AN ECONOMIC ANALYSIS OF DECLINING MARRIAGES IN POST-APARTHEID SOUTH AFRICA: 1995-2006

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Declaration

This thesis is my original work. Where other people's work is used, acknowledgements have been made. I declare that it has not been previously submitted for the award of a degree at any university.

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Grace Kumchulesi

Date ——————————————12 August 2010——————————

Dedication

To my Mum, Catherine and to the memory of my late Dad, Harris

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Abstract

Survey by survey comparisons of marriage rates in nationally representative cross-sectional datasets suggest that marriages are declining in South Africa. For African South African women of working age (between 15 and 59 years) marriage rates declined from 38.7 percent in 1995 to 31.4 percent in 2004. This change in marriage patterns motivated the current research and we asked whether the drop in marriage rates indicates a real generational shift in marital behaviour, or if this can be explained by changes in sampling frames in the independent surveys.

The broad objective of the study is to investigate declining marriages in post-apartheid South Africa. The specific objectives are threefold. First, we construct a synthetic panel dataset from the 1995 to 1999 annual October Household Surveys and from the 2000 to 2006 September wave of the biannual Labour Force Surveys. Using the pseudo panel, we make use of the Age-Period-Cohort Model to disentangle marriage trends into age, period, and cohort effects in order to establish whether the change in marital patterns observed in post-apartheid South Africa reflects a real decline in marriages.

Having established that the change in marriage rates indeed reflects a generational change in marital behaviour, the second objective focuses on the determinants of women's marriage decisions. To this end, we attempt to account for the interdependence between female labour force participation and marriage decisions by estimating simultaneous equation models for each cross-sectional year from 1995 to 2006. Availability of women's jobs in a District Council locality is used as an exogenous shock in the labour force participation equation to identify the marriage equation. The analysis finds that age, education, labour market status, availability of potential partners in the local marriage market, and location are all important factors in a woman's marriage decision. While the results show that labour force participation and a high level of education lower the probability of marriage, age and availability of potential partners are found to increase it.

The third objective is an explanation of the trend towards fewer marriages by relating the changing effects of the variables to the marriage decline. Using the Blinder-Oaxaca decomposition technique, we establish that marriage decline is predominantly explained by a change in the marital behaviour of African South African women, rather than change in the distribution of the characteristics that determine marriage decisions. A detailed decomposition of the characteristic portion of the marriage decline analysis indicates that a rise in education levels and in labour force participation contributes to increasing the marriage decline. On the other hand, distribution in age of women, how they are geographically distributed, and the [unequal] distribution of men and women contribute to narrowing the marriage decline.

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Chapter 1

Introduction

The availability of datasets from repeated nationally representative surveys and censuses in South Africa has sparked an increasing interest in tracking the performance of post-apartheid trends. The first survey of this kind was conducted in 1993[1]. To date, there is a rich series of nationally representative independent cross-sectional datasets created annually up to 1999 in the form of the October Household Surveys and the biannual Labour Force Surveys from 2000 to 2007. In addition to these, there are the quinquennial Population Censuses of 1996 and 2001 and the General Household Surveys annually undertaken from 2002 to 2008.

Survey by survey, the statistic of interest (typically an average) is measured for a particular characteristic and compared over time. This thesis focuses on marriages. Prior cross-sectional comparison of datasets has captured what appears to be a decline in marriages[2]. For example, Casale and Posel (2002) noted a decline in married proportions for

[1]The World Bank sponsored 1993 Project for Statistics on Living Standards and Development (PSLSD) for South Africa. The principal purpose of the Survey was to collect data on living standards which can be used for evidence-based policy formulation research. The Survey was undertaken by the Southern Africa Labour and Development Research Unit (SALDRU) at the University of Cape Town.

[2]Declining marriages is not a phenomenon exclusive to South Africa or the post-apartheid era. Similar trends have been documented elsewhere, especially in western countries (for example Davis, 1985; Westoff, 1986; van de Kaa, 1987). Moreover, ethnographic studies have captured a decline in African marriages even during the apartheid era (Hunter, 2007). However, apartheid statistics are relatively unreliable due to among other reasons, under-representation or no representation of Africans in the surveys.

African[3] women aged 15 to 59 years from 38.7 percent in 1995 to 34.5 percent in 1999. Ntuli (2007) noted a further decline to 31.4 percent in 2004 for the same population group. This trend in marriages motivated the current research, and we asked: is this perhaps a data quality issue, where more married African women were sampled in the earlier years than in the recent years, or does the marriage rate differential suggest a generational shift in marriage behaviour for African women? If declining marriages is a data quality issue, then data comparisons over time may not be legitimate. Datasets from some surveys may be useful and trusted, while others may be unreliable. However, if this is a generational shift in the African population, then it may represent a significant shift in the basic structure of the African community and family life.

All analyses in this thesis make use of datasets from the 1995-1999 October Household Surveys (OHSs) and the September wave of the 2000-2006 Labour Force Surveys (LFSs) in order to allow for a longer period of coverage in which the decline in marriages can be investigated. Average comparisons indicate that marriage rates were lower in 2006 relative to all earlier years. Nevertheless, rather than using datasets from the 1995 and 2006 surveys only, we include all years in between in order to make sure that the results are not contaminated by the choice of the endpoints.

For each year of the survey data, our variable of interest is responses to the question on marital status. While the responses in all the OHSs were categorised as married (civil), married (traditional), living together with partner, widower/widow, divorced/separated and never married, the first three categories were lumped together as married/living together in the LFSs from 2000 to 2003. From 2004 onwards, married (civil) and married (traditional) were one category (married) and living together was a separate category. StatsSA (2001)

[3]Mainly for the purposes of tracking performance in post-apartheid indicators, South Africa continues to racially categorize her subjects into black and white. Blacks are further divided to include Indians/Asians, coloureds and indigenous South Africans. Indigenous South Africans are called Africans, to separate them from the rest of the black population, and according to Census 2001, they make up about 80 percent of South Africa's population.

defines marriage to include marriages by civil or religious ceremonies, marriages by customary law, and all those living together as married. In this regard, and for consistency with the classifications in the LFS, marriage in this study is synonymous to "forming a couple". Analyses that disaggregate cohabiters from the "married" would be informative in those years in which the two groups were separated. For example, we show evidence in this study that the decline in marriage would be more pronounced if the disaggregation is done. Since the Statistics South Africa's definition precludes this study from separating cohabiters from married people for some of the years under review, we live this for future work.

The thesis focuses on a number of objectives to understand the workings of the South African marriage market for the African population group. Firstly, rather than merely comparing marriage statistics between datasets, chapter 2 of the thesis applies the Age-Period-Cohort model, a technique for investigating trends. This gives a good update on marriage trends in South Africa. In addition, the analysis provides the background for tackling the issue of why there has been such a decline in marriages over the period under review.

Using datasets collected from the nationally representative household surveys over the period 1995 to 2006, we construct a synthetic panel, whereby we follow age cohorts of women through the period of study. In the absence of long-running panels, cohort datasets can be useful to capture a dynamic picture. In constructing cohort data, we calculate the group share of marriage proportions in 1995 and track the cohorts through the twelve years until they are last observed in 2006. Our aim is to separate out cohort effects from age and period effects on the marriage rates in order to establish if marital experiences of younger and older cohorts are different. The analysis, through the period effect on married proportions, also helps to establish if the marriage rate differentials between earlier and more recent surveys is a real marriage decline, and not one driven by changing sampling frames. The analysis suggests that younger cohorts are delaying marriage when compared to cohorts even a few years older. The period effects are negligible, suggesting that there are no major discrepancies between the surveys.

The Age-Period-Cohort model analysis suggests that there are dynamics taking place in the African population group's marriage market which are driving the marriage decline. The marriage literature in South Africa lacks a comprehensive analysis of the determinants of women's marriage decisions as well as the factors that might have driven the marriage decline.

To address this issue, the second objective of the thesis is to explore, in simple descriptive approaches, some of the likely factors that might have contributed to the marriage decline. In chapter 3, we look at the trends of these variables and make inferences on their likely association with marriage. This analysis helps to give a first impression of the dynamics taking place in the marriage market.

In the marriage market, the ratio of men to women is very important. The relative number of men and women, generally termed the sex ratio, is hypothesized to influence an individual's marriage chances. The scarcer gender will likely face more marriage options in the marriage market. In order to pick up the supply decisions for marriage among women, we take into account the quality measure of men by considering only employed men in our analyses.

Economic [in]capabilities of men and women have been highlighted in the literature to affect a woman's pool of marriageable men. For instance, women's economic advances lessen their financial dependency on husbands, with the potential consequences of postponed or forgone marriages as women become choosy when selecting their mates (Oppenheimer, 1988). On the other hand, increased male joblessness is likely to shrink the pool of potential spouses, also with the likely consequence of declining marriages.

In post-apartheid South Africa, several changes have taken place which may be affecting both the "supply" and "demand" sides of the marriage market. For instance, rises in education levels and labour force participation of women have been captured alongside the marriage decline. Male joblessness is rampant in South Africa and is also an influencing factor. If the changes in demand and supply of numbers of men and women do not match, a deficit in potential spouses may result, causing a marriage decline.

To understand the determinants of African women's marriage decisions, we firstly carefully account for the potential endogeneity problem between women's marriage and labour force participation decisions in chapter 4. An instrumental variable approach is applied and the availability of women's jobs in a District Council locality is used to instrument female labour force participation. The estimation results support the women's economic independence hypothesis and confirm that female labour force participation and education each have a negative effect on women's likelihood of marriage. Also, like other researchers, our findings support the "man shortage" hypothesis with the finding that a shortage of potential spouses reduces the likelihood of marriage. However, our findings are robust to these predictions only when the marriage model assumes away the endogeneity of women's labour force participation decisions. Once endogenous labour force participation is recognized, the estimates are not robust across the years under investigation.

In a final quest to understand the dynamics in African marriages, we implement the Blinder-Oaxaca decomposition technique to investigate whether the marriage decline is a result of a change in the distribution of the characteristics which has taken place over time, or if the marriage decline is influenced by changes in behaviour. This exercise is undertaken in chapter 5. Both aggregated and detailed decompositions are undertaken. Our findings suggest that the marriage decline is largely driven by changes in the behavioural relationships between marriage and its determinants, rather than changes in the marriage market characteristics.

From a policy perspective, declining marriages have potentially serious implications for community functioning and individual well-being. For example, declining marriages are associated with adoption of alternative family structures. These may include having children out of wedlock, giving rise to single motherhood. Evidence in the United States indicates that black children raised by mothers alone are three times more likely to be impoverished than those raised by two parents (Sweet and Bumpass, 1987). Other less measurable concerns include consequences of large numbers of male children unattached to traditional socializing structures (Rossi, 1984), young men not committed to the responsibilities of

being husbands or fathers and increasingly inclined to less socially acceptable social forms (Tucker and Mitchell-Kernan, 1995). Similarly, young women may be forced to drop out of school due to [premarital] pregnancies. The consequences are recurring and can be detrimental to society.

In chapter 6 we summarize the research work by synthesizing all the findings of the research. Here, we also evaluate our research, including the limitations of the study and suggestion for further research. The thesis concludes that African marriages in post-apartheid South Africa have declined and identifies potential future research areas to explore the contribution of temporal changes in behavioural responses to marriage market conditions related to this marriage decline.

Chapter 2

Marriage Trends in South Africa: 1995-2006

2.1 Introduction

More research on the decline in marriages has been undertaken for developed countries than for developing countries. In the United States of America for example, most of these studies compare black women with white women. The findings show that while the decline in marriages is pervasive throughout US society, the extent is greater in the African American population group (Tucker and Mitchell-Kernan, 1995).

In South Africa, similar evidence has been documented. Marriage rates from datasets of the earlier surveys are higher than those from the more recent surveys. Most researchers have interpreted this as a decline in marriage. However, since these surveys are independent and sampling designs change, it is possible that the observed marriage decline is a sampling issue, where some surveys sampled more married women than others. This study makes use of repeated cross-sectional survey data, spanning over a decade. Using these dataset, this chapter will undertake a trend analysis, in order to establish if the marriage decline is real.

At the exploratory stage of the analysis, we compare marriage rates from the repeated cross-sectional surveys. This is done as a preliminary check on whether marriage rates have changed between 1995 and 2006. A bivariate relationship between age and marriage is also evaluated at this stage. Further, we "pool" the cross-sectional surveys in a cohort analysis

framework in order to determine whether the relationship between age and marriage has changed over time. This undertaking demonstrates whether the observed marriage decline in the cross-sectional analysis may be a generational change, suggesting possible permanent change in marital behaviour among African women and men in the period under study. Finally, the chapter undertakes a decomposition analysis for trends. This procedure aims at distinguishing trends from erratic fluctuations. At that stage, we decompose the marriage trends into age, period and cohort effects in order to determine whether the change in marital pattern is influenced by these.

The rest of the chapter proceeds as follows. Section 2.2 briefly summarizes prior evidence of the decline in marriages in South Africa. In section 2.3, we present a detailed discussion of the national surveys to be used in the analyses. We also highlight some of the concerns associated with the use of such data. Section 2.4 presents the empirical results from the descriptive analysis of marriage trends in South Africa from 1995 to 2006. In section 2.5, we discuss the methodology used to disentangle the age, period and cohort effects, followed by a presentation of the results from the decomposition analysis. Finally, section 2.6 concludes the chapter.

2.2 Prior Evidence of Declining Marriages in South Africa

Several researchers have documented declining marriages in South Africa. However, most of the research on this subject has shortfalls. For example, Casale and Posel (2002) and Casale (2003) picked up the decline while studying the feminisation of the South African labour market. Since marriage was not the core subject of their studies, the marriage rates that are reported are too aggregated.

Others like Kalule-Sabiti, Palamuleni, Makiwane, and Amoateng (2007) focused on marriages. Using data from Census 1996, Census 2001 and South Africa Demographic and Health Survey 1998, Kalule-Sabiti, Palamuleni, Makiwane, and Amoateng (2007) found that marriage is more popular among whites and Asians than among African and coloured population groups. In their research, marriage also seems to be unpopular among younger

women and more educated women. However, they used data from different sources to generate marriage trends, and the marriage decline from such data is likely to suffer from a change in sampling designs.

Going back to pre-democratic South Africa, a number of ethnographic studies also noted a "crisis" in the African family. Denis and Ntsimane (2004) and Hunter (2005a), for example, reveal extremely low marital rates among Africans, especially from the 1980s. Aside from difficulties in interpretation (because African marriages are a process rather than an event), apartheid statistics are notoriously unreliable because of under-representation of Africans in surveys.

A more recent study by Hosegood, McGrath, and Moultrie (2009) found that marriages have continued to decline even in the 2000s. However, this study had a narrowed scope as it examined marriage trends only in the KwaZulu-Natal Province of South Africa, which may not be representative of South Africa.

The limited scope of analysis of these studies means this study can make a significant contribution to the literature on marriages in South Africa. This study uses datasets from a series of repeated cross-sectional surveys from 1995 to 2006, which makes our series longer and smoother. Secondly, the surveys from which the samples are drawn are nationally representative, and finally, the surveys were conducted by one data producer, Statistics South Africa, which rules out biases arising when data is collected by different organisations.

For these reasons, our study may be viewed as an update of marriage trends in South Africa. Most importantly, we ask whether the decline in marriages is even real? In other words, is the marriage decline just a sampling issue, in which some surveys sampled more married women than others? Our use of a series of independent cross-sections and a comprehensive decomposition analysis on marriage rates makes this study important. The indication of a decline in marriages to be presented in this thesis is not new evidence. The thesis, however, provides further evidence on the causes of the marriage decline. In the following section, we discuss in detail the data to be used as well as its limitations.

2.3 Data Sources

Our main sources of data are the 1995-1999 October Household Surveys (OHSs) and the September wave of the 2000-2006 Labour Force Surveys (LFSs). Although this series of surveys was initiated in 1993, we have left out the 1993 and 1994 datasets because their sampling methodology significantly differs from the 1995 survey onwards. In 1993 and 1994, samples of 30000 households were drawn from 1000 enumeration areas. Beyond 1995, the sample was drawn from 3000 enumeration areas. Apart from differences in the number of households included in the sample, the 1993 OHS is also different because the TBVC states[1] were not included in the sample. Varying sampling methodologies like these challenge survey to survey comparisons, hence, we work with the more consistent cross-sectional datasets from 1995 onwards.

The OHSs are annual independent cross-sectional surveys, and different samples were designed for each of them. However, in a standard OHS, the sample was explicitly stratified by province, magisterial district, urban/rural setting and population group. A sample was drawn by applying a two-stage sampling procedure. In the first stage, enumeration areas (EAs) representing primary sampling units (PSUs) were systematically selected by means of probability proportional to size principles in each stratum to ensure adequate representation. The measure of size was the number of households in each PSU. The database of EAs, as established during the demarcation phase of Census 1996, constituted the sampling frame for selecting EAs. In the second stage, households were randomly selected from the selected EAs. Depending on the availability of funding, the number of sampled households ranged from 16000 in 1996 through to 20000 in 1998 and 30000 in 1995, 1997 and 1999.

The LFS replaced the OHS after their discontinuation in 2000. The sampling design for the standard LFS is similar to that of the OHS. The main element distinguishing these two surveys is that the LFS was designed to be a twice yearly rotating panel with the

[1]Transkei, Bophuthatswana, Venda and Ciskei were bantustans or black African homelands.

waves running in February/March[2] and September. A twenty percent rotating scheme was designed, implying that new dwelling units would be included to replace the dropped ones in the second wave (SADA, 2001). For the purpose of this study, we will only make use of the September wave of the surveys.

The preceding paragraphs immediately suggest that there is a challenge in comparison both between and within the two surveys. Data from both surveys were collected by Statistics South Africa, which rules out biases resulting from "house effects" (Johnston, 1981), especially when detecting a trend from survey to survey. Data from a single survey organisation is not immune to error, however. Even if data is collected by the same organisation, the wording of a question might have changed from survey to survey, producing a significant change in response (Rasinski, 1988; Smith, 1987). "Context effect" is another concern, in which responses to a particular question may be affected by the nature of that question as well as that of other questions in the survey (Smith, 1988; Smith, 1992). Other than changes in sampling methodology, and consistency issues, another concern may be changes in the definition of variables over time. As alluded to in the introductory chapter, marriage in this study shall include both the "legally" married and the cohabiters. We will therefore estimate the proportion of a particular age cohort for each marital state.

One major limitation of the OHSs and LFSs is little coverage of questions on marriage, in particular, and other questions generally useful in a marriage study. For instance, marriage dates are missing. In addition, a highly culturally diverse society like South Africa would be expected to have marital behaviours that are influenced by culture. Unfortunately, these surveys did not ask questions which would accommodate a culturally disaggregated study. For example, brideprice (or ilobolo payment) is one of the important features that differentiate nuptials between different ethnicities. At best, one could examine racial differentials in marriage rates, but this would not be adequate to establish marital behaviour of a particular ethnic group, for example. Nonetheless, despite these and other data limitations,

[2]The first waves of the 2000, 2001 and 2002 LFSs were conducted in February. The 2003-2006 first waves in march.

the OHSs and the LFSs remain the best data option available for depicting an aggregated picture of marriage trends.

The only survey that collects additional information on marriage (other than marital status) is the 1998 KwaZulu-Natal Income Dynamics Study (KIDS). KIDS resurveyed 1100 households from the KwaZulu-Natal Province who were initially interviewed for the first nationally representative survey, the Project for Statistics on Living Standards and Development (PSLSD) in 1993. The main limitation of using the KIDS dataset for our purposes is that it is not nationally representative, because the sample is representative of KwaZulu-Natal Province only. For this reason, we did not make use of the KIDS dataset in this study.

The other available datasets that are both nationally representative and were collected after the first democratic elections in 1994 are from the Census 1996 and Census 2001. However, the limitation of using census data for our purposes is that the South African census is only conducted five-yearly. For that reason, we remain with census data collected only at two points in time. This would challenge the basic analytic principle that data accumulated at more time periods is more useful for the analysis of trends. A firmer basis for conclusions regarding trends would therefore be provided by many repeated surveys spanning a decade or more of annual or biannual data. This study has been made possible by availability of rich data of such nature in South Africa.

For trend analysis, we use synthetic panel data constructed from twelve successive cross-sectional national surveys. We restrict our sample to African women aged between 15 and 49 years, since this is the prime age range in which marriages take place. Nevertheless, we also present marriage rates for white women and African men for the purposes of racial and gender comparisons.

2.4 Marriage Patterns: The Relationship between Age and Marriage

We commence with a descriptive analysis where we present the cross-sectional and cohort dimensions of marriage patterns, while uncovering the relationship between age and marriage. To estimate the proportion of a particular age or age cohort that falls into one of the four marital categories, we employ locally weighted estimations of a scatter-plot smoothing (LOWESS) technique, which is explained in detail in appendix A. This technique was developed by Cleveland (1979) and is used to smooth scatter-plots which have been contaminated with noise. The advantage of using nonparametric estimation is that it does not impose a particular functional form on the data for relationships but allows the data to reveal the form of a relationship (Deaton, 1997). Thus, no prior assumption about a relationship is made.

2.4.1 Stylized Facts from a Cross-sectional Analysis

We first present findings from the cross-sectional analysis, giving visual evidence of declining marriage rates in the period 1995 to 2006. We compare marriage trends across gender and racial lines, while focusing on African women. From Table A.1 in appendix A, we observe that while marriages were generally declining across all races, the decline is marked among Africans. In 1995, the marriage rate was 35 percent for African women aged between 15 and 49 years old and by 2006, this had dropped by about 10 percent to 31 percent.

The relationship between age (in years) and marriage for African women over time, is depicted in the top panel of Figure 2-1. Each trajectory in the figure (drawn using the LOWESS technique) depicts the proportion of married African women for a particular age in a particular year[3]. We observe clear evidence of declining marriage rate over the period

[3]In tracking marital states across time, we noticed an inconsistency in the 1998 OHS. Marital status codes were inadvertently swopped. The code for "married" was used for "never married"; "never married" for "divorced"; "divorced" for "widowed"; and "widowed" for "married". The inconsistency was a result of incorrect documentation that had been sent out with the survey. The 1997 questionnaire had been distributed

1995-2006, across age.

The balance at each age for each year for married state is single, widowed or divorced, implying that a decline in the married state is an increase in either or all of the other marital states. The diagram for the single state in the bottom panel of Figure 2-1 nearly mirrors the one for the married state, for all ages, with the deviations captured in the widowed and divorced categories. This suggests that non-marriage is what adequately accounts for the declining marriage rate, as opposed to singlehood resulting from marriage dissolution by death of a spouse or divorce. The cross-sectional picture provides a snapshot pointing towards a decline in marriages. The decline is evident from age 25 and beyond.

For each cross-section, the proportion of married women increases with age, and rapidly so, until the age of 35 years, after which it remains fairly stable. This suggests that after African women get to their mid-thirties they are unlikely to enter into marriage. The surveys did not ask questions about age at marriage, making it difficult to establish whether there is any evidence of late entry into marriage. However we find that for each cross-section, a significant proportion of African women start getting married after the age of 22 years, giving evidence of late entry into marriage. Racial calculations of the singulate mean age at marriage (SMAM)[4] in Table A.2 (in appendix A) shows that African women enter marriage at relatively older ages compared to their white counterparts. In addition, the singulate mean age at marriage for African women is at least 29 years in all the years, indicating evidence of late marriage. This claim is based on Bogue's (1969) threshold for "late marriage" as given by the median age of 22 years for females[5]. A gender comparison

with a 1998 cover sheet. However, the marital status codes had changed in the 1998 questionnaire and this led to erroneous coding of the categories. Errors like these are critical, and especially because marital status is one variable that is usually included in most regression analyses.

[4]SMAM refers to the mean number of years spent in the single (never married) state by those in the hypothetical cohort who marry by age 50 (Hajnal, 1953). For pedagogy, a step by step calculation of the SMAM is shown in appendix A.

[5]In Kalule-Sabiti, Palamuleni, Makiwane, and Amoateng (2007).

of the singulate mean age at marriage indicates that the married male sample is on average older than the married female sample across all races and years. This is unsurprising, considering that traditionally a man is usually older in a marriage.

One of the limitations of this study is a failure to separate out the extent of cohabitation in the married state due to inconsistencies in the categorization of the marital states for the different surveys. For instance, in the surveys used married and cohabitating states were lumped together from the years 2000 to 2003. In these years marriage rates would be inflated by cohabitation, and the decline in marriages may be understated if cohabitation has increased. This kind of data capturing thus becomes a limitation if one wants to investigate whether marriages are being replaced by single-hood or by cohabitation.

We show, in Table A.3 in appendix A, the extent of this problem, by factoring out cohabitation from the married state in the surveys where the two were categorized separately. Married proportions are inflated when cohabiters and the married are lumped together. Cohabitation over the twelve-year period has increased by 7 percentage points. This suggests that African women's union formation behaviour may be similar to that of the western world, with informal unions replacing formal unions. However, whether cohabiting relationships in South Africa tend to be long-term or short-term is another issue, which needs further investigation.

The evidence from the cross-sectional analysis suggests that marriages have declined, not only among African women, but also across gender and racial lines. We further test the hypothesis that the decline in marriages of African women is real by using cohort data.

2.4.2 Stylized Facts from a Cohort Analysis

In cross-sectional analysis, we observe an individual only at a point in time. However, individuals are aging throughout the cross-sections with possibility of cohort replacement and different marital behaviours for different cohorts. Such changes cannot be picked up from cross-sectional analysis. With a rich series of cross-sections, however, we are able to follow cohorts of individuals throughout the cross-sections. This helps to reveal whether

the changes observed in marriage rates are generational changes. Cohort analysis, involving comparing an age cohort in different cross-sections is more informative than simply comparing subjects of the same age in different years.

We define cohort by age in 1995, and we follow these age cohorts through the eleven years to 2006. The picture from the selected cohorts in Figure 2-2 shows that within cohorts there is a positive relationship between age and proportion of women that are married. Between cohorts, we observe that for most of the period, trajectories of older age cohorts lie above the ones for the younger cohorts, suggesting different marital experiences for different generations. For instance, comparing the 20 year old age cohort at the age of 25 and the 24 year old age cohort at the same age, we observe a clear shift in marital behaviour, with the proportion married for the younger cohort, lower than their predecessors. Similar comparisons can be made between other cohorts, with results pointing to a decline in marriages.

The trajectories are not smooth, demonstrating cohort-global effects. With survey data, concern is more around sampling effects rather than macroeconomic effects. By grouping cohorts in five-year bands, to smooth the trajectories, shown in the bottom panel of Figure 2-2, we obtain clear evidence of differences in marital behaviour between the younger and older women. At the age of 35, 50 percent of the cohort aged 20-24 in 1995 is married, while at the same age, about 58 percent of the cohort aged 30-34 in 1995 is married. We therefore conclude from the cohort analysis that within cohorts, the proportion married increases with age, and between cohorts, marital experiences are different, signifying a generational change. However, we do not rule out the presence of sampling effects, following the zigzagged trajectories in the top panel of Figure 2-2.

The picture from the cohort analysis includes age, cohort and period effects. The age and cohort effects are visible. With regard to the cohort effects for example, the trajectories for the older cohorts are [always] above the younger cohorts (in the five-year age band except for the 15-19 and 20-24 age groups, which coincide). This suggests that the young and the old face different marital experiences, signifying a generational change.

The age effect is also evident by the positive relationship between age and proportion married and takes a slight S shape. In this study, it is evident that the proportion of women who are married tends to increase rapidly between ages 25 and 30, and less rapidly beyond 30. Though the age effect is not captured for ages beyond 50 in this study, the proportion of married women is expected to be fairly constant in those ages when no or less marriage formations take place, formed marriages stabilize and deaths stabilize too. The proportion is expected to start falling in old age when marriage dissolutions, usually by death, have little or no replacement by new entrants into the marriage institution.

The period effects are captured by the span of each trajectory, which corresponds to the 12 years of the surveys, 1995 to 2006. Graphs from the Age-Period-Cohort models disentangle age, period and cohort effects from marriage rates.

2.5 Decomposition Analysis: Age, Period and Cohort Model

An event such as marriage is influenced by age, period and cohort characteristics, in some way. If we observe that marriage rates are declining in datasets from independent surveys, the decrease could be due to differing sampling designs (period effect), more specific processes related to aging (age effect) or if specific cohorts display differing likelihoods to marry, then the decrease could be cohort-based. A more revealing picture of underlying marriage rate schedules can therefore be extracted by disentangling age, period and cohort effects.

The Age-Period-Cohort (APC) model[6] is the generational model used to identify whether changes in human behaviour are cohort-based or due to other factors such as age or calendar year. In a marriage analysis, the age effect would represent different allocations between the marital states associated with different age groups, giving a typical age profile. The period effect represents variation in distribution across marital states over time, simultaneously

[6]In addition to empirical application on data from repeated cross-section surveys, APC models are also applicable to analysis of age-by-time period tables of rates (for example Fu, 2000; Yang, Fu, and Land, 2004; Yang, 2008; Yang, Schulhofer-Wohl, Fu, and Land, 2008) and in cohort analysis of accelerated longitudinal panel designs (for example Miyazaki and Raudenbush, 2000; Yang, 2007).

associated with all age groups, and affects every cohort. The cohort effect represents the difference in the distribution across groups of individuals with the same birth year (Fu, Hall, and Rohan, 2004).

However, attempts to separate age, period and cohort effects are bedevilled by the identification problem resulting from specifying all three in an additive model[7]. Due to the exact linear dependency nature of the APC model, a unique solution for each of the effects cannot be found, since a matrix containing age, period and cohort variables does not have full rank.

There is no perfect technical solution to disentangle age, period and cohort effects. However, a number of defensible solutions to this problem have been proposed in the literature (for example Glenn, 1976; Fienberg and Mason, 1978; Hobcraft, Menken, and Preston, 1982; Wilmoth, 1990; Deaton, 1997; O'Brien, 2000; Fu, 2000; Knight and Fu, 2000; Yang, Fu, and Land, 2004; Yang, 2006; Yang and Land, 2006), one of the simplest solutions being to drop one of the multicollinear variables. This strategy assumes that one of the effects is zero, which however, becomes problematic where all of the variables are seen to be potentially important in explaining behaviour. This means the results are only as reliable as the identification assumption made, and for example, if the age effect is wrongly assumed to be zero, the estimates of period and cohort effects will be contaminated with age effects. That poses problems for correctly interpreting the two other estimated coefficients.

A widely used class of correctional methods that acknowledges the importance of all three involves making constraints on the coefficients, generally known as the coefficient-constraint approach[8], where constraints suiting the phenomenon under study have to be

[7] $Cohort = Period - Age$. However in an age-period-cohort regression model, neither the age or period or cohort effect can be estimated, *ceteris paribus*. For example, if cohort is defined by year of birth and κ denotes the expected change in marriage rate when year of birth is increased by one year, κ cannot be estimated for a fixed age and period. Likewise, the age slope (or period slope) can not be estimated for a fixed period and cohort (fixed age and cohort). This is what is refered to as the identification problem in cohort analysis.

[8] Firebaugh (1997) calls this "technical fix" strategy or "fixing coefficients *a priori*".

imposed. As with dropping one of the effects, the problem with this methodological remedy is that the parameter restrictions have to be theoretically motivated, which poses a challenge for an analysis of most phenomena including the current study. In addition, the estimates are sensitive to the choice of restrictions and goodness-of-fit to the data of constrained models is impossible to determine.

A number of authors have proposed different identifying assumptions. Deaton (1997) suggests a normalisation which assumes that period effects have zero mean and are orthogonal to the time trend. For example, here, where marriage proportion is the variable to be decomposed, the idea is to attribute marriage rate differentials between the surveys to age and cohort effects, and to use period effects to capture effects from changes in sampling designs that average to zero in the long run. Empirical estimation of the APC model subject to Deaton's (1997) normalisation involves the usual dropping of a row each of the age and cohort dummy matrices. In addition, two rows of the period dummy matrix are dropped so that the remaining $T-2$ period dummy matrix is defined according to:

$$d_t^* = d_t - [(t-1)\, d_2 - (t-2)\, d_1] \tag{2.1}$$

where d is a dummy variable taking the value of 1 if period is t, and zero otherwise, for $t = 3, ..., T$. The period effects for the two previously dropped period dummy variables are recoverable from the fact that all period effects sum to zero and are orthogonal to the time trend.

A relatively new approach to the estimation of APC models, called the intrinsic estimator, has been developed. The intrinsic estimator approach utilizes estimable functions that are invariant to the selection of constraints on parameters[9] (Fu, 2000). This approach has been validated by both case studies and simulation tests of model validation.[10] (for example Yang, Fu, and Land, 2004).

[9]Refer to Yang, Schulhofer-Wohl, Fu, and Land (2008), for the algebraic, geometric and verbal description of the intrinsic estimator as well as its application in Stata.

[10]Including tests for the estimability, unbiasedness, efficiency and asymptotic consistency of the model.

The second strategy is the proxy variables approach. This strategy uses one or more variables to proxy the age, period, or cohort coefficients (for example O'Brien, 2000). Difficulty with this approach is that it may not be in the analyst's interest to assume that all of the variation associated with the age, period and cohort dimensions is fully accounted for by a proxy variable.

The third approach is the non-linear parametric (algebraic) transformation approach, where a non-linear parametric function of one of the age, period, or cohort variables is defined so that its relationship to others is non-linear. A limitation with this strategy is determining what non-linear function to be defined for the age, period, or cohort effect.

There is no "magic formula" for separating age, period and cohort effects. With no strong hypothesis to motivate the influence of age, period and cohort effect on marriages in South Africa, this study prefers Deaton's identifying assumption as a descriptive device for expressing marriage trends.

2.5.1 Model Specification and Estimation

In linear regression form, the APC model for marriage rates can be specified as:

$$M_{ij} = \mu + \alpha_i A + \gamma_j P + \kappa_k C + \epsilon_{ij} \tag{2.2}$$

where M_{ij} denotes mean marriage rates for the ith age for $i = 15, ..., 49$ at the jth time period for $j = 1995, ..., 2006$; μ denotes the intercept; α_i denotes the ith age effect; γ_j denotes the jth period effect; κ_k denotes the kth cohort effect for $k = 1, ..., 35$ cohorts, with $k = i + j - 1995$; and ϵ denotes the random error term with $E[\epsilon_{ij}] = 0$ and $E\left[\epsilon_{ij}^2\right] = \sigma^2$. A, P and C are matrices of age, period and cohort dummies, respectively.

Due to the grouped nature of the data, the dependent variable is a proportion, rendering estimation by ordinary least squares (OLS) inappropriate. A better alternative which we adopt for this study is to estimate a generalized linear model (GLM), a method proposed by Papke and Wooldridge (1996). This is analogous to using a logit or probit model in place of a linear probability model, in order to ensure that the predicted probabilities are in the

valid range of zero and one. By estimating a GLM instead of an OLS, the predicted values of the fractional dependent variable will fall between the range of zero and one. Accordingly, we estimate age, period and cohort effects by quasi-likelihood estimation methods which do not need any special data adjustments for the extreme values of zero and one (Papke and Wooldridge, 1996). The quasi-likelihood method is fully robust and relatively efficient under the GLM assumption. In this regard, we maximise a Bernoulli log-likelihood function, given by:

$$l_i(\beta) = M_{ij} \log\left[G(\mathbf{x}_i\boldsymbol{\beta})\right] + (1 - M_{ij}) \log\left[1 - G(\mathbf{x}_i\boldsymbol{\beta})\right] \tag{2.3}$$

where $G(.)$ is a logit link function, ensuring that predicted values of the dependent variable lie in $(0, 1)$; β is a vector of parameters of age, period and cohort effects, $\mathbf{x}_i's$ are matrices of age, period and cohort dummies; and M_{ij} denotes marriage rates as previously defined.

Taking the estimation issues into account, equation (2.2) takes a generalised linear model form with a logit link and a binomial family to achieve a logistic model formulated as:

$$\theta_{ij} = \log\left(\frac{m_{ij}}{1 - m_{ij}}\right) = \mu + \alpha_i A + \gamma_j P + \kappa_k C \tag{2.4}$$

where θ_{ij} is the odds of marriage and m_{ij} is the probability of marriage in cell (i, j). We include the robust option in the GLM estimation in order to obtain robust standard errors which is particularly useful if the distribution family is incorrectly specified. Subject to Deaton's (1997) normalization, the regression consists of $(I - 1)$ age dummies, $(J - 1)$ period dummies and $(K - 2)$ cohort dummies.

2.5.2 Age, Period and Cohort Effects

Following the Age-Period-Cohort decomposition strategy, we present, in Figures 2-3, 2-5 and 2-4 the estimated coefficients and their 95% confidence intervals plotted for successive categories within the age, period, and cohort classifications. But since no theoretically motivated restrictions were made, we use the APC model as a descriptive device, which is adequate for this chapter's objectives.

The age effect shown in Figure 2-3 is positive for all cohorts and its magnitude increases with age. The global positive age effect indicates that the odds of marrying increase as young adults age, as with their predecessors. In other words, the age cohorts under study are merely adhering to what is expected of individuals as they age, in terms of marriage, which replicates the marital behaviour of prior generations. The weaker positive age effects for younger cohorts indicate that compared to older people, the odds for marriage for younger people are less. This is unsurprising, considering the life-cycle expectation of marriage. Most likely, the young adults are still in school, and once they have completed their schooling, they will be more available for marriage. Consistent with the estimated mean age at marriage of 30 years, the age effect shows that the age of 30 years is the peak-age for marriages. Beyond the age of 30, the age effect remains fairly constant or is weaker. Perhaps marriage behaviour after the age of 30 is influenced by women's economic independence, as they have by then established themselves in the workplace.

Figure 2-4 shows that cohort effects increase with age. The earlier a woman is born, the older she is in 1995, and age in 1995 defines the cohort to which an individual belongs. We observe very low and near constant effects on the odds of marriage for women up to the age of 24, after which cohort effects increase. The implication is that cohort effects are present and the younger and older generations behave differently, driven by their own cohort influences. A potential explanation for the different marital behaviours is that the younger African women are enjoying the opportunities afforded to them by change in the political environment. Unlike the older generation, they are able and have economic incentives to stay longer in school, rather than marry at a young age as their predecessors did. In other words, while an event such as a new government is common to all cohorts, its consequences regarding marriage vary between the younger and the older generations. The association between cohort and marriage is characterised by a decline in marriage rates in younger cohorts.

The estimated year effects in Figure 2-5 are much smaller in magnitude than either the cohort or age effects. In addition, the year on year differential of the period effect is

negligible, with no peculiar behaviour in any of the survey years. Mostly yearly period effects are around zero. This result suggests that there are no outlier surveys as far as sampling of African women is concerned, and therefore, the cross-sections are comparable. This is a very important result because it confirms that the decline in marriages observed in the cross-sectional and cohort analyses above is a real incident which is not the result of differences in sampling and questionnaire design. The decline in marriages possibly reflects a push for African women to achieve economic, educational and career goals, enhanced by the opportunities enabled by the new legislation of the post-apartheid government supporting women's rights. In the next chapter, we explore, in a bivariate context, some of the likely reasons for the decline in marriages.

2.6 Conclusion

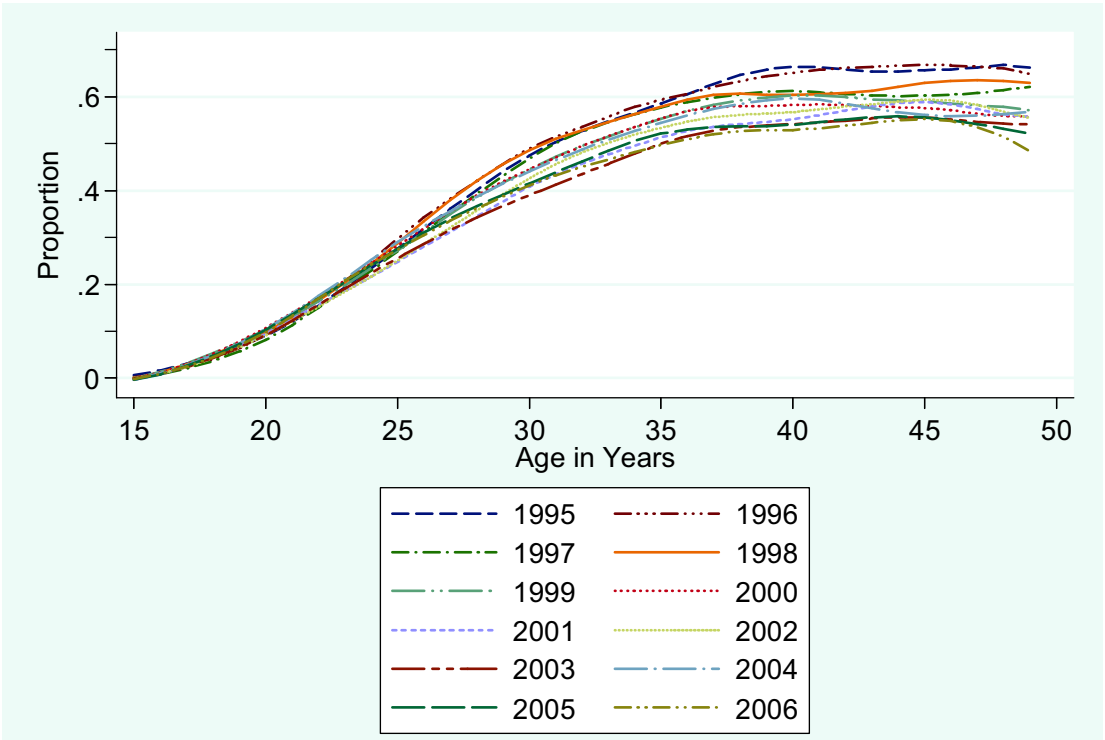
The objective of this chapter was to lay the groundwork for an empirical analysis of marriage decline that follows in the subsequent chapters. We set out with information that marriages may be declining. Using data from a series of nationally representative household surveys conducted from 1995 to 2006, we endeavoured to examine if the marriage decline deduced from comparing marriage rates at different time points of cross-sectional survey data is a real decline and not one driven by differing sampling designs used in the surveys. We constructed a synthetic panel from the October Household Surveys and the Labour Force Surveys. Cohorts, which we defined by year of birth (or age in 1995), were followed through the period.

