on wages is collected separately for each wage employment activity. Information on wages is collected as daily, long-term or contract/piece rate depending on the type of employment. Further details are available in Box I.2.

For each person wages are annualized and the wages from different sources are aggregated to obtain the annual wage income of every individual. The wage income of

individual family members is then aggregated in order to obtain a figure for the wage income of the household.

Box I.2 The calculation of wage employment income

- ***Daily wage income:*** Daily wage income is calculated as cash received per day plus the value of in-kind payments received per day multiplied by the number of days worked in that particular activity, plus the value of in-kind payments for the whole period.
- ***Long-term wage employment:*** Wages received in agricultural employment are calculated as total cash received from that work activity for that long-term period plus any daily in-kind payments multiplied by number of days worked plus any in-kind payments received for the whole period. Wage outside of agricultural employment are calculated as monthly payments and monthly transportation allowances multiplied by the number of months worked in each activity, plus bonuses, tips, allowances, clothing and any other payments received yearly from each work activity.
- ***Piece-rate/contract income:*** Piece rate or contract basis wage income is the reported cash and in-kind received by individual per each work.

I.II.III. Non-farm enterprises income

Net revenues from each household enterprise (or the share owned by the household) are aggregated to get annual non-farm enterprises income for each household.

I.II.IV. Non-agricultural rental income

This consists of rental income received from renting out residential property, land property and any other real assets.

I.II.V. Transfer Income

Transfer income is simply a sum of remittances received by all household members in the last 12 months, both as cash and in-kind.

I.II.VI. Value of owner-occupied housing

When the dwelling of a household is either owned outright or free then the value of this dwelling is included in income as a form of home-produced consumption. The value of such a dwelling is not directly available so respondents were asked the amount they thought they would be paid if someone rented the dwelling.

I.II.VII. Other income

Other income sources included in the calculation are summarized in Box I.3 along with a summary of all the income sources used to construct total household income.

Box I.3 Summary of the construction of income

Main Component	Items to add	Items to deduct
Farm Income	Value of total crop production (net of share paid to landlord)	Cultivation costs (seeds, fertilizers, hired labour, irrigation etc.)
	Value of by-product production	
	Net income from renting farm assets (draft animal, tractor, thresher etc.)	
	Value of sales from non-crop farm production (milk, ghee, eggs etc.)	Fodder and other livestock expenditure (veterinary services)
	Earning from the sale of livestock	Expenditure for the purchase of livestock
	Value of home -produced non-crop consumption	
	Total cash and in-kind received from tenants on land leased-out	Cash rent paid to landlord on land leased-in
Wage Income	Value of cash and in-kind earning per year in agriculture (includes daily, piece-rate and permanent labour)	
	Value of cash and in-kind earning per year outside agriculture (includes daily, piece-rate and permanent labour)	
Non-farm Enterprises Income	Gross revenues from non-agriculture enterprises/activities during past 12 months	Wage paid both cash and in-kind
		Energy expenditure
		Expenditure on raw material
		Other operating expenditure
		Share of net revenues paid to partners
Non-agriculture Rental Income	income from renting out non agriculture property	
	income from renting out non agriculture assets	
Transfers	Remittances	
Owner-occupied housing	imputed rental value of housing which would had to be paid to purchase housing services	
Other Income	interest, dividends, profit earning from shares and savings/deposit accounts	
	Pension income (Domestic and Foreign)	
	Commission fees and royalties, other incomes	

I.II.VIII. Items omitted from the income aggregate

Income from farm machinery, housing property and net interest payments were not included.

Net interest income could not be included because the NLSS does not include sufficient questions to fully distinguish this type of income, especially given the informal nature of most interest income in Nepal.

Income from sales of housing, land-property and farm machinery represent a change in assets (i.e. investment or disinvestment) and are thus excluded from the income variable since this is supposed to represent current income.