ADEQUACY OF RETIREMENT INCOME IN DEFINED CONTRIBUTION PENSION PLANS

(CASE OF TEACHERS SERVICE COMMISSION AND JOMOKENYATTA FOUNDATION)

BY

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D53/13194/05

A Research Project submitted to the School of Business in partial fulfillment for the degree of Master of Business Administration (Finance) of Kenyatta University.

June 2008

DECLARATION

This Project is my original work and is not similar to any other work that has been previously submitted to any University for academic fulfillment.

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DEDICATION

To my dear wife Millicent, children Blessing, Neville, Denis, Elsie and loving mom Silpa for their sacrifice, support and encouragement.

ACKNOWLEDGEMENT

First and foremost I wish to thank God Almighty for his provision and the strength he gave me to pursue the Course.

My supervisor Farida Abdul was indeed an inspiration to me, her useful guidance and help made this proposal a reality. For this reason, I express my gratitude to her. Raphael Maganjo, lecturer; Accounting and Finance provided me with plenty of advice and help for which I should never forget to be grateful.

I feel deeply indebted to my dear wife Mary, Children Neville, Denis and Elsie Mercy who made great sacrifice in terms of provision just to have me go through the course. Mr. A.D Bajona deserves special thanks for editing the final work.

Muthoni Wango of RBA provided me with useful materials that helped in the development of this proposal. I do indeed appreciate her assistance.

I profoundly thank my brother Danis, friends Hans and Jane Smith who went out of their way and supported me materially. My work was made a lot easier because of the lap top Jane and her daughter Heidi Smith provided.

This study would not have been actualized if my employer, the Teachers Service Commission didn't grant me study leave with pay. I'm grateful for the support I received during the entire period of study.

To my Classmates from whom I received valuable comments, I say thank you all and may God bless you mightily.

DEFINITIONS OF TERMS

Annuity – A fixed sum of money paid each year to a person for the rest of his/her life, or a form of insurance that provides such a regular annual income.

Pension – A sum of money paid regularly to retired people or their dependants by government or former employers.

Retirement Benefits Scheme – Is defined under the Retirement Benefit Authority Act 1997 as a scheme or arrangement under which persons are entitled to benefits in the form of payments upon retirement, death or termination of service.

Defined Benefit Plan – A pension plan where the employees benefits are predetermined by use of a formula, the employee's contribution is fixed but the employer fluctuate to meet any deficit in the liabilities.

Defined Contribution Plan – It is a pension design where the employer and employee pay a fixed rate of contribution. These contributions along with investment returns accumulate in a fund that is eventually used to provide pension benefits.

Replacement Rates – Is the ratio of a person's pre-retirement income to retirement income.

Parastatal – Is a state corporation under the state corporation Act Cap 446(1987). It may be a body corporate established by or under an Act of parliament or may represent a bank or a financial institution licensed under the banking Act or other Company incorporated by the government.

LIST OF ABBREVIATIONS

O.E.C.D	Organizations for Economic Co-operation and Development.
R.B.A	Retirement Benefit Authority
D.B	Defined Benefits
D.C	Defined Contribution
R.R	Replacement Ratio
ILO	International Labor Organization
SRB	Staff Retirement Benefit
KTDA	Kenya Tea Development Authority
TSC	Teachers Service Commission
K.R.A	Keya Revenue Authority
HFS	Household Consumer Finance Survey

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ABSTRACT

The study is a comparative analysis of adequacy of income in Defined benefits Pension plans and defined contribution pension plans.

The main objective of the study is to establish whether retirees will have adequate income at retirement under defined contribution pension plan and its differential effects on income distribution among different categories of retirees.

Problem with Defined Contribution Pension plan is that the benefits to retirees are not certain because the benefits depend on the contribution rates and investment returns. Because of undeveloped capital markets in most developing countries, it is unclear whether retirees can achieve adequate replacement ratio in defined contribution pension design.

The two-thirds retirement model of Macdonald and Cairn (2006) was used to test adequacy of retirement income. If the DC yields a replacement ratio of forty percent, the retirement income will be considered adequate for this study. According to the World Bank and International Labor Organization, 40% replacement ration is considered adequate for developing economies. To determine the inequality of income among retirees in the two pensions plans a gini coefficient was used.

Using a sample of 118 employees of the Teachers Service Commission and 40 staff of the Jomo Kenyatta Foundation, the study established that employees with DB plans are likely to be more secure in terms of retirement income than retirees under the defined contribution pension plan. The results also show that there is greater disparity of retirement income under the Defined Contribution Pension design than under the Defined Benefit plan.

The key findings are that DC plans tend to have lower retirement income and higher income disparity among workers compared to DB designs. Whereas basic earnings contribute about 80% of retirement benefits under the defined benefits plans, contribution rates and investment returns contribute about 60% of retirement benefits in Defined Contribution pension plan.