Our main objective was to separate period effects from the age and cohort effects in the marriage rates in order to establish if marital experiences of younger and older cohorts are different. The period effects are negligible, suggesting that the marriage decline is a real decline. Age effects are present and greater in magnitude but, most importantly, cohort effects are also evident, indicating a shift in marital behaviour between the younger and the older cohorts, pointing to a decline in marriage. We suggest women's increased economic independence (afforded by more favourable labour market opportunities for African women

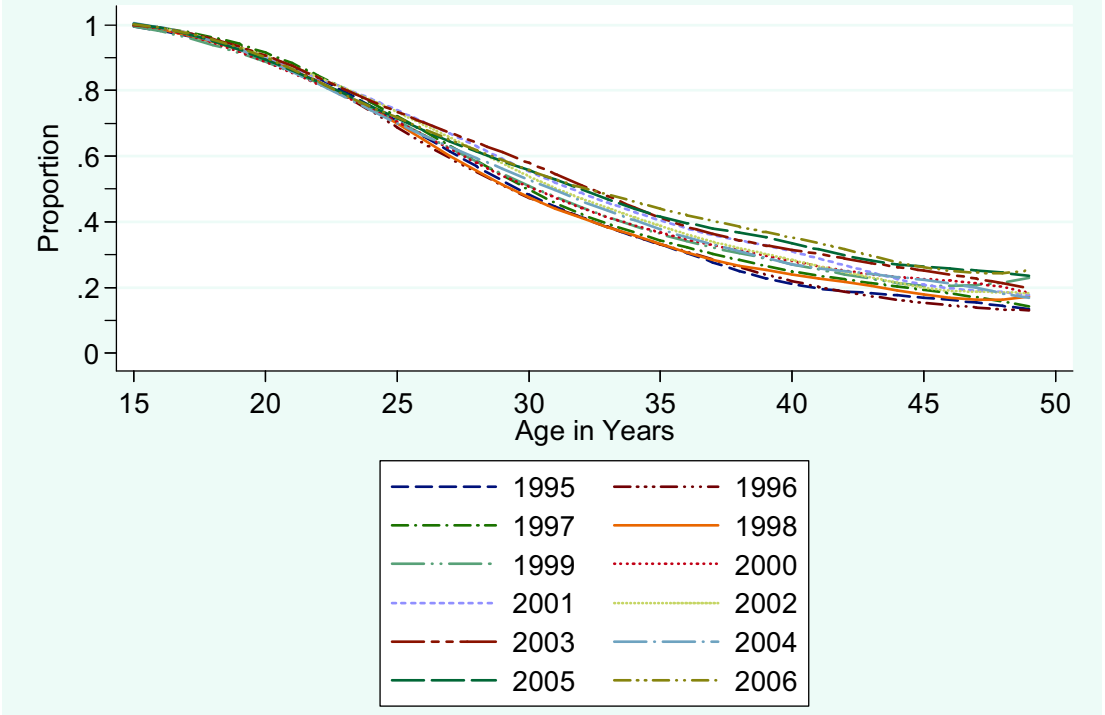
owing to reforms in the post-apartheid labour market) and a shortage of "marriageable" men (due to increased African male joblessness) as likely explanations for the decline.

In this chapter, we have shown that that marriages are indeed declining. Marriage rates for African women aged between 15 and 49 years declined from 35 percent in 1995 to 31 percent in 2006 and the period effect component of these marriage trends confirms that this decline is a real decline. In the next chapter, we explore, with a bivariate descriptive approach, relationships between marriage and some of its covariates that may be driving non-marriage behaviour.

Figure 2-1: Married and Single African Women: 1995-2006

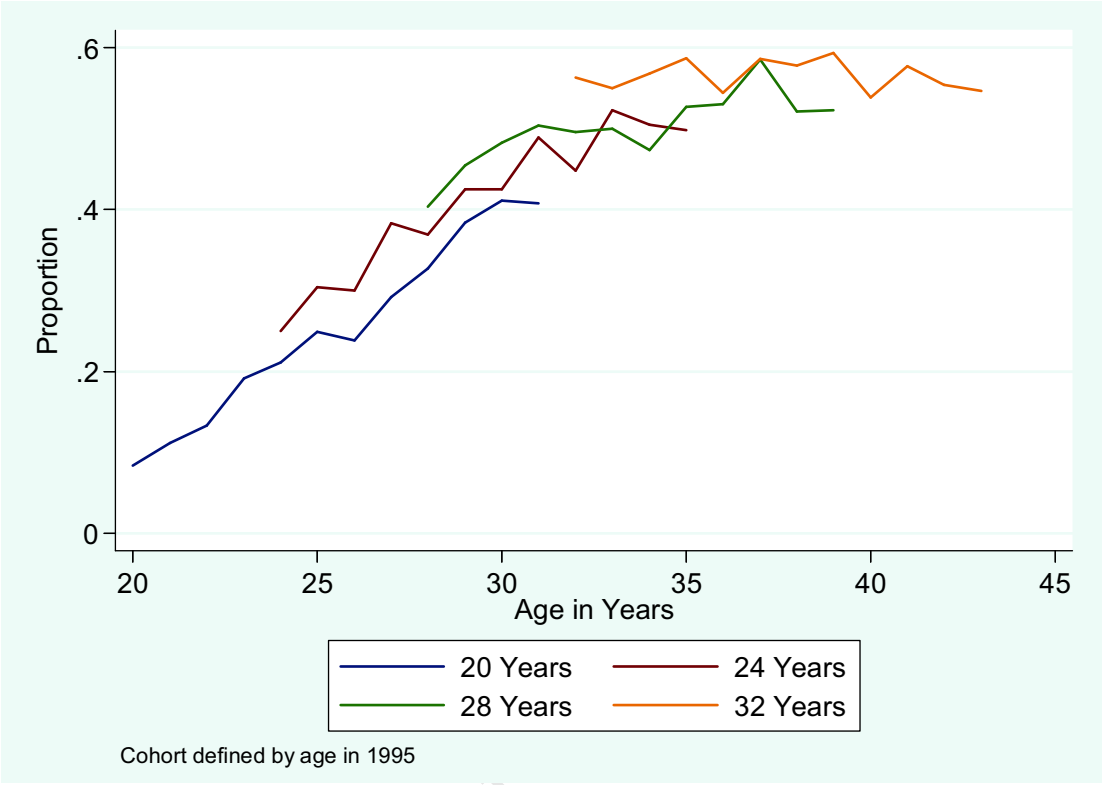


Source: Own Calculations Using OHS 1995-1999 and LFS 2000-2006 (September Waves)

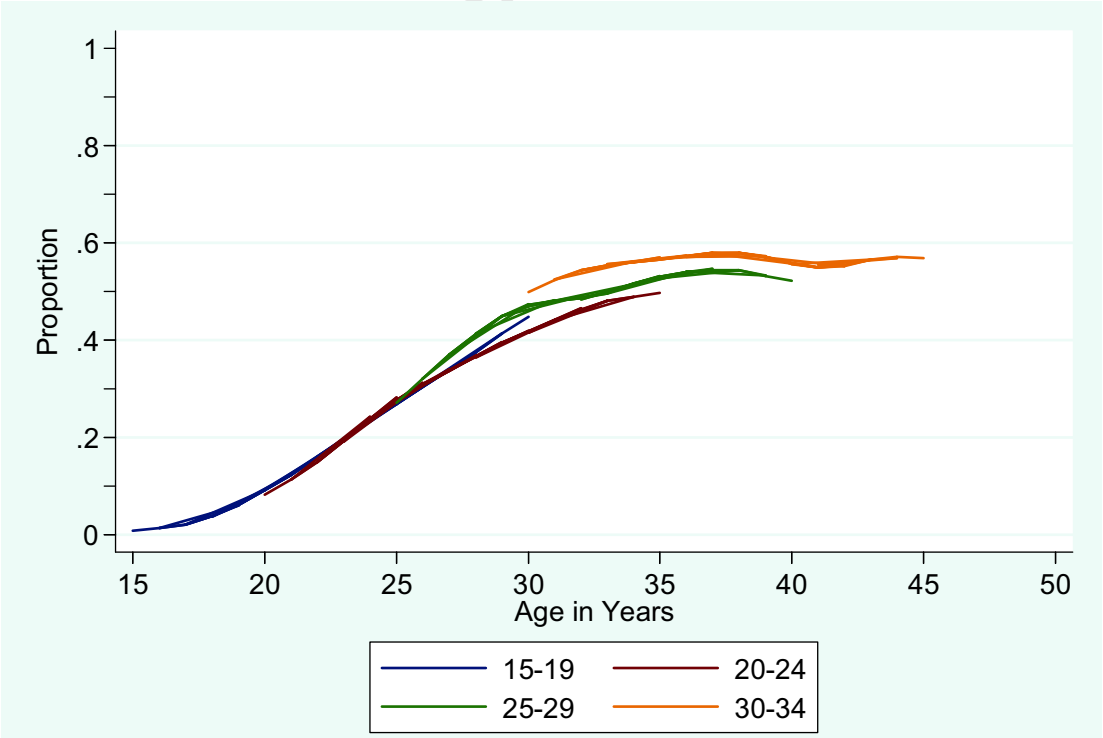


Source: Own Calculations Using OHS 1995-1999 and LFS 2000-2006 (September Waves)

Figure 2-2: Proportion Married by Cohort



Cohort defined by age in 1995



Source: Own Calculations Using 1995-1999 OHSs and 2000-2006 LFSs

Figure 2-3: Coefficient Estimates and 95 Percent Confidence Intervals of the Age Effects on Marriage Trends

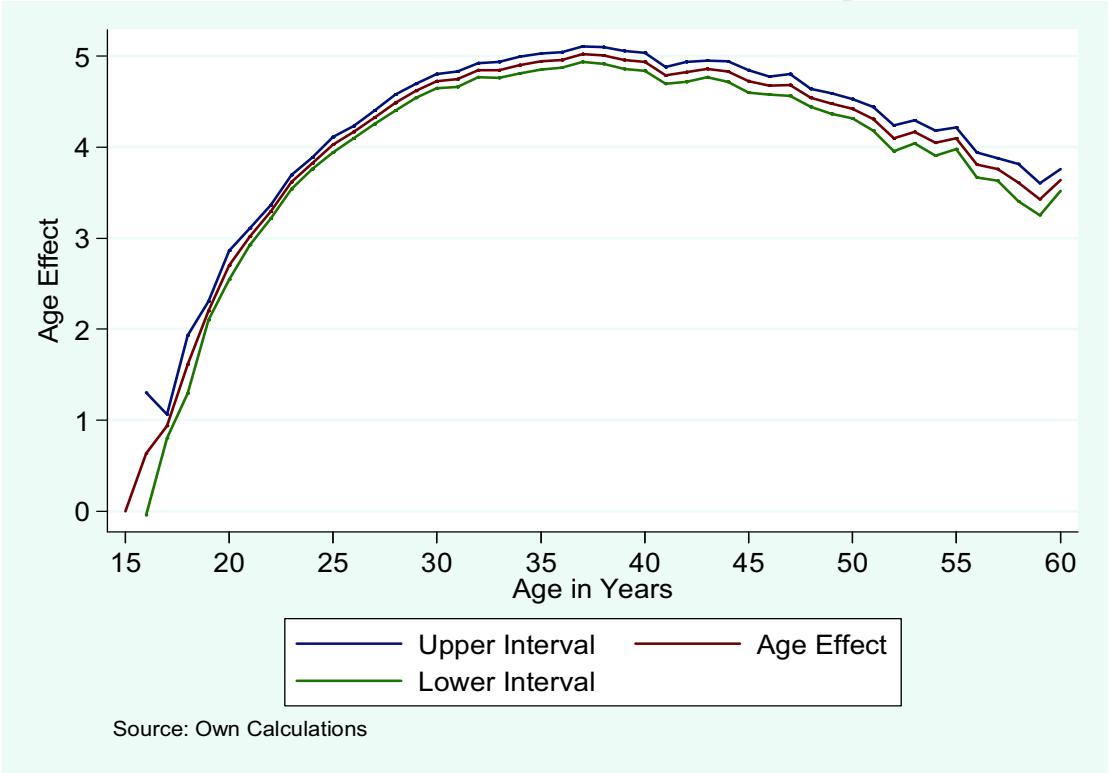


Figure 2-4: Coefficient Estimates and 95 Percent Confidence Intervals of the Cohort Effects on Marriage Trends

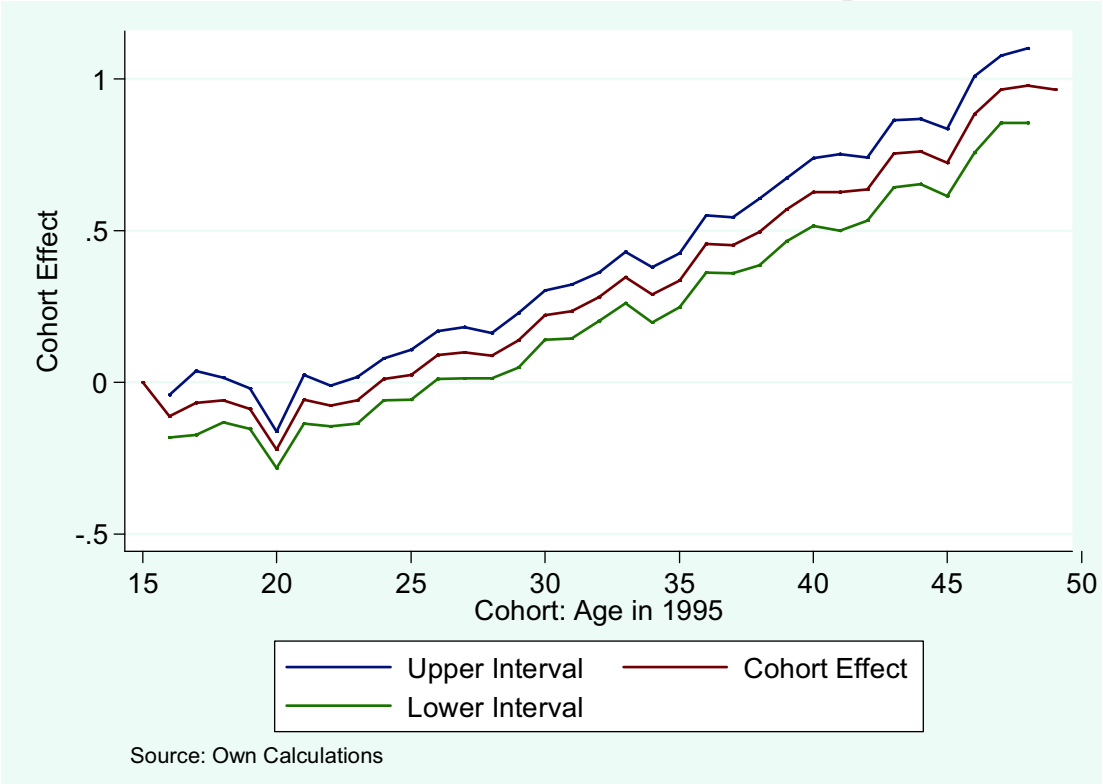
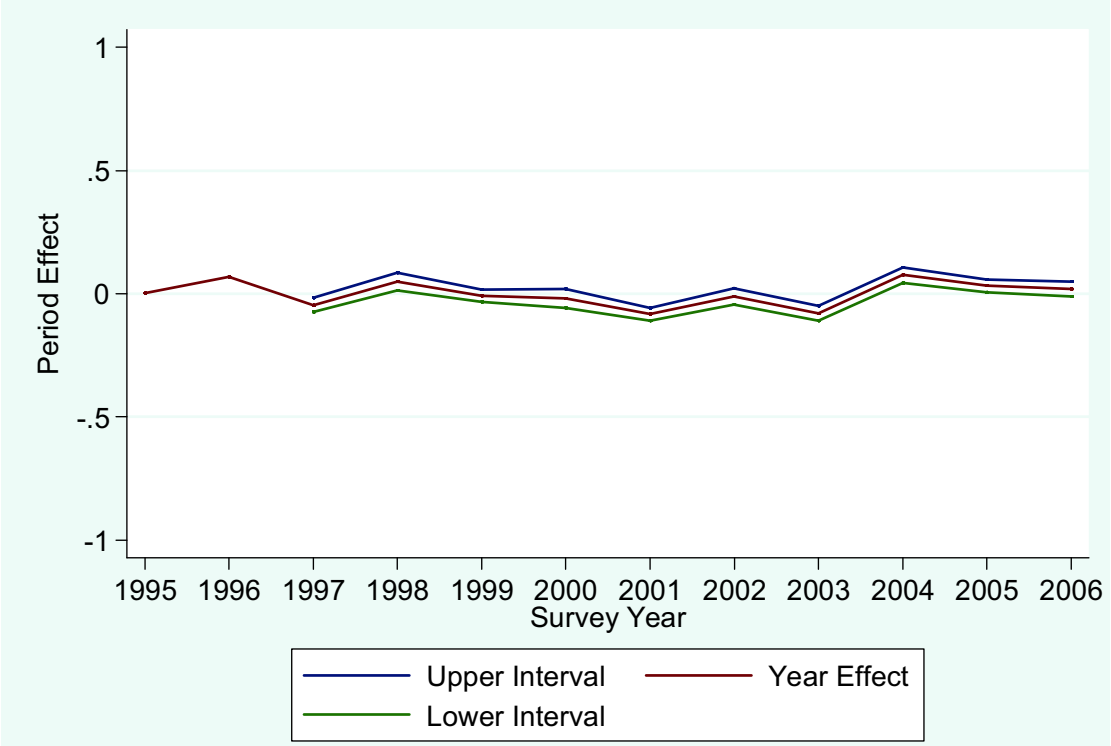


Figure 2-5: Coefficient Estimates and 95 Percent Confidence Intervals of the Period Effects on Marriage Trends



Chapter 3

Changes in Factors Influencing Non-marriage Behaviour among Women

3.1 Introduction

In the previous chapter, we documented details on marriage trends in South Africa. Using datasets from nationally representative household surveys conducted from 1995 to 2006 in an Age-Period-Cohort model, we established clear evidence of a real shift in marital behaviour across generations. The proportion of married African women markedly declined over the period. The period effects are negligible, suggesting that there are no major discrepancies between the surveys. The data shows that the highest marriage rate for African women was 36 percent in 1996 and by 2006 this dropped to only 31 percent, representing a 5 percentage point decline in marriages.

Theory suggests a number of possible reasons why marriages among women may decline, including unavailability of marriageable men and women's economic independence (Becker, 1973; Wilson, 1987; Grossbard-Shechtman and Neuman, 1988). Gustafsson and Worku (2006) examined mortality data for South Africa for the age group 15-49. They found a higher mortality among men than women, with men being four times more likely to die from unnatural causes, such as violence, than women. While higher mortality among men does not necessarily result in less marriageable men, it follows from the theories of marriage

that the scarcer men are relative to women, the less likely women are to marry.

Women's economic independence may result from their increasing labour force participation and higher wages and their attainment of higher education. According to the women's economic independence hypothesis, if a woman's financial situation enables her to maintain a single household, her economic gain from marriage decreases. As a result the propensity to marry decreases (Becker, 1991). Evidence shows that in post-apartheid South Africa, declining marriage rates have been accompanied by women's growing labour force participation (for example Casale and Posel, 2002). This suggests that disruption in union formation is often related to the growth in women's earning potential.

The current chapter aims to look for associations between some of the factors that may have influenced the marriage decline among African women. We want to establish if these variables are correlated with each other. Correlates of the marriage decision are explored, the changes in these factors are explored over the period under review, and where possible, we examine the association of these factors with marriage rates. The importance of this chapter is in framing the multivariate study towards explaining causes of change of family formation patterns.

Our focus is specifically on demographic and economic arguments because such causes can be influenced through social policy. To achieve our goals, we continue to use aggregated datasets. For this reason, the analyses in this chapter are limited to examining change in average characteristics to infer the likely causes of the decline in marriage.

The chapter documents the characteristics of the marriage market and that of marriageable individuals. This is afforded by a descriptive analysis approach. Performance of various observed characteristics which are deemed important in the marriage market are investigated for men and women. We explore the marriage market for the African population group by using the notion of a sex ratio as a proxy for the supply of partners in the marriage market. Different measures of the sex ratio are used to establish the quality of the marriage market.

As in the first empirical chapter, we continue to make use of data from the 1995 to 2006

household surveys in this chapter. We define the married as everyone who has ever married (including the married, cohabiting, widowed and divorced). Again, the marriageable sample consists of African women aged 15 to 49. We focus on African women, rather than all individuals because the decline in marriages has been marked for this group. Moreover, this group is interesting because related indicators have been changing along with changes in marriage rates.

3.2 Trends in Some Correlates of the Marriage Decision

In this section, we endeavour to describe some of the key patterns that relate to marriage decisions. It is worth mentioning at this point that our secondary data do not capture all the information that may be useful for a marriage study. For example, it would have been interesting to have included information on how individuals rank (at a point in time as well as over time) preferences regarding characteristics of (potential) spouses. In that regard, we could have examined psychological and emotional factors (for example chemistry, connection, perception of issues, attitude and support) and physical factors (such as beauty and financial strength) related to marriage choices. This would inform whether there has been a change in preferences that might have influenced the marriage decline. In addition, performance of quality of life before and after marriage would have been of interest in order to establish whether decline in gains from marriage explain the unattractiveness of marriage. Since our data are limited, however, we rely on averages of observable characteristics (over time) of both men and women to examine African women's marriage market in South Africa.

The economic characteristics that we focus on are education levels and labour market status. Both theory and empirical research have cited education and labour market status as important variables in the marriage market. While these approximate women's economic independence and hence make marriage less desirable for them, higher education levels and labour market status for men are strengths for men in the marriage market. We investigate these in turn.

3.2.1 Education

Although preferences are ranked differently by different individuals, both theory and empirical studies agree that a man's education is one of the important variables that women look for when looking for a mate to marry. A man with higher education will be more marriageable than one with lower education. This is because higher education means better prospects in the labour market which puts a man in a better position to fend for his family. Similarly, men also value women's education, when men are on average more educated than women. This implies that the value of individuals with high education is high in the marriage market, *ceteris paribus* and attaining more years of education increases an individual's marriageability.

However, women with higher levels of education usually face challenges in the marriage market when the pattern of education changes in such a way that overall, women have more education than men. In that case, if selecting a mate by education level has a role in the marriage market, the pool of marriageable men for highly educated women tends to decrease. This has consequences of later as well as fewer marriages for women.

In South Africa, women's mean years of education have been on the rise. Casale (2003) captures a clear rising trend across age cohorts in 2001. We classify the sample into seven education categories namely, No schooling; Incomplete primary; Primary; Incomplete secondary; Secondary; Diploma; and Degree. The cross-sectional picture from the selected years, shown in Figure 3-1 below, concurs with Casale's findings. Mean years of education are higher for the later years than the earlier years for African women of all ages between 20 and 49 years. For instance, 35 year olds in 1995 have about 6 mean years of education while in 2006, this increases to about 8. Moreover, the picture shows that younger women have on average, more years of education than older women in all trajectories. In sum, Figure 3-1 shows that in the period 1995 to 2006, education for African women has been on a rising trend.

Additional evidence of this is provided by replicating Casale's cohort analysis for 2006 in Table 3.1 below. The figures show that older cohorts have fewer mean years of education

compared to younger cohorts (for both men and women), a pattern similar to that found by Casale (2003) using the dataset from the 2001 Labour Force Survey. We note that while older male cohorts have more mean education years than older female cohorts, younger female cohorts have higher mean education years than younger male cohorts. Casale (2003) asserts that the increase in education attainment is faster for women than for men, suggesting that on average, African women are becoming more educated than African men. These shifts in education may have changed what it means to be a young single African woman. Increasing education allows women to defer or forgo marriage and instead pursue labour market roles.

We next look at the distribution of mean years of education across marital status. From Figure 3-2, we find that those women who have never married (category 0) have more mean years of education compared to those who have ever experienced marriage (category 1). In addition, we see an increasing trend in the mean years of education for both ever married and never married African women, supporting the generalization that there is a growing trend towards greater education attainment among women, as illustrated in Figure 3-1. For African men (Figure 3-5), the difference in mean years of education between the never married and the ever married is not as pronounced as it is for women. Most likely, education does not get in the way of marriage for men as it seems to for women.

In Tables 3.2 and 3.3, we present marriage rates across education levels for African women and men, respectively. The point is to obtain a clear indication of who marries and who does not, with respect to the education level of individuals. Generally, educated women are less likely to be ever-married than their less-educated counterparts. This, according to Oppenheimer (1988), could be because most educated women will have a lengthened search strategy to assess potential spouses' economic prospects, resulting in delayed marriage or decisions not to marry.

From the figures shown in Table 3.2, it is evident that women of all education levels marry, and this is true for the whole period under review. However, marriage rates are lower for women with some secondary education and secondary qualification. This is con-

sistent with Ntuli's (2007) findings and with most documented explanations of increasing non-marriage behaviour. Focusing on education in her investigation of determinants of female labour force participation between 1995 and 2004, Ntuli (2007) finds that secondary education slightly reduces women's prospects of getting married. A probable explanation for lower marriage rates among these groups of women is that they are continuing with their education and are possibly delaying marriage.

Increased rates of marriage are found for women with no schooling and with incomplete primary education. This is unsurprising, considering that there are likely to be cohort effects here, since these will tend to be older women. Considering the age range of our choice (15-49), it is unlikely that these education groups are still in school. Most likely, women in these education groups who are not yet married have chosen to forgo rather than to delay marriage.

In general, we observe a decline in marriages at the lower levels of education for women, while the rates remain constant or increase in the higher education levels. For example, in 1995, about 66 percent of women with no schooling reported to have ever married. By 2006, this had dropped to 62 percent. Among women who had completed primary school, 46 percent had ever been married in the 1995 survey but by 2006, only 41 percent reported to have ever married. In contrast, among women with incomplete secondary and diploma qualification, 30 percent and 49 percent, respectively, reported to have ever married in the 1995 survey. These figures remained the same by 2006. On the other hand, about 48 percent of women with at least a degree reported to have ever married in 1995 and this proportion shot up to a remarkable 71 percent by 2006.

It is surprising to find non-marriage behaviour for women in the lowest education level category. While non-marriage behaviour was implied for educated women, Table 3.2 shows that there is a specific group of educated women who are not marrying. Surprisingly, these are not the ones in the upper end of the education distribution, but rather the ones with incomplete secondary and a secondary qualification. A possible explanation for non-marriage behaviour for women with incomplete secondary and secondary qualification is

that they might still be in school. Most likely, these are younger women who possibly had not yet considered marriage at the time of the survey. What perhaps remains a puzzle, is that those women who face the highest opportunity cost of marriage (with at least a degree) also marry at a higher rate.

The pattern is similar for African men, with declining marriage rates reported for all education level categories and an increase of about 6 percent registered for those with at least a degree, from 55 percent in 1995 to 61 percent in 2006.

The findings of this analysis suggest that there is a correlation between education and marriage, as suggested by theory. However, while education is likely to be an important factor explaining the decline in African women's marriages in South Africa, controlling for education alone is unlikely to tell the full story about why there has been such a decline over the period under review.

3.2.2 Labour Market Status

The next characteristic we consider is the labour market status of an individual. On this issue, we specifically consider male joblessness and the increase in female labour force participation. In the literature, the growing joblessness of males is given as one prominent explanation of declining levels of marriage. Rates of marital disruption, including divorce, separation and non-marriage are linked to the inability of fathers to provide stable financial support to their families. Ellwood and Rodda (1990), Lichter, LeClere, and McLaughlin (1991), Fossett and Kiecolt (1993) and others demonstrate a robust association between male (un)employment and marriage. In the United States, Testa and Krogh (1995) used survey data to estimate the effects of employment on marriage rates among black males. The findings from the study provide evidence showing that black male employment is positively related to marriage rates. Black single men who were in stable employment were found to be twice as likely to marry than single men who were unemployed and economically inactive.

The South African literature shows evidence of an increase in male joblessness in the

post-apartheid era. For example, using the broad definition of unemployment[1], Casale (2003) shows that there were approximately 1.57 million more unemployed males in 2001 than in 1995. Additional evidence shows that while African females experience higher unemployment rates than their male and white counterparts, the increase in the African male unemployment rate from 29.5 percent in 1995 to 40.1 percent in 2004 was astounding. In addition, persistent unemployment characterises the South African labour market, with growing numbers of unemployed having been unemployed for three years or longer (Unit, 2006).

Accompanied by male joblessness is an increase in female labour force participation. Since the demise of apartheid, the South African government has implemented various economic policies to curb the injustices of the past. One result emanating from these policies is the growing labour force, in general and among the younger spectrum of the population in particular. These policies have had an impact on African females especially, resulting in substantial increases in their labour force participation rate from 47 percent in 1995 to 64.4 percent in 2002 (Unit, 2006). The male labour force participation rate also increased but not by nearly as much as the participation rate of women.

We compare the labour market status and marital status of individuals to establish if there is some association between the two. In Figures 3-3, 3-6, 3-7 and 3-8, we compare the distribution of employment status for married and unmarried individuals, across time (in years). We do this separately for African men and women. We report results using the broad/expanded definition of unemployment (which includes the non-searching unemployed). Our choice of the broad definition is guided by empirical findings by Kingdon

[1]Two definitions of unemployment, namely the strict and the broad/expanded definitions are traditionally distinguished in South African labour market studies. The former, which is also considered as the official definition, includes only those unemployed individuals who report having actively searched for work in the previous four weeks. The latter includes "discouraged" unemployed individuals who report wanting to work even if they had not engaged in active job search in the previous four weeks. Refer to Kingdon and Knight (2000a) and Dinkelman and Pirouz (2002) for more details.

and Knight (1999) following their investigation on whether "a wage curve"[2] exists in South Africa. Their finding sheds some light on the debate regarding the definition of unemployment in labour market analyses in South Africa. They argue that the broad definition of unemployment (where the labour force includes persons who did not actively look for work in the past four weeks, also referred to as "discouraged workers") is an appropriate definition of unemployment in South Africa since it influences wage determination.

The figures represent the allocation of sample estimates and the corresponding percentages of the individuals into not economically active (NEA), employed and unemployed categories calculated separately from the sample of ever married and never married individuals.

The figures for never married African women in Figure 3-3 show different results for different periods. The results from 1995 to 1999 are consistent with the ones found by Mutedi (2002). We find larger proportions of non economically active women than the economically active among the never married for the period up to year 1999. From year 2000, we find that a larger proportion of single women are entering the labour market, even though most of them are unemployed.

Figure 3-6 shows that most married African women are economically active. The findings hold for most of the cross-sections under review. This is surprising and contrary to the women's economic independence hypothesis' predictions. Perhaps one of the explanations for this association is that the workplace provides some level of flexibility so women are able to balance both home work and outside work. An increasing number of married women in the workplace may also mean a change in the attitude that a woman's place is in the kitchen. Men may only be allowing their wives to do more than just home work.

For men, we find similar results, which unlike for women, are expected. Figure 3-7 shows that the percentages of men who have both ever married and are economically active (and

[2]The wage curve finds a strong empirical negative relationship between local wages and local unemployment levels. Refer to Blanchard and Oswald (1995) and Kingdon and Knight (1999) for a detailed empirical investigation of the presence of a wage curve.

employed) are markedly high. On the other hand, large proportions of men who have never married (in Figure 3-8) are economically inactive. This finding has some empirical support. Previous research has stressed the role of unobserved differences in workers' productivities. Either marriage makes men more productive, with some men becoming more productive than others; or more productive men are more likely to be married. While these past studies assume that the individual is already in employment and focus mainly on investigating whether evidence of a marriage premium[3] exists, it is likely, using the same line of reasoning, that marriage makes men choose to work or that work makes marriage likely for men. Suppose that men have different preferences for family goods (such as children), and that these are costly. Increased consumption of these goods necessitates choosing work over no work and those workers with greater demands for costly family goods will take less leisure and work in jobs that offer a better wage. If these men are also more likely to be married, a positive correlation between work and marital status (and also wage and marital status) could arise.

What is particularly interesting in this section is the finding that a large proportion of unmarried women are economically active. One might therefore claim that there is a negative association between female labour force participation and marriage. However making a causal statement may be far-fetched at this stage, given the evidence that marriage considerably decreases the probability of women's labour force participation (for example Casale, 2003) and more recently, (Ntuli, 2007) and also considering that we do not control for other covariates of marriage.

We did not find any evidence in the literature that identifies female labour force participation as the cause of the decline in marriages. However, these twin-trends, the increase in female labour participation and declining marriages point towards a possible causal association between female labour force participation and marriage decisions.

The literature suggests that female labour market supply may be endogenous in women's

[3]The earning differential between married and single workers, with the former earning significantly more than the latter.

marriage decisions. Prior marriage research suggests that market work affects female marital status. On the other hand, sufficient evidence in the female labour supply literature shows that marriage affects market work for women. Marriage and market work are often incompatible among women because women are traditionally expected to do more housework and at the same time, they aspire to advance their career goals. The decisions to marry and to supply labour are jointly determined. On the other hand, labour force participation for men is considered to increase their marriageability and hence considered as a trait women look for in mates. This is essentially because women who do not work will need financial support from their husbands. Even those women who work may still need a supplementing income from their husbands if female pay is low.

One of the prime explanations of the joint determination of marriage and labour supply decisions for women is that both are often made around the same time and especially around the time of school completion. The differences in the labour force participation of men and women may reflect differences in what marriage means for women and men, in terms of life cycle and patterns. Thus, reverse causality is likely for women and a convincing explanation of the decline in marriages calls for a careful empirical investigation that takes into account the endogeneity of female labour market status to estimate, in particular, the effect of female labour supply on marriage decisions or, more generally, the determinants of marriage decisions. This issue will be dealt with in detail in the multivariate analysis context that follows in the subsequent chapter. A multivariate analysis would be informative in assessing the causation of marriage and labour force participation decisions for women.

3.2.3 Supply of Partners in the South African Marriage Market

Having analysed the economic arguments considered important in the marriage market, it is the objective of this section to assess the demographic argument for marriage decline. The focus here is on the availability of potential spouses. This analysis will help in the understanding of the extent of availability of men, and especially those men with traits that are valued in the marriage market. We use the sex ratio as a proxy for the supply of

partners in the marriage market. A sex ratio is defined as the relative number of males and females.

When calculating the sex ratio in the marriage market context, we consider only those individuals who are of marriageable age. A sex ratio of less than one implies that there are more women than there are men. Individuals are assumed to search for the best match, given their characteristics and their desired characteristics in a spouse. Although information about the demand and supply of these characteristics is imperfect, the sex ratio hypothesis asserts that members who are of the scarcer gender have a bargaining advantage in male/female relations because more options are available to them (Guttentag and Secord, 1983). Members of the scarcer gender tend to develop higher expectations from their potential partners and members of the abundant gender tend to be pressurised into lowering their expectations of partners or risk doing without a partner. Consequently, the abundant gender is predicted to be less likely to marry.

In this section, we aim to obtain an understanding of the South African marriage market, while focusing on the African population group. Both quantity and quality of men matter in the spousal choices of women. We will therefore explore the sex ratios (both quantity and quality measures) for the period under review. Posel and Casale (2009) have also examined the relationship between alternative definitions of sex ratios and marriage outcomes across racial lines for women in South Africa. We control for the likelihood that fewer men are likely to show up in the survey than women by weighting the sample using person weights. Person weights denote the inverse of the probability that the observation is included because of the sampling design.

At this stage of the analysis, we consider the aggregate sex ratio (i.e. South Africa, rather than a local marriage market). Following Gustafsson and Worku (2006), the sex ratio is calculated as follows:

$$SR_i = \frac{\sum_{i}^{i+9} M_i}{\sum_{i-3}^{i+6} F_i} \tag{3.1}$$

Where SR_i represents the sex ratio for woman of age group i. The denominator represents the "demand" side of the marriage market. It depicts the number of women an African woman of age i is competing with for her pool of marriageable African men. In our case, $i \in [-3, 6]$ would be a subset of women a given woman would be competing with for men. The age range is chosen based on the assumption that women will prefer men who are at least their age and up to 9 years older (Gustafsson and Worku, 2006). That is, if it is common practice for a woman to marry a man in her own age range or up to nine years older, then a 20 year old woman competes with women 3 years younger (17 year olds) and 6 years older (26 year olds), for men her age and up to 9 years older (29 years old). The numerator represents the "supply" side of the marriage market. $i + 9$ corresponds to the pool of African men available for marriage to an African woman of age i.

We compute two other sex ratios to generate the quality measure. This is done by modifying the numerator of the above ratio where M_i becomes : 1) the number of employed men and 2) the number of men with completed education higher than grade 12 (standard 10). The quality measure is connected to evaluating whether the men can afford to pay *ilobolo*[4] for the women. All three measures of the sex ratio are calculated for the entire period

[4] *Ilobolo* is paid to a woman's parents as bridewealth by her husband-to be as an appreciation sign to the parents for taking care of the woman. In modern societies, this money can be given in 'cattle money'; otherwise, live cattle are traditionally used. The national household surveys in South Africa do not have information on the payment of ilobolo. The only available information on ilobolo payment was collected in the 1998 KIDS, which is limited in coverage, as it was conducted only in the KwaZulu-Natal province. The literature on ilobolo gives some indication that ilobolo payment is widely practiced. For instance, Casale and Posel (2009) show that of the married respondents aged 60 years or younger, three quarters reported making ilobolo payments with marriage. Literature also indicates that ilobolo is highly valued. For example, valued in 2000 prices, ilobolo typically ranged from 10000 Rands to 25000 Rands. Ilobolo's average payment of approximately 20000 Rands is almost 13 times the average monthly real earnings of black men revealed

under review, in order to establish the trend. Figure 3-4 reports the quantity measure of the sex ratio. The other two [quality] measures are presented in Figures 3-9 and 3-10.

Figure 3-4 shows evidence of imbalanced sex ratios. The sex ratios are consistently less than one for all the ages and in all the years, indicating that there have been fewer men in those years. The average number of men for a woman declines with age, for each of the cross-sections. We expect an individual to be highly likely to marry when he/she has completed secondary education, which on average would be around the age of 20 and beyond. The figure reveals long-term declines in the pool of black men. This is an indication that the problem of fewer men is increasing over the years.

Measures of availability of quality men are even worse. The quality of the South African marriage market is poor, with availability measures by employment status lower than one for all the years. The story is similar and worse for availability measures by education attainment, as shown in Figure 3-10. This supports Wilson's (1987) thesis that increasing rate of joblessness among African men may be one of the major underlying factors in the rise of non-marriage behaviour. This is an indication that probably most men cannot afford to pay *ilobolo*. This might be a problem especially in those communities where *ilobolo* has been highly commercialised. With most women becoming more educated, *ilobolo* payment may contribute to the decline in marriage rates since more educated women attract a higher payment.

The inequalities of the sexes may have a significant effect on marriage rates. For the most part, the sex ratio has a weaker effect on men's marriage rates than women's marriage rates because of differential structural power. Presumably, men are less dependent than women on a partner for economic support. With better economic opportunities for women, women's dependence on men for economic support is expected to be reduced, hence the effect of the sex ratio on female marriage rates is expected to be weakened in multivariate analysis.

As is expected, Table B.1 in appendix B suggests that the scarcity of men unfavourably

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in the 1998 KIDS sample (Kaarsholm, 2005; Gustafsson and Worku, 2006; Posel and Casale, 2009).

affects marriage rates of both men and women. The table also reports the racial differences in the sex ratio over the period. From the figures, we observe that white women, who have a relatively favourable marriage market compared to African women have higher marriage rates. Findings from bivariate correlations between marriage rates and sex ratios (calculated at the district council level) also provide evidence which suggests that the sex ratio has consequences for behaviour related to marriage formation. Although not strong, the sex ratio is positively related to the percentage of married African men and women, for most of the years.

Overall, African sex ratios provide evidence of fewer men relative to women. Sufficient evidence in the literature implicates the sex ratio as a determinant of family formation (. Guttentag and Secord, 1983; Darity and Myers, 1984) In the United States, it has been suggested that low marriage rates among African-Americans may be linked to the low sex ratios for blacks, which mainly results from high rates of mortality and institutionalization for black men. Less attractive marital outcomes for women, and hence the decline in marriages are predicted when the sex ratio is low. Our sex ratio figures suggest that the situation may be similar for South Africa. A shortage of men may be one reason why marriages are fewer among Africans. In addition to the lower prevalence of marriage, other phenomena which might be labeled as a "crisis to the African family" such as fewer traditional husband and wife families, higher non-marital births and high rates of divorce may also result from low sex ratios.

As seen in this sample, African male's value has been enhanced by their quantity as well as quality scarcity. Apparently, this may induce them to believe that they can be "choosier" in terms of mate selection, thereby putting pressure on women and on marriage rates. In the past, the problem of the shortage of men in the marriage market was being solved by polygamy, which modern women are now rejecting. Modern women refuse to "legally" share their men. The problem of the shortage of eligible men can be solved if single men improve their "quality" by becoming more educated.

3.3 Conclusion

This chapter has considered a broad set of issues surrounding the recent decline in marriages among African South African women. The focus has been on identifying the possible reasons for the recent marriage decline. We looked at the trends around relevant variables and made inferences on their likely association with marriage. Our focus was directed to education, labour force participation and availability of potential spouses.

We found compelling evidence of a shift towards high levels of education for women. According to the women's economic independence hypothesis, high levels of education for African women imply that they can now compete with their male counterparts for jobs and marriage will not be an economic necessity for them. Therefore, one would expect an association between education and marriage in such a way that high education attainment may result in non-marriage behaviour. What is striking, however, is that while we expect non-marriage behaviour to be prominent among women with high levels of education, we find that most women who are not getting married are the ones with only some secondary education or secondary qualification.

In South Africa, the demise of apartheid and more progressive legislation has resulted in the expansion of opportunities for women outside the family. In the labour market, women's labour force participation rates have risen. It is possible that changes in the labour market have changed what it means to be a young single woman. Increasing employment opportunities allow women to pursue roles other than those of wife and mother. This may result in increasing age at marriage as women opt for longer periods of independence from the burdens of child care and housework. Female labour force participation has concurrently increased with declining marriages. However, since this is a bivariate case, we can only talk about the correlation rather than the causation. Whether the direction of causation runs from an increase in female labour force participation to declining marriages or vice-versa is an issue that can best be addressed in a multivariate analysis context. This issue will be examined in detail in the next chapter.

A shortage of men and especially "quality" men is also found to be associated with

declining marriage rates. Sex ratios calculated from restricting the pool of men to employed and more educated men confirms that there are more educated and employed women than educated and employed men. This could mean that the pool of marriageable men may be reduced in a way that is unfavourable for women.

From the analysis in this chapter, it is clear that the determinants of women's marriage decision and the declining marriage rates cannot be extracted from mere bivariate analyses between marriage rates and a likely explanatory variable. In addition, many other factors aside from the traits we have explored in this section may determine the likelihood of marriage and help explain why African marriages have declined over the years. For example, beauty or intelligence may be some of the traits that may be important in the marriage market. Further, it may not be just one trait, but a combination of several traits that may be valuable in the marriage market. Unfortunately, some of these variables (beauty for instance) will not be observable in the analysis of the data. Nevertheless, a rigorous investigation of what determines the choice of marriage in a multivariate context is worth undertaking in order to get consistent and reliable explanations regarding why marriages have declined over the years. We tackle this subject in the next chapter, where marriage regressions will be estimated and a decomposition analysis will follow in order to reveal how much of the decline in marriage can be explained.

Figure 3-1: Mean Years of Education for African Women by Age in Years

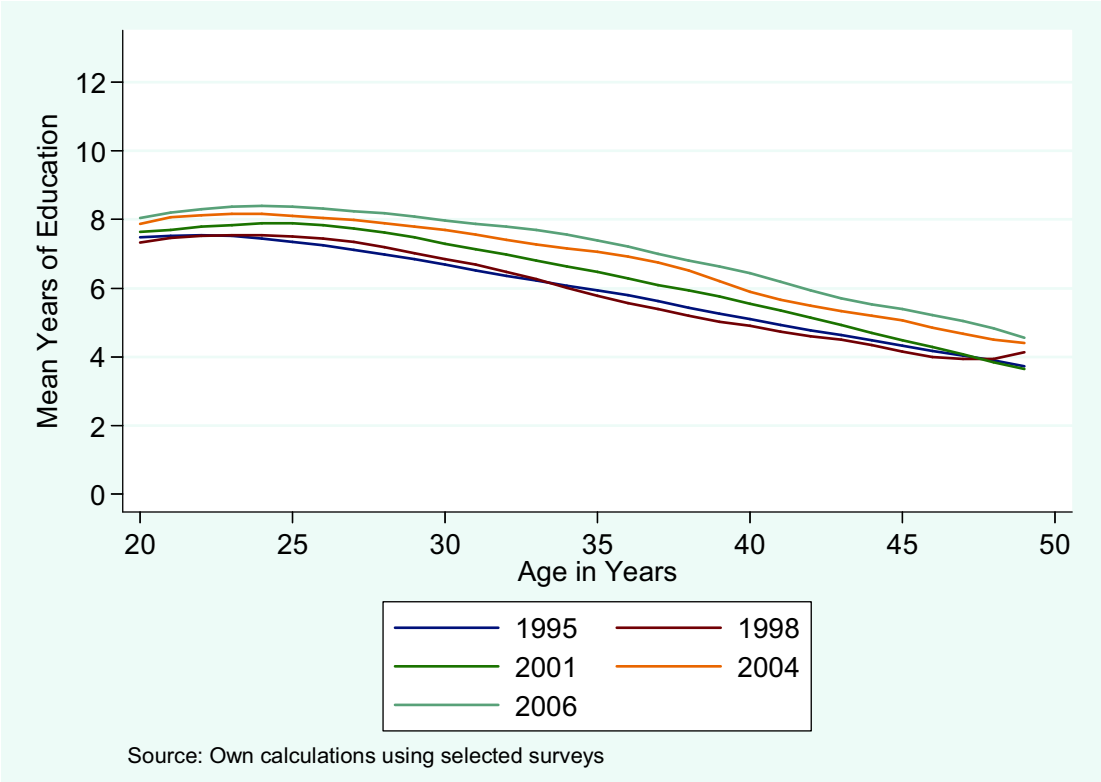


Table 3.1: Mean Years of Education of the African Population Group by Age Cohort (in Years) and Gender in 2006

Age Cohort	**Male**	**Female**
20-24	8.02 (2.25)	8.38 (2.09)
25-29	8.30 (2.56)	8.44 (2.35)
30-34	8.03 (2.78)	8.14 (2.72)
35-39	7.69 (3.17)	7.60 (3.11)
40-44	6.86 (3.31)	6.74 (3.17)
45-49	6.12 (3.30)	6.04 (3.23)

Source: Own calculations; Note: Standard errors in parentheses

Figure 3-2: Mean Years of Education for African Women by Marital Status and Year

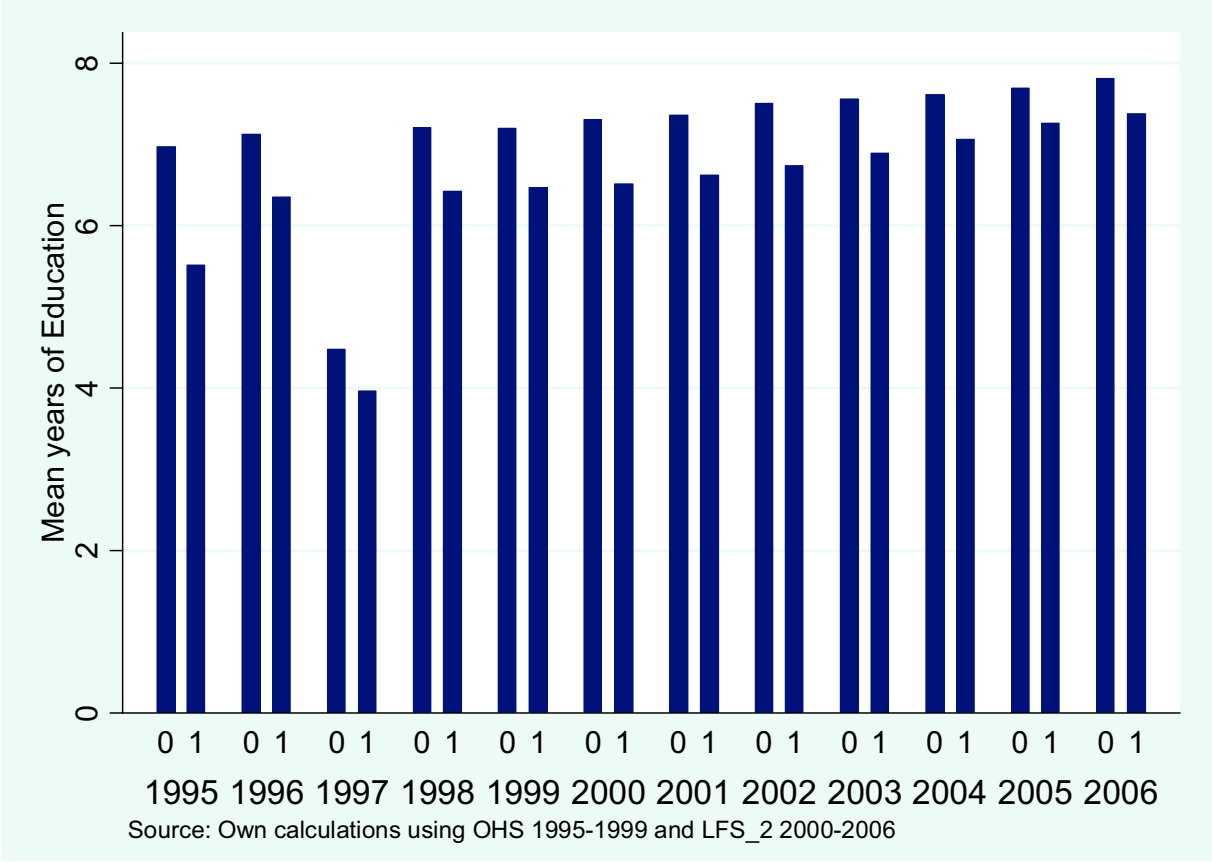


Table 3.2: Trends of Proportion Ever Married Women Disaggregated by Education Level

Education	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
No Schooling	.66	.7	.67	.67	.65	.68	.68	.68	.65	.7	.61	.62
	(.47)	(.46)	(.47)	(.47)	(.48)	(.46)	(.47)	(.47)	(.48)	(.46)	(.49)	(.48)
Incomplete Primary	.54	.51	.45	.53	.49	.51	.49	.53	.51	.54	.5	.52
	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)
Primary	.46	.46	.3	.44	.4	.42	.39	.41	.42	.44	.42	.41
	(.5)	(.5)	(.46)	(.5)	(.49)	(.49)	(.49)	(.49)	(.49)	(.5)	(.49)	(.49)
Incomplete Secondary	.3	.33	.29	.31	.3	.31	.28	.28	.29	.31	.3	.3
	(.46)	(.47)	(.46)	(.46)	(.46)	(.46)	(.45)	(.45)	(.45)	(.46)	(.46)	(.46)
Secondary	.3	.31	.28	.28	.29	.29	.28	.3	.31	.35	.33	.32
	(.46)	(.46)	(.45)	(.45)	(.45)	(.46)	(.45)	(.46)	(.46)	(.48)	(.47)	(.47)
Diploma	.49	.51	.47	.53	.49	.49	.43	.44	.44)	.52	.49	.49
	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.49)	(.5)	(.5)	(.5)	(.5)	.5)
Degree	.48	.65	.59	.58	.54	.45	.54	.53	.55	.59	.64	.71
	(.5)	(.48)	(.49)	(.49)	(.5)	(.5)	(.5)	(.5)	(.5)	(.49)	.48	.45)

Source: Own calculations; Note: Standard errors in parentheses

Figure 3-3: Distribution of Never Married African Women in the Labour Force by Year

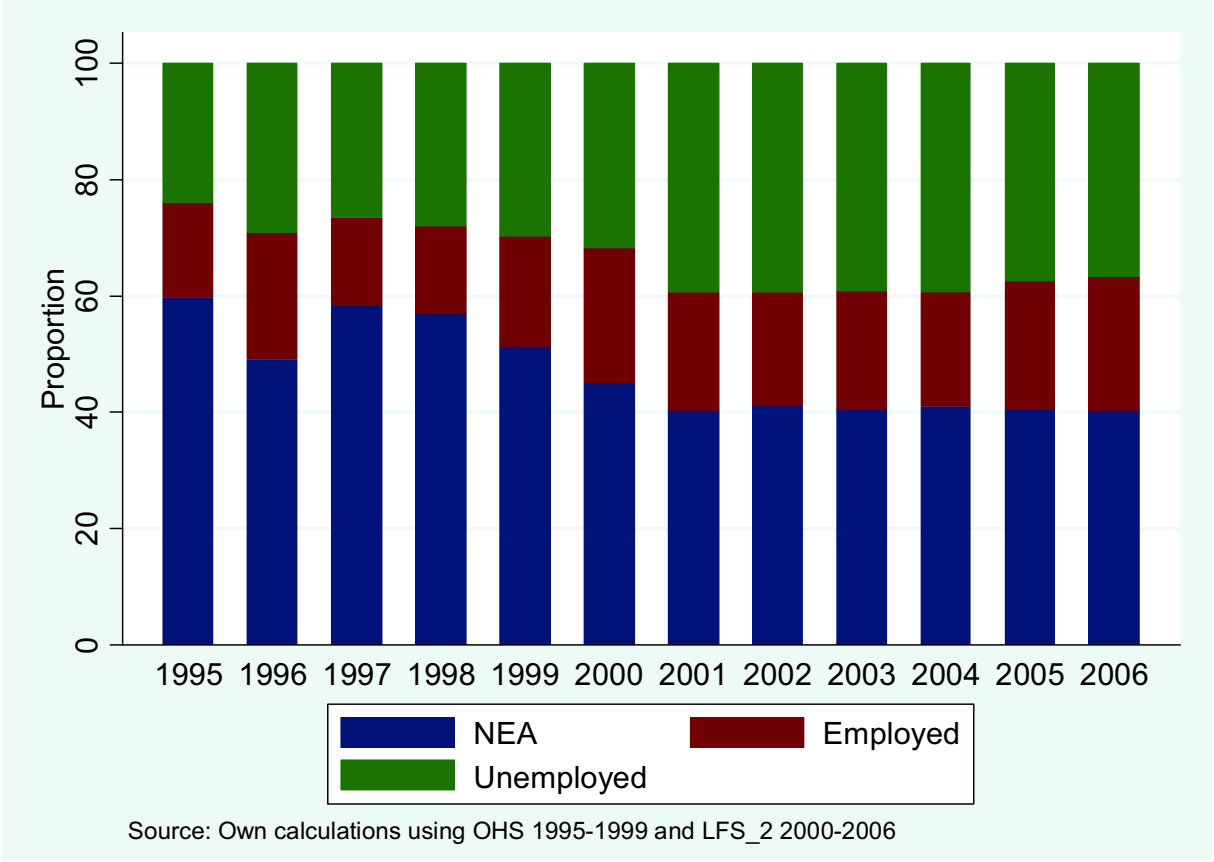


Figure 3-4: Sex Ratios (Quantity Measure)

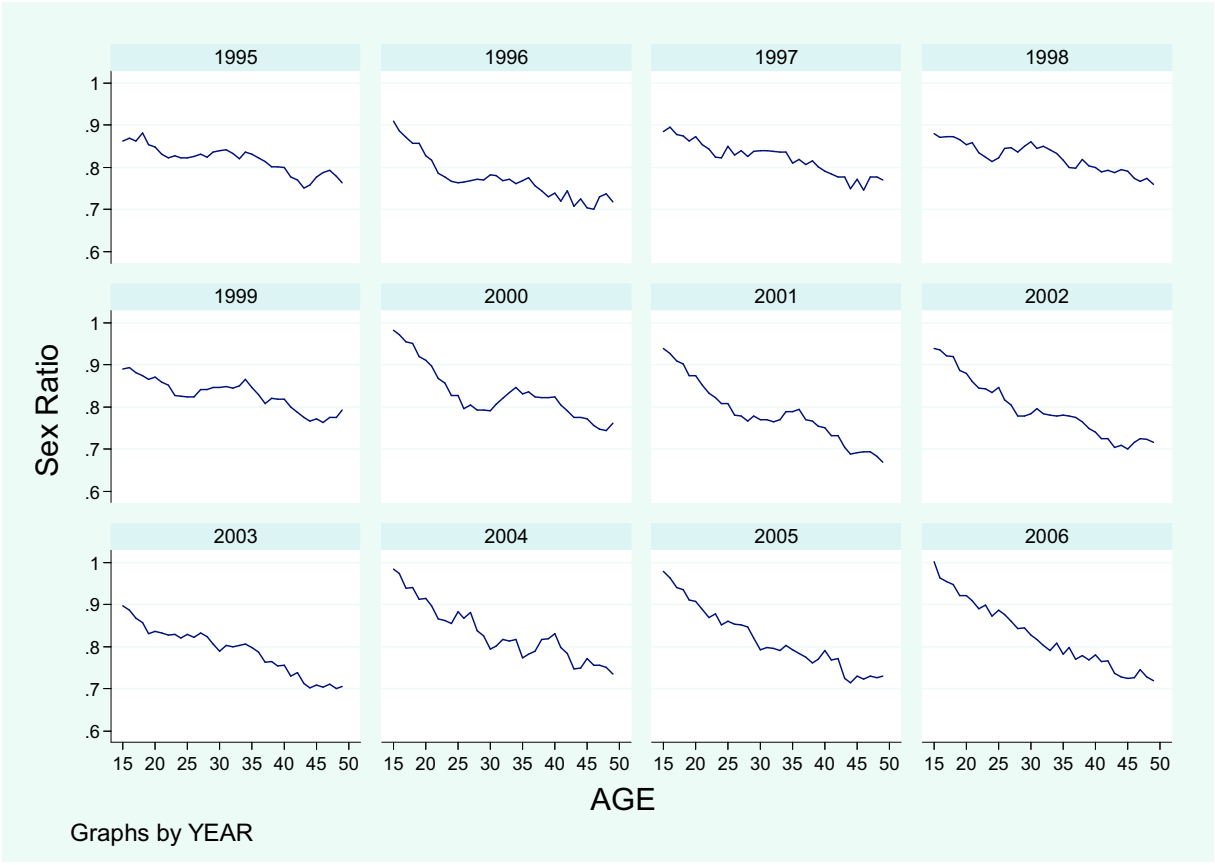


Figure 3-5: Mean Years of Education for African Men by Marital Status and Year

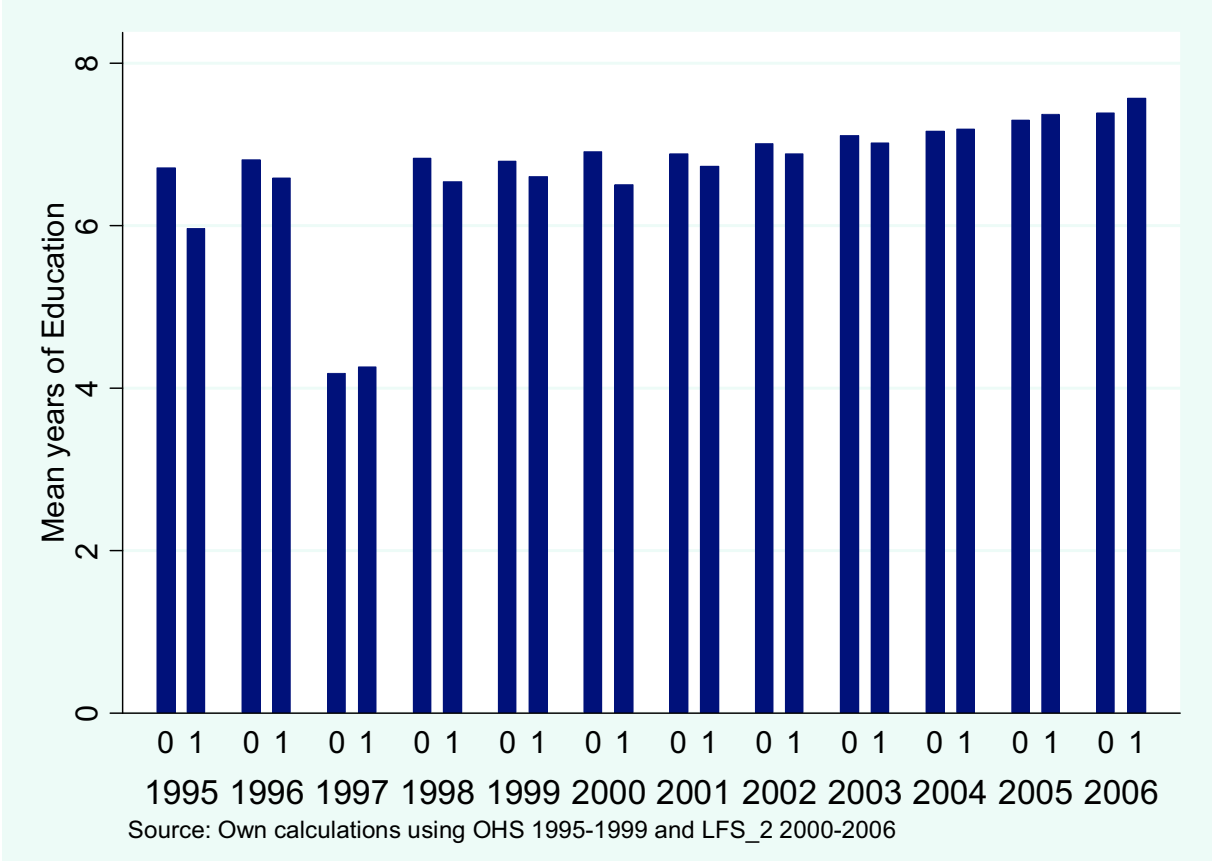


Table 3.3: Trends of Proportion Ever Married Men Disaggregated by Education Level

Education	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
No Schooling	.56	.59	.52	.56	.55	.5	.48	.5	.5	.5	.47	.45
	(.5)	(.49)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)
Incomplete Primary	.4	.37	.34	.39	.36	.36	.34	.35	.35	.36	.36	.35
	(.49)	(.48)	(.47)	(.49)	(.48)	(.48)	(.47)	(.48)	(.48)	(.48)	(.48)	(.48)
Primary	.35	.34	.22	.32	.3	.32	.28	.3	.31	.3	.3	.24
	(.48)	(.48)	(.41)	(.47)	(.46)	(.47)	(.45)	(.46)	(.46)	(.46)	(.46)	(.43)
Incomplete Secondary	.27	.27	.26	.28	.27	.25	.22	.22	.23	.23	.23	.23
	(.44)	(.44)	(.44)	(.45)	(.44)	(.43)	(.42)	(.42)	(.42)	(.42)	(.42)	(.42)
Secondary	.3	.3	.28	.28	.29	.26	.26	.27	.28	.32	.31	.32
	(.46)	(.46)	(.45)	(.45)	(.45)	(.44)	(.44)	(.45)	(.45)	(.47)	(.46)	(.47)
Diploma	.52	.54	.49	.52	.47	.43	.48	.45	.49	.53	.53	.51
	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)	(.5)
Degree	.55	.66	.62	.65	.59	.54	.57	.59	.63	.65	.62	.61
	(.5)	(.47)	(.49)	(.48)	(.49)	(.5)	(.5)	(.49)	(.48)	(.48)	(.49)	(.49)

Source: Own calculations; Note: Standard errors in parentheses

Figure 3-6: Distribution of Ever Married African Women in the Labour Force by Year

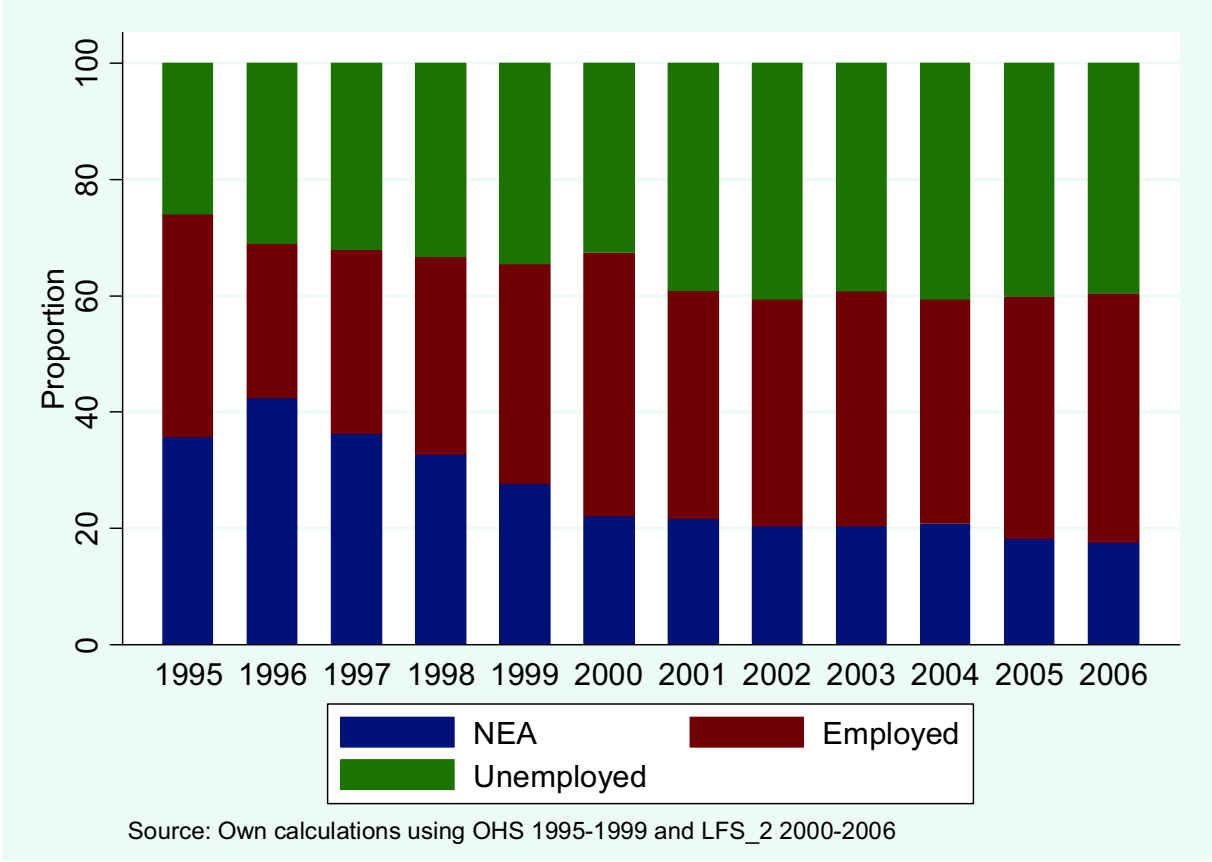


Figure 3-7: Distribution of Ever Married African Men in the Labour Force by Year

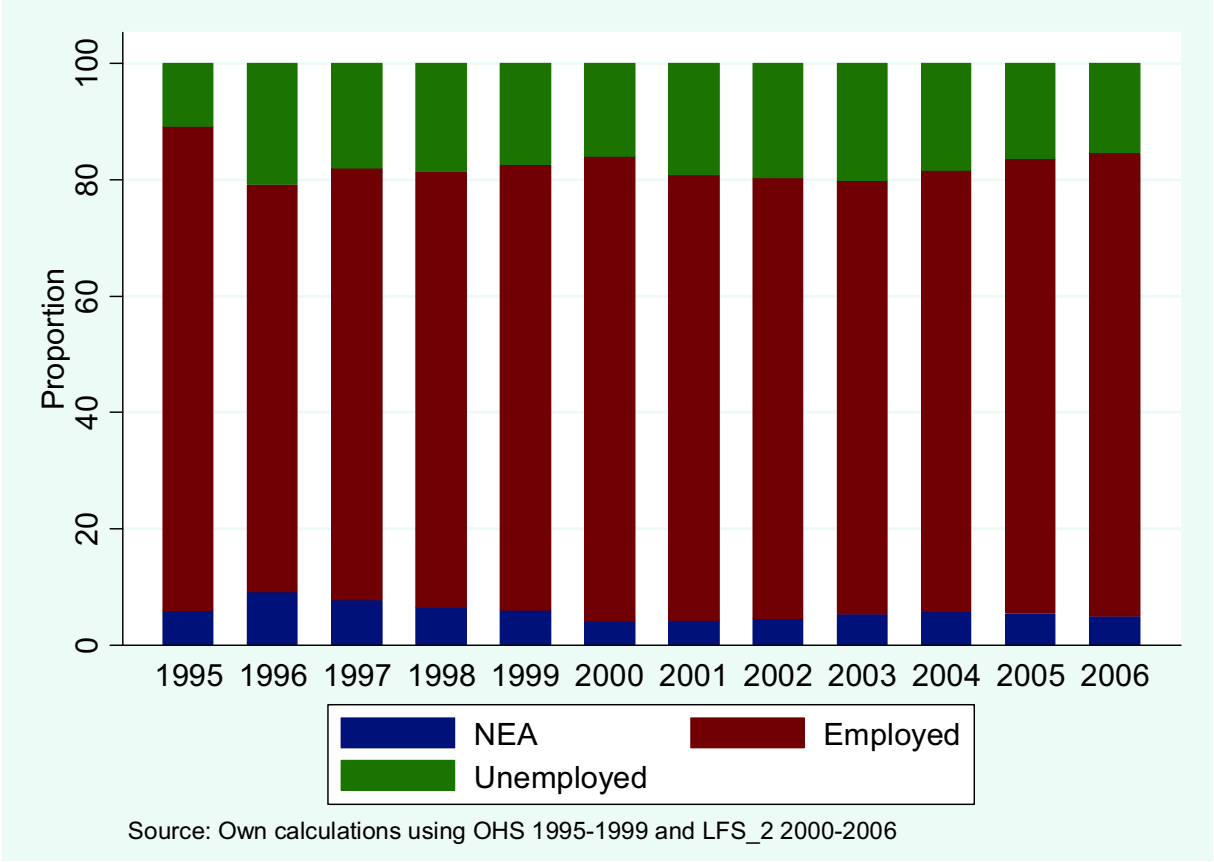


Figure 3-8: Distribution of Never Married African Men in the Labour Force by Year

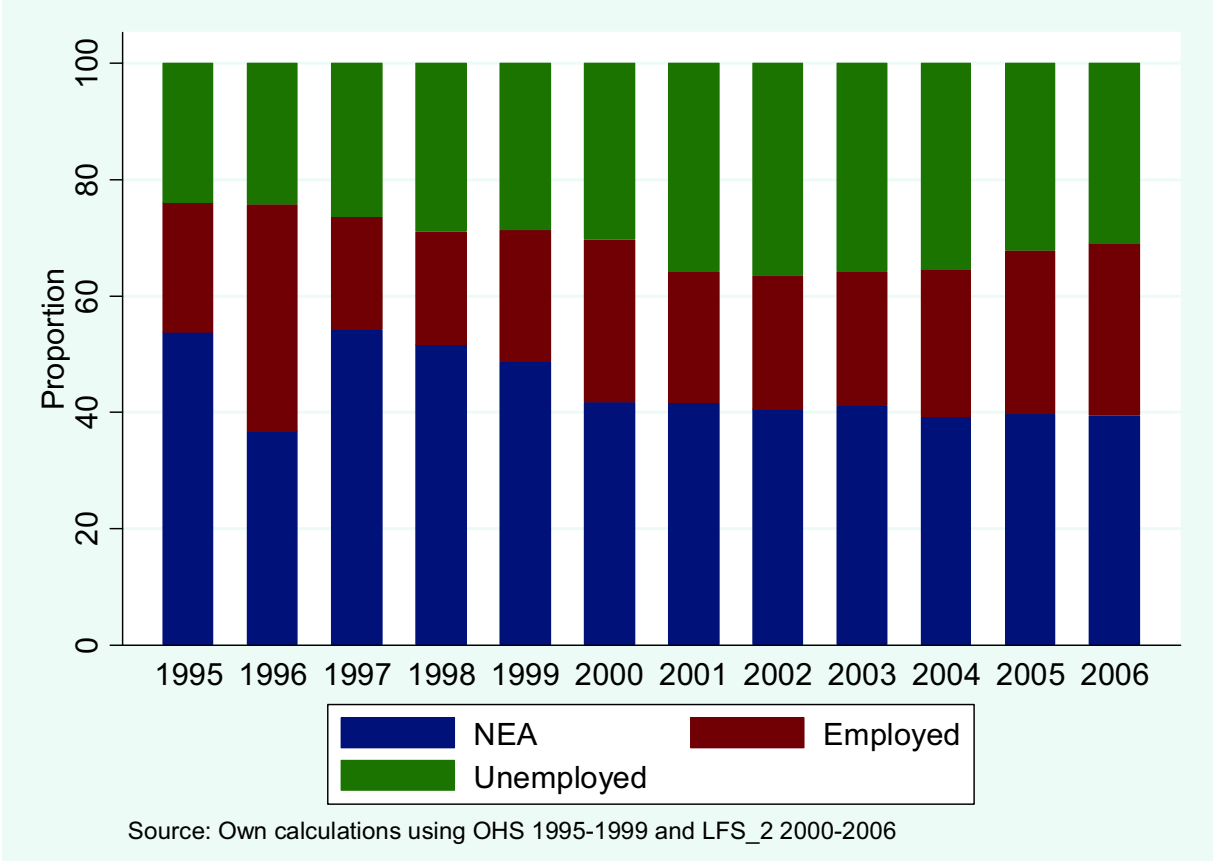


Figure 3-9: Sex Ratio Measured by Men's Employment Status

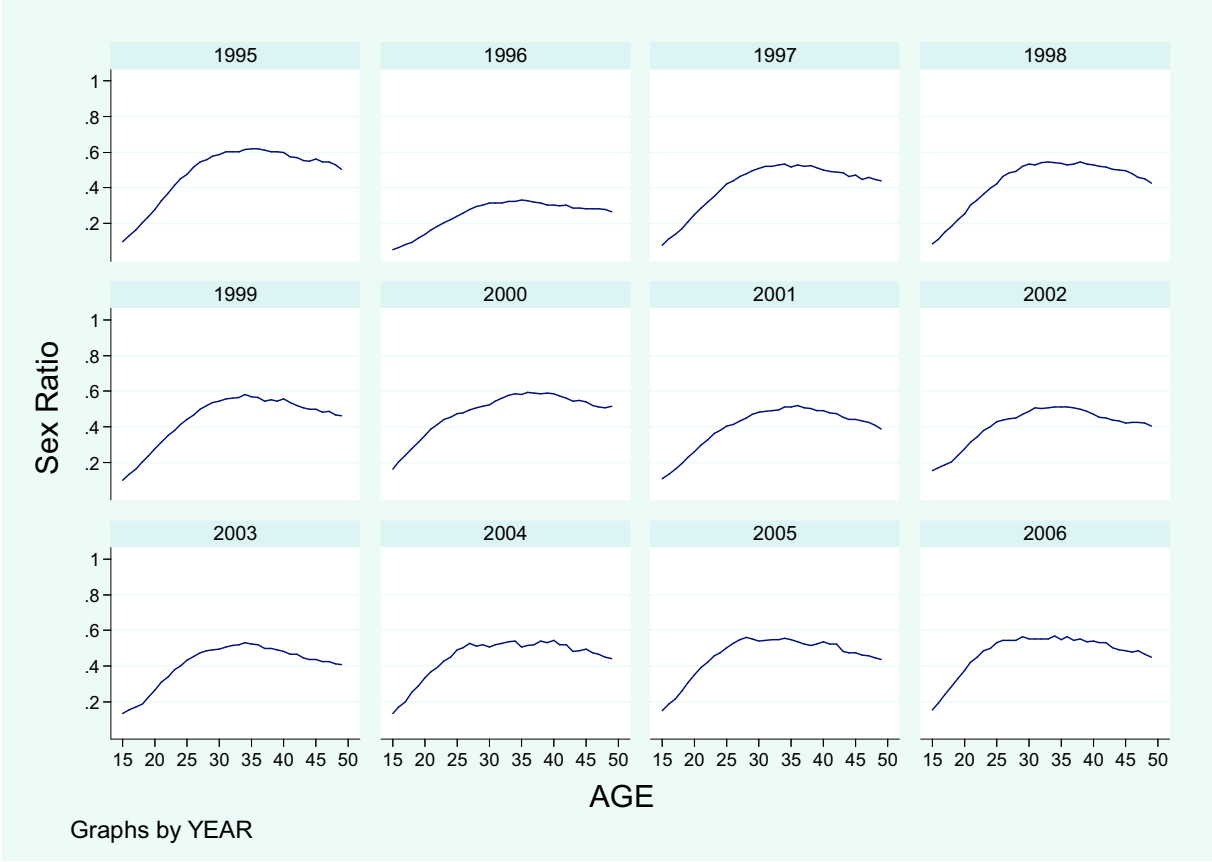
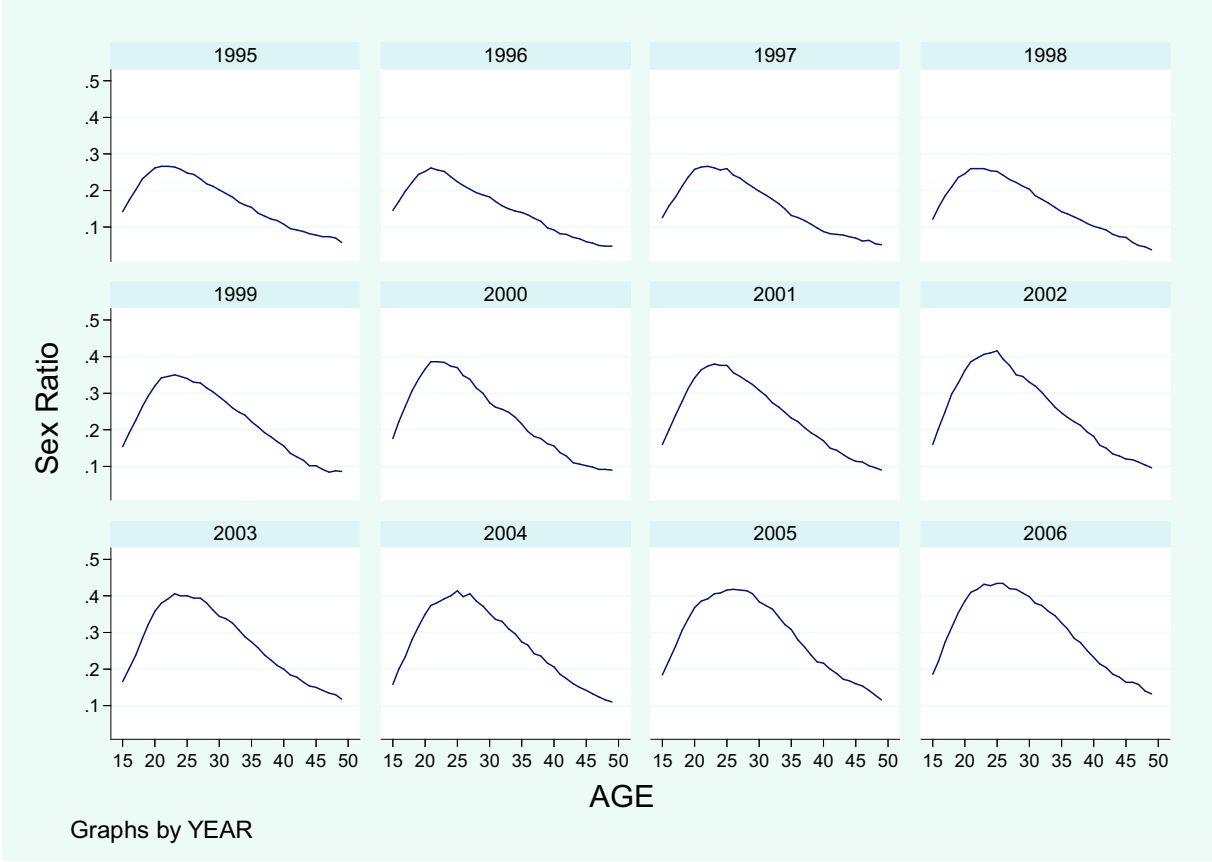


Figure 3-10: Sex Ratios Measured by Men's Education Attainment



Chapter 4

Determinants of Women's Marriage Decisions

4.1 Introduction

Marriage rates in South Africa have been declining for some time. In the United States of America and other developed countries, similar patterns are not a new phenomenon. For example, lower marriage rates for black Americans compared to their white counterparts are well documented and extensively studied (for example Espenshade, 1985; Mare and Winship, 1991). However, there is still a gap in the literature regarding what determines the marriage decision.

As reviewed in the previous chapters, in South Africa, most studies interested in declining marriage have focused more on the decline itself, and hence, have only generated marriage patterns[1]. This chapter fills this in the South African marriage literature and puts emphasis on the determinants of marital behaviour. Moreover, South Africa is potentially a rich source of data on declining marriages in developing countries, yet this country has not been included in international comparative studies of marriages and family formation.

Van de Walle (1993), Lesthaeghe and Jolly (1995) and Harwood-Lejeune (2001) show evidence of exceptional marriage patterns in South Africa, relative to other countries in

[1]For example, Hosegood, McGrath, and Moultrie (2009) studied marriage patterns in rural KwaZulu-Natal, South Africa from 2000-2006.

the sub-Saharan African region[2]. Being one of the few countries in the developing world characterised by declining marriage rate, South Africa provides a unique case study for evaluating declining marriage rates for this group of countries.

More than a decade after the abolition of apartheid in 1994, improved labour market policies have led to a change in several patterns, including that of marriages and labour force participation. Marriages have declined, while labour force participation has increased, especially for African women. Opportunities in the labour market resulting from change in the political environment may affect the decisions that women make regarding market work and homework. One possible reason for this affecting marriage choices is the fact that marriage demands much of a woman's time in the home. Nevertheless, we can not make a causal statement as far as female labour force participation and marriage decisions are concerned, because causality can go either way. In other words, labour force participation can affect marriage, and at the same time, be affected by it. In this chapter, we address the question "what determines women's marriage decisions?", with emphasis on the effect of female labour force participation.

Most of the previous empirical studies on the interaction between labour force participation and marriage decisions have ignored the joint determination characteristic of these two decisions. Those studies which have taken this element into account have focused on the impact of the endogenous marriage decision on the labour force participation decision (for example Van der Klaauw, 1996; Lee, 2005). Some of these studies have ignored the joint determination problem by considering only married women (for example Mincer, 1962; Mroz, 1987). Other studies have treated marriage as an exogenous dummy variable or ignored it altogether. However, assuming completed choices may result in a sample selection bias.

Our interest in the current research runs in the other direction, the impact of endogenous

[2]They show that by the 1980s, marriage patterns were already exceptional in South Africa, relative to other countries in sub-Saharan Africa. The mean age at marriage for women was one of the highest in the region, at 23.3 years of age and marriages were far from universal.

participation on the marriage decision. While the impact of labour force participation decisions on marriage outcomes is expected for women, we have not come across any studies that have examined the nature and magnitude of this relationship. It is important to mention that schooling may also be jointly determined with marriage, as with labour force participation (for example Boulier and Rosenzweig, 1984; Sander, 1992; Goldin, 1995; Gould, 2003)[3]. For simplicity, we ignore the potential endogeneity of schooling in this study but we recommend accounting for this problem in future research.

Empirical investigation of the interrelationship between female marriage and labour force participation decisions raises one main difficulty. The probable endogeneity of the labour force participation decision in the marriage equation (and vice versa) has to be accounted for. This suggests that estimating a standard univariate probit model may be inappropriate since it may give biased estimates. The presence of an endogenous variable calls for simultaneous equation modelling, which complicates the analysis. For example, an instrumentation approach is required and finding a good instrument is an empirical challenge.

To capture interdependence between labour force participation and marriage, we undertake a two-step estimation procedure. In the first step, we estimate a labour force participation model, and in the second step, a marriage model is estimated with the predicted values of labour force participation generated in the first step included as one of the explanatory variables. The procedure is estimated using three sets of models, namely, a probit model, a linear probability model and a standard bivariate model. These models will be discussed in detail in the methodology section.

To understand what determines women's marriage decisions, we present the estimates for each of the cross-sections. The estimates are similar for most of the cross-sections from 1995 to 2006. We therefore focus only on one cross-section, the 1998 October Household Survey, to discuss the estimates in detail. The analysis generally produces expected results. The

[3]Sander (1992) proved the endogeneity of schooling for white men in the United States using a Hausman test.

estimation results confirm that labour force participation has a negative effect on women's decision to marry, as predicted by economic theory. This suggests that the probability of marriage for women who are in the labour force is lowered, compared to that of women who are out of the labour force. Other control variables are also considered. For example, age is found to have a positive effect on the likelihood of marriage. The older a woman is, the more likely it is that she will be married. Education, which is captured in categories of dummy variables, is also generally found to have a negative effect on the likelihood of marriage. The results indicate that having at least some secondary education generally reduces the likelihood of marriage. Also, availability of mates, which is proxied by the sex ratio, positively and significantly increases the likelihood of marriage, as predicted by economic theory.

The rest of the chapter progresses as follows. In section 4.2, we review both the theoretical framework and the empirical literature on marriage. In section 4.3, we outline the empirical strategy for jointly modelling labour force participation and marriage decisions. We use a female sample in the marriageable age group of 20-49 years using datasets from the nationally representative surveys from 1995 to 2006. Data is also discussed in section 4.3. Econometric estimates are presented in section 4.4 along with a discussion of the results and finally, section 4.5 concludes the chapter.

4.2 Literature Review

4.2.1 Theoretical Framework

Becker's (1973) theory of marriage is a pioneering work in the economics of marriage, providing a framework for analyzing marriage behaviour using the principles of economics. Becker bases his theory on the theory of preferences and the concept of utility maximization. In principle, marriage is perceived as a manifestation of utility maximizing behaviour of rational agents. Equivalent to utility are gains from marriage, which form the heart of the theory. An individual's decision to marry or remain single is synonymous with a constrained

utility maximization problem, with gains from marriage as the objective bounded by budget and time constraints. Thus, a marriage between two people would occur if, for both partners, the gains from marriage exceed the gains from being single. Becker assumes that utility from marriage depends not only on the consumption of the goods and services purchased in the market place, but also on the consumption of the commodities produced within and/or by the household. Husbands are typically expected to be breadwinners and produce the former, and wives are more often homemakers, specializing in the latter. In other words, Becker's economic theory is based on the notion of production complementarities. This is typically understood as specialization of labour within the household, believed to make couples more efficient than singles.

According to Becker (1973), the list of household-produced commodities include the quality of meals, quality and quantity of children, prestige, recreation, companionship, love and health status. For simplicity, Lam (1988) asserts that market-purchased and household-produced commodities are aggregated into a single composite good, Z. Each household, single or not, has a production function to produce Z, whose inputs are market goods and services and own time of different household members. Becker (1973) formalises these ideas as follows. The production function is given as:

$$Z = \phi\left(x_i, t_j, E\right)$$

where x_i represents various goods and services, t_j is household member's time inputs, and E are environmental factors.

Therefore, in Becker's (1973) language, if M and F represent two individuals who must decide whether to marry each other or remain single, then Z_{m0} and Z_{0f} represent the maximum outputs of a single M and a single F respectively. Analogously, M_{mf} and F_{mf} respectively represent a married man's output and a married woman's output and the production function of M_{mf} and F_{mf} is similar to that of Z above. Therefore, focusing on F, she will decide to marry if her output from marrying M is at least as much as her single state output (analogously, the output of M from marrying F should be at least as much as

his single state output).

Let us assume that the married woman's output and the single woman's output are respectively determined by:

$$F_{mf} = x_{mf}\beta + \mu_1$$

$$Z_{0f} = x_{0f}\delta + \mu_2$$

where x_{mf} and x_{0f} are subsets of x_i and t_j. They respectively represent vectors of factors required for the married woman's and the single woman's outputs. μ_1 and μ_2 are error terms, each of which is assumed to be normally distributed with zero mean and unit variance.

Following ideas from Lee, Jang, and Sarkar (2008)[4], experiencing marriage is identified with output of the marriage and a woman will marry if this output is at least as much as the amount she can produce if she is unmarried. A woman's decision to marry is therefore determined by x_i and a necessary condition for F to marry M can be rewritten as:

$$x_{mf}\beta - x_{0f}\delta > \mu_2 - \mu_1 \tag{4.1}$$

If we define $\upsilon = \mu_1 - \mu_2$, also assumed to be normally distributed with zero mean and constant variance, σ_1, then inequality (4.1) can be rewritten as:

$$\frac{x_{mf}\beta - x_{0f}\delta}{\sigma_1} > \frac{-\upsilon}{\sigma_1}$$

The probability of marriage is given by $P = 1 - \Phi\left(\frac{-\left(x_{mf}\beta - x_{0f}\delta\right)}{\sigma_1}\right)$ where Φ is a cumulative distribution function. A probit estimation method is used if $\frac{\left(x_{mf}\beta - x_{0f}\delta\right)}{\sigma_1}$ is assumed to follow a normal distribution.

The vector of the determinants of the marriage decision contains labour force participation, and as alluded to in the previous paragraphs, labour force participation is likely to be endogenous. Economic thinking claims that the decision to participate in the labour force should be analyzed in the context of the family (for example Mincer, 1962). Given

[4]They modelled the effect of endogenous marriage on female labour force participation.

the interrelationship between these two decisions, it is implied that the decision to marry should be analyzed in the context of an individual's labour market status.

Other determinants of the gains from marriage include physical capital, age, race, height, beauty, intelligence, personal chemistry and attitude towards marriage. Ideally, an increase in the value of the potential spouse's and own traits would generally increase the gains from marriage, and hence, increase the desirability of marriage.

Another factor affecting the probability of marriage is availability of partners. Wilson (1987) argues that marriage behaviour is highly likely to be affected by availability of men, in particular, good quality men. Availability of men gives an indication of performance of the marriage market. In practice, the sex ratio is used as a proxy for the supply of partners. A sex ratio which is greater than one, for instance, means that there are more men than there are women, and vice-versa for a sex ratio which is less than one. A shortage of men implies that a number of women would not have husbands, especially in monogamous societies, resulting in fewer marriages.

With limited information on the marriage market, individuals engage in a costly[5] search process to find a suitable marriage partner. The concept of searching for a potential spouse in the marriage market is analogous to that of searching for a job in the labour market (for example Lichter, McLaughlin, Kephart, and Landry, 1992; Wood, 1995; Brien and Sheran, 2003). Like in the labour market, where the employer will look for a potential employee with a minimum set of qualifications, each individual looking for a potential spouse to marry will have a minimum set of acceptable characteristics, below which, a match will not occur. In that case, a marriage proposal will not be accepted (Lichter, McLaughlin, Kephart, and Landry, 1992). Some of these characteristics include economic attractiveness, age, race, height, beauty, intelligence, personal chemistry and attitude towards marriage. Essentially, a large supply of suitable potential spouses will reduce the cost of search for a marriage partner and increase the potential benefits from marriage. Therefore, like a typical market, the marriage market will not clear if demand and supply of potential partners do

[5]Emotional rather than monetary.

not equilibrate.

The theoretical prediction is that locations where there is a greater availability of unmarried men, especially men with high levels of education or good jobs, should have more marriages for women. On the other hand, relative scarcity of men means women would have fewer men to choose from and more women to compete with for a potential spouse. Others have related the notion of the sex ratio to bargaining power within the household (for example Grossbard-Shechtman, 1993; Angrist, 2002; Chiappori, Fortin, and Lacroix, 2002). Ideally, women would have more bargaining power if they attain a larger share of the marriage market. In other words, they would play a more influential role in the decision making processes regarding how resources are allocated within the household[6].

Evidence in the literature supports the hypothesis that sex ratios influence the decision to enter into marriage. In considering the marriage market, issues of how to calculate the sex ratio should be considered. This involves going beyond the numeric supply of potential partners (Oppenheimer, 1988; Becker, 1991). Considerations of power relations between the two gender's (Guttentag and Secord, 1983), marriageability/quality (Wilson, 1987; Wilson and Neckerman, 1986), demography (for example age of marriageable partner) and geographical boundaries where meetings with potential partners are likely to occur are highlighted. Nevertheless, identical behaviour is predicted under similar conditions, regardless of how the sex ratio is defined. Wilson's (1987) argument that a shortage of marriageable men results in fewer marriages has spurred fruitful research into changing marriage patterns and has mostly been applied to declining marriage rates among African Americans. This argument has found ample empirical support (for example Brien, 1997; McLaughlin and Lichter, 1997; Angrist, 2002; Wood, 1995; Gustafsson and Worku, 2006;

[6]For example, Porter (2007) demonstrates that children whose mothers were born when the Chinese government enacted the one-child policy in 1979 that resulted in what Sen (1990) calls "missing women" benefited significantly. These children's health measures are believed to have significantly improved due to higher marriage market ratios. The explanation is that their mothers had more say in the allocation of household resources, and invested more of the resources in children than their fathers would have done, due to maternal altruism.

Posel and Casale, 2009) as evidenced in the empirical literature review below.

4.2.2 Empirical Literature Review

A considerable amount of research has attempted to analyze the determinants of marriage or union formation. The literature summarizes the key influences on family formation into four broad categories namely, demographic, economic, socio-cultural, and psychological influences. The specific demographic influences include non-marital childbearing and the (un)availability of men (for example Kiecolt and Fossett, 1995; Sampson, 1995; Angrist, 2002). Women's economic independence and men's economic status fall under economic influence (for example Testa and Krogh, 1995). Gender role expectations and the meaning of marriage are viewed as socio-cultural influences and finally, psychological influences constitutes issues like interaction processes and attitude towards marriage (for example Tucker and Mitchell-Kernan, 1995).

The literature on the topic is enriched by examinations of the effect of sex ratios on marriage decisions. The empirical results are broadly consistent with views which postulate that higher sex ratios increase the likelihood of marriage.

McLaughlin and Lichter (1997) base their argument on the grounds that marriage provides one route out of poverty[7]. They use data from the US National Longitudinal Survey of Youth to examine first marriage transitions for poor young women while controlling for differences in economic independence, mate availability, family culture and living arrangements. They found that lower mate availability in a local area depressed the probability of marriage among poor women but had no influence on the probability of marriage among women who are not poor.

Angrist (2002) used data from the US 1910 and 1940 Censuses to study the effects of sex ratios on the incidence and quality of marriage. He used variation in immigrant flows as a natural experiment to study the effect of sex ratios on the marriage prospects of children and grandchildren of immigrants. His empirical results suggest that high sex ratios had a large

[7]This would be the case only if marriage is not perfectly positively assorted on income.

positive effect on the likelihood of female marriage. Angrist suggests that the implication of his finding is that female children born to parents in a high sex ratio environment were better off in the marriage market.

Brien (1997) studied the role of the marriage market in the timing of first marriage among African-Americans and whites using longitudinal data. He used five definitions of marriageable men: 1) all men; 2) all employed men; 3) all men who were employed, in school or short-term unemployed; 4) all men who were full-time employed; and 5) all men with earnings above a certain amount. He used the 5 percent sample of the US Census 1980 data to construct the sex ratios and he distinguished different levels of geography (county, SMSA, state) for all the sex ratios; his definition of marriageable men coincided with that of Wood (1995)[8]. He concluded that residing in a state that had a favourable marriage market shortened the waiting time to marriage. Using more sophisticated measures of mate availability[9], Lichter, LeClere, and McLaughlin (1991) have also found similar results.

In South Africa, Gustafsson and Worku (2006) studied the effects of local marriage markets on the marital decisions of women with at least one child. Their study was motivated by the low proportion of African mothers who were married, which was only up to 48 percent in Census 2001. Using the Census 2001 dataset, they test the hypothesis that a low sex ratio results in less attractive marital outcomes for women. They use the following measures for marriageable men: 1) all men 2) the number of employed men; 2) the number of men with completed education higher than grade 12 (standard 10); 4) the number of men with an income greater than R800[10] per month. They estimate an ordered probit model with different marital types ranked from less desirable (never married) to more attractive

[8]Wood (1995) identified the causal effect of economic prospects on marriage rates and found that only about 4 percent of the decline in the marriage rates of black American females could be explained by the drop in the number of black Americans men with good economic prospects.

[9]They consider the economic attractiveness of prospective male partners by including the unemployment rate and mean earnings of full-time, full-year male workers.

[10]About US$100 in 2010 prices.

(married civil). The estimation results support the hypothesis that a low sex ratio reduces the likelihood of marriage. The results are robust, regardless of whether the quantity or quality measure of marriageable men is used.

More recently, Posel and Casale (2009) examined the relationship between alternative definitions of sex ratios and marriage outcomes among African and white women in South Africa. Using matched data from the 2001 Population Census and the South African Labour Force Surveys, they find that both the quantity and quality of unmarried men relative to women in local marriage markets are significant predictors of African marriages. They however find that economic-based measures of marriageability perform better than simple sex ratios in explaining marriage outcomes for the African population group.

With regard to the effect of female labour force participation on marriage, the literature remains sparse. The economic variables that have mostly been studied in the literature include women's employment, hours of work and earnings. The research findings on the effect of women's employment on marriage have been varied. While some find negative effects of women's employment on marriage (for example Schultz, 1992; Lloyd and South, 1996; Cready, Fossett, and Kiecolt, 1997; Blau, Kahn, and Waldfogel, 2000) others have found positive effects (for example Olsen and Farkas, 1990; South, 1991; Raley, 1996; McLaughlin and Lichter, 1997; Sweeney, 2002), and still others found no effects (for example Manning and Smock, 1995).

4.3 Methodology

The conceptualization in the previous chapters cannot fully explain the marital behaviour that characterizes African women in South Africa. Here, in order to take into account the fact that marriage and labour force participation decisions are potentially endogenous, we use a two-step estimation procedure.

4.3.1 Model Specification

The Simultaneous Equation Probit Model

Based on the theoretical framework above, a baseline probit model is specified as:

$$m^* = \mathbf{x}\boldsymbol{\gamma} + \upsilon \tag{4.2}$$

where $\mathbf{x}$ denotes a $(1 \times K)$ vector of observable characteristics explaining the marriage decision, $\boldsymbol{\gamma}$ denotes a $(K \times 1)$ vector of estimable parameters, and m^* denotes the unobserved gains from marriage. m^* is equal to the difference between the gains from marriage, F and the gains from being single, Z in the theoretical framework above. We let the indicator variable m be the self-reported marital status measured in the form of a dichotomous variable with two possible values $\{0, 1\}$. m takes the value of 1 if the latent m^* is positive (indicating that she has ever married to include the married, cohabiters, the widowed and the divorced[11]), and 0 otherwise. $\upsilon \sim N(0, 1)$ is a normally distributed stochastic component with zero mean and unit variance. The binary marital status choice problem is determined according to:

$$\left.\begin{array}{r} m = 1 \text{ if } m^* > 0 \text{ (experience marriage)} \\ m = 0 \text{ Otherwise (remain single)} \end{array}\right\} \tag{4.3}$$

If we denote P as the probability that $m = 1$ and $(1 - P)$ is the probability that $m = 0$, then $E[m] = P = \Phi(\mathbf{x}\boldsymbol{\beta})$, where $E[.]$ is the expectation operator and $\Phi(.)$ represents the standard normal cumulative density function (CDF) of the error term υ. In this case, the coefficients of the binary choice equation can be estimated in a maximum likelihood

[11]Strictly speaking, a rational individual cannot choose to be widowed. However, if an individual is widowed, it follows that they chose to be married at some point. Similar arguments can be made for the divorced. Accordingly, we assume that every person who has ever married still has the qualities that made them choose marriage in the first place. We also consider cohabiters as being married, because they signal preference for marriage rather than remaining single by choosing to live with a partner, even though the union is not legal. This essentially means that they are deriving a higher utility from the "union" compared to the utility they derive in a single state.

framework by probit analysis, provided that the variance of υ is normalised to 1.

However, as alluded to in the previous paragraphs, one problem associated with estimating a probit model is that $\mathbf{x}$ contains labour force participation, which is potentially an endogenous variable. Ignoring this problem may result in biased estimates of the effect of labour force participation on marriage for young women. To address the endogeneity problem, we rewrite equation (4.2) to capture the following structural model:

$$m^* = \alpha_1 p^* + \beta_1 x_1 + \mathbf{z}\boldsymbol{\gamma}_1 + \upsilon_1 \tag{4.4}$$

$$p^* = \alpha_2 m^* + \beta_2 x_2 + \mathbf{z}\boldsymbol{\gamma}_2 + \upsilon_2 \tag{4.5}$$

Analogous to the marriage model, p^* denotes the net benefits of participating in the labour force, indicator variable p is self-reported labour market status measured in the form of a dichotomous variable with two possible values $\{0, 1\}$. $p = 0$ implies that the individual is out of the labour market and $p = 1$ is restricted to the economically active, including the employed, the self-employed and the unemployed. The binary labour force participation choice problem is determined according to:

$$\left.\begin{array}{r} p = 1 \text{ if } p^* > 0 \text{ (in the labour market)} \\ p = 0 \text{ Otherwise (out of the labour market)} \end{array}\right\} \tag{4.6}$$

x_1 is a variable that features only in the marriage equation and x_2 is a variable featuring only in the participation equation. $\mathbf{z}$ is a vector of explanatory variables common to both the marriage and participation equations. α_1 measures the effect of participation on marriage and α_2 measures the impact of marriage on labour force participation. υ_1 and υ_2 represent normally distributed random errors for the marriage and the participation equations respectively such that $(\upsilon_1, \upsilon_2) \sim N(0, 0, 1, 1, \rho)$.

Following Maddala (1983, pp. 246), the structural model can be estimated by a two-step maximum likelihood procedure. In the first step, we estimate a probit model for the labour force participation equation using the availability of women's jobs as the instrumental variable along with other exogenous variables. The fitted values of labour force participation

probabilities are then obtained. In the second step, we estimate a probit model for the marriage equation using the fitted labour force participation probabilities from the first step.

One major problem, however, is that the imputed unobservables applied in the second step are measured with error. An adjustment is necessary, otherwise this will give rescaled structural estimates if used directly as a regressor in the second step. Otherwise, we can just interpret the sign of the coefficients while ignoring the size. Also, for valid statistical inference, it is necessary to adjust the estimated asymptotic covariance matrix in this step to allow for the first-step estimation. The basic idea is that the two-step method fails to account for the fact that the unobservable regressors have been estimated in calculating second-step coefficients and standard errors. Therefore, a third step is necessary, where a correction in the covariance matrix is done. Maddala (1983, pp. 247) provides such a correction for our type of model.

The Simultaneous Equation Linear Probability Model

The simultaneous equation linear probability model is naturally an attractive option in the wake of the estimation difficulties of the simultaneous equation probit model (Heckman and Macurdy, 1985). The model has observed outcomes instead of unfathomable latent variables and can be written as follows:

$$m = \alpha_1 p + \mathbf{z}\boldsymbol{\gamma}_1 + \upsilon_1 \tag{4.7}$$

$$p = \alpha_2 m + \mathbf{z}\boldsymbol{\gamma}_2 + \upsilon_2 \tag{4.8}$$

Here, the expectations of the error terms are unlikely to be zero since m and p are likely endogenous. The latent variable formulation which corrects for the endogeneity problem is specified as in structural equations (4.4) and (4.5) above. Therefore, instead of estimating probit models for the structural model above in the first and second stages as in Maddala (1983), Heckman and Macurdy (1985) use a two-stage least squares (2SLS) estimation

procedure. Heckman and Macurdy's (1985) model is a categorical data analogue for the conventional linear simultaneous equation for continuous endogenous variables. The simultaneous equation LPM is capable of estimating unconditional relationships among jointly endogenous continuous random variables. Put differently, the linear simultaneous equation model is easy to interpret because it captures the effect of latent labour force participation on latent marriage (the effect of the propensity to work on the propensity to marry). In that case, the estimates are better than the ones generated from the naïve marriage probit model because the approach adequately accounts for the serially correlated unobserved variables that are causing the endogeneity problem. In addition, we are able to talk about the magnitude and the statistical significance of the effect of the variables, unlike Maddala's (1983) approach, where only the direction of the effect is shown.

4.3.2 Identifying the Coefficients and Investigating the Validity of the Instrumental Variable

Identification in this system is achieved by including at least one variable in the participation equation (marriage equation), not contained in the marriage equation (participation equation). Our exclusion restriction in the identification of the marriage equation is availability of local women's jobs[12].

In order to be considered a plausible instrumental variable, the women's jobs variable must not be directly related to marriage. However, the two variables should be related only through the impact of women's jobs on women's labour force participation, which in turn has an impact on women's marriage. The idea is that there is some sort of gender discrimination in jobs (for example Casale, 2003; Ntuli, 2007). This implies that gender discriminatory jobs would be demand driven. However, women's jobs need to be created irrespective of the marital status of a woman. This means, the jobs are not created with married or single women in mind. If for example an employer wants to establish a business

[12]Finding an instrument was perhaps the biggest challenge of this research project as we did not come across any related studies which already argued for "valid" instruments.

in a locality, they will not do so because there are women of a particular marital status in that locality, whom the employer expects to employ. If this is true, availability of women's jobs does not directly affect women's marriage decision. Availability of women's jobs affects marriage through women's labour force participation decision, making the instrument valid.

A local women's jobs variable is measured as a proportion of women jobs in a District Council. This variable is generated by first calculating the proportion of women in a particular occupation in the labour force. The occupation dominated by women (at least 50 percent being women where the 50 percent cut-off was arbitrarily chosen) was considered to be a woman's job. We coded such jobs with a one and collapsed all women's jobs by District Council. This gave the proportion of women's jobs in a district council. This variable indicates the extent of employment opportunities available to women in a particular locality. We chose to calculate women's jobs at a local level. The reason is that a woman's likelihood of participating in the labour market may depend on the availability of jobs in her locality. In addition, different local labour market conditions may have different consequences with regard to outcomes for individuals of that particular locality. Simply put, the effects of availability of women's jobs may [unusually] vary across areas.

A second condition for a valid instrument requires that the women's jobs variable be exogenous to the labour force participation equation. This condition means that the women's jobs variable is not correlated with the error term, but does help to explain female labour force participation decisions. We expect the women's jobs variable to positively impact on women's labour force participation decisions. Demonstrating this condition of a valid instrument is straightforward and requires estimating the reduced form labour force participation model. The performance of women's jobs in its capacity as an instrument is informed by results from specific models discussed in detail in section 4.4.

To identify the participation equation, we follow the literature by using the sex ratio (also at a District Council level) as an instrument. In that regard, the sex ratio needs to be significantly related to marriage. Empirical evidence to support this claim is adequately discussed in the empirical literature review section above. The expectation is that the

availability of potential spouses, which is proxied here by the sex ratio, should have a positive impact on marriage. In addition, we require the sex ratio to affect women's labour force participation only through its impact on marriage.

4.3.3 Data Description

In this chapter, we choose the OHS 1998 to understand the determinants of women's marriage decisions. Apart from the fact that the instrument worked better in the OHS 1998 we focus on it because its dataset gives predicted estimates. Notwithstanding, the other years are given fair attention in the discussion of results that follow. We define the married as everyone who has ever married (including the married, cohabiting, widowed and divorced). We restrict the estimable sample to African women in the age range 20 to 49 years. We also perform the analysis for a sub-sample of women aged 20 to 34 years. The survey from which the data is obtained is discussed in chapter 2.

The explanatory variables included in the regression estimation include individual level and regional characteristics. The choice of explanatory variables was largely guided by theory, past empirics and the availability of data.

A set of individual characteristics include age, education, labour market status, language and the location where one resides. Age is captured as cohort-level dummies in 5 year bands. Education and labour market status are also captured as dummies. Empirical evidence supports the hypothesis that education and labour market status may be important in a woman's marriage decision. For example, Lichter, McLaughlin, Kephart, and Landry (1992) and Oppenheimer (1994), using data from the National Longitudinal Survey of Youth in the USA, have shown that women with higher education, higher earnings, and better employment are more likely to marry than women with less education and lower earnings. However, these findings are contrary to the predictions of the women's economic independence hypothesis. The hypothesis suggests that as women's education and earnings increase or the gender differential of these narrows, women will be less reliant on marriage for financial support, resulting in a decrease in women's incentives to marry (McLaughlin

and Lichter, 1997).

Availability of bridewealth (or *ilobolo*) is expected to significantly influence marriage. However, information on bridewealth was not collected in either the OHS or the LFS. We therefore proxy the traditional bridewealth payment culture with language. The justification is that brideprice payment is widely practiced among African people. A traditional family would typically speak an ethnic language in the home. For that reason, including language as one of the explanatory variables may inform on the influence bridewealth may have on the marriage decision for African women. Language is captured as a 0/1 dummy for each of the languages.

Location characteristics are represented by a set of provincial dummies. We also include an urban/rural dummy, which takes the value of one if the woman resides in a rural area, and zero otherwise. In addition, we consider a variable capturing the availability of men. The supply of partners in a local marriage market is considered, and is proxied by the sex ratio at the district council (DC) level[13]. The District Council is assumed to be the geographical area where women would search for potential partners. We consider the province to be too broad to measure the local marriage market. The District Council is the third level of hierarchy from country to enumeration area in the census geography.

For the estimates to be comparable with those from other years, it is fundamental that the census geography from which the surveys are based should be comparable. In our case, the OHSs and LFSs were based on the 1996 and 2001 Censuses, respectively. In this case, the

[13]South Africa is divided into 9 provinces in both the 1996 and 2001 Census geography. Below the provinces are 53 district councils which were further divided into 365 and 231 local municipalities in the 1996 and 2001 Censuses, respectively. Main place is level five in the geographical hierarchy and there are 2,674 of these in the 2001 Census. 15,966 unique sub-places follow in the sixth level. Enumeration Areas (EAs) are at the lowest level of hierarchy in the census geography frame. These have been created by Stats SA as units of manageable size which enumerators visit during a census to interview members of households. There were approximately 94,000 EAs in Census 1996 and 80,787 EAs were demarcated for Census 2001 (StatsSA, 1998; StatsSA, 2003).

DCs may not be comparable because the census geography changed between the censuses. We reconcile this problem by re-allocating data from the OHSs and LFSs according to a common set of boundaries. This is achieved through the centroid location of enumeration areas (point-in-polygon location). Centroid locations in magisterial district polygons were generated using 1996 spatial data and these were intersected with the 1996 DCs. The results were merged with the 2001 DCs to generate matched DCs for 1996 and 2001. Geographical Information System (GIS) software called ArcView[14] was used to reconcile district council information in 1996 and 2006. There are 53 DCs in total for all the cross-sectional datasets.

The local marriage market is calculated by considering the geographical and racial "marriage markets", to take account of the fact that most people marry someone of the same race who lives relatively close to them (Gustafsson and Worku, 2006). Only men and women who are available for marriage are included in the sex ratio index. These include men and women who are single, divorced, separated, widowed or cohabiting. In addition, we consider the age-specific aspect of the sex ratio. For men, we only consider employed men in order to capture the "quality" measure of the sex ratio.

The sex ratios used for the analysis were calculated from datasets obtained from large-scale surveys because of the problem of few observations with data from the household surveys. We used Census data for 1996 and 2001 to interpolate sex ratios in between the censuses and to extrapolate for 1995. Between 2001 and 2006, we interpolate sex ratios using 2001 Census data and data from the 2007 Community Survey[15]. Conceptually, the interpolation process has two stages. First, we fit an interpolating function, $f(x)$, to the data points provided, and second, we evaluate that interpolating function at the target

[14]ArcView is full-featured geographic information system (GIS) software for visualizing, managing, creating, and analyzing geographic data. Using ArcView, one can understand the geographic context of the data. I am highly indebted to Nicholas Lindenberg, the manager of the GIS lab at the University of Cape Town for his assistance in reconciling the District Council information in the 1996 and 2001 Censuses.

[15]Censuses 1996 and 2001 are the only censuses conducted under the new democratic government. Since Census 2006 was not conducted, a gap in data between Census 2001 and the next Census, scheduled to be carried out in 2011 was created. The 2007 Community Survey in 2007 was conducted to fill this gap.

point, $x = 1998$[16].

In Table 4.1, we present the mean values (and the standard deviations) of the variables controlled for in the OHS 1998 sample. The results indicate that in 1998, about 50 percent of African women had ever married. There is also a good representation of women in the work force, at about 65 percent.

The distribution of education among the women is standard, with fewer women at the tails. For example, while 10 percent have no schooling and 6 percent have some tertiary education, about 27 percent have at least some primary schooling and close to 57 percent of the women have some secondary schooling. The distribution of age shows that our sample is mostly young. For instance, we find that nearly 65 percent of the women are under 34 years of age. Only about 20 percent of the sample consists of women who are at least 40 years old.

The provincial dummies show that there are fewer African women in the Northern Cape and they make up a total of about 1 percent of the whole sample. On the other hand, KwaZulu-Natal and Gauteng Provinces are relatively well represented, with representation at around 20 percent. The urban/rural distribution is quite equal, with near-equal percentages of women in the sample residing in each of these area types.

Also interesting are the means from the sex ratio. The sex ratio is less than one. At 0.81, the mean sex ratio indicates that there were more women than there were "good quality" men in 1998. With fewer men than women, the likelihood of marrying may go down, and even more so when potential men with good jobs and good education are few.

With regard to language, we observe that the sample is to a large extent made up of Xhosa and Zulu speaking people, who together make up about 50 percent of the sample. On the other hand, the proportion of Afrikaans and English speaking people, as well as people who speak other languages such as German, Italian, Portuguese, Swahili collectively represent only about 1 percent of the sample.

[16]We implement the procedure by using the *ipolate* command in Stata.

4.4 Estimation Results and Discussion

In this section, we present and discuss the econometric results. We first demonstrate the performance of women's jobs as an instrumental variable in the labour force participation model, followed by a discussion of the coefficients from the various econometric models of the marriage model. We report the reduced form labour force participation estimates from Maddala's (1983) model, the bivariate probit model and Heckman and Macurdy's (1985) simultaneous equation model in Table 4.2. For simplicity, we focus our discussion on the estimates from the representative sample of the 1998 cross-section.

The instrument is well behaved in all the three models. In the bivariate probit model, women's jobs is positive and statistically significant at the 1 percent level of significance in the participation equation. In the same model, the effect of women's jobs on the likelihood of marriage is not statistically significant at any standard level of significance. This is an indication that women's jobs is important in influencing women's labour force participation decisions. The insignificant coefficient of the marriage model indicates that women's jobs is not important in predicting women's marriage decisions. These results give a good indication that the instrument worked well in the OHS 1998. The effect of women's jobs on the likelihood of labour force participation continues to be positive and statistically significant, even when Maddala's (1983) approach is used. Likewise, the effect of women's jobs is positive and statistically significant on latent participation in the Heckman and Macurdy's (1985) model. The magnitude of the F-statistic (which equals t^2) of women's jobs variable is 10.7584>10 in the OLS regression, indicating that this variable is a strong instrument in the 1998 cross-section.

In the bivariate probit model, rho is found to be significantly different from zero. This shows the importance of jointly modelling marriage and participation decisions and confirms that the estimates obtained from a univariate decision framework would be inefficient. It is also unsurprising to observe that rho has a negative sign, indicating that marriage and labour force participation have a negative correlation, as is expected. In addition, the results from the endogeneity test in Table 4.3 confirm that labour force participation is

endogenous in the marriage model. The two endogeneity tests, Hausman's and Wu's, give identical results. The general Hausman version is in chi-square form, while the Wu version is a t-statistic, which is the square root of Hausman's chi-square. They have the same P-values in each year, which are statistically significant. The P-values indicate rejection of the consistency of OLS, providing support for using 2SLS.

Maximum likelihood estimates of the naïve single-equation marriage probit model are reported in the first column of Table 4.4. Second-step estimates from Maddala's (1983) model, naïve linear probability model estimates and second-step estimates from Heckman and Macurdy's (1985) model are respectively reported in columns (2), (3) and (4) of the same table. These are respectively titled Probit 1, Maddala, LPM (for linear probability model) and SELPM (for simultaneous equations linear probability model) and are henceforth referred to as such.

Probit 1 and the LPM assume away the endogeneity of women's labour market status on their marriage decision, while the second step estimates from the respective simultaneous-equation models account for the endogeneity problem. The naïve LPM is estimated in order to enable a like with like comparison with the SELPM which controls for the endogeneity problem. Likewise, while we cannot compare the magnitudes of the coefficients from the Probit 1 and Maddala models, we can compare the direction of the effects of the variables from these two models.

For all the models, the χ^2-statistic (and the F-statistic in the OLS regressions) tell us that our model as a whole is statistically significant. This means that all the variables included in the models are jointly significant. To measure the qualitative importance of all our right-hand-side variables, we report the marginal effects after the probit estimation for Probit 1 and Maddala estimations. The marginal effects are given by the derivative of the probability that a woman marries with respect to a specific variable. The coefficients of the marriage model show the expected signs. We next discuss each of the variables in turn, in the context of the predictions of economic theory.

4.4.1 Labour Force Participation

Female labour force participation has a negative and statistically significant effect on marriage. However, while the effect of labour force participation is insignificant in the SELPM, the negative effect is consistent and robust to the type of model estimated in the 1998 cross-section. The result means that the probability of marriage for women who are in the labour force is statistically different from that of women who are out of the labour force. The negative effect indicates that economically active women are less likely to marry than their stay-at-home counterparts, as is predicted by economic theory.

The magnitude of the negative effect varies across the models. It is important to mention again here that Maddala's approach only allows for a discussion of the direction of the effect of the variable on the probability of marriage. Consistent negative signs of the marginal effect of labour force participation in both the Maddala and Probit 1 models shows that labour force participation has a negative influence on the likelihood of marriage, regardless of whether its endogenous nature in the marriage model is accounted for or not.

Comparing the estimates from the LPM and SELPM, we find that the effect of labour force participation on marriage is also negative. However, the effect for the LPM is estimated at -0.02, while that for the SELPM is -0.29. What this means is that being in the labour force lowers the probability of marriage by 2 percentage points in the LPM, and by 29 percentage points in the SELPM. From these estimates, we see that ignoring the endogeneity problem underestimates the negative effect of labour force participation on marriage.

Also, it is interesting to find the same size and sign of the estimate of labour force participation regardless of whether it is either assumed to be continuous (in the LPM) or categorical (in Probit 1). The estimates are -0.02 in both models, indicating that being in the labour force lowers marriage probability by 2 percentage points.

These results suggest that there may be a trade-off between marriage and labour force participation for women, as predicted by the women's economic independence hypothesis. Our finding is in line with Casale's (2003) findings, considering that labour force participation and marriage are endogenous and negatively correlated. She finds that marriage

negatively affects the probability of women's labour force participation. In her discussion, Casale (2003) suggests that the negative effect might also (that is over and above the financial support from being married) be picking up that men prefer their wives to stay at home and do household work rather than work in the job market. This also agrees with wider empirical conclusions. For example, Lichter, McLaughlin, Kephart, and Landry (1992) disaggregated female employment by locality and found that female marriage rates are highest in local areas with the fewest economic alternatives available to women. Perhaps, the negative effect of female labour force participation on the probability of marriage suggests that what Becker earlier proposed in his theory of marriage, that husbands and wives specialize in market work and home work respectively, is still relevant in the South African context. That is, African couples may still view the family as a source of production efficiencies in the household as they specialize in gender-based market and home work.

4.4.2 Education

Education also emerged as a significant predictor of marital status. Our base education category is no schooling. The direction and magnitude of the effect of education varies with the level of education. Generally, the effect is positive for women with lower levels of schooling, and negative for women with more years of schooling.

In particular, we find that women with at least some secondary education, who have similar characteristics to those women with no schooling, are likely to be unmarried. The estimates from these dummies show a statistically significant negative relationship with marriage. The marginal effect for women with a secondary qualification is relatively high, at -0.18 in Probit 1, indicating that their probability of marriage is lowered by 18 percentage points. The effect on marriage for the same group of women is lowered by 14 percentage points in LPM and 10 percentage points in the SELPM. For women with a diploma or a degree, the sizes of the effect are similar. The probability of marriage is lowered by 7 percentage points, 5 percentage points in the respective Probit 1 and in the LPM if a woman has a diploma or a degree. We also note that the coefficients for diploma and degree dummies

are positive in the Maddala, as in the SELPM, suggesting that the probability of marriage is increased when the endogeneity problem is acknowledged. Perhaps the positive effect of education here suggests that women value family, regardless of their level of education.

For women with lower levels of education (incomplete primary and primary levels), the estimates suggest that all else held constant, there is no statistical difference in the effect of education on marriage compared to their illiterate counterparts. This is true in all models except in the Maddala model, where the estimates are relatively high and significant. In the Probit 1 model, the estimates are zero and one for the incomplete primary and primary categories. LPM and SELPM show a positive effect, but the magnitude is estimated at 1 percentage point for the LPM and 3 or 4 percentage points for the SELPM. This is an indication that having at least some education increases the likelihood of marriage compared to no education at all.

In relation to the search aspect of marriage theory, we do not expect women with fewer years of schooling to take too long in the search process as they cannot afford to be too choosy when they are selecting a potential husband. Compared to highly educated women, the pool of potential spouses for women with barely any education is much wider, considering that their set of required minimum characteristics in a potential spouse (their own characteristics taken into account) is limited.

In contrast, the increased employment opportunities available to highly educated women free them from being dependent on men for financial survival. This increases their utility in being single. In addition, they can afford to be choosy in mate selection, which narrows their pool of potential spouses. The situation may be worsened for those individuals who are from a *ilobolo* paying culture. The value of the bridewealth is higher for more educated women, making marriage more unlikely for women in communities with high levels of male unemployment.

The empirical fact arising from this analysis is that the effect of education on the likelihood of marriage agrees with expected predictions when endogenous labour force participation is assumed away. Women with at least some secondary schooling are the least likely

to marry, a finding which supports the economic independence hypothesis. On the other hand, accounting for the endogeneity problem results into large positive estimates, which contradicts the predictions of the women's economic hypothesis. It is puzzling to find that those women with a diploma or a degree are more likely to get married than women with no schooling, suggesting that South African women may actually be using education to get themselves husbands.

4.4.3 Age

Age is represented by age dummies and the reference category is 20-24 year olds. The effect of age on the probability of marriage is statistically different between these younger women and older women. The effect is positive and increases with age, as is expected. An interesting finding regarding age and marriage is that the coefficients on the age dummies are significantly different in magnitude. We notice that while the coefficient for younger women (aged 25 to 29 years) is generally around 0.20, the coefficient for the oldest women (aged 45-49 years) is at least twice as much, at around 0.50. This is an indication that younger women are less likely to be married than older women. The coefficient for 25-29 year olds also suggests women might be marrying late.

It is plausible to argue here that with the notable increase in years of schooling for women, and especially for the younger cohorts, it is possible that searching for a potential spouse takes longer. Possibly, this is because the bar for minimum acceptable characteristics is set higher for this type of women, as was argued in the preceding sub-section. Naturally, the pool of young economically attractive men to marry these women will shrink if on average, men's economic characteristics are not up to standard, all other things (such as physical attractiveness, chemistry, and other items women may list in their set of minimum accepted characteristics) considered.

Comparing the LPM and the SELPM, we observe that the magnitude of the effect is higher when we control for the endogeneity problem in the SELPM. This suggests that ignoring the endogeneity problem underestimates the positive effect of age on the likelihood

of marriage.

4.4.4 Location and Language

The province where one stays also shows some importance in predicting marriage. The base category is the Western Cape Province. Residence in the Eastern Cape, Northern Cape, North West Gauteng, Mpumalanga or Limpopo does not show significant differences on the probability of marriage compared to residing in the Western Cape. On the other hand, residence in KwaZulu-Natal or the Free State shows some strong statistical difference on the probability of marriage, compared to the Western Cape.

While residing in the Free State Province improves marriage chances for a woman, staying in KwaZulu-Natal Province decreases the probability of marriage for African women. The coefficient on the KwaZulu-Natal Province particularly requires qualification. Consistent with the view expressed and explored by Posel and Casale (2009) that *ilobolo* culture raises the bar on the "marriageability" criteria, it is plausible to argue that the effect of residing in the KwaZulu-Natal Province is strong and negative because this province contains the largest Zulu-speaking population in the country. The practice of paying bridewealth is widely practiced by this language group.

The other location variable, the urban dummy, is also strongly statistically significant and has a negative sign. The results indicate that staying in an urban area decreases the probability of marriage, compared to staying in a rural area. In Probit 1, this probability is lowered by 9 percent but is no longer significant when endogeneity is taken into account.

4.4.5 Sex Ratio

According to the male shortage hypothesis, the partner availability indicator, proxied here by the sex ratio, is expected to positively predict the likelihood of marriage. Our results show that the sex ratio measure, which takes into account the "quality" aspect of men, captured as the availability of employed men, performs well in predicting marriage. With this sex ratio measure, we find strong statistical significance at 1 percent.

The size of the effect is similar across models. For instance, the magnitude of the effect is 0.13 in both the LPM and SELPM. This means a percentage increase in the sex ratios increases the gains from marriage and hence the propensity to marry by 13 percentage points, regardless of whether or not the endogeneity problem is corrected. Where the endogeneity problem is ignored and marriage is assumed to be a categorical variable, a unit increase in the sex ratio increases the likelihood of marriage by 19 percentage points and by comparable 18 percentage points when the endogeneity problem is corrected. These findings support the view that local marriage market conditions play a fundamental role in the marital search process.

Since marriage prospects for African South African women are improved by the availability of economically marriageable male partners, it is plausible to argue that low marriage rates for these women may have to do with the economic circumstances of potential male partners. More particularly, our findings are in line with others' (for example Posel and Casale, 2009). Payment of *ilobolo* is financially constraining to marriage among African couples who practice the ilobola paying culture.

Casale and Posel (2009) found that a man's payment of *ilobolo* is considerably larger than the mean monthly earnings of African men. Therefore, it is likely that if the availability of economically attractive men better predicts marriage for African people than the quantity measure of partner availability, then high *ilobolo* prices worsens the sex ratio imbalance. The implication is that it would be easier for "marriageable" men to marry than it would be for African women and poorer men. Consequently, women would be forced to lower their "reservation value" if they do not want to remain single. Otherwise, if their set of acceptable characteristics is downward sticky, then they will be less likely to marry, resulting in lower marriage rates (Posel and Casale, 2009).

4.4.6 Sensitivity Checks

In this section, we test the robustness of our findings with a range of sensitivity checks. We want to see how the model performs with different samples. All the results are reported

in appendix C. First, we restrict the sample to younger women in the 20-34 age cohort. Marriage estimates for this sub-sample are presented in Table C.2. Second, we include only women from KwaZulu-Natal Province aged 20 to 49 years as is done in Posel and Casale (2009). The marriage estimates from these are presented in Table C.4. In this province, the population is largely made up of Zulu-speakers who practice *ilobolo* payment. Posel and Casale (2009) found that marriage rates are among the lowest and marriage decline is one of the largest in this province. Ethnographic studies have linked non-marriage behaviour among Zulu-speaking people to specific features of Zulu marriages. Particularly, the high cost of bridewealth has been singled out as exacerbating non-marriage (for example Goody, 1973; Burman and Preston-Whyte, 1992; Burman and van der Werff, 1993). The third set of regressions is for the 20-34 age cohort residing only in KwaZulu-Natal Province. The associated marriage estimates are presented in Table C.6. The respective estimates for the reduced form labour force participation are reported in Tables C.1, C.3 and C.5. The instrument, women's jobs, positively predicts labour force participation. The predictive power is highly statistically significant, at 1 percent level in the 20-34 age cohort of the entire nation. In the 20-34 age cohort sample exclusively residing in KwaZulu-Natal, the predictive power is statistically significant at the 10 percent level. However, we note that the women's jobs variable is not significant for the KwaZulu-Natal sample.

The marriage estimates from the 20-34 year old sample in the Maddala and the simultaneous equation linear probability models are similar to those from the extended sample of 20-49 year olds. Labour force participation continues to negatively predict marriage. However, for the 1998 sample, the effect is statistically insignificant for all the models run. Similarly, the effect of education on marriage remains statistically significant for this younger sample. Again, like the full sample of women aged 20 to 49, the coefficients for post-secondary dummies are insignificant once endogeneity is corrected for. For the language dummies, we find that Ndebele-speakers are less likely to be married than non-Ndebele speakers, and the effect is also statistically very strong. On the other hand, English-speakers are more likely to be married compared to non-English speakers, with a strong statistical significance

too. The bridewealth payment culture may be driving this result. In other words, since Ndebele-speakers are likely to be required to pay *ilobolo* to the bride's family, their likelihood of marriage may be lower, especially if there is a high African male unemployment rate. On the other hand, non-traditional English-speakers would be likely to marry since they may not be subjected to the financial constraints of *ilobolo* paying culture. The estimates also indicate that other groups like Zulu speakers, who also practice bridewealth payment are less likely to be married compared to non-Zulu speakers. The large positive and highly statistically significant coefficients (at the 1 percent level) on the sex ratio variable in Table C.2 show that scarcity of economically able men may explain the low likelihood of marriage among traditional African couples.

Investigating this issue further, we tested the model on only the KwaZulu-Natal sample, a province with the highest proportion of the Zulu-speaking population. Particularly, we are interested in the performance of the sex ratio. For both the older cohorts and the younger cohorts, the sex ratio behaves poorly in predicting marriage, contrary to our expectations. The effect is insignificant in the younger women sample and is significant only in the Maddala and single equation linear probability models in the older women sample. This contradicts findings in Posel and Casale (2009), who use a lagged sex ratio based on Census data. For future investigations, we suggest including an interaction variable between sex ratio and the language dummy.

One may also argue that, perhaps, since bridewealth costs are unusually high, potential husbands are allowed to make an initial payment and pay the balance subsequently without a fixed paying period. If that is true, then the effect of availability of quality men on marriages may be eroded by such practice. In addition, couples may prefer less formal cohabiting relationships rather than formal marriages because of the same high bridewealth costs. Also, Zulu childbearing traditions, particularly high acceptance of out-of-wedlock childbearing, might predict marriages better. We recommend a detailed analysis of this issue for further research.

4.4.7 How Do the Determinants of Marriage Perform Across the Years?

We picked the 1998 cross-section as a typical year. The instruments used to analyse the 1998 cross-section perform well and the estimated results are in line with theoretical predictions. In this section, we report the estimates for all other years in the study. This will help us understand how the determinants of marriage perform across the years. The naïve single-equation probit model and single-equation linear probability models for the marriage equation for the individual cross-sections are respectively reported in Tables 4.5 and 4.6. The reduced form estimates from Maddala's model and from the SELPM are respectively reported in Tables 4.7 and 4.9. The second-step estimates from the respective models are presented in Tables 4.8 and 4.10. The chi-square and the F-statistic in all the models show joint statistical significance of the variables in the models, for all the years.

Female labour force participation has a negative effect on marriage for all the cross-sections in the single equation probit model, as shown in Table 4.5. The effect is also very strong, at the 1 percent level of statistical significance, except for the 2005 and 2006 cross-sections. We suspect that the peculiar behaviour of the estimates in these years is probably a data issue. The implication for the negative estimates is that when female labour force participation is treated as exogenous, the likelihood of marriage for women in the labour force is lowered, compared to that of women outside the labour force.

The magnitudes of the effect of labour market status do not vary much across the years. Even though we cannot directly compare these estimates across the years, the picture arising from the estimates is that labour force participation has a similar effect on marriage for each individual cross-section. These results are similar to what we found for the 1998 cross-section above.

The estimates for education also perform quite consistently across the years, especially with regard to the dummies for incomplete secondary schooling and higher. Like the 1998 cross-section, the estimates for incomplete secondary, secondary, diploma and degree dummies are typically negative and statistically significant. This means that the likelihood of marriage for women with these educational qualifications is lower, compared to that of

women with no schooling, *ceteris paribus.*

On the other hand, the estimates for incomplete primary and primary dummies are not consistent across the years. The numbers jump from positive to negative. For example, from 1996 to 2002 and 2004, the estimate for incomplete primary education is negative. The 1993, 2003, 2005 and 2006 cross-sections show positive numbers. Also, we find that these estimates are significant in some years and insignificant in other years. The level of statistical significance is however, very weak, at 10 percent, compared to strong significance found for the more consistent estimates in the higher-education level dummies.

For age, the estimates are also consistent across time, in size, sign and strength. As with 1998, an increase in age increases the likelihood of marriage. The effects of age on the probability of marriage are statistically different between younger women aged 20-24 years (reference category) and older women. The effect is positive and increases with age for all the years.

Province dummies and urban dummies also produce similar estimates for the rest of the cross-sections[17]. The province where one resides, for example, has some influence on the probability of marriage. As in the 1998 cross-section, residing in either the Eastern Cape, Northern Cape, Gauteng or Mpumalanga Provinces does not result in statistical differences on the probability of marriage compared to residing in the Western Cape Province. On the other hand, residing in either KwaZulu-Natal, Free State, North West or Limpopo Provinces leads to strong statistical differences in the probability of marriage, compared to residency in the Western Cape. However, while residing in Free State or Limpopo Provinces improves the marriage chances of a woman, staying in KwaZulu-Natal or North West Provinces decreases the probability of marriage for African women. The positive economic significance (magnitude of the effect) is stronger when one resides in the Free State Province, compared to residing in Limpopo Province. On the other hand, the negative

[17]Please note that these results include all the 9 province dummies. The unreported 3 which are insignificant were omitted because of space constraints. However, the whole output of results is available from the author upon request.

economic significance is quite strong when one resides in KwaZulu-Natal, compared to staying in North West Province. Generally, the economic significance of the statistically insignificant province dummies is lower than that of the statistically significant province dummies. Mostly, the marginal effects are close to zero. The indication is that staying in these provinces contributes very little to the probability of marriage compared to staying in the Western Cape Province. This suggests that the marriage market environment in the provinces with statistically insignificant marginal effects may be similar to that of the Western Cape Province, all other things remaining constant.

The other location variable, the urban dummy, is also strongly statistically significant and has a negative sign. The results indicate that staying in an urban area decreases the probability of marriage, compared to staying in a rural area. In 1997, the probability is lowered by 9 percentage points.

Finally, estimates for the sex ratio generally show strong statistical significance at the 1 percent level. The sex ratio variable is statistically significant in 9 out of 11 cross-sections. The signs are positive in 10 out of 11 cross-sections, indicating that partner availability increases the probability of marriage. In 1997 for example, a unit increase in partner availability increases a woman's probability of marriage by 12 percentage points.

However, the estimates of most of the variables are not robust when we control for endogeniety of female labour force participation. In the Maddala model for example, the negative effect of female labour force participation is consistent in 1995 through to 2003. Of these 8 cross-sections, 6 are statistically significant. Likewise, estimating an SELPM does not give predicted effect of female labour force participation decisions on marriage decisions outcome. Dummies for post-secondary qualifications (diploma and degree) also continue to have unexpected results when endogeneity is controlled for in both the Maddala and the simultaneous equation linear probability models. The effect of age on the probability of marriage is unexpected in 2005 and 2006 cross-sections in the endogeneity-corrected SELPM. The sex ratio variable is insignificant in some years and the estimates are negative in other years.

However, even though the endogeneity-corrected models do not give robust expected results, we show that there is evidence of simultaneity bias when female labour force participation is included in the marriage model. In Table 4.11, we present a summary of the performance of the instrumental variable and the estimates, highlighting results for those years which give consistence results in all parameters. We show that the correlation statistic, rho, is both positive and statistically significant in all the cross-sections, indicating that marriage and labour force participation decisions for women are jointly determined. In addition, Hausman's endogeneity test also provides evidence of simultaneity bias except for the 1996, 2004 and 2006 cross-sections.

To account for this problem, we use the women's jobs variable as an instrument in the two-step estimation framework. Out of the twelve cross-sections, women's jobs is significant in ten of these and the effect of women's jobs on labour force participation is the expected positive sign in eight of these cross-sections in the Maddala model. In the SELPM, the expected positive and significant results are obtained also in at least half of the cross-sections. However, while the instrument seems to work in most of the cross-sections, the F-statistic of women's jobs shows that this variable is a weak instrument in five out of the twelve cross-sections, including the 1996, 2003 and 2006 cross-sections in which women's jobs is not significant.

When the endogeneity problem is ignored, the impact of labour force participation on marriage is negative, as expected. Both the naïve probit and linear probability models show a consistent negative effect in all the cross-sections. The expected negative effect is however, not consistent in all the cross-sections when the endogeneity of labour force participation is accounted for. Possibly, this is because the first step needs to work in order for the second step to work. For instance, the women's jobs variable is significant, has the correct positive sign and is a strong instrument in the 1995, 1998 and 1999 cross-sections. In turn, the impact of labour force participation on marriage is, as expected, negative in these years. Comparisons between the naïve linear probability model and the simultaneous linear probability model in these cross-sections show that the impact of labour force participation

on marriage is underestimated in the former.

Our findings suggest that ignoring the potential endogeneity of labour force participation when modeling marriage decisions underestimates the negative impact of labour force participation on marriage. The other control variables are also not robust when controlling for endogeneity. Probably, the culprit here is the credibility of the instrumental variable rather than the instrumental variable approach that is used to correct for the endogeneity problem. Studies which might obtain a more reasonable instrumental variable for the instrumental variable approach will go a long way in filling the gaps that the current study has left, as well as in establishing the correct effects of the factors that influence marriage decisions when the correct methods are employed. If all estimation issues are taken care of and the effect of LPM on marriage is positive, this may contradict the women's independence hypothesis, and then may suggest that South African women 'buy' themselves into marriage if they have jobs more often than they miss out on marriage due to their LFP status. This may indicate what Grossbard-Shechtman (1993) calls a low quasi-wage in marriage markets in recent years.

4.5 Conclusion

This chapter set out to investigate the factors that influence the probability that an African woman aged between 20 to 49 years marries or does not marry. It is possible that women's education and labour force participation decisions are endogenous in their marriage decision. Although we ignore the potential endogeneity of education, the chapter attempts to account for the endogeneity of labour force participation on marriage decisions. This is achieved by use of a two-step estimation procedure. Availability of women's jobs is used as an exogenous shock to the labour force participation decision.

Data used for the analyses were from the nationally representative household surveys. Specifically, we used datasets from the October Household Surveys from 1995 to 1999, and the September series of the Labour Force Surveys from 2000 to 2006. The data generally produces theoretically predicted results when the endogeneity of labour force participation

is assumed away. As expected, the estimation results confirm that labour force participation has a negative effect on women's marriage decisions. This suggests that women who are economically active are less likely to choose marriage, compared to women who are economically inactive.

Other control variables were also considered. For example, age was found to have a positive effect on the likelihood of marriage. The older a woman is, the more likely it is that she will be married. Education, which was captured as a series of dummy variables, was generally found to have a negative effect on the likelihood of marriage. The results indicated that some secondary education generally reduces the likelihood of marriage. Also, availability of economically attractive men, which was proxied by the sex ratio using employed men, positively increases the likelihood of marriage, as expected. This finding suggests that low marriage rates among African women reflect not so much a shortage of available African men, but a shortage of "marriageable" men.

We argue that a culture of *ilobolo* payment shrinks the pool of available marriageable men. This causes a sex ratio imbalance in the marriage market. The situation is aggravated when the male unemployment rate is high which reduces the supply of marriageable men. In this case, if women are willing to reduce their "reservation value" with regard to the characteristics of marriageable men, then the pool of available men will expand, increasing the likelihood of marriage. On the other hand, if the "reservation value" is not reduced, marriage will be less likely, and this would partly explain low marriage rates among African women in South Africa.

The results are fairly robust to changes in the age composition as well as geographical scope of the sample in naïve marriage models. Findings were similar to those discussed above even when the younger women sample was analysed. Similarly, analyses restricted to just KwaZulu-Natal women provide similar results to those of all women in South Africa.

However, we have also found, in this chapter, that the estimates are not robust to those expected when the endogeneity problem is accounted for. Across the years, the estimates jump from negative to positive signs and from significant to insignificant in the core variable

of interest, labour force participation, as well as in the other explanatory variables which are equally important in predicting marriage decisions outcome, such as the sex ratio. Albeit, we have shown evidence of simultaneity bias when the endogeneity of female labour force participation is ignored in a marriage model. Although our proposed instrumental variable, women's jobs, shows signs of being a weak instrument, we believe that correcting for the endogeneity problem is necessary. However, since the estimates from the "corrected" models are contaminated by weak instrumentation, we focus, in the next chapter, on the results for the naïve marriage model estimates. There, we examine the dynamic picture of African marriages in South Africa. We endeavour to study, in a multivariate framework, the determinants of declining marriage rates. The estimates for the simultaneous equation marriage model will be reported in the appendix of that chapter.

Table 4.1: Means and Standard Deviations for the 1998 Sample Characteristics

Variable	Mean	Std. Deviation	Variable	Mean	Std. Deviation
Married	.5008	(.5)	**Area Type**		
Participation	.6451	(.4785)	Urban	.5083	(.4999)
Sex Ratio	.8136	(.2541)	Rural	.4917	(.4999)
Education			**Languages**		
No Schooling	.1064	(.3084)	Afrikaans	.0042	(.0648)
Incomplete Primary	.1844	(.3879)	English	.0031	(.0558)
Primary	.0856	(.3879)	Isindebele	.0176	(.1317)
Incomplete Secondary	.3972	(.4893)	Isixhosa	.2238	(.4168)
Secondary	.1668	(.3728)	Isizulu	.3178	(.4656)
Diploma	.0477	(.2131)	Northern Sotho	.1048	(.3063)
Degree	.0103	(.1011)	Southern Sotho	.1067	(.3087)
Age			Setswana	.1188	(.3235)
20-24 Years	.2586	(.4379)	Siswati	.0289	(.1676)
25-29 Years	.2055	(.4041)	Tshivenda	.027	(.1622)
30-34 Years	.1854	(.3887)	Xitsonga	.0457	(.2087)
35-39 Years	.1495	(.3566)	Other Languages	.0015	(.0393)
40-44 Years	.1152	(.3193)			
45-49 Years	.0857	(.2799)			
Province					
Western Cape	.0329	(.1785)			
Eastern Cape	.1545	(.3614)			
Northern Cape	.0093	(.096)			
Free State	.0743	(.2623)			
KZN	.2221	(.4157)			
North West	.0974	(.2965)			
Gauteng	.1953	(.3964)			
Mpumalanga	.079	(.2698)			
Limpopo	.1352	(.3419)			
Observations	13619			13619	

Table 4.2: Reduced Form Labour Force Participation Model Estimates for the 20-49 Year Old Female Sample: 1998

		Bivariate Probit Model		
Variable	**Maddala**	**Marriage Eqn.**	**Participation Eqn.**	**SELPM**
Incomplete Primary	0.09***	0.01	0.25***	0.09***
	(0.02)	(0.05)	(0.05)	(0.02)
Primary	0.11***	0.00	0.32***	0.11***
	(0.02)	(0.06)	(0.06)	(0.02)
Incomplete Secondary	0.05***	-0.21***	0.13***	0.04***
	(0.02)	(0.05)	(0.04)	(0.02)
Secondary	0.17***	-0.47***	0.50***	0.17***
	(0.02)	(0.06)	(0.05)	(0.02)
Diploma	0.28***	-0.19***	1.03***	0.28***
	(0.01)	(0.07)	(0.08)	(0.02)
Degree	0.29***	-0.19	1.22***	0.32***
	(0.02)	(0.13)	(0.18)	(0.03)
25-29 Years	0.21***	0.68***	0.64***	0.24***
	(0.01)	(0.04)	(0.04)	(0.01)
30-34 Years	0.26***	1.15***	0.81***	0.29***
	(0.01)	(0.04)	(0.04)	(0.01)
35-39 Years	0.26***	1.49***	0.86***	0.31***
	(0.01)	(0.05)	(0.04)	(0.01)
40-44 Years	0.22***	1.68***	0.71***	0.26***
	(0.01)	(0.05)	(0.05)	(0.02)
45-49 Years	0.19***	1.96***	0.61***	0.23***
	(0.01)	(0.06)	(0.05)	(0.02)
Eastern Cape	-0.07**	-0.06	-0.18**	-0.07**
	(0.03)	(0.08)	(0.08)	(0.03)
Northern Cape	0.02	0.02	0.06	0.02
	(0.04)	(0.13)	(0.12)	(0.04)
Free State	0.06*	0.33***	0.16	0.05
	(0.03)	(0.10)	(0.10)	(0.03)
KZN	0.07**	-0.20*	0.21**	0.07**
	(0.04)	(0.11)	(0.10)	(0.03)
North West	0.07**	-0.09	0.20*	0.06*
	(0.03)	(0.11)	(0.10)	(0.03)
Gauteng	0.07**	0.05	0.20**	0.06**
	(0.03)	(0.10)	(0.09)	(0.03)
Mpumalanga	0.10***	0.12	0.30***	0.10***
	(0.03)	(0.11)	(0.10)	(0.03)
Limpopo	0.02	0.15	0.05	0.01
	(0.04)	(0.12)	(0.11)	(0.04)
Urban	0.09***	-0.24***	0.25***	0.09***
	(0.01)	(0.03)	(0.03)	(0.01)
Sex Ratio	0.02	0.46***	0.04	0.03
	(0.03)	(0.10)	(0.08)	(0.03)
Women's Jobs	0.21**	-0.12	0.57**	0.20***
	(0.08)	(0.24)	(0.23)	(0.08)
Constant		-0.93***	-0.78***	0.22***
		(0.25)	(0.23)	(0.08)
Rho		-0.03*	-0.03*	
		(0.02)	(0.02)	
Observations	13613	13613	13613	13613
χ^2-statistic	1301.23	4054.21	4054.21	58.73
Prob>χ^2	0.0000	0.0000	0.0000	0.0000

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Table 4.3: Endogeneity Test

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Hausman Exogeneity Test												
χ^2-statistic	10.65	1.88	6.61	7.49	6.79	10.64	12.72	4.69	12.89	0.00	41.67	1.70
$\Pr ob > \chi^2$	(0.001)	(0.170)	(0.010)	(0.006)	(0.009)	(0.001)	(0.000)	(0.030)	(0.000)	(0.945)	(0.000)	(0.192)
Wu Version of Hausman Test												
t-statistic	-3.26	1.37	-2.5765	-2.74	-2.61	3.26	-3.57	2.17	3.59	0.07	8.05	-0.26
$\Pr ob > \lvert t \rvert$	(0.001)	(0.170)	(0.010)	(0.006)	(0.009)	(0.001)	(0.000)	(0.030)	(0.000)	(0.945)	(0.000)	(0.192)

Table 4.4: Marriage Model Estimates for the 20-49 Year Old Sample: 1998

Variables	**Probit 1**	**Maddala**	**LPM**	**SELPM**
Participation	-0.02*	-1.09***	-0.02**	-0.29
	(0.01)	(0.28)	(0.01)	(0.37)
Incomplete Primary	0.01	0.10***	0.01	0.03
	(0.02)	(0.03)	(0.02)	(0.04)
Primary	0.00	0.12***	0.01	0.04
	(0.03)	(0.04)	(0.02)	(0.05)
Incomplete Secondary	-0.08***	-0.03	-0.07***	-0.05**
	(0.02)	(0.02)	(0.02)	(0.02)
Secondary	-0.18***	-0.00	-0.14***	-0.10
	(0.02)	(0.05)	(0.02)	(0.07)
Diploma	-0.07**	0.22***	-0.05**	0.02
	(0.03)	(0.07)	(0.02)	(0.11)
Degree	-0.07	0.24***	-0.05	0.03
	(0.05)	(0.08)	(0.04)	(0.12)
25-29 Years	0.26***	0.47***	0.21***	0.28***
	(0.01)	(0.05)	(0.01)	(0.09)
30-34 Years	0.42***	0.59***	0.40***	0.48***
	(0.01)	(0.04)	(0.01)	(0.11)
35-39 Years	0.49***	0.62***	0.51***	0.60***
	(0.01)	(0.02)	(0.01)	(0.11)
40-44 Years	0.51***	0.60***	0.57***	0.64***
	(0.01)	(0.02)	(0.01)	(0.10)
45-49 Years	0.53***	0.58***	0.64***	0.70***
	(0.01)	(0.01)	(0.01)	(0.08)
Eastern Cape	-0.03	-0.09**	-0.02	-0.03
	(0.03)	(0.03)	(0.03)	(0.03)
Northern Cape	0.01	0.03	0.02	0.02
	(0.05)	(0.05)	(0.04)	(0.04)
Free State	0.13***	0.18***	0.11***	0.12***
	(0.04)	(0.04)	(0.03)	(0.04)
KZN	-0.08*	-0.01	-0.06	-0.04
	(0.04)	(0.05)	(0.04)	(0.04)
North West	-0.03	0.02	-0.02	-0.00
	(0.04)	(0.04)	(0.03)	(0.04)
Gauteng	0.02	0.09**	0.03	0.05
	(0.04)	(0.04)	(0.03)	(0.04)
Mpumalanga	0.05	0.14***	0.05	0.07
	(0.04)	(0.05)	(0.03)	(0.05)
Limpopo	0.06	0.06	0.05	0.05
	(0.05)	(0.05)	(0.04)	(0.04)
Urban	-0.09***	-0.00	-0.07***	-0.05
	(0.01)	(0.03)	(0.01)	(0.03)
English	0.19	0.03	0.17	0.13
	(0.12)	(0.14)	(0.11)	(0.12)
Isindebele	-0.28***	-0.34***	-0.22***	-0.25***
	(0.06)	(0.05)	(0.06)	(0.07)
Isizulu	-0.05	-0.08	-0.03	-0.04
	(0.07)	(0.07)	(0.05)	(0.06)
Sex Ratio	0.19***	0.18***	0.13***	0.13***
	(0.04)	(0.04)	(0.02)	(0.02)
Observations	13613	13613	13613	13613
χ^2- Statistic(or F for LPM)	2903.36	2891.89	189.62	4405.52
$\Pr ob > \chi^2$ ($\Pr ob > F$)	0.0000	0.0000	0.0000	0.0000
Predicted Probability	0.4955	0.4951		

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Table 4.5: Single Equation Marriage Probit Model Estimates for the Other Cross-Sections

Variable	**1995**	**1996**	**1997**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Participation	-0.04***	-0.05***	-0.06***	-0.03***	-0.04***	-0.07***	-0.04***	-0.07***	-0.06***	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Incomplete Primary	0.03*	-0.04*	-0.03**	-0.01	-0.00	-0.03	-0.01	0.01	-0.01	0.03	0.03
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Primary	0.03	0.01	-0.03*	0.02	-0.00	-0.02	-0.04*	0.01	-0.02	0.06**	-0.00
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Incomplete Primary	-0.08***	-0.08***	-0.08***	-0.09***	-0.09***	-0.10***	-0.11***	-0.06***	-0.10***	-0.05**	-0.07**
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Secondary	-0.11***	-0.14***	-0.17***	-0.15***	-0.17***	-0.15***	-0.16***	-0.12***	-0.14***	-0.09***	-0.12***
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Diploma	-0.04*	-0.06*	-0.08***	-0.07***	-0.08***	-0.09***	-0.12***	-0.09***	-0.09***	-0.05	-0.05
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)
Degree	-0.09*	0.08	-0.05	-0.03	-0.16***	-0.03	-0.05	-0.02	-0.08	0.08	0.10*
	(0.05)	(0.05)	(0.04)	(0.04)	(0.05)	(0.03)	(0.04)	(0.04)	(0.06)	(0.05)	(0.05)
25-29 Years	0.27***	0.29***	0.29***	0.25***	0.22***	0.22***	0.23***	0.23***	0.23***	0.23***	0.21***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
30-34 Years	0.44***	0.42***	0.46***	0.39***	0.37***	0.36***	0.37***	0.36***	0.37***	0.33***	0.35***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
35-39 Years	0.51***	0.49***	0.52***	0.47***	0.44***	0.47***	0.46***	0.47***	0.45***	0.44***	0.42***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
40-44 Years	0.54***	0.54***	0.54***	0.51***	0.50***	0.51***	0.51***	0.51***	0.50***	0.49***	0.47***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
45-49 Years	0.54***	0.53***	0.55***	0.52***	0.51***	0.55***	0.54***	0.54***	0.52***	0.52***	0.52***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Free State	0.13***	0.10***	0.08***	0.10***	0.08**	0.14***	0.11***	0.13***	0.08**	0.05	0.06*
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
KZN	-0.13***	-0.14***	-0.19***	-0.14***	-0.13***	-0.09***	-0.10***	-0.11***	-0.13***	-0.16***	-0.15***
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
North West	0.00	-0.03	-0.09***	-0.09***	-0.13***	-0.11***	-0.12***	-0.08***	-0.11***	-0.12***	-0.10***
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
Gauteng	0.09***	-0.00	0.02	-0.01	-0.01	-0.01	-0.01	0.00	0.06	0.03	0.02
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
Mpumalanga	-0.02	0.02	-0.04*	-0.01	-0.03	0.01	-0.05	0.01	-0.01	-0.04	-0.06*
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
Limpopo	-0.02	0.10***	0.04	0.07**	0.12***	0.10***	0.12***	0.09***	0.06	-0.00	0.01
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
Urban	-0.08***	-0.05***	-0.09***	-0.07***	-0.08***	-0.10***	-0.09***	-0.06***	-0.04***	-0.03**	
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
Sex Ratio	-0.01	0.12**	0.04	0.08***	0.16***	0.14***	0.14***	0.10***	0.06***	0.08***	0.03*
	(0.02)	(0.05)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Observations	19444	12734	23292	18009	18343	18360	17067	16508	18463	18356	18071
χ^2 - Statistic	4227.35	2777.70	5367.93	3231.30	2680.52	3415.72	3291.29	2850.84	2238.38	1880.91	1816.34
$\Pr ob > \chi^2$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pred. Prob.	0.4965	0.5141	0.4858	0.4701	0.4770	0.4572	0.4748	0.4503	0.476	0.4402	0.437

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Table 4.6: Single Equation Marriage (LPM) Estimates for the Other Cross-Sections

Variable	1995	1996	1997	1999	2000	2001	2002	2003	2004	2005	2006
Participation	-0.03***	-0.04***	-0.05***	-0.02***	-0.03***	-0.06***	-0.04***	-0.06***	-0.05***	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Incomplete Primary	0.02*	-0.03*	-0.02**	-0.01	-0.00	-0.02	-0.01	0.01	-0.01	0.02	0.03
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Primary	0.02	0.01	-0.02*	0.02	-0.00	-0.01	-0.03	0.01	-0.01	0.05**	-0.00
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Incomplete Secondary	-0.06***	-0.06***	-0.06***	-0.07***	-0.08***	-0.09***	-0.09***	-0.05***	-0.08***	-0.04**	-0.06***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Secondary	-0.09***	-0.11***	-0.14***	-0.12***	-0.14***	-0.12***	-0.13***	-0.10***	-0.12***	-0.07***	-0.11***
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Diploma	-0.04**	-0.04	-0.06***	-0.06***	-0.06***	-0.08***	-0.10***	-0.08***	-0.07***	-0.04	-0.05
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Degree	-0.08*	0.08*	-0.03	-0.02	-0.14***	-0.02	-0.03	-0.02	-0.06	0.07*	0.09**
	(0.04)	(0.04)	(0.04)	(0.03)	(0.05)	(0.03)	(0.03)	(0.03)	(0.05)	(0.04)	(0.04)
25-29 Years	0.22***	0.24***	0.23***	0.20***	0.18***	0.16***	0.17***	0.17***	0.19***	0.17***	0.16***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
30-34 Years	0.43***	0.42***	0.44***	0.36***	0.34***	0.32***	0.33***	0.31***	0.34***	0.29***	0.31***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
35-39 Years	0.55***	0.54***	0.54***	0.48***	0.44***	0.45***	0.46***	0.46***	0.46***	0.42***	0.39***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
40-44 Years	0.63***	0.65***	0.61***	0.55***	0.53***	0.52***	0.54***	0.52***	0.54***	0.49***	0.47***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
45-49 Years	0.66***	0.68***	0.66***	0.59***	0.56***	0.60***	0.61***	0.58***	0.58***	0.54***	0.54***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)
Free State	0.10***	0.08***	0.06***	0.08***	0.07**	0.12***	0.09***	0.10***	0.06*	0.04	0.05*
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
KZN	-0.10***	-0.11***	-0.15***	-0.12***	-0.11***	-0.07***	-0.08***	-0.09***	-0.11***	-0.13***	-0.13***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
North West	0.00	-0.02	-0.07***	-0.08***	-0.11***	-0.09***	-0.09***	-0.07***	-0.09***	-0.10***	-0.09***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Gauteng	0.07***	-0.00	0.02	-0.01	-0.01	-0.00	-0.01	0.00	0.05	0.02	0.02
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Mpumalanga	-0.02	0.01	-0.03*	-0.01	-0.03	0.01	-0.04	0.01	-0.01	-0.03	-0.05*
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Limpopo	-0.02	0.07**	0.03	0.05**	0.09***	0.09***	0.09***	0.08***	0.05	-0.00	0.01
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Urban	-0.06***	-0.03***	-0.07***	-0.06***	-0.07***	-0.08***	-0.07***	-0.05***	-0.04***	-0.03**	
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
Sex Ratio	-0.01	0.08**	0.03	0.07***	0.13***	0.12***	0.12***	0.09***	0.06***	0.07***	0.03*
	(0.02)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Observations	19444	12734	23292	18009	18343	18360	17067	16508	18463	18356	18071
F - Statistic	407.27	272.01	522.56	276.31	228.48	302.46	300.43	240.63	185.47	143.25	142.16
$\Pr ob > F$	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Table 4.7: Reduced Form Labour Force Participation Estimates (Maddala Model) for the Other Cross-Sections

Variable	**1995**	**1996**	**1997**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Women's Jobs	**-0.32*** **	**0.02**	**-0.33*** **	**0.24*** **	**0.25*** **	**0.13***	**0.14** **	**0.11***	**0.31*** **	**0.20*** **	**-0.01**
	(0.06)	(0.09)	(0.08)	(0.07)	(0.06)	(0.08)	(0.06)	(0.06)	(0.07)	(0.07)	(0.06)
Incomplete Primary	0.07***	0.10***	0.07***	0.08***	0.07***	0.08***	0.05***	0.07***	0.07***	0.05***	0.07***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Primary	0.04**	0.10***	0.08***	0.11***	0.09***	0.09***	0.09***	0.10***	0.10***	0.09***	0.09***
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Incomplete Secondary	0.01	0.05***	0.03**	0.09***	0.05***	0.09***	0.08***	0.11***	0.12***	0.09***	0.11***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Secondary	0.12***	0.13***	0.17***	0.17***	0.12***	0.14***	0.13***	0.15***	0.17***	0.15***	0.16***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Diploma	0.15***	0.25***	0.27***	0.24***	0.18***	0.18***	0.17***	0.17***	0.18***	0.16***	0.17***
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Degree	0.20***	0.26***	0.32***	0.22***	0.18***	0.16***	0.13***	0.16***	0.18***	0.15***	0.16***
	(0.03)	(0.04)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
25-29 Years	0.22***	0.22***	0.23***	0.18***	0.13***	0.12***	0.13***	0.11***	0.15***	0.11***	0.12***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
30-34 Years	0.28***	0.29***	0.28***	0.20***	0.16***	0.12***	0.13***	0.10***	0.13***	0.13***	0.13***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
35-39 Years	0.26***	0.29***	0.28***	0.22***	0.14***	0.11***	0.13***	0.09***	0.13***	0.12***	0.12***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
40-44 Years	0.24***	0.26***	0.27***	0.20***	0.15***	0.10***	0.12***	0.09***	0.12***	0.09***	0.11***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
45-49 Years	0.20***	0.19***	0.20***	0.17***	0.14***	0.08***	0.11***	0.07***	0.09***	0.10***	0.10***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Free State	-0.04	-0.02	0.02	0.01	-0.03	0.05***	0.02	0.03*	-0.02	-0.07**	-0.05*
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
KZN	-0.10***	-0.03	0.03	0.06**	0.02	0.06***	0.05***	0.05***	-0.02	-0.02	-0.05*
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
North West	-0.18***	-0.00	0.04**	0.02	-0.07**	0.02	-0.00	-0.01	-0.02	-0.02	-0.08**
	(0.03)	(0.03)	(0.02)	(0.02)	(0.04)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Gauteng	0.02	0.07***	0.14***	0.04	0.00	0.05***	0.04**	0.00	-0.00	-0.01	-0.00
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
Mpumalanga	-0.16***	-0.00	-0.05**	0.05**	-0.00	0.03*	0.02	0.04**	0.04	0.01	-0.02
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Limpopo	-0.21***	-0.08**	-0.04*	0.06**	-0.03	0.08***	0.08***	0.06***	0.05*	-0.01	-0.07**
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)
Urban	0.10***	0.17***	0.09***	0.07***	0.05***	0.03***	0.05***	0.04***	0.04***	0.04***	
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
Sex Ratio	-0.10***	0.01	-0.10***	0.22***	0.18***	0.12***	0.10***	0.13***	0.11***	0.11***	0.06***
	(0.02)	(0.05)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Observations	19444	12734	23292	18009	18343	18360	17067	16508	18463	18356	18071

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.8: Second-Step Marriage Estimates (Maddala Model) for the Other Cross-Sections

Variable	1995	1996	1997	1999	2000	2001	2002	2003	2004	2005	2006
Participation	-0.95***	-1.10**	-0.14	-0.41**	0.16	-0.63***	-0.54**	-0.73***	0.10	0.45*	0.44
	(0.20)	(0.52)	(0.20)	(0.20)	(0.24)	(0.24)	(0.23)	(0.22)	(0.21)	(0.24)	(0.32)
Incomplete Primary	0.09***	0.07	-0.03	0.02	-0.02	0.03	0.02	0.08**	-0.03	0.00	-0.02
	(0.02)	(0.06)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)
Primary	0.06***	0.11**	-0.03	0.06**	-0.02	0.05	0.02	0.11***	-0.04	0.01	-0.06
	(0.02)	(0.06)	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)
Incomplete Secondary	-0.07***	-0.02	-0.08***	-0.05**	-0.10***	-0.04	-0.06**	0.04	-0.12***	-0.10***	-0.13**
	(0.02)	(0.03)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.05)
Secondary	-0.02	-0.01	-0.16***	-0.08*	-0.19***	-0.05	-0.09**	0.02	-0.18***	-0.17***	-0.21***
	(0.03)	(0.07)	(0.03)	(0.04)	(0.04)	(0.05)	(0.04)	(0.05)	(0.05)	(0.05)	(0.07)
Diploma	0.08**	0.19	-0.05	0.04	-0.12**	0.04	-0.02	0.09	-0.13*	-0.15**	-0.16*
	(0.04)	(0.12)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.07)	(0.06)	(0.09)
Degree	0.07	0.31***	-0.02	0.07	-0.19***	0.09	0.04	0.15**	-0.12	-0.02	-0.01
	(0.06)	(0.10)	(0.08)	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.08)	(0.07)	(0.10)
25-29 Years	0.44***	0.46***	0.31***	0.33***	0.19***	0.31***	0.31***	0.31***	0.20***	0.16***	0.14**
	(0.03)	(0.07)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)	(0.06)
30-34 Years	0.59***	0.59***	0.47***	0.46***	0.34***	0.44***	0.44***	0.43***	0.35***	0.26***	0.28***
	(0.03)	(0.06)	(0.04)	(0.04)	(0.05)	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)	(0.06)
35-39 Years	0.61***	0.60***	0.53***	0.53***	0.42***	0.52***	0.52***	0.52***	0.44***	0.38***	0.35***
	(0.02)	(0.04)	(0.03)	(0.03)	(0.04)	(0.02)	(0.03)	(0.02)	(0.03)	(0.04)	(0.05)
40-44 Years	0.60***	0.61***	0.55***	0.56***	0.47***	0.55***	0.55***	0.55***	0.49***	0.45***	0.42***
	(0.01)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)
45-49 Years	0.58***	0.57***	0.55***	0.55***	0.49***	0.57***	0.56***	0.57***	0.51***	0.48***	0.48***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.03)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)
Free State	0.12***	0.08**	0.08***	0.10***	0.08**	0.17***	0.11***	0.15***	0.08**	0.07*	0.08**
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
KZN	-0.21***	-0.17***	-0.18***	-0.12***	-0.14***	-0.06*	-0.07**	-0.08**	-0.13***	-0.15***	-0.13***
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
North West	-0.11***	-0.03	-0.09***	-0.09***	-0.12***	-0.11***	-0.12***	-0.09***	-0.10***	-0.11***	-0.07*
	(0.04)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
Gauteng	0.10***	0.06	0.03	0.00	-0.01	0.02	0.01	0.00	0.06	0.03	0.02
	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
Mpumalanga	-0.11***	0.02	-0.05*	0.01	-0.03	0.03	-0.04	0.04	-0.02	-0.04	-0.05
	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)
Limpopo	-0.18***	0.04	0.04	0.09***	0.12***	0.15***	0.16***	0.14***	0.05	0.00	0.04
	(0.05)	(0.05)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)
Urban	0.00	0.12	-0.08***	-0.04***	-0.09***	-0.08***	-0.06***	-0.03**	-0.05***	-0.05***	
	(0.02)	(0.08)	(0.02)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	
Sex Ratio	-0.06**	0.15***	0.04	0.15***	0.14***	0.20***	0.19***	0.18***	0.05**	0.04	0.01
	(0.03)	(0.05)	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.03)
Observations	19444	12734	23293	18009	18361	18360	17067	16508	18463	18356	18071

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4.9: Reduced Form Labour Force Participation Estimates (SELPM) for the Other Cross-Sections

Variable	1995	1996	1997	1999	2000	2001	2002	2003	2004	2005	2006
Women's Jobs	-0.30***	0.03	-0.30***	0.25***	0.28***	0.15*	0.15**	0.09	0.29***	0.18***	-0.05
	(0.05)	(0.09)	(0.08)	(0.07)	(0.07)	(0.08)	(0.06)	(0.06)	(0.07)	(0.07)	(0.06)
Incomplete Primary	0.07***	0.10***	0.07***	0.08***	0.08***	0.10***	0.07***	0.11***	0.10***	0.07***	0.10***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Primary	0.04**	0.10***	0.08***	0.12***	0.10***	0.12***	0.13***	0.15***	0.15***	0.13***	0.14***
	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Incomplete Secondary	0.01	0.05***	0.03**	0.09***	0.04***	0.11***	0.10***	0.15***	0.15***	0.11***	0.13***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
Secondary	0.11***	0.13***	0.17***	0.19***	0.13***	0.18***	0.16***	0.21***	0.22***	0.19***	0.21***
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Diploma	0.14***	0.25***	0.28***	0.28***	0.21***	0.25***	0.22***	0.28***	0.28***	0.23***	0.27***
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Degree	0.19***	0.25***	0.31***	0.26***	0.21***	0.22***	0.18***	0.26***	0.28***	0.22***	0.25***
	(0.03)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
25-29 Years	0.24***	0.22***	0.25***	0.21***	0.17***	0.16***	0.18***	0.13***	0.19***	0.15***	0.16***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
30-34 Years	0.31***	0.31***	0.32***	0.23***	0.20***	0.16***	0.17***	0.13***	0.17***	0.17***	0.17***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
35-39 Years	0.29***	0.31***	0.31***	0.27***	0.19***	0.15***	0.18***	0.12***	0.17***	0.16***	0.17***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
40-44 Years	0.26***	0.29***	0.31***	0.26***	0.20***	0.14***	0.16***	0.11***	0.16***	0.12***	0.16***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
45-49 Years	0.23***	0.21***	0.23***	0.22***	0.20***	0.11***	0.15***	0.09***	0.12***	0.14***	0.14***
	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.02)
Free State	-0.03	-0.02	0.02	0.00	-0.03	0.04**	0.01	0.03	-0.01	-0.06***	-0.05**
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
KZN	-0.09***	-0.03	0.03	0.05**	0.02	0.06***	0.06***	0.05***	-0.01	-0.02	-0.04**
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
North West	-0.15***	-0.00	0.04*	0.01	-0.08***	0.01	-0.01	-0.02	-0.02	-0.02	-0.07***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Gauteng	0.01	0.06**	0.11***	0.02	-0.02	0.04*	0.03*	-0.00	-0.00	-0.01	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Mpumalanga	-0.13***	-0.00	-0.05**	0.05**	-0.01	0.03	0.02	0.04*	0.04*	0.01	-0.02
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Limpopo	-0.18***	-0.07**	-0.04*	0.06**	-0.03	0.08***	0.09***	0.07***	0.05**	-0.01	-0.06***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Urban	0.09***	0.16***	0.08***	0.07***	0.05***	0.04***	0.05***	0.05***	0.04***	0.04***	
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	
Sex Ratio	-0.08***	0.03	-0.07***	0.23***	0.20***	0.13***	0.11***	0.14***	0.10***	0.10***	0.06***
	(0.02)	(0.05)	(0.03)	(0.02)	(0.03)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.01)
Constant	0.53***	0.21***	0.44***	0.04	0.19***	0.27***	0.29***	0.32***	0.25***	0.35***	0.53***
	(0.04)	(0.06)	(0.04)	(0.05)	(0.05)	(0.06)	(0.05)	(0.04)	(0.05)	(0.05)	(0.04)
Observations	19444	12734	23292	18009	18343	18360	17067	16508	18463	18356	18071
R^2	0.117	0.132	0.132	0.119	0.093	0.078	0.080	0.077	0.083	0.077	0.073

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Table 4.10: Second-Step Marriage Estimates (SELPM) for the Other Cross-Sections

Variable	1995	1996	1997	1999	2000	2001	2002	2003	2004	2005	2006
Participation	-0.81***	1.16	0.42	-0.28	0.85***	-0.35	0.30	1.13	1.11***	3.20**	-3.35
	(0.22)	(4.12)	(0.26)	(0.29)	(0.32)	(0.58)	(0.45)	(1.27)	(0.37)	(1.28)	(3.73)
Incomplete Primary	0.07***	-0.15	-0.06***	0.01	-0.07**	0.01	-0.03	-0.12	-0.13***	-0.19*	0.38
	(0.02)	(0.41)	(0.02)	(0.03)	(0.03)	(0.06)	(0.03)	(0.14)	(0.05)	(0.10)	(0.40)
Primary	0.05**	-0.11	-0.06**	0.05	-0.09**	0.02	-0.07	-0.18	-0.18***	-0.35*	0.46
	(0.02)	(0.42)	(0.03)	(0.04)	(0.04)	(0.07)	(0.06)	(0.20)	(0.07)	(0.18)	(0.53)
Incomplete Secondary	-0.06***	-0.12	-0.07***	-0.05*	-0.12***	-0.05	-0.12***	-0.23	-0.25***	-0.38***	0.39
	(0.02)	(0.22)	(0.01)	(0.03)	(0.02)	(0.06)	(0.05)	(0.19)	(0.06)	(0.15)	(0.50)
Secondary	-0.01	-0.26	-0.21***	-0.07	-0.26***	-0.07	-0.19**	-0.34	-0.37***	-0.68***	0.60
	(0.03)	(0.53)	(0.05)	(0.06)	(0.05)	(0.11)	(0.08)	(0.26)	(0.09)	(0.25)	(0.80)
Diploma	0.07*	-0.34	-0.19**	0.01	-0.25***	-0.00	-0.17*	-0.41	-0.40***	-0.79***	0.84
	(0.04)	(1.03)	(0.07)	(0.08)	(0.07)	(0.15)	(0.10)	(0.35)	(0.11)	(0.31)	(0.99)
Degree	0.06	-0.23	-0.18**	0.05	-0.33***	0.04	-0.09	-0.34	-0.39***	-0.65**	0.93
	(0.07)	(1.05)	(0.09)	(0.08)	(0.09)	(0.13)	(0.09)	(0.34)	(0.12)	(0.30)	(0.96)
25-29 Years	0.40***	-0.03	0.11*	0.26***	0.02	0.21**	0.11	0.01	-0.03	-0.32	0.70
	(0.05)	(0.92)	(0.07)	(0.06)	(0.06)	(0.09)	(0.08)	(0.17)	(0.07)	(0.20)	(0.61)
30-34 Years	0.66***	0.05	0.29***	0.42***	0.16**	0.36***	0.27***	0.16	0.14**	-0.28	0.89
	(0.07)	(1.26)	(0.08)	(0.07)	(0.07)	(0.09)	(0.08)	(0.16)	(0.07)	(0.23)	(0.65)
35-39 Years	0.77***	0.17	0.39***	0.55***	0.27***	0.50***	0.39***	0.32**	0.26***	-0.11	0.96
	(0.07)	(1.26)	(0.08)	(0.08)	(0.07)	(0.09)	(0.08)	(0.15)	(0.07)	(0.22)	(0.63)
40-44 Years	0.84***	0.30	0.46***	0.62***	0.34***	0.56***	0.49***	0.38***	0.35***	0.10	1.01*
	(0.06)	(1.18)	(0.08)	(0.08)	(0.07)	(0.08)	(0.08)	(0.15)	(0.07)	(0.17)	(0.59)
45-49 Years	0.84***	0.44	0.55***	0.64***	0.38***	0.63***	0.56***	0.47***	0.44***	0.11	0.99*
	(0.05)	(0.84)	(0.06)	(0.06)	(0.07)	(0.06)	(0.07)	(0.12)	(0.05)	(0.18)	(0.51)
Free State	0.09***	0.10	0.06***	0.08***	0.08**	0.13***	0.08***	0.07	0.07	0.22**	-0.11
	(0.03)	(0.09)	(0.02)	(0.03)	(0.04)	(0.03)	(0.03)	(0.05)	(0.04)	(0.10)	(0.19)
KZN	-0.17***	-0.08	-0.16***	-0.11***	-0.14***	-0.05	-0.10***	-0.15**	-0.10**	-0.09	-0.29
	(0.04)	(0.13)	(0.02)	(0.03)	(0.04)	(0.04)	(0.04)	(0.08)	(0.05)	(0.08)	(0.20)
North West	-0.10**	-0.02	-0.09***	-0.08***	-0.06	-0.09***	-0.09***	-0.05	-0.06	-0.07	-0.32
	(0.04)	(0.05)	(0.02)	(0.03)	(0.04)	(0.02)	(0.03)	(0.04)	(0.05)	(0.08)	(0.27)
Gauteng	0.08**	-0.07	-0.03	-0.00	-0.01	0.01	-0.02	0.00	0.05	0.04	-0.01
	(0.03)	(0.24)	(0.04)	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)	(0.04)	(0.07)	(0.08)
Mpumalanga	-0.09**	0.02	-0.02	-0.00	-0.02	0.02	-0.04	-0.04	-0.05	-0.08	-0.11
	(0.04)	(0.05)	(0.02)	(0.03)	(0.04)	(0.03)	(0.03)	(0.06)	(0.05)	(0.08)	(0.10)
Limpopo	-0.16***	0.15	0.05**	0.07**	0.11***	0.11**	0.06	-0.01	-0.02	0.01	-0.22
	(0.05)	(0.28)	(0.03)	(0.03)	(0.04)	(0.05)	(0.05)	(0.10)	(0.05)	(0.08)	(0.26)
Urban	0.01	-0.22	-0.11***	-0.04*	-0.10***	-0.07***	-0.09***	-0.11*	-0.08***	-0.15**	
	(0.02)	(0.65)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.06)	(0.02)	(0.06)	
Sex Ratio	-0.06**	0.04	0.05*	0.12*	0.01	0.15**	0.09*	-0.06	-0.03	-0.19*	0.23
	(0.03)	(0.13)	(0.03)	(0.06)	(0.05)	(0.07)	(0.05)	(0.17)	(0.04)	(0.11)	(0.23)
Constant	0.60***	-0.03	0.15*	0.29***	-0.12	0.30	0.06	-0.23	-0.19	-1.28**	1.93
	(0.10)	(0.92)	(0.08)	(0.06)	(0.13)	(0.21)	(0.17)	(0.46)	(0.16)	(0.60)	(1.87)
Observations	19444	12734	23292	18009	18343	18360	17067	16508	18463	18356	18071

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Table 4.11: Summary Table

Parameter	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Is there evidence of simultaneity bias?												
Rho	**Yes**	Yes	Yes	**Yes**	**Yes**	Yes	**Yes**	**Yes**	Yes	Yes	Yes	Yes
Hausman Test	**Yes**	No	Yes	**Yes**	**Yes**	Yes	**Yes**	**Yes**	Yes	No	Yes	No
Does the Instrument Work?												
Significance	**Yes**	No	Yes	**Yes**	**Yes**	Yes	**Yes**	**Yes**	No	Yes	Yes	No
Sign	**-**	+	-	**+**	**+**	+	**+**	**+**	+	+	+	+
Weak	**No**	Yes	No	**No**	**No**	No	**Yes**	**Yes**	Yes	No	No	Yes
What is the Impact of Labour Force Participation?												
Naïve LPM	**-**	-	-	**-**	**-**	-	**-**	**-**	-	-	-	-
Naïve Probit	**-**	-	-	**-**	**-**	-	**-**	**-**	-	-	-	-
Maddala	**-**	-	-	**-**	**-**	+	**-**	**-**	-	+	+	+
SELPM	**-**	+	+	**-**	**-**	+	**-**	**-**	+	+	+	+
Coefficient Difference	**-0.96**	0.35	0.37	**-0.36**	**-0.44**	0.43	**-1.95**	**-0.46**	0.48	0.74	1.42	4.6
Direction of Bias	↓	↑	↑	↓	↓	↑	↓	↓	↑	↑	↑	↑

Chapter 5

Determinants of Declining Marriage in South Africa: 1995-2006

5.1 Introduction

Thus far, we have established new evidence confirming dropping marriage rates for young African women in the period 1995 to 2006. After confirming the marriage decline, a natural next step is to seek to explain the decline. In chapter 3 and elsewhere, we see evidence indicating that there is a time-period change (in the same period that marriage rates have dropped) in the distribution of some of the factors which are likely to influence a woman's marriage decisions. In this chapter, we seek to investigate whether the marriage decline is due to the change in the distribution of the characteristics which has taken place over time, or if it is due to temporal change in the relationship between these characteristics and marriage.

This directs us to decomposition analysis, a technique which enables us to identify and quantify the separate contributions of temporal group differences in measurable characteristics to the marriage decline. In other words, we want to understand what the South African marriage market would have looked like if the individuals sampled between 1995 through 2005 had faced 2006 marriage market conditions. Conversely, we want to understand how the marriage decisions for individuals sampled in 2006 would have looked had they faced

the marriage market conditions of the earlier years.

The rest of the chapter progresses as follows. In section 5.2, we present some of the arguments from the literature to explain time-period gaps in marriage rates. Section 5.3 describes the data. In section 5.4, we outline the methodology for achieving our objectives and discuss the results of these. Estimations are done for cases where marriage decisions are independently and jointly modelled with labour force participation decisions. All estimations which correct for the endogeneity problem are reported in appendix D. Finally, section 5.5 concludes the chapter.

5.2 Literature Review

5.2.1 Theoretical Explanations for Declining Marriages

As reviewed in chapter 4, Becker's (1973) theory of marriage explains the decision to marry (or stay single) as the utility maximizing behaviour of any rational individual of marriageable age. Technically, a union that will likely make an individual well off is the one that he or she will choose. Thus, a marriage between two people will occur if, for both partners, the expected gains from marriage exceed the gains from being single. Becker asserts that gains from marriage arise from production complementarities and specialization as well as enjoyment of economies of scale in consumption. With regard to declining marriages, it follows that diminishing gains from marriage should result in non-marriage behaviour. A reasonable economic explanation of declining marriages must account for diminished gains from production specialization and/or vanishing consumption complementarities in marital unions.

Theoretical literature appraises the women's economic independence and shortage of men hypotheses as driving forces of the phenomenal "modern" non-marriage behaviour among young (black) women. The former claims that a rise in human capital power possessed by women in recent years has granted women opportunities in the labour market, directing their services to paid jobs. Empirical work uses earnings, education attainment

and/or labour market status to proxy women's economic independence. The last two are preferred because they do not present the difficulty of estimating potential earnings for those who do not work. According to Becker's gender specialization notion, the gains from the gender division of labour within the household production unit are reduced by a rise in women's education attainment and their labour force participation. Thus falling marriage rates for women might be explained, at least partly, by increases over time in education attainment and labour force participation for women.

The latter hypothesis is accredited to Wilson (1987), who claims, in his often-quoted "The Truly Disadvantaged", that the increasing delay of marriage and low rate of marriage among black women in the US seem to be directly associated with the increasing labour force problems of men. According to this view, declining marriage is associated with a shrinking over time of the pool of economically and socially advantaged men of marrying age. With gains from marriage influencing the marriage decision, women tend to be picky when choosing marriage partners, and men whose current or future earning capabilities are "questionable" and likely to make a negative net contribution to the marriage tend to be "sorted out" of the marriage market.

5.2.2 Prior Studies on Declining Marriages

Previous international studies have attempted to explain the substantial shifts in family formation in general, and the marriage decline in particular. While some explanations are common across countries, others are exclusive to a particular country or region. Generally speaking, the reasons for fewer marriages in recent years can be divided into two categories. The first category relates explanations of marriage decline to differences in the distribution of characteristics of individuals between time periods. The second category, which aligns with theoretical ideas, comprises explanations which attribute the drop in marriage rates to differences in the returns (or gains) from marriage between periods. In other words, the characteristics of individuals between the two periods under comparison may be the same, but their marriage behaviour, given their characteristics, may be different. These

notions are respectively termed the characteristic and coefficient effects in the terminology of decomposition analysis, and will be discussed in detail in the methodology section below.

Changes in the distribution of variables that influence marriage decisions fall into the first category. Changing trends in age, education, labour force participation and the sex ratio are some of the factors that have been identified to contribute to the marriage decline. In this respect, the changing distribution of variables does not directly influence the individual's decision to marry. For instance, with respect to age, the demographic composition of the population may have changed in such a way that in recent years the population is comprised of a younger population who are not thinking of marriage yet. Similarly, the economic prospects of individuals may have changed, enabling them to put off marriage, without necessarily attaching prospects from marriage to their decisions. Regarding this, one might think of change in legislation, for example, in post-apartheid South Africa, which enabled women to acquire higher levels of education as well as obtain higher paid jobs. Marriage may be one aspect of their lives that might be unintentionally affected by such changes.

With regard to the differences in returns to characteristics, it may be argued that the expected gains from marriage from a particular characteristic (such as education) may be different with time. Couples marry (and stay married) when the gains from marriage exceed the gains from being single. According to Becker (1973), these gains come from several sources, such as production complementarities (gender role specialization) and consumption complementarities (such as joint consumption, which yields benefits from economies of scale)[1]. Economic (in)capability has been cited as a contributor to marital decline (for example Wilson and Neckerman, 1986; Wilson, 1987). The specific economic processes include declining male economic power, increasing female economic power, and a declining differential between male and female economic power. Possibly, a change in the economic

[1]Needless to say, others have argued that one need not marry in order to have children, have fun, or have gender-specialised work done. All these can be purchased in the market place. For example, one can have children outside marriage or adopt; sex can be purchased from the sex market, and one does not need to marry in order to enjoy leisure activities.

incentives to marry may be related to shifts in marriage patterns. For instance, declining male economic power may be associated with fewer marriages, due to a shortage of economically attractive men[2]. On the other hand, increasing female economic power, and a declining differential between male and female economic power are associated with women's financial independence, and hence non-marriage behaviour.

There is compelling empirical evidence in support of Wilson's and Neckerman's contention. For example, Oppenheimer (1988) and others (for example Ross and Sawhill, 1975; Hannan and Tuma, 1978; Cherlin, 1979; Moore and Waite, 1981; Tzeng, 1992) have presented evidence that changes in marital patterns are linked to women's continued economic advances. Gender equity in societies now enables women to get more education, just like their male counterparts. This gives women job opportunities in market work. An increase in women's labour force participation has increased their economic independence and hence has greatly reduced the desirability of marriage. Since women are not as dependent on marriage for financial upkeep, they are less likely to enter or remain in a bad marriage out of financial necessity.

The opportunity cost of marriage may also be different between time periods. With increasing female labour force participation and higher education levels for women, most women would be more likely to stay unmarried in recent years. McDonald (2000) and others argue that many professional women prefer the social and economic independence that they have gained. Thus, the opportunity cost of staying at home and performing traditionally gender specialized home work is higher with the advent of professional jobs for women. In

[2]In the United States, the number of males relative to females in the African-American population declined steadily in the 1920s, compared to the white sex ratios. Given this background, it is widely believed that the sex ratio imbalance is a significant factor in black marital decline in that country (Staples, 1981; Guttentag and Secord, 1983). However, Espenshade (1985) has argued that decreases in black marriages have only been evident since the 1960s, and he concludes that sex ratio imbalances could not be the primary cause of this change. Tucker and Mitchell-Kernan (1995) attempted to reconcile the inconsistencies noted by Espenshade (1985) by among other factors, accounting for the economic eligibility dimension in the calculation of the sex ratio.

addition, reduced market discrimination against women and technological advances that allow much of what was once produced by skilled labour in the home to be purchased or produced with little skill reduce the benefits from specialization of spouses in the home and market spheres, thereby decreasing the gains from marriage. Thus, both the opportunity cost and the altered gains from marriage, emanating from the characteristics of individuals, may encourage non-marriage behaviour and lead to declining marriages.

Attitudes towards marriage may also change between different generations of individuals. In part, this is explained by escalating rates of divorce. In the United States, it was reported in the "State of Our Unions: The Social Health of Marriage in America" that younger people have lost confidence in the idea of finding a lifetime mate, having witnessed marital failure. This is sometimes found to be key in explaining the decline of marriages. Instead, many people tend to opt for alternative family forms, such as cohabitation and out-of-wedlock childbearing. These family forms are widely accepted, as a result, marriage is no longer viewed as the traditional, expected route into adulthood.

The major difference between the explanations of marriage decline related to a change in the distribution of characteristics and a change in the marriage behaviour of individuals is that the former mainly affects the workings of the marriage market. In particular, availability of marriageable partners is affected, influencing the timing of marriage. Women tend to be choosy when looking for potential spouses, and sometimes take longer when searching. The latter, on the other hand, mainly influences the intention to marry. In other words, the problem of non-marriage behaviour is seen as not with the marriage market but with marriage itself. Here, discontent with marriage is the driver of marital change. This is associated with forgoing marriage altogether.

These are some of the reasons that motivate the decomposition analysis, which enables us to calculate which one of these broad categories is the predominant explanation for the marriage decline in post-apartheid South Africa. A further disaggregated decomposition analysis enables us to look at each individual characteristic's contribution to the marriage decline.

5.3 Data Description

The sample used here comes from the series of independent nationally representative household surveys used previously, namely, the October Household Surveys (OHS; 1995 to 1999) and the September round of the Labour Force Surveys (LFS; 2000 to 2006). The working sample includes African women aged 20 to 49 years old.

Table 5.1 shows the mean values (and the standard deviations) of selected variables in the sample. Using the weighted sample, it shows marriage rates have dropped from 50 percent in 1995 to 45 percent in 2006. In addition, we notice that marriage rates in the intermediate years are all higher than that of 2006. Table 5.4 show the predicted marriage rates for an LPM, a probit model and a SELPM. From the decomposition analysis, we see evidence that the differences in the marriage rates are statistically significant. The significant differences show that studying time period differences in marriage rates makes sense in this context.

The characteristics of married and single women are different, as shown in Tables 5.2 and 5.3. Most women who are married are older, and those who are single are mostly younger. For example in 1995, the figures show that 8 percent of married women are aged between 20 and 24 years and 14 percent are aged between 45 and 29 years. For single women, about 45 percent are aged between 20 and 24 years and only 3 percent are aged between 45 and 49 years.

The sample shows evidence of an increase in education levels for African women. We notice that the numbers in lower levels of education, such as no schooling, incomplete primary and primary are decreasing. In Table 5.1, we show that for all women aged between 20 and 49 years old, about 11 percent had no schooling in 1995. By 2006, this proportion had been reduced to about 6 percent. Similarly, proportions for women with incomplete primary and primary schooling had declined from 18 and 8 percent respectively in 1995 to 13 and 7 percent in 2006. On the other hand, we show astounding evidence of an increase in education levels with regard to secondary qualifications. In 1995, the proportion was 16 percent and a 10 percentage point increase was registered by 2006. For incomplete

secondary education, the proportion was about 38 percent in 1995, which increased to about 43 percent in 2006. Both married and single women show higher rates with regard to incomplete secondary education. However, the rates are higher for single women throughout the years. Single women also have higher rates of secondary qualifications across the years, compared to the married sample. Overall, married women have lower levels of education than single women. Rates are higher for lower education categories such as those with no schooling, incomplete primary and primary schooling for married women, compared to single women. However, the rates for higher education categories, that is, women with a diploma or degree, are similar for single and married women.

Labour force participation rates are higher for married women than for single women. This is evident across the cross-sections. Our data shows compelling evidence of increased female labour force participation. The proportion of women who are economically active has increased from 1995 to 2006 (here, we use the broad definition of unemployment). The increase is recorded at 20 percentage points (from 61 percent in 1995 to 81 percent in 2006) in Table 5.1, which is quite astounding. This concurs with recent evidence of an increase in female labour force participation in South Africa by others (for example Casale, 2003; Ntuli, 2007).

Also interesting are the means for the sex ratios. Free mobility enabled by the change in regimes means that local marriage markets for women have also adjusted, thereby affecting their likelihood of marriage. The sex ratio, which accounts for only those men who are available for marriage and are employed, is less than one in earlier years, indicating that there are more African women than there are men; and more than one in the later years, establishing that there were more women than there were men in those years. With fewer men than women, the likelihood of marrying may go down, and even more when potential men with good jobs and good education are few. On the other hand, availability of potential spouses improves marriage prospects.

5.4 Methodology

The conceptualization in the previous chapters cannot fully explain the substantial shifts in marital behaviour that characterize African women in South Africa. Elsewhere, a number of studies have attempted to compare and test various explanations of marital change. Although these studies confirm that both demographic and economic factors are implicated in family formation trends, the results have been varied and inconclusive. Below, we present the empirical strategy for our investigation of declining marriages in South Africa. The discussion is for a single-equation linear probability model, where the marriage equation is estimated independently with all the explanatory variables assumed exogenous. We additionally present the results from a probit model and a simultaneous-equation linear probability model estimation. The latter accounts for the endogeneity of women's labour force participation decisions in their marriage decisions.

5.4.1 The Linear Probability model

We commence by establishing the modelling framework for the specific procedures to be undertaken in this chapter. The basic model for our purposes is a linear latent marriage model, given by:

$$m_i^* = \mathbf{x}_i\boldsymbol{\beta}+\mu_i \tag{5.1}$$

As in the preceding chapter, the dependent variable, m_i^* denotes gains from marriage, which indicates the propensity to marry. In the dataset, we observe $m_i = 1$ if $m_i^* > 0$ (the woman is married), and $m_i = 0$, otherwise. $\mathbf{x}$ is a $1 \times K$ vector of individual characteristics. β is a vector of estimable parameters and μ is the error term. In a general binary response modelling framework, we conventionally write:

$$E[m|\mathbf{x}_i] = \Pr(m_i = 1|\mathbf{x}_i) = \Phi(\mathbf{x}_i\boldsymbol{\beta}) \tag{5.2}$$

where $E[.]$ and $\Pr(.)$ respectively indicate expected value and probability. In the linear

case, $\Phi(\mathbf{x}_i\boldsymbol{\beta}) = \mathbf{x}_i\beta$, we have the linear probability model (LPM) which can be consistently estimated by ordinary least squares (OLS). Even though estimating a linear probability model when the dependant variable is binary is viewed as unattractive, mainly due to heretoskedasticity and because LPMs can potentially predict probabilities outside the zero-one bounds, we prefer to estimate a linear probability model, first of all, because of its computational simplicity. But most of all, we prefer to use a linear probability model because we are interested in predicting the conditional mean (or expected value) of marriage, rather than making inferences about individual parameters (Angrist and Pischke, 2009). On that basis, LPM will be adequate, especially in the decomposition analysis.

5.4.2 Decomposition Analysis

The objective of this section is to outline the estimation strategy for an understanding of the time-period differences in marriage rates. In linear models, possible distributional shifts in characteristics are corrected by using ideas from the fundamental Blinder-Oaxaca decomposition technique. The technique is widely used to identify and quantify the separate contributions of measurable characteristics to racial and gender differences in outcomes. In this study, decomposition analysis enables separation of the effect of the changing coefficients from the changing characteristics on the marriage decline, widely known respectively as the coefficient effect (or unexplained part) and the characteristic effect (or explained part).

The "explained" part of the decline is that part that is explained by group differences in the determinants of marriage and the unexplained portion is the residual part that cannot be accounted for by such differences in marriage determinants. So, for example, the former would be what the distribution of marriages would be in the year 2006 if women sampled in 2006 faced similar marriage market conditions as in the year 1995, or vice-versa. If the aggregate characteristics of women in the sample are found to have a large effect on the decline in marriages, this would suggest that overall the values of the explanatory variables had changed in such a way that would discourage marriage. If, on the other hand, the coefficient effect on the decline in marriages is found to be large, it would suggest that

the marriage model relationship has changed in such a way that individuals in 2006 with similar characteristics to those in 1995 would be less likely to marry. In addition, a detailed decomposition of the characteristic effect enables us to identify the major factors driving the marriage decline. For example, a detailed decomposition of the characteristic effect would provide insight into how much women's participation in the labour force contributes to the marriage decline. Knowledge of the factors that discourage marriages is informative to policy makers.

As alluded to in the previous chapter, however, the female labour force participation decision is potentially endogenous in a woman's marriage decision. Thus, we get consistent estimates when we jointly model these two decisions. It is therefore important that similar adjustments be made to the decomposition analysis to account for the simultaneous-equation modelling[3]. To this end, we make use of the instrumental variable approach in a two-stage least squares estimation framework. Note however, that the instrument, women's jobs variable performs weakly,and therefore discussion of the results focuses on naïve estimates, which ignore the endogeneity problem.

We apply the standard Blinder-Oaxaca decomposition method (independently Blinder (1973) and Oaxaca (1973)) because we are estimating a linear probability model[4]. Thus, having estimated the marriage equation separately on each year's dataset, relative to 2006, we use the estimated coefficients, $\widehat{\beta}$, assuming these are consistent estimates of β_i, to consistently approximate the differences in the means of choosing option 1 (marrying) over option 0 (not marrying) between two groups (time periods t and 2006), in order to find the effects of the differences in each characteristic and coefficient. Yun (2000) calls the part explained by differences in coefficients a behavioural response if the choice is made by an individual's own will, or discrimination if the choice is made by others (like in wage gap studies). In

[3]Yun (2000) provides an extension for the decomposition analysis to the case where the choice equation is estimated jointly with other equations in a maximum likelihood estimation framework.

[4]An extension of the Blinder-Oaxaca decomposition for binary choice models is normally used for logit and probit models (Even and Macpherson, 1990; Yun, 2000; Fairlie, 2005).

this study, since an individual is viewed as deciding whether to get married or stay single, we interpret that part of the decline explained by differences in coefficients as a behavioural response.

The marriage model is outlined again here in order to accommodate the dynamic component of the current chapter. We include in our notation the time factor, t, to allow for the time dimension, which is the grouping variable required for the decomposition analysis. Assume we have T cross-sectional datasets, each of which has observations denoted N. Therefore, we observe the marital status of an n^{th} woman in the t^{th} period (m_{tn}) which takes the value of 1 if the latent variable (m^*_{tn}) is positive (indicating that she has ever married) and 0 otherwise. With the t component, the marriage regression model is estimated separately for the groups $t = (t, 2006)$, for $t = 1995, ..., 2005$ and it is defined as follows:

$$m^*_{tn} = \mathbf{x}_{tn}\boldsymbol{\beta}_t + \mu_{tn} \tag{5.3}$$

$$\left.\begin{array}{c} m_{tn} = 1 \text{ if } m^*_{tn} > 0 \text{ (experience marriage)} \\ m_{tn} = 0 \text{ Otherwise (remain single)} \end{array}\right\} \tag{5.4}$$

In the case of the linear probability model, the decomposition of differences in mean values between 2006 and time period t, proposed by Blinder (1973) and Oaxaca (1973) is given by[5]:

$$\overline{m}_t - \overline{m}_{06} = \left(\overline{\mathbf{x}}_t\widehat{\beta}_t - \overline{\mathbf{x}}_{06}\widehat{\beta}_{06}\right) = \left[\left(\overline{\mathbf{x}}_t - \overline{\mathbf{x}}_{06}\right)\widehat{\beta}_t\right] + \left[\overline{\mathbf{x}}_{06}\left(\widehat{\beta}_t - \widehat{\beta}_{06}\right)\right] \tag{5.5}$$

All the terms are as previously defined. The term in the first square bracket captures the characteristic effect component of the marriage decline. It is also known as the explained portion of the decline in marriages. It represents the change in marriages that arises due to the changing characteristics of the population from year 2006 to year t values, while holding

[5] $\overline{m}_{06} - \overline{m}_t = \left[\overline{\Phi\left(x_{06}\widehat{\beta}_{06}\right)} - \overline{\Phi\left(x_t\widehat{\beta}_{06}\right)}\right] + \left[\overline{\Phi\left(x_t\widehat{\beta}_{06}\right)} - \overline{\Phi\left(x_t\widehat{\beta}_t\right)}\right]$ or alternatively, $\overline{m}_{06} - \overline{m}_t = \left[\overline{\Phi\left(x_{06}\widehat{\beta}_t\right)} - \overline{\Phi\left(x_t\widehat{\beta}_t\right)}\right] + \left[\overline{\Phi\left(x_{06}\widehat{\beta}_{06}\right)} - \overline{\Phi\left(x_{06}\widehat{\beta}_t\right)}\right]$ for the nonlinear analogue of the decomposition equations.

constant the determinants of marriage at year t (i.e. unchanged at $\widehat{\beta}_t$). Put differently, it represents the change in marriages that occurs if the coefficients were held constant at year t values and only the sample's characteristics were to change from year t to year 2006 values. These are also known as endowment effects in gender or racial wage discrimination studies, a typical application of the Blinder-Oaxaca decomposition.

The term in the second square bracket captures the coefficient effect portion of the characteristics that explain the marriage decline. It is also referred to as the unexplained portion of the decline in marriage. It describes the change in marriages arising from the changing coefficients of the characteristics. This occurs if for the sample in year t, the determinants of marriage are held constant at year 2006 values. In this case, $\widehat{\beta}_t$ changes to $\widehat{\beta}_{06}$. The unexplained portion is the part of the decline that results from a given individual being less likely to be married and is conventionally known as the price effect or "discrimination" in wage discrimination studies, but here we could consider it a change in "behaviour".

An alternative method of decomposition can be derived by swapping the reference and comparison time periods to get an equally valid decomposition formulation as follows:

$$\overline{m}_t - \overline{m}_{06} = \left[\left(\overline{\mathbf{x}}_t - \overline{\mathbf{x}}_{06}\right)\widehat{\beta}_{06}\right] + \left[\overline{\mathbf{x}}_t\left(\widehat{\beta}_t - \widehat{\beta}_{06}\right)\right] \tag{5.6}$$

In this case, year 2006 is used as a base year, and the corresponding coefficients are used as weights in the first term while year t distributions of independent variables are used as weights for the second term. Thus, the difference between the alternative decompositions is that, while the first decomposition in equation (5.5) uses $\overline{\mathbf{x}}_{06}\widehat{\beta}_t$ to divide the differences in mean marriages into a part that depicts the effect of different coefficients between the two time periods and a part that depicts differences in the effects of different individual characteristics between the two time periods, the alternative decomposition in equation (5.6) uses $\overline{\mathbf{x}}_t\widehat{\beta}_{06}$. In other words, equation (5.5) uses year t coefficients in the counterfactual, while equation (5.6) uses year 2006 coefficients in the counterfactual. The former implies that if there was no gap in average marriage rates between year t and year 2006, the marriage profile of year t would prevail. On the other hand, use of year 2006 coefficients in the

alternative decomposition model implies that if there was no gap in average marriage rates, the marriage structure of year 2006 would prevail. These alternative methods of calculating the decomposition often provide different estimates, which is the familiar index problem with decomposition analyses (Fairlie, 2005; Jones, 1983)[6].

For the nonlinear analogue of the decomposition equations, the aggregated decomposition model when year 2006 coefficients is given by

$$\overline{m}_{06} - \overline{m}_t = \left[\overline{\Phi\left(x_{06}\widehat{\beta}_{06}\right)} - \overline{\Phi\left(x_t\widehat{\beta}_{06}\right)}\right] + \left[\overline{\Phi\left(x_t\widehat{\beta}_{06}\right)} - \overline{\Phi\left(x_t\widehat{\beta}_t\right)}\right] \tag{5.7}$$

or alternatively by

$$\overline{m}_{06} - \overline{m}_t = \left[\overline{\Phi\left(x_{06}\widehat{\beta}_t\right)} - \overline{\Phi\left(x_t\widehat{\beta}_t\right)}\right] + \left[\overline{\Phi\left(x_{06}\widehat{\beta}_{06}\right)} - \overline{\Phi\left(x_{06}\widehat{\beta}_t\right)}\right] \tag{5.8}$$

when year t coefficients are used. All else in equations (5.7) and (5.8) is as previously defined.

5.4.3 Detailed Decomposition Analysis

Equations (5.5) and (5.6) only give the aggregate measures of the effects of the differences in characteristics and their coefficients between two time periods[7]. A detailed decomposition helps to account for the contribution of each individual predictor in terms of the characteristic and coefficient effect to the marriage decline. From the decomposition model in equation (5.5), the contribution that a k^{th} variable $(k = 1, ..K)$ makes to the explained portion of the total marriage rate gap is given by

$$\left(\overline{\mathbf{x}}_t - \overline{\mathbf{x}}_{06}\right)\widehat{\beta}_t = \left(\overline{\mathbf{x}}_t - \overline{\mathbf{x}}^k_{06}\right)\widehat{\beta}_t + \left(\overline{\mathbf{x}}^k_{06} - \overline{\mathbf{x}}_{06}\right)\widehat{\beta}_t \tag{5.9}$$

[6]Another alternative is to weight the explained portion of the decomposition equation using coefficient estimates from a pooled sample of the two groups as proposed independently by Neumark (1988) and Oaxaca and Ransom (1994).

[7]Refer to Yun (2000) for a two-step modification of the decomposition for non-linear models with endogenous variables. Yun also offers a procedure for the detailed decomposition of such models.

A detailed decomposition analysis allocates shares to the marriage decline according to the relative size of the explanatory variable's impact on marriage.

The analogue detailed decomposition of the characteristic effect when year 2006 coefficients are used in the counterfactuals is given by:

$$\left(\overline{\mathbf{x}}_t - \overline{\mathbf{x}}_{06}\right)\widehat{\beta}_{06} = \left(\overline{\mathbf{x}}_t - \overline{\mathbf{x}}_{06}^k\right)\widehat{\beta}_{06} + \left(\overline{\mathbf{x}}_{06}^k - \overline{\mathbf{x}}_{06}\right)\widehat{\beta}_{06} \tag{5.10}$$

The contribution of the kth variable to the characteristic effect (denoted $W_{\Delta x}^k$) is given in equation (5.11). From this equation, we can see that the contribution of each variable, k, to the explained portion of the marriage decline, is equal to the change in mean marriages from replacing the year t distribution with the year 2006 distribution of that variable while holding the distribution of the other variables, $-k$, constant.

$$W_{\Delta x}^k = \frac{\left(\overline{\mathbf{x}}_t^k - \overline{\mathbf{x}}_{06}^k\right)\widehat{\beta}_t^k}{\left(\overline{\mathbf{x}}_t - \overline{\mathbf{x}}_{06}\right)\widehat{\beta}_t}; \sum_{k=1}^{K} W_{\Delta x}^k = 1 \tag{5.11}$$

Similarly, a detailed decomposition for the coefficient effect for when year t coefficients are used in the counterfactuals is given by equation (5.12) and its analogue for the year 2006 coefficients is given by equation (5.13).

$$\overline{\mathbf{x}}_{06}\left(\widehat{\beta}_t - \widehat{\beta}_{06}\right) = \overline{\mathbf{x}}_{06}\left(\widehat{\beta}_t - \widehat{\beta}_{06}^k\right) + \overline{\mathbf{x}}_{06}\left(\widehat{\beta}_{06}^k - \widehat{\beta}_{06}\right) \tag{5.12}$$

$$\overline{\mathbf{x}}_t\left(\widehat{\beta}_t - \widehat{\beta}_{06}\right) = \overline{\mathbf{x}}_t\left(\widehat{\beta}_t - \widehat{\beta}_{06}^k\right) + \overline{\mathbf{x}}_t\left(\widehat{\beta}_{06}^k - \widehat{\beta}_{06}\right) \tag{5.13}$$

The contribution of the kth variable to the coefficient effect (denoted $W_{\Delta\beta}^k$) is given in equation (5.14).

$$W_{\Delta\beta}^k = \frac{\left(\overline{\mathbf{x}}_t^k - \overline{\mathbf{x}}_{06}^k\right)x_{06}^k}{\left(\overline{\mathbf{x}}_t - \overline{\mathbf{x}}_{06}\right)x_{06}}; \sum_{k=1}^{K} W_{\Delta\beta}^k = 1 \tag{5.14}$$

As proposed by Yun (2005), the non-linear variant of the combined detailed decomposition for the characteristic and coefficient effects is equation (5.15) as follows:

$$(\overline{\mathbf{x}}_t - \overline{\mathbf{x}}_{06t}) = \sum_{k=1}^{K} W_{\Delta x}^{k} \left[\overline{\Phi\left(x_t\beta_t\right)} - \overline{\Phi\left(x_{06}\beta_t\right)}\right] + \sum_{k=1}^{K} W_{\Delta\beta}^{k} \left[\overline{\Phi\left(x_{06}\beta_t\right)} - \overline{\Phi\left(x_{06}\beta_{06}\right)}\right] \quad (5.15)$$

where $W_{\Delta x}^{k}$ and $W_{\Delta\beta}^{k}$ are respectively, the individual-specific contributions of the characteristic to the overall characteristics and coefficients effects.

However, Oaxaca and Ransom (1999) show that the detailed decomposition of the coefficient effect is not invariant to the choice of the reference category when dummy variables are used. Yun (2005) proposes a solution to this problem by using normalised regressions to identify the estimates of each dummy variable. Using Yun's (2005) remedy[8], marriage equation (5.3) can be transformed into what Yun calls a normalised equation as follows:

$$m^* = \sum_{p=1}^{P} \overline{\beta}_p + \sum_{q=1}^{Q} x_q\beta_q + \sum_{p=1}^{P} \sum_{r_p=1}^{R_p} D_{pr_p} \left(\beta_{pr_p} - \overline{\beta}\right) + \mu \quad (5.16)$$

where Q is the number of continuous variables (x), and P are the sets of dummy variables (D). The P^{th} set of the dummy variables has r_p categories. All the other variables are as previously defined and the n^{th} woman and t^{th} group subscripts are suppressed. The idea is to use equation (5.16) to calculate the contribution to the marriage decline of each dummy variable in regression analysis by averaging the measured contributions (coefficients) with the different specifications of the reference category, including the constant. Refer to Yun (2005) for a detailed illustration and derivation of the normalised coefficients.

It is necessary that the total sum of the contributions from individual variables to the characteristic (coefficient) effect of the marriage decline be equal to the total contribution of the characteristic (coefficient) effect from all the variables.

5.4.4 Determinants of Marriage Decline between 1998 and 2006

In this section as in the previous chapter, we continue to focus on the 1998 cross-section in a discussion of the marriage decline. We primarily consider the case where labour force

[8]Refer to Nielsen (2000) and Gardeazabal and Ugidos (2005) for other solutions to this identification problem.

participation is assumed to be exogenous, in the single-equation linear probability model as well as in the probit model estimations. Estimates for the simultaneous-equation linear probability model are also reported. Predicted marriages for the single-equation linear probability model, probit model and simultaneous equation models are reported first, in Table 5.4. The estimates for the linear probability model are reported in Tables 5.5 and 5.6. Year 2006 coefficients and year t coefficients are respectively used in the counterfactual. Tables 5.9 and 5.10 report the same for the non-linear counterpart. Further, we present the results where the endogeneity of labour force participation is accounted for in the simultaneous-equation linear probability modelling framework. Tables D.1 and D.2 in appendix D report the results for the respective year 2006 and t coefficients. These results are relegated to the appendix because they are problematic. As mentioned in the previous chapter, the endogeneity problem in our marriage model needs to be corrected by the instrumentation approach. However, weak instrument problems are affecting our results but we report these results anyway.

We report both the aggregated and the individual contributions of the explanatory variables to the marriage decline. We discuss the results of the aggregate decomposition first, followed by a discussion of the results of the detailed decomposition of the characteristics and coefficient effects. Again, our discussion here focuses on the results from the single-equation linear probability model. The results from probit model estimation are however, very similar to those for the linear probability model.

Results of the Aggregated Decomposition

The predicted marriages from a linear probability model in Table 5.4 indicate that the marriage rate for 2006 is lower (at 45 percent) than that for 1998 (at 50 percent)[9]. The difference between these rates is statistically significant at the 1 percent level. In a linear

[9]Note that all results are weighted using sampling weights. These are weights that denote the inverse of the probability that the observation is included because of the sampling design. The advantage of using weights is that the results represent a population, rather than a sample.

probability model, we find that out of the significant 5 percentage point marriage decline in this period (reported in Table ∇), -0.007 (about -13 percent) is attributable to the characteristic effect, while 0.0507 (113 percent) is attributable to the coefficient effect. This applies when the 2006 coefficients are used in the counterfactuals. The implications of the decomposition results do not vary much when the 1998 sample is used for the coefficients. In that case, we find that -0.021 (-40 percent) of the marriage decline is explained, while 0.074 (140 percent) is unexplained (reported in Table 5.6).

Using year 2006 (t) coefficients in the counterfactuals, the figures from the aggregate decomposition suggest that about 13 (-40) percent of the marriage decline that occurred between 1998 and 2006 can be attributable to a change in the distribution of the characteristics that affect a woman's marriage decision. On the other hand, 113 (140) percent of the marriage decline in that period can be attributed to changes in the relationship between marriage and its determinants. The results mean that if 1998 and 2006 characteristics were to be equalized, -13 (-40) percent of the marriage decline would vanish. On the other hand, if marriage behaviour for 1998 and 2006 individuals were the same, at least 100 percent of the marriage decline would disappear.

Similar results are obtained when a probit model is estimated. Here, predicted marriages are again, 50 percent and 45 percent in the respective 1998 and 2006 cross-sections. As reported in Table 5.9, about -0.006 (-11 percent) is the total marriage decline that is explained and a highly significant 0.0587 (111 percent) remains unexplained when 2006 coefficients are used in the counterfactuals. Alternatively when 1998 sample coefficients are used in the decomposition model (5.10), -0.0243 (-46 percent) of the 5 percent marriage decline is explained, while a significant 0.0771 (146 percent) remains unexplained.

These results indicate that the marriage decline between 1998 and 2006 is exclusively due to differences in coefficients and is not due to behavioural differences. This means that the marriage decline cannot be simply explained by a change in the average characteristics of women. There has also been a change in the way the probability of marriage is determined. This finding is not entirely surprising, considering that in the previous chapter, we observed

some temporal changes in the relationship between marriage and some of its determinants. For example, while labour force participation negatively affected the likelihood of marriage consistently between 1998 and 2006, the magnitude of its effect was not constant. In 1998, the effect was -0.02 and significant, while in 2006, the effect was -0.01 and no longer significant. Similarly, level of education was found to have a negative effect on the probability of marriage but the magnitude of the effect varied between the two years. For instance, the effect of the secondary dummy was a highly significant -0.18 in 1998. The effect was lower in 2006, reducing the likelihood of marriage by 11 percentage points. Sex ratio had a significant positive effect of 19 percentage points in 1998. By 2006, the magnitude of the effect was still significant but lower at only 3 percentage points. These are a summary of findings for some of the determinants of marriage in the case where labour force participation was assumed to be exogenous and marriage was treated as a binary categorical variable.

Results of the Detailed Decomposition

Results from the detailed decomposition of both the explained and the unexplained portions of the marriage decline are discussed here. Tables 5.5 and 5.6 respectively show estimates from the detailed decomposition of the explained portion of the marriage decline when year 2006 and year t sample coefficients are used in the decomposition model. In Table 5.7, we report results from the detailed decomposition of the unexplained portion of the marriage decline. These results are obtained from the estimation of a marriage model which ignores the endogeneity of labour force participation, treats marriage as a continuous variable and uses the 2006 sample coefficients in the counterfactuals. Table 5.8 reports the same for year t sample coefficients in general, and year 1998 sample coefficients in particular for the discussion of the results in the current section. Normally, focus is given to the detailed decomposition of the explained portion of a gap. In the detailed decomposition of the explained portion of the marriage decline, we would be interested in whether (and how much) time period differences in the most likely "suspects" (age groups, education, labour market status, sex ratio and location) contribute to the marriage decline over a specific

year, t and year 2006. In particular, we would be interested in the contribution of these variables to the explained portion of the marriage decline that we found in the aggregate decomposition. The findings are informative regarding the causes and policy implications of declining marriages. However, since our findings from the aggregate decomposition analysis suggest that the largest part of the marriage decline remained unexplained, the results from a detailed decomposition of the unexplained part of the marriage decline will be given additional attention. We look at the contributions of each one of the characteristics that we controlled for in turn, in the context of the two detailed decomposition portions.

Labour Force Participation Ever since the post-apartheid regime enforced constitutional changes[10] to South African labour legislation to reverse both legalised and informal racial and gender discrimination in the workplace, African women's labour force participation rates have been increasing. Theoretically, it is predicted that the labour force participation rate for married women would be lower than for unmarried women, due to the conflicting time demands between market work and home work that women face. This suggests that female labour force participation would be expected to negatively affect women's marriage decisions. An increase in female labour force participation would therefore be expected to positively contribute to a decline in women's marriages.

Using the 2006 coefficients in the counterfactuals when a linear probability model is estimated, the detailed decomposition estimates of the characteristic effect show that labour force participation contributed positively to the marriage decline. Out of the -0.007 which is attributable to the total characteristic effect, 0.0016 is attributable to an increase in female labour force participation. This finding is robust to the choice of coefficients in the counterfactuals. The increase in labour force participation continues to widen the marriage decline. For example, when the 1998 sample is used for coefficients, the estimates

[10]The Employment Equity Act (1998) aimed to abolish discrimination in the work place and provides a platform for the implementation of Affirmative Action by firms and for the monitoring and reduction of wage differentials.

show that -0.021 out of 0.0039 of the total characteristic effect is explained by labour force participation. The importance of the increase in female labour force participation in explaining the marriage decline between 1998 and 2006 is significant at the 1 percent level when 1998 cross-section sample coefficients are used to estimate the decomposition model of the marriage decline. This finding is in line with the hypothetical predictions of this chapter.

In terms of the detailed decomposition of the coefficient effect, the figures in Table 5.7 indicate that with 2006 coefficients in the counterfactuals, labour force participation contributes -0.002 to the total coefficient effect of 0.006 that contributes to the marriage decline. A counterpart figure for when 1998 sample coefficients are used in the sample is -0.0043. The equivalent figures for a probit model are given in Tables 5.11 and 5.12 and are respectively -0.0025 and -0.0051. These estimates suggest that change in the relationship between labour force participation and marriage has contributed negatively to the marriage decline. In other words, change in behaviour that influence labour force participation and marriage decisions in women contributed to narrowing the marriage decline between 1998 and 2006.

Education Evidence in chapter 3 and elsewhere shows a general increase in the proportion of educated women in post-apartheid South Africa. From the predictions of women's economic independence hypothesis, women's education is expected to render financial freedom to women. Increasing levels of education in women therefore reduce their prospects of marriage, thereby positively contributing to the marriage decline.

The estimates from the detailed decomposition of the characteristic effect in the linear probability model of marriage that uses year 2006 sample coefficients show that education contributed positively to the marriage decline in the period 1998-2006. This finding is in line with the theoretical prediction as well as the prior empirical evidence that the marriage decline is linked to women's economic advances. When the 2006 coefficients are used and the linear probability model is estimated, education contributes 0.0134 to the total characteristic effect of the marriage decline. The analogue of education effects when year

1998 coefficients are used in the counterfactuals is 0.0193. The equivalent figures in the probit model estimation are 0.0124 and 0.0184. In both model specifications, education is found to be the largest contributor of all the variables to the marriage decline. Estimates from both the 1998 and 2006 coefficients show that education was significant in affecting the marriage decline. The statistical levels of the estimates are both very strong at the 1 percent level of significance.

The estimates from the detailed decomposition of the coefficient effect in both the LPM and the probit model are also positive. At 0.0167, the contribution is statistically significant at the 10 percent level in the model that uses 2006 coefficients. The contribution of education remains positive at 0.0108 when 1998 coefficients are used, but is no longer significant. In the probit model, the figures are respectively, a 10 percent level significant coefficient of 0.017 and the statistically insignificant 0.0092. The positive effect suggests that a change in the how education influences marriage decisions in women that might have occurred between 1998 and 2006 contributed to widening the marriage decline between the two years.

Age Age also shows high levels of significance in predicting marriage decline. However, its contribution is negative, regardless of the type of model estimated and the sample coefficients used in the estimation. Using the 2006 sample for coefficients in the LPM, age is found to narrow the marriage decline between 1998 and 2006 by 0.0068. Likewise, the change in the distribution of age between 1998 and 2006 narrows the marriage decline by 0.0077 when the 1998 sample is used for coefficients. The probit counterpart figures are 0.0064 and 0.0075. The negative estimates may mean that the distribution of women's ages between 1998 and 2006 has changed, such that there are more older women in 2006 than there were in 1998. Such a change in the age distribution may have resulted in more marriages among older women in 2006.

Since the negative estimates have an effect of narrowing the marriage decline, their effect might be eroding the positive effects that labour force participation and education have to the marriage decline, hence the negative total explained value we obtain in the aggregate decomposition of the marriage decline.

The estimates from the detailed decomposition of the coefficient effect are likewise negative in both model specifications and their alternate coefficient samples. This is an indication that there is a change in the relationship between marriage and age that results in more marriages.

Sex Ratio Ideally, we expect the decline in the availability of "good quality" men in 2006 compared to 1998 to contribute positively to narrowing the marriage decline. However, calculations for the sex ratio in chapter 3 and in the descriptive statistics of this chapter suggest that the sex ratio is increasing. The figures in Table 5.1 show that the sex ratio was 0.814 for all women aged 20-49 years in 1998, an indication that there were more women than there were employed men available for marriage in that year. By 2006, the figure had gone up to 1.2755, signifying more marriageable men available than there were in 1998. With this sex ratio pattern, sex ratio cannot possibly be responsible for the fall in marriage rates observed between 1998 and 2006.

It is therefore unsurprising that the sex ratio has a negative coefficient in the decomposition analysis. In the LPM with 2006 coefficients used in the analysis, the effect is -0.0126. With year 1998 coefficients used in the counterfactuals, the effect is -0.0366. Both these coefficients are statistically significant at 10 percent and 1 percent level, respectively. In the probit model, the estimates are -0.0104 and -0.0389 respectively for the 2006 and 1998 sample coefficients.

Like age, changes in the distribution of men and women that may have occurred between 1998 and 2006 contribute to narrowing the marriage decline in that period, eroding the positive effects that labour force participation have in explaining the marriage decline in the same period.

The estimate for the sex ratio in the detailed decomposition of the coefficient effect is positive and significant. This means changes in the marriage model relationship with the sex ratio have contributed positively to the marriage decline. The effect was higher in 1998 at 0.19 and fell to only 0.03 in 2006, suggesting that participants in the marriage market do not respond to the availability of partners as positively in 2006 as they did in 1998, hence

the positive contribution of this variable.

Province Unlike labour force participation, education, age and the sex ratios, the combined province dummies do not show a consistent pattern in their role of explaining the marriage decline for the various model specifications.

The coefficient is -0.0026 and statistically significant at the 10 percent level in the LPM which uses 2006 coefficients, suggesting a negative contribution to the marriage decline. In the alternative LPM specification that uses the 1998 counterfactuals, the effect is almost negligible and statistically insignificant at 0.0001. The estimates for a probit model that uses 2006 (1998) coefficients in the counterfactuals are -0.0025(0.0002), with the former being significant at the 1 percent level and the latter being insignificant.

The contribution of the province dummies to the marriage decline when using 1998 coefficients is minimal and insignificant, signifying negligible changes in the distribution of the female population across the provinces between 1998 and 2006. The negative and significant estimates obtained when using 2006 coefficients indicate that changes in the distribution of women across the provinces of South Africa contributed to narrowing the marriage decline. If instead, female migration to places of perceived job opportunity rises, location distributional change would be expected to contribute to fewer marriages in 2006 than in 1998. This is because women who move are likely to move to areas where they can get employment, and such women who are willing to work in paid jobs are the ones who are unlikely to marry.

5.4.5 A General Outlook on the Determinants of Time Period Differences in Women's Marriages

In this section, we analyse all the other years to see how the variables and their coefficients generally contributed to time period differences in marriage rates. The estimates for the linear probability model are reported in Tables 5.5 and 5.6 for the year 2006 and year t coefficients respectively. Like the marriage decline between 1998 and 2006, we find that the coefficient effect is generally dominant in explaining the marriage decline between each of

the years t and 2006. We find that behavioural differences (the coefficient effect), rather than distributional differences, predominantly contribute to the total marriage decline. Exceptional results that contradict this general finding are for years 2001-2003. Also, over all years results are quite different when using year t coefficients. Percentage of the marriage decline explained by the characteristic effect is much higher. This means the decomposition analysis successfully explained the marriage decline in some years and failed to explain the marriage decline in other years.

In a detailed decomposition of the characteristic effect, we find that all the variables included in our marriage model contribute to the marriage decline in some way, in at least one of the years. While some variables contributed significantly, others did not; and while others contributed positively, others did so negatively. Regardless of the coefficients used in the counterfactuals, the general picture coming out of the detailed decomposition results is that a big part of the characteristic effect is taken up by the education factor, which is both positive and significant. Labour force participation also contributes substantially to the explained portion of the marriage decline. Age, sex ratio and province on the other hand are generally found to have a contractionary effect on the marriage decline.

A quick glance at the results from the aggregate decomposition analysis leads one to conclude that the bulk of the marriage decline remains unexplained, and that the marriage decline in this period is driven more by temporal changes in the behavioural relationships than it is by temporal changes in the distribution of the factors that affect marriage decisions.

A detailed decomposition analysis of the characteristic effect reveals a contrary finding. In Table 5.5 we show the relative contribution of education to the marriage decline. Interestingly, education, which contributes most to the marriage decline contributes quite highly. The contribution is mostly over a quarter and in some cases education explains at least some of the marriage decline. It turns out that sex ratio, age and province erode their negative effects. We have further decomposed the coefficient effect in order to understand the individual-specific contributions of the variables that arise from changes in the marriage

model relationships.

The following conclusion can be made from these outcomes. The economic changes that have taken place in post-apartheid South Africa are adequate in explaining the marriage decline in the period under review. For instance, in line with Casale's (2003) finding, women might be finding opportunities in post-apartheid paid job markets. In addition, we have shown evidence in the previous chapters that women are increasingly getting more education in post-apartheid South Africa. Both these changes explain the marriage decline but their positive effects are suppressed by the negative effects of other factors of marriage decisions, such as age, province and sex ratio.

Policy intervention to help the African South African family in crisis may not be obvious in this case because a large portion of the marriage decline remains unexplained. However, for the most part, demographic issues seem to be important here because of the offsetting effect they have on the contributions brought about by economic changes In particular, labour migration to places of employment might have changed the distribution in the provincial composition, thereby influencing numbers and quality in the local marriage market. In addition, it appears from the decomposition analysis that the determination of age in the marriage model highly influenced the marriage decline. The population appears to be younger in 2006, up to the levels of driving marriage rates to low levels, relative to the earlier years.

5.5 Conclusion

In this chapter, we ask why the distribution of marriages has changed over time among African women. In light of the time-period differences in marriage rates between 1995 and 2006 that we captured in the previous chapters and which have also been documented for South African marriages by others, we go a step further to quantify the individual contribution of specific factors to the marriage decline. To this end, we use the Blinder-Oaxaca type decomposition analysis. Declining marriage is decomposed into what can be explained by differences in individual characteristics and what can be explained by

differences in coefficients.

Datasets used for the analyses were the October Household Surveys from 1995 to 1999 and the September wave of the Labour Force Surveys from 2000 to 2006. While datasets from some cross-sections produce results that are contrary to the research objectives, other cross-sections produce reasonable results.

The results from the decomposition analysis have shown that the predominant part of the marriage decline between year t and year 2006 is unexplained rather than explained. In other words, the effects of differences in coefficients outweigh those of differences in individual characteristics. However, this conclusion is not general across all the cross-sections. In years 2001 to 2003, for example, the explained portion of the marriage decline was predominant in explaining the gap when year 2006 coefficients are used. When year t coefficients are used, we also find that the characteristic effect is much higher in a few more cross-sections.

As expected, the estimates for education and labour force participation education were found to predominantly contribute to the explained portion of the marriage decline. In line with the women's economic independence hypothesis, we do find that increases in education contributed significantly to the decline in marriage. In fact, it is the main variable that explains the changes over time, as the other variables mostly lead to changes in the opposite direction. Age, sex ratio and province had a contractionary effect on the characteristic effect of the marriage decline. It is puzzling that marriage declined even though sex ratios increased.

This detailed decomposition analysis of the characteristic effect shows that declining marriages cannot be attributable exclusively to changing levels in only one characteristic. In particular, the results support the findings in the descriptive chapter 3 that the marriage decline over the 12 year period under review is not just attributable to an increase in female labour force participation among African women.

Table 5.1: Means and Standard Deviations of Sample Characteristics for Women Aged 20 to 49 Years Old

Variables	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Married	0.4981	0.5142	0.4943	0.5008	0.4789	0.4839	0.4669	0.4826	0.4628	0.4823	0.4525	0.4486
	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)	(0.50)
Participation	0.6107	0.579	0.6167	0.6451	0.7059	0.7656	0.7968	0.8013	0.8105	0.7944	0.8063	0.81
	(0.49)	(0.49)	(0.49)	(0.48)	(0.46)	(0.42)	(0.40)	(0.40)	(0.39)	(0.40)	(0.40)	(0.39)
No Schooling	0.1059	0.1135	0.1115	0.1064	0.0887	0.081	0.0812	0.077	0.0675	0.0659	0.0605	0.0556
	(0.31)	(0.32)	(0.31)	(0.31)	(0.28)	(0.27)	(0.27)	(0.27)	(0.25)	(0.25)	(0.24)	(0.23)
Incomplete Primary	0.184	0.1949	0.178	0.1844	0.1901	0.1811	0.1769	0.1681	0.1545	0.1456	0.136	0.125
	(0.39)	(0.40)	(0.38)	(0.39)	(0.39)	(0.39)	(0.38)	(0.37)	(0.36)	(0.35)	(0.34)	(0.33)
Primary	0.0832	0.0826	0.0876	0.0856	0.0807	0.0854	0.0853	0.0791	0.0774	0.0691	0.0683	0.0658
	(0.28)	(0.28)	(0.28)	(0.28)	(0.27)	(0.28)	(0.28)	(0.27)	(0.27)	(0.25)	(0.25)	(0.25)
Incomplete Secondary	0.3812	0.3773	0.4023	0.3972	0.3759	0.3897	0.3851	0.3916	0.3908	0.4231	0.4175	0.4255
	(0.49)	(0.48)	(0.49)	(0.49)	(0.48)	(0.49)	(0.49)	(0.49)	(0.49)	(0.49)	(0.49)	(0.49)
Secondary	0.1627	0.1704	0.1697	0.1668	0.1882	0.1869	0.1898	0.2018	0.2285	0.2372	0.2534	0.2647
	(0.37)	(0.38)	(0.38)	(0.37)	(0.39)	(0.39)	(0.39)	(0.40)	(0.42)	(0.43)	(0.43)	(0.44)
Diploma	0.0587	0.0387	0.0398	0.0477	0.0491	0.0531	0.056	0.0581	0.0588	0.0381	0.0431	0.0435
	(0.24)	(0.19)	(0.20)	(0.21)	(0.22)	(0.22)	(0.23)	(0.23)	(0.24)	(0.19)	(0.20)	(0.20)
Degree	0.012	0.0106	0.008	0.0103	0.0163	0.0177	0.0198	0.0196	0.0183	0.0167	0.0187	0.016
	(0.11)	(0.10)	(0.09)	(0.10)	(0.13)	(0.13)	(0.14)	(0.14)	(0.13)	(0.14)	(0.13)	(0.13)
20-24 Years	0.2584	0.252	0.2428	0.2586	0.2572	0.2469	0.2322	0.2251	0.2343	0.2478	0.2419	0.2387
	(0.44)	(0.43)	(0.43)	(0.44)	(0.44)	(0.43)	(0.42)	(0.42)	(0.42)	(0.43)	(0.43)	(0.43)
45-49 Years	0.0848	0.0876	0.0913	0.0857	0.0855	0.0971	0.099	0.0993	0.1078	0.1028	0.1042	0.1032
	(0.28)	(0.28)	(0.29)	(0.28)	(0.28)	(0.30)	(0.30)	(0.30)	(0.31)	(0.30)	(0.31)	(0.30)
Sex Ratio	.3768	.5028	.6564	.814	.9485	1.0989	1.2351	1.2333	1.2536	1.254	1.2649	1.2755
	(.2554)	(.179)	(.2139)	(.2631)	(.2734)	(.3162)	(.366)	(.3723)	(.3886)	(.4051)	(.4281)	(.4676)
Observations	20202	12734	23303	13619	18015	18371	18360	17080	16517	18474	18365	18071

Table 5.2: Means and Standard Deviations of Sample Characteristics for Married Women

Variables	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Participation	0.6494	0.6032	0.6397	0.6758	0.7295	0.7819	0.7925	0.8083	0.8012	0.7966	0.8201	0.8247
	(0.48)	(0.49)	(0.48)	(0.47)	(0.44)	(0.41)	(0.41)	(0.39)	(0.40)	(0.40)	(0.38)	(0.38)
No Schooling	0.1475	0.1618	0.1581	0.1506	0.1242	0.1178	0.1233	0.1139	0.0981	0.0978	0.0833	0.0795
	(0.35)	(0.37)	(0.36)	(0.36)	(0.33)	(0.32)	(0.33)	(0.32)	(0.30)	(0.30)	(0.28)	(0.27)
Incomplete Primary	0.2345	0.2319	0.2188	0.2376	0.2427	0.2354	0.2313	0.2289	0.2085	0.1917	0.18	0.1707
	(0.42)	(0.42)	(0.41)	(0.43)	(0.43)	(0.42)	(0.42)	(0.42)	(0.41)	(0.39)	(0.38)	(0.38)
Primary	0.1017	0.1016	0.1029	0.1058	0.0997	0.1039	0.1055	0.0967	0.0968	0.0869	0.0911	0.0817
	(0.30)	(0.30)	(0.30)	(0.31)	(0.30)	(0.31)	(0.31)	(0.30)	(0.30)	(0.28)	(0.29)	(0.27)
Incomplete Secondary	0.3295	0.3332	0.3638	0.342	0.3265	0.3468	0.3291	0.341	0.354	0.378	0.3754	0.3897
	(0.47)	(0.47)	(0.48)	(0.47)	(0.47)	(0.48)	(0.47)	(0.47)	(0.48)	(0.48)	(0.48)	(0.49)
Secondary	0.1072	0.1103	0.1025	0.0992	0.1206	0.1204	0.1254	0.1345	0.1602	0.1782	0.1942	0.1995
	(0.31)	(0.31)	(0.30)	(0.30)	(0.33)	(0.33)	(0.33)	(0.34)	(0.37)	(0.38)	(0.40)	(0.40)
Diploma	0.0583	0.0391	0.0408	0.0513	0.0509	0.0538	0.0542	0.0566	0.056	0.041	0.0465	0.0483
	(0.23)	(0.19)	(0.20)	(0.22)	(0.22)	(0.23)	(0.23)	(0.23)	(0.23)	(0.20)	(0.21)	(0.21)
Degree	0.0117	0.0133	0.0098	0.0121	0.0186	0.0164	0.0239	0.0227	0.0217	00202	0.0264	0.0254
	(0.11)	(0.11)	(0.10)	(0.11)	(0.14)	(0.13)	(0.15)	(0.15)	(0.15)	(0.14)	(0.16)	(0.16)
20-24 Years	0.0787	0.0809	0.0721	0.0859	0.0895	0.092	0.0786	0.0718	0.0785	0.0908	0.0896	0.0917
	(0.27)	(0.27)	(0.26)	(0.28)	(0.29)	(0.29)	(0.27)	(0.26)	(0.27)	(0.29)	(0.29)	(0.29)
45-49 Years	0.1434	0.1462	0.1528	0.1436	0.1416	0.1566	0.1711	0.1672	0.1797	0.1699	0.1719	0.1737
	(0.35)	(0.35)	(0.36)	(0.35)	(0.35)	(0.36)	(0.38)	(0.37)	(0.38)	(0.38)	(0.38)	(0.38)
Sex Ratio	0.6356	0.6527	.0724	0.7756	0.8144	0.8682	0.8971	0.89	0.9025	0.9104	0.9131	0.9155
	(0.32)	(0.23)	(0.27)	(0.26)	(0.25)	(0.26)	(0.26)	(0.27)	(0.27)	(0.28)	(0.29)	(0.30)
Observations	10216	6642	11678	7066	8991	8747	8783	8232	7660	8495	7931	7681

Table 5.3: Means and Standard Deviations of Sample Characteristics for Single Women

Variables	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Participation	0.5722	0.5535	0.5943	0.6142	0.6841	0.7502	0.8005	0.7949	0.8185	0.7924	0.7949	0.7979
	(0.49)	(0.50)	(0.49)	(0.49)	(0.46)	(0.43)	(0.40)	(0.40)	(0.39)	(0.41)	(0.40)	(0.40)
No Schooling	0.0646	0.0623	0.0661	0.0621	0.0561	0.0466	0.0443	0.0426	0.0413	0.0363	0.0416	0.0362
	(0.25)	(0.24)	(0.25)	(0.24)	(0.23)	(0.21)	(0.21)	(0.20)	(0.20)	(0.19)	(0.20)	(0.19)
Incomplete Primary	0.1339	0.1558	0.1381	0.1311	0.1417	0.1301	0.1293	0.1114	0.108	0.1027	0.0995	0.0878
	(0.34)	(0.36)	(0.35)	(0.34)	(0.35)	(0.34)	(0.34)	(0.31)	(0.31)	(0.30)	(0.30)	(0.28)
Primary	0.0648	0.0624	0.0728	0.0653	0.0632	0.0679	0.0676	0.0626	0.0607	0.0525	0.0495	0.0529
	(0.25)	(0.24)	(0.26)	(0.25)	(0.24)	(0.25)	(0.25)	(0.24)	(0.24)	(0.22)	(0.22)	(0.22)
Incomplete Secondary	0.4324	0.4241	0.4399	0.4526	0.4213	0.43	0.4341	0.4387	0.4225	0.4652	0.4522	0.4546
	(0.50)	(0.49)	(0.50)	(0.50)	(0.49)	(0.50)	(0.50)	(0.50)	(0.49)	(0.50)	(0.50)	(0.50)
Secondary	0.2177	0.2341	0.2354	0.2346	0.2504	0.2492	0.2462	0.2646	0.2873	0.2921	0.3022	0.3178
	(0.41)	(0.42)	(0.42)	(0.42)	(0.43)	(0.43)	(0.43)	(0.44)	(0.45)	(0.45)	(0.46)	(0.47)
Diploma	0.0591	0.0384	0.0388	0.044	0.0474	0.0525	0.0576	0.0594	0.0611	0.0354	0.0402	0.0396
	(0.24)	(0.19)	(0.19)	(0.21)	(0.22)	(0.22)	(0.23)	(0.23)	(0.24)	(0.18)	(0.20)	(0.20)
Degree	0.0123	0.0076	0.0063	0.0086	0.0141	0.019	0.0162	0.0167	0.0154	0.0134	0122	0.0083
	(0.11)	(0.09)	(0.08)	(0.09)	(0.12)	(0.14)	(0.13)	(0.13)	(0.12)	(0.11)	0.11	(0.09)
20-24 Years	0.4368	0.4332	0.4096	0.4319	0.4114	0.3921	0.3667	0.368	0.3685	0.394	0.3678	0.3584
	(0.50)	(0.50)	(0.49)	(0.50)	(0.49)	(0.49)	(0.48)	(0.48)	(0.48)	(0.49)	(0.48)	(0.48)
45-49 Years	0.0266	0.0255	0.0312	0.0276	0.0339	0.0414	0.0359	0.0359	0.0458	0.0402	0.0482	0.0458
	(0.16)	(0.16)	(0.16)	(0.17)	(0.16)	(0.18)	(0.20)	(0.19)	(0.21)	(0.20)	(0.21)	(0.21)
Sex Ratio	.4589	.5698	.6977	.8132	.9338	1.0584	1.1629	1.1776	1.1876	1.1826	1.1835	1.2074
	(.2311)	(.1972)	(.2197)	(.2447)	(.2729)	(.3012)	(.3394)	(.3381)	(.3472)	(.3548)	(.3634)	(.398)
Observations	9986	6092	11625	6553	9024	9624	9577	8848	8857	9979	10434	10390

Table 5.4: Predicted Marriages

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
LPM											
1995	0.5027***	0.5159***	0.4942***	0.5009***	0.4761***	0.4839***	0.4662***	0.4820***	0.4624***	0.4814***	0.4523***
	(0.0040)	(0.0049)	(0.0035)	(0.0047)	(0.0042)	(0.0047)	(0.0041)	(0.0043)	(0.0044)	(0.0050)	(0.0051)
2006	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***
	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)
Raw Gap	0.0547***	0.0679***	0.0462***	0.0529***	0.0281***	0.0359***	0.0182***	0.0340***	0.0144**	0.0334***	0.0043
	(0.0066)	(0.0072)	(0.0063)	(0.0071)	(0.0067)	(0.0071)	(0.0067)	(0.0068)	(0.0069)	(0.0073)	(0.0073)
Probit											
1995	0.5019***	0.5155***	0.4941***	0.5002***	0.4759***	0.4833***	0.4660***	0.4814***	0.4617***	0.4809***	0.4515***
	(0.0039)	(0.0048)	(0.0034)	(0.0046)	(0.0041)	(0.0046)	(0.0040)	(0.0042)	(0.0043)	(0.0049)	(0.0050)
2006	0.4474***	0.4474***	0.4474***	0.4474***	0.4474***	0.4474***	0.4474***	0.4474***	0.4474***	0.4474***	0.4474***
	(0.0052)	(0.0052)	(0.0052)	(0.0052)	(0.0052)	(0.0052)	(0.0052)	(0.0052)	(0.0052)	(0.0052)	(0.0052)
Raw Gap	0.0545***	0.0681***	0.0466***	0.0528***	0.0285***	0.0358***	0.0186***	0.0340***	0.0143**	0.0334***	0.0041
	(0.0065)	(0.0071)	(0.0062)	(0.0070)	(0.0066)	(0.0070)	(0.0066)	(0.0067)	(0.0067)	(0.0072)	(0.0072)
SELPM											
1995	0.5027***	0.5159***	0.4942***	0.5009***	0.4761***	0.4839***	0.4662***	0.4820***	0.4624***	0.4814***	0.4523***
	(0.0040)	(0.0025)	(0.0035)	(0.0047)	(0.0042)	(0.0047)	(0.0041)	(0.0043)	(0.0044)	(0.0050)	(0.0051)
2006	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***	0.4480***
	(0.0053)	(0.0022)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)	(0.0053)
Raw Gap	0.0547***	0.0679***	0.0462***	0.0529***	0.0281***	0.0359***	0.0182***	0.0340***	0.0144**	0.0334***	0.0043
	(0.0066)	(0.0033)	(0.0063)	(0.0071)	(0.0067)	(0.0071)	(0.0067)	(0.0068)	(0.0069)	(0.0073)	(0.0073)

Table 5.5: Decomposition Analysis: year 2006 sample used for coefficients; LFP assumed exogenous in LPM

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Aggregate Decomposition											
Total Explained	-0.0162	-0.0098	-0.0100	-0.0070	-0.0055	0.0022	0.0127***	0.0165***	0.0149***	0.0004	0.0003
	(0.0130)	(0.0115)	(0.0092)	(0.0073)	(0.0054)	(0.0039)	(0.0032)	(0.0031)	(0.0030)	(0.0031)	(0.0031)
% of Raw Gap	-29.62%	-14.43%	-21.65%	-12.8%	-19.57%	6.13%	69.78%	48.53%	103.47%	1.2%	6.98%
Total Unexplained	0.0709***	0.0776***	0.0562***	0.0600***	0.0336***	0.0337***	0.0055	0.0175***	-0.0005	0.0330***	0.0040
	(0.0138)	(0.0126)	(0.0102)	(0.0090)	(0.0074)	(0.0068)	(0.0061)	(0.0061)	(0.0062)	(0.0065)	(0.0066)
% of Raw Gap	129.62	114.29%	121.65%	109.69%	119.57%	93.87%	30.22%	51.47%	-3.47%	98.8%	93.02
Detailed Decomposition for the Characteristic Effect											
Participation	0.0019	0.0022	0.0018	0.0016	0.0010	0.0004	0.0001	0.0001	-0.0000	0.0001	0.0000
	(0.0026)	(0.0030)	(0.0025)	(0.0021)	(0.0014)	(0.0006)	(0.0002)	(0.0001)	(0.0001)	(0.0002)	(0.0001)
Education	0.0141***	0.0146***	0.0076***	0.0134***	0.0126***	0.0118***	0.0117***	0.0097***	0.0063***	0.0040***	0.0023***
	(0.0021)	(0.0022)	(0.0012)	(0.0020)	(0.0017)	(0.0016)	(0.0015)	(0.0013)	(0.0011)	(0.0009)	(0.0008)
% of Raw Gap	25.78%	21.5%	16.45%	25.33%	44.84%	32.87%	64.29%	28.53%	43.75%	11.98%	53.49%
Age	-0.0069***	-0.0033	-0.0001	-0.0068***	-0.0075***	-0.0031	0.0049**	0.0091***	0.0107***	-0.0015	-0.0005
	(0.0024)	(0.0026)	(0.0023)	(0.0026)	(0.0024)	(0.0026)	(0.0024)	(0.0025)	(0.0025)	(0.0026)	(0.0026)
Province	-0.0010	-0.0023**	-0.0027**	-0.0026**	-0.0028**	-0.0022**	-0.0027**	-0.0014	-0.0015*	-0.0016*	-0.0011
	(0.0011)	(0.0012)	(0.0010)	(0.0011)	(0.0011)	(0.0010)	(0.0012)	(0.0011)	(0.0009)	(0.0010)	(0.0009)
Sex Ratio	-0.0244*	-0.0209*	-0.0167*	-0.0126*	-0.0088*	-0.0047*	-0.0012*	-0.0010*	-0.0006	-0.0006	-0.0005
	(0.0132)	(0.0113)	(0.0090)	(0.0068)	(0.0048)	(0.0026)	(0.0007)	(0.0006)	(0.0004)	(0.0004)	(0.0003)

Robust standard errors in parentheses

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

Table 5.6: Decomposition Analysis: year t sample used for coefficients; LFP assumed exogenous in LPM

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aggregate Decomposition											
Total Explained	0.0318**	-0.0077	0.0271**	-0.0210**	-0.0006	-0.0035	0.0185***	0.0217***	0.0149***	0.0003	-0.0005
	(0.0160)	(0.0252)	(0.0119)	(0.0098)	(0.0069)	(0.0044)	(0.0033)	(0.0033)	(0.0031)	(0.0033)	(0.0031)
% of Raw Gap	58.14%	-11.34%	58.66	-39.7%	-2.14%	-9.75%	101.65	63.82%	103.47%	0.9%	-11.63%
Total Unexplained	0.0229	0.0756***	0.0190	0.0740***	0.0288***	0.0395***	-0.0003	0.0122**	-0.0005	0.0331***	0.0048
	(0.0168)	(0.0262)	(0.0129)	(0.0113)	(0.0087)	(0.0072)	(0.0061)	(0.0062)	(0.0062)	(0.0067)	(0.0067)
% of Raw Gap	41.86%	111.34%	41.13%	139.89%	102.49%	110.03%	-1.65%	35.88%	-3.47%	99.1%	111.63%
Detailed Decomposition for the Characteristic Effect											
Participation	0.0078***	0.0107***	0.0098***	0.0039***	0.0032***	0.0016***	0.0008**	0.0004	-0.0000	0.0007**	0.0000
	(0.0014)	(0.0021)	(0.0013)	(0.0015)	(0.0009)	(0.0005)	(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0001)
Education	0.0165***	0.0133***	0.0062***	0.0193***	0.0126***	0.0142***	0.0118***	0.0102***	0.0048***	0.0038***	0.0019***
	(0.0014)	(0.0018)	(0.0010)	(0.0018)	(0.0013)	(0.0015)	(0.0012)	(0.0011)	(0.0009)	(0.0008)	(0.0007)
Age	-0.0079***	-0.0042	0.0005	-0.0077**	-0.0079***	-0.0033	0.0059**	0.0108***	0.0127***	-0.0017	-0.0003
	(0.0031)	(0.0033)	(0.0028)	(0.0031)	(0.0028)	(0.0027)	(0.0027)	(0.0028)	(0.0027)	(0.0029)	(0.0027)
Province	-0.0029***	-0.0005	-0.0020**	0.0001	-0.0003	-0.0001	0.0032***	0.0032***	-0.0011	-0.0018*	-0.0012
	(0.0010)	(0.0011)	(0.0009)	(0.0010)	(0.0010)	(0.0011)	(0.0011)	(0.0010)	(0.0008)	(0.0010)	(0.0009)
Sex Ratio	0.0183	-0.0271	0.0127	-0.0366***	-0.0082	-0.0160***	-0.0032***	-0.0028***	-0.0014***	-0.0008*	-0.0010**
	(0.0157)	(0.0253)	(0.0117)	(0.0094)	(0.0064)	(0.0033)	(0.0008)	(0.0007)	(0.0006)	(0.0004)	(0.0005)

Standard errors in parentheses

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

Table 5.7: Detailed Decomposition for Coefficient Effect (LPM) using 2006 coefficients

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Participation	-0.0032**	-0.0030**	-0.0048***	-0.0020	-0.0042	-0.0071*	-0.0145***	-0.0090*	-0.0154***	-0.0111**	-0.0013
	(0.0016)	(0.0013)	(0.0017)	(0.0023)	(0.0031)	(0.0043)	(0.0047)	(0.0048)	(0.0050)	(0.0050)	(0.0053)
Education	0.0203**	-0.0010	-0.0218	0.0167*	0.0111	0.0249***	0.0104	0.0129*	0.0203***	0.0165*	0.0071
	(0.0081)	(0.0088)	(0.0234)	(0.0087)	(0.0075)	(0.0084)	(0.0070)	(0.0072)	(0.0076)	(0.0097)	(0.0087)
Age	-0.0145***	-0.0148***	-0.0106***	-0.0104***	-0.0065***	-0.0030	-0.0065***	-0.0065***	-0.0040**	-0.0057**	-0.0015
	(0.0022)	(0.0025)	(0.0019)	(0.0024)	(0.0023)	(0.0023)	(0.0018)	(0.0017)	(0.0016)	(0.0022)	(0.0022)
Province	0.0013	-0.0042	0.0026	0.0015	0.0007	-0.0003	0.0074	0.0091*	0.0015	0.0061	0.0015
	(0.0055)	(0.0057)	(0.0051)	(0.0053)	(0.0053)	(0.0057)	(0.0051)	(0.0053)	(0.0053)	(0.0057)	(0.0056)
Sex Ratio	-0.0218**	0.0047	-0.0355**	0.0461**	-0.0020	0.0766***	0.0558**	0.0658**	0.0548*	0.0122	0.0366
	(0.0105)	(0.0212)	(0.0179)	(0.0223)	(0.0253)	(0.0283)	(0.0271)	(0.0280)	(0.0290)	(0.0286)	(0.0277)
Constant	0.0889***	0.0958***	0.1262***	0.0080	0.0345	-0.0574*	-0.0471	-0.0548*	-0.0578*	0.0151	-0.0385
	(0.0242)	(0.0298)	(0.0335)	(0.0292)	(0.0304)	(0.0321)	(0.0298)	(0.0306)	(0.0311)	(0.0314)	(0.0301)

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

Table 5.8: Detailed Decomposition for Coefficient Effect (LPM) using t coefficients

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Participation	-0.0092**	-0.0115**	-0.0127***	-0.0043	-0.0064	-0.0083*	-0.0152***	-0.0093*	-0.0154***	-0.0117**	-0.0013
	(0.0046)	(0.0049)	(0.0045)	(0.0049)	(0.0048)	(0.0050)	(0.0049)	(0.0049)	(0.0050)	(0.0052)	(0.0053)
Education	0.0179**	0.0004	-0.0852	0.0108	0.0111	0.0225**	0.0103	0.0124	0.0219***	0.0167*	0.0076
	(0.0087)	(0.0092)	(0.1681)	(0.0092)	(0.0082)	(0.0093)	(0.0080)	(0.0081)	(0.0083)	(0.0099)	(0.0089)
Age	-0.0135***	-0.0139***	-0.0112***	-0.0094***	-0.0061***	-0.0027	-0.0075***	-0.0081***	-0.0059***	-0.0055**	-0.0017
	(0.0021)	(0.0024)	(0.0020)	(0.0022)	(0.0021)	(0.0022)	(0.0020)	(0.0021)	(0.0021)	(0.0022)	(0.0022)
Province	0.0033	-0.0060	0.0019	-0.0012	-0.0017	-0.0025	0.0014	0.0044	0.0011	0.0062	0.0016
	(0.0052)	(0.0056)	(0.0050)	(0.0052)	(0.0051)	(0.0054)	(0.0050)	(0.0052)	(0.0051)	(0.0056)	(0.0056)
Sex Ratio	-0.0645**	0.0109	-0.0648**	0.0701**	-0.0027	0.0879***	0.0577**	0.0676**	0.0557*	0.0124	0.0371
	(0.0309)	(0.0489)	(0.0326)	(0.0338)	(0.0333)	(0.0324)	(0.0280)	(0.0288)	(0.0294)	(0.0291)	(0.0280)
Constant	0.0889***	0.0958***	0.1911	0.0080	0.0345	-0.0574*	-0.0471	-0.0548*	-0.0578*	0.0151	-0.0385
	(0.0242)	(0.0298)	(0.1696)	(0.0292)	(0.0304)	(0.0321)	(0.0298)	(0.0306)	(0.0311)	(0.0314)	(0.0301)

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

Table 5.9: Decomposition Analysis: year 2006 sample used for coefficients in Probit Model

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Aggregate Decomposition											
Total Explained	-0.0140	-0.0075	-0.0086	-0.0059	-0.0045	0.0028	0.0130***	0.0168***	0.0151***	0.0004	0.0005
	(0.0132)	(0.0116)	(0.0093)	(0.0073)	(0.0053)	(0.0038)	(0.0031)	(0.0030)	(0.0029)	(0.0030)	(0.0029)
% of Raw Gap	-25.69%	-11.01%	-18.5%	-11.17%	-15.79%	7.82%	69.89%	49.41%	105.59%	1.2%	12.2%
Total Unexplained	0.0685***	0.0757***	0.0553***	0.0587***	0.0330***	0.0330***	0.0056	0.0172***	-0.0007	0.0331***	0.0036
	(0.0139)	(0.0127)	(0.0103)	(0.0090)	(0.0073)	(0.0067)	(0.0060)	(0.0061)	(0.0062)	(0.0065)	(0.0066)
% of Raw Gap	125.69%	111.16%	118.7%	111.17%	115.79%	92.18%	30.11%	50.59%	-4.9%	99.1%	87.80%
Detailed Decomposition for the Characteristic Effect											
Participation	0.0013	0.0007	0.0013	0.0010	0.0006	0.0003	0.0001	0.0001	-0.0000	0.0002	0.0000
	(0.0026)	(0.0014)	(0.0025)	(0.0021)	(0.0013)	(0.0007)	(0.0002)	(0.0001)	(0.0000)	(0.0016)	(0.0002)
Education	0.0136***	0.0129***	0.0073***	0.0124***	0.0112***	0.0132***	0.0122***	0.0101***	0.0068***	0.0077	0.0039
	(0.0019)	(0.0026)	(0.0012)	(0.0018)	(0.0015)	(0.0028)	(0.0015)	(0.0014)	(0.0011)	(0.0576)	(0.0162)
Age	-0.0068***	-0.0032	-0.0004	-0.0064**	-0.0068***	-0.0035	0.0047**	0.0090***	0.0105***	-0.0033	-0.0008
	(0.0023)	(0.0024)	(0.0021)	(0.0025)	(0.0025)	(0.0033)	(0.0024)	(0.0024)	(0.0025)	(0.0294)	(0.0076)
Province	-0.0010	-0.0021**	-0.0026***	-0.0025**	-0.0026**	-0.0025*	-0.0029**	-0.0015	-0.0017*	-0.0032	-0.0019
	(0.0011)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0013)	(0.0013)	(0.0012)	(0.0010)	(0.0248)	(0.0087)
Sex Ratio	-0.0210	-0.0166	-0.0143	-0.0104	-0.0071	-0.0048	-0.0011	-0.0009	-0.0006	-0.0010	-0.0007
	(0.0136)	(0.0128)	(0.0093)	(0.0071)	(0.0049)	(0.0036)	(0.0007)	(0.0006)	(0.0004)	(0.0080)	(0.0033)

Standard errors in parentheses

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

Table 5.10: Decomposition Analysis: year t sample used for coefficients in Probit Model

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aggregate Decomposition											
Total Explained	0.0256	-0.0189	0.0237*	-0.0243**	-0.0004	-0.0029	0.0187***	0.0222***	0.0153***	0.0002	-0.0003
	(0.0158)	(0.0257)	(0.0123)	(0.0112)	(0.0070)	(0.0043)	(0.0031)	(0.0031)	(0.0030)	(0.0031)	(0.0029)
% of Raw Gap	46.97%	27.75%	50.86%	-46.02%	-1.4%	-8.1%	100.54%	65.29%	106.99%	0.6%	-7.32%
Total Unexplained	0.0290*	0.0870***	0.0230*	0.0771***	0.0289***	0.0387***	-0.0002	0.0118*	-0.0010	0.0333***	0.0043
	(0.0167)	(0.0266)	(0.0133)	(0.0126)	(0.0089)	(0.0072)	(0.0061)	(0.0062)	(0.0062)	(0.0066)	(0.0067)
% of Raw Gap	53.21%	127.75%	39.36%	146.02%	101.4%	108.1%	-1.08%	34.71%	-6.99%	99.7%	104.88%
Detailed Decomposition											
Participation	0.0079***	0.0049***	0.0096***	0.0035**	0.0019	0.0015***	0.0008**	0.0004	-0.0000	0.0004	0.0000
	(0.0015)	(0.0010)	(0.0013)	(0.0015)	(0.0146)	(0.0005)	(0.0003)	(0.0002)	(0.0004)	(0.0034)	(0.0001)
Education	0.0164***	0.0128***	0.0061***	0.0184***	0.0075	0.0130***	0.0124***	0.0110***	0.0054***	0.0022	0.0009
	(0.0014)	(0.0016)	(0.0010)	(0.0016)	(0.0589)	(0.0013)	(0.0012)	(0.0011)	(0.0009)	(0.0173)	(0.0052)
Age	-0.0080***	-0.0042	-0.0001	-0.0075***	-0.0047	-0.0029	0.0055**	0.0104***	0.0127***	-0.0010	-0.0001
	(0.0029)	(0.0029)	(0.0026)	(0.0027)	(0.0378)	(0.0025)	(0.0026)	(0.0027)	(0.0026)	(0.0064)	(0.0020)
Province	-0.0028***	-0.0002	-0.0019**	0.0002	-0.0002	-0.0001	0.0032***	0.0033***	-0.0013	-0.0010	-0.0006
	(0.0010)	(0.0010)	(0.0009)	(0.0010)	(0.0017)	(0.0010)	(0.0012)	(0.0011)	(0.0009)	(0.0079)	(0.0036)
Sex Ratio	0.0121	-0.0369	0.0099	-0.0389***	-0.0048	-0.0145***	-0.0032***	-0.0029***	-0.0015**	-0.0004	-0.0004
	(0.0157)	(0.0263)	(0.0122)	(0.0110)	(0.0413)	(0.0039)	(0.0009)	(0.0008)	(0.0006)	(0.0034)	(0.0026)

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

Standard errors in parentheses

Table 5.11: Detailed Decomposition for Coefficient Effect (Probit) using 2006 coefficients

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Participation	-0.0039**	-0.0121**	-0.0059***	-0.0025	-0.0051	-0.0086*	-0.0170**	-0.0105*	-0.0065	-0.0129**	-0.0015
	(0.0018)	(0.0049)	(0.0019)	(0.0025)	(0.0035)	(0.0047)	(0.0068)	(0.0054)	(0.0334)	(0.0054)	(0.0066)
Education	0.0192**	-0.0023	-0.0347	0.0170*	0.0108	0.0240***	0.0102	0.0119	0.0072	0.0154	0.0079
	(0.0084)	(0.0090)	(0.0252)	(0.0091)	(0.0080)	(0.0088)	(0.0082)	(0.0076)	(0.0375)	(0.0096)	(0.0111)
Age	-0.0183***	-0.0188***	-0.0142***	-0.0135***	-0.0078***	-0.0037	-0.0083***	-0.0082***	-0.0018	-0.0062**	-0.0018
	(0.0026)	(0.0029)	(0.0024)	(0.0028)	(0.0027)	(0.0025)	(0.0032)	(0.0021)	(0.0091)	(0.0025)	(0.0031)
Province	0.0007	-0.0041	0.0021	0.0010	0.0008	-0.0001	0.0080	0.0091*	0.0004	0.0060	0.0015
	(0.0058)	(0.0059)	(0.0056)	(0.0056)	(0.0057)	(0.0059)	(0.0057)	(0.0055)	(0.0027)	(0.0057)	(0.0065)
Sex Ratio	-0.0180	0.0182	-0.0335	0.0638**	0.0013	0.0848***	0.0641*	0.0743**	0.0206	0.0138	0.0417
	(0.0112)	(0.0238)	(0.0209)	(0.0279)	(0.0286)	(0.0306)	(0.0327)	(0.0305)	(0.1062)	(0.0303)	(0.0362)
Constant	0.0890***	0.0860***	0.1414***	-0.0071	0.0330	-0.0634*	-0.0514	-0.0595*	-0.0207	0.0169	-0.0442
	(0.0252)	(0.0320)	(0.0365)	(0.0341)	(0.0338)	(0.0344)	(0.0355)	(0.0332)	(0.1090)	(0.0332)	(0.0417)

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

Table 5.12: Detailed Decomposition for Coefficient Effect (Probit) using t coefficients

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Participation	-0.0124**	-0.0165**	-0.0202**	-0.0051	-0.0079	-0.0100*	-0.0025	-0.0115*	-0.0084	-0.0137**	-0.0014
	(0.0059)	(0.0067)	(0.0092)	(0.0052)	(0.0055)	(0.0055)	(0.0837)	(0.0061)	(0.0273)	(0.0058)	(0.0063)
Education	0.0172*	-0.0025	-0.0434	0.0092	0.0105	0.0208**	0.0013	0.0114	0.0100	0.0156	0.0079
	(0.0103)	(0.0092)	(0.0350)	(0.0091)	(0.0089)	(0.0095)	(0.0444)	(0.0091)	(0.0326)	(0.0099)	(0.0104)
Age	-0.0186***	-0.0171***	-0.0188***	-0.0116***	-0.0073***	-0.0035	-0.0013	-0.0106***	-0.0032	-0.0061**	-0.0019
	(0.0035)	(0.0024)	(0.0062)	(0.0023)	(0.0024)	(0.0024)	(0.0439)	(0.0030)	(0.0105)	(0.0024)	(0.0028)
Province	0.0030	-0.0060	0.0019	-0.0019	-0.0018	-0.0023	0.0002	0.0045	0.0004	0.0063	0.0016
	(0.0061)	(0.0056)	(0.0070)	(0.0053)	(0.0056)	(0.0056)	(0.0074)	(0.0057)	(0.0026)	(0.0057)	(0.0061)
Sex Ratio	-0.0596	0.0411	-0.0787	0.0933**	0.0017	0.0968***	0.0092	0.0813**	0.0270	0.0142	0.0401
	(0.0436)	(0.0527)	(0.0695)	(0.0395)	(0.0382)	(0.0340)	(0.3129)	(0.0330)	(0.0887)	(0.0311)	(0.0321)
Constant	0.0994***	0.0842**	0.1822**	-0.0069	0.0336	-0.0631*	-0.0071	-0.0634*	-0.0268	0.0171	-0.0419
	(0.0353)	(0.0329)	(0.0858)	(0.0328)	(0.0353)	(0.0337)	(0.2433)	(0.0355)	(0.0904)	(0.0335)	(0.0358)

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

Chapter 6

Summary and Conclusion

This thesis has considered a number of issues surrounding marriages for African women in South Africa. The empirical evidence from the analysis of household survey data has demonstrated a number of important characteristics of the marriage experience in South Africa. Firstly, marriages are declining, and secondly, women are marrying late. In 1995, the marriage rate for African women aged between 15 and 49 years was 35 percent, as shown by the data from the 1995 October Household Survey. By 2006, the Labour Force Survey indicated a drop in the marriage rate of 4 percentage points to 31 percent for African women in the same age and population group. The main concern with these figures is that they are obtained from independent surveys with different sampling designs.

The drop in marriage rates that we observe might lead one to think that perhaps, Statistics South Africa sampled more married African women in the earlier years than in the recent years, and hence, question the comparability of marriage model estimates obtained from independently repeated survey datasets used in this study. Nonetheless, it is clear from a cohort data analysis that marriage behaviour of younger women is different from that of older women. The effect of cohort on marriage in the Age-Period-Cohort model is consistently positive for all age cohorts. However, very low and constant effects are present for the young generations, up to the age of 24, after which increasing effects mount. The implication is that cohort effects are present and the two generations behave differently, driven by cohort-specific influences. One explanation of this is that younger cohorts stay single longer compared to their older counterparts because of opportunities availed to them, enabling them to stay in school longer. The association between cohort and marriage is

characterised by a gradual and persistent decline in marriage rates in successive cohorts.

The year on year coefficient differential of the period effect is negligible. This is a very important result and from this we conclude that the decline in marriages observed in the cross-sectional and cohort analyses is a real phenomenon, which is not just driven by change in the sampling design of the surveys. The decline is unlikely to be due to reporting errors resulting from a misunderstanding of the marital status question as this question is clear, straightforward and consistent in the surveys.

The negative effect of economic variables (labour force participation and education) on marriage shown in the multivariate regression analyses reflects a tradeoff between marriage and economic advances as African women push to achieve educational and career goals, enhanced by the enabling legislation of the post-apartheid government. We found compelling evidence of a shift towards high levels of education as well as a rise in labour force participation rates for women. It may not be unrealistic to think that there may be relationships between labour force participation and education on the one hand, and marriage on the other hand, because these variables are both changing. This necessitated the simultaneous equation modelling framework between labour force participation and marriage decisions.

According to the women's economic independence hypothesis, high levels of education for African women imply that they can now compete with their male counterparts for jobs. This is a driving force of non-marriage behaviour as the financial gains from marriage are diminished. However, unlike other studies reviewed as well as theoretical predictions, our findings in the decomposition analysis do not support the predictions of the women's economic independence hypothesis, as rises in labour force participation and education for women were not sufficient to alter the gains from marriage. With regard to the increase in labour force participation, this finding is in line with other studies in South Africa on the feminisation of the labour force. For example, Casale (2003) finds that the rise in labour force participation in South Africa is driven by a rise in unemployment or entry into low paying jobs, which is unlikely to free women from depending on spouses for financial survival. While this may not be a unique characteristic for the South African labour market, a rise

in female labour force participation in other countries, mostly with developed economies is driven by an increase in female employment in well paid jobs, making the women's economic independence hypothesis relevant.

Other control variables were also considered. For example, age was found to have a positive effect on the likelihood of marriage. The older a woman is, the more likely it is that she will be married. The age effect on the likelihood of marriage remained positive across the cross-sections. However, the magnitude of the age dummies were higher in the earlier years and lower in the later years.

Availability of economically attractive men, which was proxied by the sex ratio of employed men to women, positively increases the likelihood of marriage, as expected. Over time, the sex ratio effect was much higher. This finding is unsurprising, considering that the sex ratio increased over the review period of the study. This finding suggests that it is possible that low marriage rates among African women reflect not so much a shortage of available African men, but a shortage of "marriageable" men. We argue that a culture of *ilobolo* payment shrinks the pool of available marriageable men. This causes a sex ratio imbalance in the marriage market. The situation is aggravated when the male unemployment rate is high which reduces the supply of "marriageable" men. In this case, if women are willing to reduce their "reservation value" for the characteristics of marriageable men, then the pool of available men will expand, increasing the likelihood of marriage. On the other hand, if the "reservation value" is downward sticky, marriage will be less likely, and this would partly explain low marriage rates among African women in South Africa.

While much has been learned about marriages in South Africa using existing household surveys, the work summarized here was not without limitations, and can by no means be regarded as a final statement on this topic. First, the data analyses suggest several factors that could be addressed in future data collection, in order to make analyses of marriages in South Africa comprehensive. For instance, it would be valuable to learn the age at which individuals marry, in addition to learning their marital status. Currently available national surveys do not contain direct information about age at marriage, be it first marriage or

subsequent marriages. Due to this data limitation, we could only estimate the singulate mean age at marriage, which, even though it is extremely informative regarding whether marriages are delayed, is not the same as the real mean age at marriage.

Singulate mean age at marriage does not take into account specific cohort and/or period experiences in its calculations, since it calculates ages at marriage by aggregating the whole range of experiences of individuals aged between 15 and 50 at a single point in time. This may be misleading if the marriage patterns of different cohorts are changing rapidly. In addition, since, unlike the authentic mean age at marriage, the singulate mean age at marriage is calculated retrospectively, it is influenced by variations in the demographic composition of the population. For example, if an area experiences a large-scale influx of young unmarried people, this will artificially inflate the proportions never married, and therefore, also the singulate mean age at marriage. Similarly, a relative out-migration of married couples would have the same effect. Despite these reservations, the singulate mean age at marriage remains a useful substitute for the true mean age at marriage, where age at marriage of individuals is absent in the data.

All research on marriages in South Africa would benefit from the collection of longitudinal data[1]. A partial substitute for longitudinal data would be detailed retrospective marriage histories. Data on marriage histories (including the age of entry into marriage, how many marriages dissolved (by death of spouse or divorce), and how many years elapsed since being single for those who are currently married) would be desirable in learning the dynamics of marital experiences in South Africa.

Unlike cohort data, longitudinal data or marriage histories would better indicate the marital experiences of individuals, including whether the decline in marriages is attributable to a fall in the number of new entrants into marriage in recent years, as well as whether marriages are being postponed or forgone. Additionally, existing surveys provide almost no information on bride prices, making it difficult to fully investigate what is likely an inter-

[1]On a positive note, data from the first wave of National Income Dynamics Study (NIDS) was made public at the end of July, 2009. NIDS is the first national household panel study in South Africa.

esting aspect of South African marriages, to inform international research, since marriages are declining across the world and brideprice payment is practiced in many other countries.

The biggest challenge of the thesis was finding a good instrument, since female labour force participation is potentially endogenous in a marriage model. The weak instrument problem affected the results in the chapters on the determinants of marriage decisions and declining marriages. Since it is hard to find variables that meet the definition of a valid instrument, both in the available datasets as well as conceptually (most variables that have an effect on female labour force participation decisions may also have a direct effect on the marriage decision), a qualitative data analysis may be an "attractive nuisance". We therefore recommend field work and qualitative data collection in order to have an understanding of why marriages are declining.

Despite data limitations and inadequate tools to answer some of the questions we set out to answer, the contribution that this research makes to the marriage literature in South Africa can be seen as significant. The research has provided new information on the determinants of the marriage decision for women, as well as on the factors that affected declining marriages in post-apartheid South Africa. Most importantly, the study has established empirical evidence that supports the independence hypothesis. We do find that increases in education contributed significantly to the decline in marriage. In fact, over and above labour force participation, education is the main variable that explains the changes over time, as the other variables mostly lead to changes in the opposite direction.

Additional future research for policy formulation on the decline in marriage can be addressed by asking; who is affected, how are they affected and what are the implications? Answering these questions would enlighten us as to the extent to which the decline in marriages represent a "problem" to individuals, communities and societies. Programs and policies can then be tailored and directed towards attaining the desired goals.

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Appendix A

Appendix to Chapter 2

A.1 A nonparametric Approach: LOWESS Technique

LOWESS is a data analysis technique for smoothing scatter-plots, (x_i, y_i), $i = 1, ..., n$ which have been contaminated with noise. Scatter-diagram smoothing involves drawing a smooth curve on a scatter diagram to summarize a relationship, in a fashion that makes very few initial assumptions about the form or strength of the relationship. Cleveland (1979) proposed the LOWESS algorithm as an outlier resistant method based on local polynomial fits.

The basic idea of the LOWESS technique is to first fit a polynomial regression in order to find parameter(s) which minimize the influence of outliers on the curve. A fitted value is calculated at each position of the window in x. The technique then moves a window along the x-axis of a scatter-plot. The fitted values at each position of a window, when connected, form the LOWESS smoothed curve.

The fitted value at x_k is the value of a line fit to the data using weighted least squares where the weight for(x_i, y_i) is large if x_i is close to x_k and small if x_i is further away from x_k. Plotting the smoothed points, which form a nonparametric regression of y on x, frequently allows the visual effects on the scatter-plot that are otherwise difficult to detect.

Caution must be taken so that the scatter-plots are not over/under-smoothed. A tradeoff between bias and variance arises with respect to the degree of smoothing such that over-smoothing increases bias but reduces variance while under-smoothing does the reverse. One simple solution towards optimal smoothing is choosing an optimal window within which a

point can be smoothed. Within the window defined by the bandwidth, weighted least squares regression of y on x is run using the following "tricube" weights:

$$w_i = \left(1 - |u_i|^3\right)^3$$

where $u_i = \frac{x_k - x_i}{d_i}$ and d_i is the distance between x_k and its furthest neighbour within the band. The weighting allocates a value of 1 for $x_k = x_i$ and declining weights for points further away, reaching zero at the borders of the bands. Thus, points near the middle of the window receive more weight than points towards the boundaries.

For this study, a constant bandwidth of 0.3 is chosen (following Wittenberg (2002)). This indicates that 30 percent of the sample is contained in each band and is used to smooth each point. The LOWESS technique thus fits a line to the data, portion by portion. The fitted x_i are used as $f(x_i)$ in the model $y = f(x_i) + \varepsilon_i$ where ε_i is assumed to be a white noise process. The result of this process is that the predicted smoothed y values for n observations is obtained by "stitching" together n regressions (Halmiton, 2004). In this case, $f_j(x_i)$ is the proportion in each marital state j; j =married, single, widowed, divorced controlling for age, gender and population group. We will therefore have a nonparametric estimation which will create a scatter of points which follow a distinct trend of plots of proportions on the y-axis of each age category on the x-axis that is in a particular marital status. Such representations will be drawn for the years 1995 to 2006. The slopes of the resulting graphs from the analysis give the estimates of the underlying flow rates, thereby giving information about changing levels in the marital categories over the years.

Specifically interested in levels and flows, this graphical analysis will identify the key turning points and other broad trends in the data. The method is fairly simple and yet yields fruitful results.

A.2 Singulate Mean Age at Marriage

The Singulate mean age at marriage (SMAM) index, originally developed by John Hajnal in 1953, is what is normally estimated in the absence of data on actual age at marriage.

Two key assumptions are made in the calculation of SMAM. First, nobody marries before the age of 15, and second, those never married by age 50 will never marry. The proportion never married is then calculated for eight quinquennial age groups in the age range 15-54. These are disaggregated by gender and race. We assume that the proportion never married is P_{gra}, where P is proportion, g stands for gender, r stands for race and a stands for quinquennial age group.

The first stage in the calculation of the SMAM involves calculation of the mean years of singlehood lived per hundred persons of the population in question, as follows:

under 15: $15 * 100 = 1500 = Years_{<15}$

15-49: $\sum_{a=15-19}^{45-49} P_{gra} * 5 = Years_{15-49}$

<15 to 50: $Years_{<15} + Years_{15-49} = Years_{<15-50}$

$Years_{<15-50}$ however needs to be adjusted in order to account for the fact that some people will stay unmarried their whole life. This is done by averaging the proportions never married for the two quinquennial age groups, 15-54 as follows:

$\left(\sum_{a=45-49}^{50-54} P_{gra}\right)/2 = A$

It follows, therefore, that the total number of years of singlehood experienced by those never married by age 50 is $A * 50$. This implies that for those in the marrying population, the total number of years experienced per hundred persons of the whole population is $Years_{<15-50} - (A * 50)$. However, the actual population of people married by age 50, denoted M is $100 - A$. Finally, the SMAM is given by $\frac{Years_{<15-50} - (A*50)}{M}$.

A.3 Other Tables

Table A.1: Racial Differentials of Percentage Decline in Marriages, by Gender

	1995	**2006**	**1995**	**2006**	**Male**	**Female**
	Male		**Female**		**% Change**	
All Races	.3741	.3155	.3992	.3596	-15.7	-9.9
	(.4839)	(.4647)	(.4897)	(.4799)		
African	.3231	.2717	.3496	.3149	-15.9	-9.9
	(.4677)	(.4448)	.4768)	(.4645)		
Coloured	.423	.4004	.4233	.4168	-5.3	-1.5
	(.4941)	(.4901)	(.4941)	(.4931)		
Indian	.5349	.5298	.5748	.6158	-0.1	-7.1
	(.499)	(.4996)	(.4946)	(.4868)		
White	.6248	.5444	.6719	.6297	-12.9	-6.5
	(.4842)	(.4982)	(.4696)	(.4831)		

Standard deviations in parentheses

Table A.2: Singulate Mean Age at Marriage, by Gender and Race

	Africans		**Whites**	
	Female	**Male**	**Female**	**Male**
1995	29.6	32.3	23.1	25.7
1996	29.3	32.0	24.8	27.7
1997	29.6	32.5	23.8	26.6
1998	29.2	31.9	24.3	27.7
1999	29.4	31.2	25.0	27.7
2000	29.8	32.8	24.8	27.4
2001	30.3	33.0	25.0	27.7
2002	29.9	32.8	25.0	27.5
2003	30.5	33.3	25.5	28.0
2004	30.4	33.6	25.4	28.2
2005	30.8	33.7	26.3	27.9
2006	31.0	34.0	25.8	28.9

Table A.3: Cohabitation Factor among Africans

	1995	**1996**	**1997**	**1998**	**1999**	**2004**	**2005**	**2006**
Married	.3057	.3167	.2886	.2746	.2746	.2318	.2105	.2036
	(.4607)	(.4652)	(.4531)	(.4463)	(.4427)	(.422)	(.4077)	(.4027)
Cohabiting	0439	.0477	.0539	.0726	.0649	.106	.1095	.1113
	(.2049)	(.2131)	(.2258)	(.2595)	(.2464)	(.3079)	(.3122)	(.3145)

Standard deviations in parentheses

Appendix B

Appendix to Chapter 3

Table B.1: Correlation between Sex Ratios and Marriage Rates

Africans						Whites		
Year	Sex Ratio	Female Marriage Rate	Correlation (Female)	Male Marriage Rate	Correlation (Male)	Sex Ratio	Female Marriage Rate	Male Marriage Rate
1995	0.93	0.4	0.1	0.34	0.25	0.98	0.68	0.58
1996	0.89	0.42	0.13	0.34	0.23	0.98	0.68	0.62
1997	0.93	0.4	0.1	0.32	0.17	0.98	0.7	0.59
1998	0.94	0.4	0.1	0.34	0.11	1.0	0.67	0.58
1999	0.94	0.39	0.1	0.33	0.1	0.99	0.67	0.59
2000	0.95	0.39	-0.02	0.31	0.14	1.1	0.72	0.61
2001	0.91	0.38	-0.02	0.3	0.12	1.05	0.71	0.61
2002	0.92	0.39	-0.1	0.3	0.03	1.02	0.7	0.59
2003	0.91	0.38	0.1	0.3	-0.05	0.94	0.69	0.62
2004	0.96	0.38	0.02	0.3	0.1	1.05	0.73	0.63
2005	0.96	0.39	0.1	0.31	0.1	1.05	0.67	0.63
2006	0.96	0.37	0.1	0.3	0.1	1.04	0.69	0.57

Appendix C

Appendix to Chapter 4

C.1 Additional Estimation results

Table C.1: Reduced Form Labour Force Participation Estimates for the 20-34 Year Old Sample: 1998

Variables	**Maddala**	**Marriage Eqn.**	**Participation Eqn.**	**SELPM**
Incomplete Primary	0.09***	-0.10	0.26***	0.09***
	(0.03)	(0.08)	(0.08)	(0.03)
Primary	0.12***	-0.11	0.33***	0.12***
	(0.03)	(0.09)	(0.09)	(0.03)
Incomplete Secondary	-0.01	-0.40***	-0.03	-0.02
	(0.03)	(0.07)	(0.07)	(0.03)
Secondary	0.14***	-0.70***	0.39***	0.14***
	(0.03)	(0.08)	(0.08)	(0.03)
Diploma	0.26***	-0.45***	0.86***	0.24***
	(0.02)	(0.10)	(0.11)	(0.03)
Degree	0.31***	-0.42**	1.16***	0.30***
	(0.04)	(0.19)	(0.26)	(0.05)
25-29 Years	0.22***	0.66***	0.60***	0.22***
	(0.01)	(0.04)	(0.04)	(0.01)
30-34 Years	0.26***	1.13***	0.75***	0.27***
	(0.01)	(0.04)	(0.04)	(0.01)
Eastern Cape	-0.04	-0.05	-0.11	-0.04
	(0.04)	(0.10)	(0.10)	(0.03)
Northern Cape	0.05	0.09	0.15	0.05
	(0.06)	(0.16)	(0.16)	(0.05)
Free State	0.02	0.35***	0.06	0.01
	(0.05)	(0.13)	(0.12)	(0.04)
KZN	0.09**	-0.23	0.25**	0.09**
	(0.05)	(0.14)	(0.13)	(0.04)
North West	0.05	-0.18	0.13	0.04
	(0.05)	(0.13)	(0.12)	(0.04)
Gauteng	0.02	0.02	0.04	0.01
	(0.04)	(0.12)	(0.11)	(0.04)
Mpumalanga	0.12***	0.08	0.33**	0.11**
	(0.04)	(0.14)	(0.13)	(0.04)
Limpopo	0.06	0.18	0.17	0.05
	(0.05)	(0.15)	(0.14)	(0.05)
Urban	0.06***	-0.22***	0.16***	0.05***
	(0.02)	(0.04)	(0.04)	(0.01)
English	-0.10	0.87**	-0.25	-0.09
	(0.15)	(0.41)	(0.38)	(0.14)
Isindebele	-0.08	-0.92***	-0.21	-0.07
	(0.09)	(0.27)	(0.24)	(0.08)
Isizulu	0.04	-0.08	0.10	0.04
	(0.08)	(0.23)	(0.21)	(0.07)
Other Languages	-0.05	0.43	-0.13	-0.05
	(0.18)	(0.46)	(0.45)	(0.15)
Sex Ratio	0.15***	0.65***	0.40***	0.16***
	(0.05)	(0.14)	(0.13)	(0.05)
Women's Jobs	0.34***	-0.10	0.89***	0.32***
	(0.11)	(0.30)	(0.29)	(0.10)
Rho		0.02	0.02	
		(0.02)	(0.02)	
Observations	8451	8451	8451	8451

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.2: Marriage Estimates from the 20-34 Year Old Sample: 1998

Variable	Probit 1	Maddala	LPM	SELPM
Participation	0.01	-0.35	0.01	-0.11
	(0.01)	(0.27)	(0.01)	(0.28)
Incomplete Primary	-0.04	-0.00	-0.03	-0.02
	(0.03)	(0.04)	(0.03)	(0.04)
Primary	-0.04	-0.00	-0.04	-0.02
	(0.03)	(0.04)	(0.03)	(0.04)
Incomplete Secondary	-0.14***	-0.15***	-0.14***	-0.14***
	(0.02)	(0.02)	(0.02)	(0.02)
Secondary	-0.23***	-0.19***	-0.22***	-0.21***
	(0.02)	(0.04)	(0.03)	(0.05)
Diploma	-0.15***	-0.07	-0.15***	-0.12
	(0.03)	(0.07)	(0.03)	(0.08)
Degree	-0.14***	-0.05	-0.14**	-0.11
	(0.05)	(0.10)	(0.07)	(0.11)
25-29 Years	0.24***	0.33***	0.20***	0.23***
	(0.02)	(0.06)	(0.01)	(0.06)
30-34 Years	0.42***	0.51***	0.37***	0.41***
	(0.02)	(0.07)	(0.01)	(0.08)
Eastern Cape	-0.02	-0.03	-0.01	-0.01
	(0.03)	(0.04)	(0.03)	(0.03)
Northern Cape	0.03	0.05	0.04	0.04
	(0.06)	(0.06)	(0.05)	(0.05)
Free State	0.13***	0.13***	0.13***	0.13***
	(0.05)	(0.05)	(0.04)	(0.04)
KZN	-0.08*	-0.06	-0.06	-0.05
	(0.05)	(0.05)	(0.05)	(0.05)
North West	-0.06	-0.05	-0.04	-0.04
	(0.04)	(0.04)	(0.04)	(0.04)
Gauteng	0.01	0.01	0.01	0.01
	(0.04)	(0.04)	(0.04)	(0.04)
Mpumalanga	0.03	0.06	0.04	0.05
	(0.05)	(0.06)	(0.04)	(0.05)
Limpopo	0.07	0.08	0.07	0.07
	(0.05)	(0.06)	(0.05)	(0.05)
Urban	-0.08***	-0.06***	-0.07***	-0.06***
	(0.02)	(0.02)	(0.01)	(0.02)
English	0.34**	0.31**	0.30**	0.30**
	(0.15)	(0.15)	(0.14)	(0.14)
Isindebele	-0.25***	-0.25***	-0.24***	-0.25***
	(0.04)	(0.04)	(0.08)	(0.08)
Isixhosa	0.01	0.02	0.01	0.01
	(0.08)	(0.09)	(0.08)	(0.08)
Isizulu	-0.03	-0.01	-0.03	-0.03
	(0.08)	(0.08)	(0.08)	(0.08)
Northern Sotho	-0.00	-0.01	-0.00	-0.00
	(0.08)	(0.08)	(0.08)	(0.08)
Southern Sotho	-0.00	-0.00	-0.01	-0.01
	(0.08)	(0.08)	(0.08)	(0.08)
Setswana	-0.07	-0.06	-0.06	-0.06
	(0.07)	(0.08)	(0.07)	(0.07)
Siswati	0.04	0.03	0.03	0.03
	(0.09)	(0.09)	(0.08)	(0.08)
Tshivenda	0.10	0.09	0.09	0.08
	(0.10)	(0.10)	(0.08)	(0.08)
Other Languages	0.16	0.15	0.14	0.14
	(0.18)	(0.18)	(0.14)	(0.14)
Sex Ratio	0.24***	0.27***	0.21***	0.22***
	(0.04)	(0.05)	(0.03)	(0.04)
Observations	8451	8451	8451	8451
χ^2 - Statistic (or F for LPM)	1285.64	1257.93	69.62	1843.46
$\Pr ob > \chi^2$ ($\Pr ob > F$)	0.0000	0.0000	0.0000	0.0000

*** p<0.01, ** p<0.05, * p<0.1
Robust standard errors in parentheses

Table C.3: Reduced Form Labour Force Participation Estimates from the KwaZulu Natal

Sample: 1998

Variable	**Maddala**	**Marriage Eqn.**	**Participation Eqn.**	**SELPM**
Incomplete Primary	0.08**	0.00	0.24**	0.09**
	(0.03)	(0.11)	(0.10)	(0.04)
Primary	0.10**	0.09	0.29**	0.10**
	(0.04)	(0.14)	(0.13)	(0.05)
Incomplete Secondary	0.03	-0.31***	0.08	0.03
	(0.03)	(0.11)	(0.10)	(0.04)
Secondary	0.15***	-0.58***	0.44***	0.15***
	(0.03)	(0.13)	(0.12)	(0.04)
Diploma	0.29***	-0.22	1.29***	0.29***
	(0.02)	(0.17)	(0.21)	(0.04)
Degree	0.26***	-0.12	1.14**	0.26***
	(0.05)	(0.37)	(0.49)	(0.06)
25-29 Years	0.21***	0.76***	0.66***	0.23***
	(0.02)	(0.10)	(0.08)	(0.03)
30-34 Years	0.20***	1.10***	0.63***	0.23***
	(0.02)	(0.10)	(0.09)	(0.03)
35-39 Years	0.19***	1.47***	0.60***	0.21***
	(0.03)	(0.11)	(0.10)	(0.03)
40-44 Years	0.17***	1.68***	0.56***	0.20***
	(0.03)	(0.12)	(0.11)	(0.04)
45-49 Years	0.09***	1.95***	0.28**	0.11***
	(0.03)	(0.13)	(0.11)	(0.04)
Urban	0.14***	-0.01	0.41***	0.13***
	(0.02)	(0.07)	(0.07)	(0.02)
Sex Ratio	0.08	0.02	0.23	0.09
	(0.08)	(0.25)	(0.22)	(0.08)
Women's Jobs	0.12	-0.53*	0.35	0.13
	(0.11)	(0.32)	(0.30)	(0.10)
Rho		-0.14***	-0.14***	
		(0.04)	(0.04)	
Observations	2451	2451	2451	2451

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.4: Marriage Estimates from the KwaZulu Natal Sample: 1998

Variable	**Probit 1**	**Maddala**	**LPM**	**SELPM**
Participation	-0.09***	-0.64	-0.07***	-1.18
	(0.03)	(0.54)	(0.02)	(1.14)
Incomplete Primary	0.01	0.06	0.00	0.10
	(0.04)	(0.07)	(0.04)	(0.11)
Primary	0.05	0.11	0.03	0.15
	(0.05)	(0.08)	(0.05)	(0.13)
Incomplete Secondary	-0.11***	-0.09**	-0.10***	-0.07
	(0.04)	(0.04)	(0.04)	(0.06)
Secondary	-0.19***	-0.12	-0.16***	0.01
	(0.04)	(0.09)	(0.04)	(0.18)
Diploma	-0.05	0.11	-0.05	0.27
	(0.06)	(0.18)	(0.06)	(0.34)
Degree	-0.02	0.13	-0.02	0.26
	(0.14)	(0.21)	(0.13)	(0.33)
25-29 Years	0.31***	0.44***	0.21***	0.47*
	(0.04)	(0.12)	(0.03)	(0.27)
30-34 Years	0.43***	0.54***	0.34***	0.59**
	(0.03)	(0.10)	(0.03)	(0.26)
35-39 Years	0.54***	0.62***	0.49***	0.73***
	(0.03)	(0.07)	(0.03)	(0.25)
40-44 Years	0.58***	0.64***	0.57***	0.79***
	(0.03)	(0.05)	(0.04)	(0.24)
45-49 Years	0.62***	0.64***	0.65***	0.76***
	(0.02)	(0.03)	(0.03)	(0.13)
Urban	0.00	0.08	0.00	0.15
	(0.03)	(0.08)	(0.02)	(0.16)
Sex Ratio	0.05	0.08	0.04	0.11
	(0.09)	(0.10)	(0.07)	(0.13)
Observations	2451	2451	2451	2451
χ^2 - Statistic (or F for LPM)	507.23	509.90	71.70	715.37
$\Pr ob > \chi^2$ ($\Pr ob > F$)	0.0000	0.0000	0.0000	0.0000
Pred. Prob.	0.3774	0.3769		

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.5: Reduced Form Labour Force Participation Estimated for the 20-34 Year Old Sample in KwaZulu Natal: 1998

Variable	**Maddala**	**Marriage Eqn.**	**Participation Eqn.**	**SELPM**
Incomplete Primary	0.12**	-0.18	0.36**	0.13**
	(0.05)	(0.15)	(0.16)	(0.06)
Primary	0.13**	-0.12	0.39**	0.14**
	(0.05)	(0.18)	(0.18)	(0.06)
Incomplete Secondary	0.02	-0.63***	0.06	0.02
	(0.05)	(0.14)	(0.14)	(0.05)
Secondary	0.17***	-0.89***	0.51***	0.17***
	(0.05)	(0.16)	(0.15)	(0.05)
Diploma	0.28***	-0.53**	1.14***	0.28***
	(0.03)	(0.23)	(0.25)	(0.06)
Degree	0.26***	-0.82*	1.07**	0.27***
	(0.07)	(0.47)	(0.53)	(0.09)
25-29 Years	0.22***	0.75***	0.66***	0.23***
	(0.03)	(0.10)	(0.08)	(0.03)
30-34 Years	0.21***	1.07***	0.62***	0.22***
	(0.03)	(0.10)	(0.09)	(0.03)
Urban	0.12***	0.06	0.35***	0.12***
	(0.03)	(0.09)	(0.08)	(0.03)
Sex Ratio	0.08	0.33	0.22	0.09
	(0.09)	(0.30)	(0.25)	(0.09)
Women's Jobs	0.22*	-0.69*	0.61*	0.22*
	(0.13)	(0.41)	(0.37)	(0.13)
Rho		-0.05	-0.05	
		(0.05)	(0.05)	
Observations	1611	1611	1611	1611

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.6: Marriage Estimates from the 20-34 Year Old Sample in KwaZulu Natal: 1998

Variable	**Probit 1**	**Maddala**	**LPM**	**SELPM**
Participation	-0.03	0.03	-0.03	-0.85
	(0.03)	(0.21)	(0.02)	(0.68)
Incomplete Primary	-0.05	-0.06	-0.06	0.04
	(0.04)	(0.05)	(0.06)	(0.11)
Primary	-0.03	-0.03	-0.04	0.07
	(0.05)	(0.06)	(0.07)	(0.12)
Incomplete Secondary	-0.18***	-0.18***	-0.20***	-0.19***
	(0.04)	(0.04)	(0.05)	(0.06)
Secondary	-0.21***	-0.21***	-0.26***	-0.12
	(0.03)	(0.04)	(0.05)	(0.14)
Diploma	-0.12***	-0.13**	-0.16*	0.06
	(0.04)	(0.06)	(0.08)	(0.21)
Degree	-0.17***	-0.17***	-0.26*	-0.05
	(0.06)	(0.06)	(0.15)	(0.25)
25-29 Years	0.25***	0.23***	0.19***	0.39**
	(0.03)	(0.07)	(0.03)	(0.16)
30-34 Years	0.37***	0.35***	0.32***	0.50***
	(0.04)	(0.07)	(0.03)	(0.16)
Urban	0.02		0.02	0.12
	(0.03)		(0.03)	(0.09)
Sex Ratio	0.14	0.15*	0.12*	0.16
	(0.09)	(0.09)	(0.07)	(0.11)
Observations	1611	1611	1611	1611
χ^2 - Statistic (or F for LPM)	201.58	200.86	22.93	210.69
$\Pr ob > \chi^2$ ($\Pr ob > F$)	0.0000	0.0000	0.0000	0.0000
Predicted Probabilities	0.2266	0.2266		

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Appendix D

Appendix to Chapter 5

D.1 Additional Estimation results

Table D.1: Decomposition Analysis: year 2006 sample used for coefficients; LFP assumed endogenous in SELPM

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aggregate Decomposition											
Total Explained	0.4109**	0.5207***	0.4709**	0.3723**	0.2231**	0.0722***	0.0123***	0.0162***	-0.0012	0.0202**	-0.0040
	(0.1653)	(0.0030)	(0.1872)	(0.1477)	(0.0889)	(0.0271)	(0.0033)	(0.0031)	(0.0073)	(0.0084)	(0.0036)
Total Unexplained	-0.3562**	-0.4528***	-0.4248**	-0.3193**	-0.1950**	-0.0363	0.0058	0.0178***	0.0157*	0.0132	0.0083
	(0.1651)	(0.0032)	(0.1870)	(0.1476)	(0.0888)	(0.0275)	(0.0062)	(0.0063)	(0.0092)	(0.0100)	(0.0069)
Detailed Decomposition for the Characteristic Effect											
Participation	0.6445**	0.7382***	0.6230**	0.5305**	0.3398**	0.1429**	0.0434**	0.0289**	-0.0008	0.0499**	0.0109*
	(0.2530)	(0.0063)	(0.2445)	(0.2083)	(0.1335)	(0.0563)	(0.0177)	(0.0123)	(0.0047)	(0.0202)	(0.0066)
Education	-0.0350*	-0.0458***	-0.0185*	-0.0400*	-0.0250*	-0.0194	-0.0167	-0.0122	-0.0035	-0.0115*	-0.0029
	(0.0196)	(0.0026)	(0.0107)	(0.0213)	(0.0151)	(0.0126)	(0.0115)	(0.0090)	(0.0046)	(0.0066)	(0.0032)
Age	-0.0148**	-0.0082	-0.0008	-0.0150**	-0.0158***	-0.0073	0.0084	0.0168***	0.0121**	-0.0067	-0.0023
	(0.0058)	(0.0053)	(0.0046)	(0.0062)	(0.0060)	(0.0055)	(0.0051)	(0.0058)	(0.0051)	(0.0058)	(0.0054)
Province	-0.0062**	-0.0114***	-0.0115***	-0.0115***	-0.0117***	-0.0095***	-0.0139***	-0.0102***	-0.0049**	-0.0070**	-0.0061**
	(0.0027)	(0.0017)	(0.0038)	(0.0039)	(0.0039)	(0.0034)	(0.0047)	(0.0038)	(0.0022)	(0.0028)	(0.0027)
Sex Ratio	-0.1775***	-0.1521***	-0.1214***	-0.0918***	-0.0643***	-0.0345***	-0.0089**	-0.0071**	-0.0042**	-0.0044**	-0.0036*
	(0.0650)	(0.0011)	(0.0444)	(0.0336)	(0.0236)	(0.0127)	(0.0035)	(0.0029)	(0.0020)	(0.0021)	(0.0019)

Robust standard errors in parentheses

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

Table D.2: Decomposition Analysis: year t sample used for coefficients; LFP assumed endogenous in SELPM

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Aggregate Decomposition											
Total Explained	0.1843***	6.7741***	-0.0093	0.0109	0.0047	-0.0198***	0.0188***	0.0207***	0.0257***	-0.0080**	0.0066*
	(0.0357)	(0.1070)	(0.0328)	(0.0418)	(0.0086)	(0.0054)	(0.0033)	(0.0033)	(0.0072)	(0.0038)	(0.0035)
Total Unexplained	-0.1295***	-6.7062***	0.0555*	0.0421	0.0234**	0.0557***	-0.0006	0.0132**	-0.0113	0.0414***	-0.0023
	(0.0360)	(0.1056)	(0.0331)	(0.0421)	(0.0102)	(0.0080)	(0.0062)	(0.0062)	(0.0089)	(0.0071)	(0.0069)
Detailed Decomposition for the Characteristic Effect											
Participation	0.1478***	17.9276***	-0.0331	0.0450	0.0344	-0.0687***	0.0035	-0.0062	0.0004	-0.0213***	-0.0170**
	(0.0293)	(0.1540)	(0.0356)	(0.0536)	(0.0303)	(0.0147)	(0.0086)	(0.0047)	(0.0024)	(0.0051)	(0.0082)
Education	0.0110***	-0.9480***	0.0076***	0.0158***	0.0091**	0.0203***	0.0104**	0.0146***	0.0104***	0.0115***	0.0105**
	(0.0018)	(0.0723)	(0.0016)	(0.0049)	(0.0036)	(0.0026)	(0.0046)	(0.0034)	(0.0039)	(0.0025)	(0.0048)
Age	-0.0106***	-0.1061	0.0004	-0.0086**	-0.0090***	-0.0002	0.0060**	0.0089***	0.0128***	0.0007	0.0029
	(0.0041)	(0.1437)	(0.0025)	(0.0036)	(0.0033)	(0.0017)	(0.0029)	(0.0027)	(0.0023)	(0.0023)	(0.0037)
Province	-0.0068***	-0.5153***	-0.0006	-0.0009	-0.0008	0.0023	0.0031***	0.0034***	-0.0009	-0.0007	0.0033**
	(0.0018)	(0.0826)	(0.0015)	(0.0016)	(0.0011)	(0.0016)	(0.0012)	(0.0010)	(0.0009)	(0.0009)	(0.0015)
Sex Ratio	0.0428***	-9.5840***	0.0164	-0.0404***	-0.0290	0.0264***	-0.0043	0.0001	0.0031	0.0018**	0.0070**
	(0.0164)	(0.0695)	(0.0120)	(0.0110)	(0.0212)	(0.0094)	(0.0036)	(0.0021)	(0.0029)	(0.0008)	(0.0028)

Robust standard errors in parentheses

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

Table D.3: Detailed Decomposition for Coefficient Effect (SELPM) using 2006 coefficients

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Participation	1.5112*	-43.4819***	2.0879***	1.8990**	2.0365**	3.6468***	2.3537**	3.1295***	3.9064***	3.6475***	6.6377***
	(0.7747)	(0.1218)	(0.7862)	(0.8408)	(0.9118)	(0.9982)	(1.1252)	(1.0904)	(1.2926)	(1.0304)	(1.1504)
Education	0.0665**	-3.8678***	-0.5200***	0.0752**	0.0582**	0.1263***	0.0546**	0.0638***	0.0662***	0.0696***	0.0856***
	(0.0287)	(0.0476)	(0.1903)	(0.0354)	(0.0256)	(0.0244)	(0.0229)	(0.0192)	(0.0172)	(0.0176)	(0.0157)
Age	0.0080	-1.9785***	0.0266**	0.0234	0.0262	0.0617***	0.0202*	0.0242**	0.0366***	0.0457***	0.0786***
	(0.0161)	(0.0978)	(0.0135)	(0.0177)	(0.0173)	(0.0158)	(0.0120)	(0.0109)	(0.0137)	(0.0153)	(0.0157)
Province	0.0060	-0.2839***	0.0188**	0.0191**	0.0207**	-0.0045	0.0289***	0.0209**	0.0063	0.0218***	0.0431***
	(0.0083)	(0.0488)	(0.0091)	(0.0091)	(0.0093)	(0.0098)	(0.0106)	(0.0099)	(0.0088)	(0.0083)	(0.0089)
Sex Ratio	-0.1126***	7.2036***	-0.1668***	-0.0988	-0.1120	-0.4130***	-0.1357	-0.2633**	-0.4625**	-0.3722***	-0.7794***
	(0.0342)	(0.0250)	(0.0557)	(0.0679)	(0.1005)	(0.1065)	(0.1411)	(0.1225)	(0.1957)	(0.1033)	(0.1248)
Constant	-1.8353*	41.9557	-1.8713**	-2.2372**	-2.2246**	-3.4535***	-2.3159**	-2.9573***	-3.5373***	-3.3991***	-6.0574***
	(0.9557)	(0.0000)	(0.7508)	(0.9766)	(0.9626)	(0.9720)	(1.0363)	(1.0100)	(1.1421)	(0.9740)	(1.0631)

Standard errors in parentheses

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

Table D.4: Detailed Decomposition for Coefficient Effect (SELPM) using t coefficients

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Participation	2.0079*	-60.6712***	2.7441***	2.3845**	2.3420**	3.8583***	2.3936**	3.1646***	3.9052***	3.7186***	6.6657***
	(1.0293)	(0.0836)	(1.0333)	(1.0557)	(1.0485)	(1.0561)	(1.1443)	(1.1026)	(1.2922)	(1.0505)	(1.1553)
Education	0.0205*	-2.9656***	-0.5461***	0.0194	0.0241*	0.0865***	0.0276**	0.0371***	0.0523***	0.0465***	0.0722***
	(0.0122)	(0.0512)	(0.2006)	(0.0185)	(0.0130)	(0.0156)	(0.0129)	(0.0121)	(0.0134)	(0.0131)	(0.0142)
Age	0.0038	-1.8806***	0.0254*	0.0170	0.0194	0.0546***	0.0226*	0.0320**	0.0359**	0.0382***	0.0734***
	(0.0129)	(0.0980)	(0.0134)	(0.0143)	(0.0140)	(0.0141)	(0.0135)	(0.0142)	(0.0143)	(0.0133)	(0.0150)
Province	0.0065	0.2199***	0.0079	0.0086	0.0098	-0.0163**	0.0120	0.0073	0.0023	0.0155**	0.0337***
	(0.0066)	(0.0648)	(0.0070)	(0.0067)	(0.0070)	(0.0082)	(0.0081)	(0.0079)	(0.0079)	(0.0069)	(0.0075)
Sex Ratio	-0.3329***	16.6355***	-0.3046***	-0.1502	-0.1474	-0.4740***	-0.1404	-0.2705**	-0.4698**	-0.3784***	-0.7900***
	(0.1012)	(0.0637)	(0.1017)	(0.1032)	(0.1322)	(0.1222)	(0.1459)	(0.1258)	(0.1988)	(0.1050)	(0.1265)
Constant	-1.8353*	41.9557	-1.8713**	-2.2372**	-2.2246**	-3.4535***	-2.3159**	-2.9573***	-3.5373***	-3.3991***	-6.0574***
	(0.9557)	(0.0000)	(0.7508)	(0.9766)	(0.9626)	(0.9720)	(1.0363)	(1.0100)	(1.1421)	(0.9740)	(1.0631)

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