CHAPTER ONE

INTRODUCTION

1.0 Background to the study

There are two main types of pension designs in Kenya. Defined benefit (DB) plans provide a pension that is defined in relation to salary and service. The individual member's contributions if any, are typically at a fixed rate and their employer contribute a certain rate in order to meet the balance of the cost of providing the individual's benefits.

Defined contribution (DC) plans do not guarantee a level of pension. Instead, both the individual and employer pay a fixed rate of contribution. These contributions, along with investment returns, accumulate in a fund that's eventually used to provide benefits at retirement. The certainty of contribution and simplicity in administration has made them the fastest growing retirement provision in Kenya (RBA News, 2004).

The dramatic shift from DB to DC means careful consideration should be given as to the variability of retirement income that private pension accounts can provide. In 2005, out of 1145 registered schemes, 87% were defined contribution pension plans and only 13% represented defined benefit pension design, an indication that the trend is toward the defined contribution pension plans.

There are numerous factors explaining the rising popularity of the defined contribution pension design. According to Odundo (2006), DC schemes tend to be age neutral; easier to understand and administer; and provide for portability of funds. Employees are also saved the risk of job mobility. However, as Odundo (2006) notes, DC pension design is subject to a number of risks, the notable one being uncertain rate of investment returns and low contribution rates. Odundo (2006) asserts that in Kenya, the defined benefit pension schemes are mostly offered by government, quasi-government and private multinational companies. The reason being defined benefits pension plans are very expensive to manage, hence private usually opt for defined contribution.

1.1.2 The trends in Defined Contribution Pension Plan

In a number of countries the pension sector is in the midst of regulatory and financial reform. The reforms are largely a response to the deterioration in the funding of the defined benefit (DB) pension plan.

Traditionally, funded occupational pension systems were designed around DB pension; DC plans accounted for a small fraction of employer-sponsored pensions and were typically offered by small firms or supplementary plans for high income earners (Woodman et al, 2006). Over the past one decade in Kenya, there has been gradual shift, predominantly in the private sector, towards employee directed DC plans and hybrid arrangements that combine features of both DB and DC plans. In 2001, the DC and DB plans were 962 and 143 respectively. As at November 2006, the DC stood at 1197 compared to 144 DB schemes, representing eighty nine percent and eleven percent respectively (RBA News, 2006). In the civil service the government draft report on sectoral reform (2005) indicated the plan was to covert to DC by 1st July 2006 and new employees were to join the new scheme; the serving employees were given the option of either continue in the old non contributory scheme or convert to the new DC pension arrangement.

Historically, the shift towards DC plans has largely been a response to changes in industrial structure and labor force composition that have given rise to an increasingly mobile workforce. Within the public sector, the shift is due to the pension expectations, which have been steadily rising as a result of increased number of pensioners and improved salaries of civil servants (Sectoral draft report on reform, 2005). Woodman et al (2006) have argued that the shift to DC plans is partly the result of a desire to make pensions more portable and attempts by employers to encourage later retirement. DB plans, which are often not portable across employers, can penalize mobile workers since the expected pension benefits generally accrue only to employees who remain with the same employer throughout their career. DC plans avoid accrual losses that can be associated with DB plans and provides mobile workers with a much more flexible means of managing their retirement savings. Over the past several years the shift from DB to

DC pension has gained momentum. The recent acceleration appears mainly to be employer driven, and is largely a response to a confluence of factors (e.g., pension under funding and its long persistence due to decline in long-term interest rates, the move to more market based accounting, increasing regulatory burden & uncertainty and recognition of the effect of longevity on plan costs that have reduced the incentives for employers to offer DB plans (W. Even & D. Macpherson, 2007). Within the pension sector there has been much greater focus on managing pension fund assets relative to liabilities rather than market benchmarks (A. Schrager, 2006). This shift in focus is also linked to regulatory reform that is making the financial risks associated with DB plans more transparent (L.N. Morintat, 2005). Since DC contributions can be fixed as a predictable share of payroll, migrating to DC plan offers employer a means of reducing balance sheet and earnings volatility, at least over the long-term.

The shift from DB to DC plans could lead to important changes in the level and distribution of future retirement income. DB plans promise a retirement benefit as annuity that is specified according to a formula that usually involves a pensioner's years of service at retirement and final average salary. Since the employer is obligated to ensure that pension contributions plus earnings on assets cover the promised benefits, the employer bears the majority of the rate of return risks on pension investment.

In DC plans, the employer and/or employee make contributions to an account and the employee is entitled to contributions plus any earnings on the assets. The rate of return risk in DC plans is absorbed entirely by the employee. DC plans are, however, generally viewed as more portable in the sense that workers who switch jobs frequently will typically accumulate more pension wealth, if covered by DC plans when they switch employers (W. Even & D. Macpherson, 2007).

These fundamental distinctions between DB and DC plans reveal several ways that the change in plan types could affect future retirement income security. First, the shift to DC plans exposes employee to rate of return risk that they were insulated from in DB plans and uncertainty about earnings at the end of their career. Second, the shift to DC plans

can either increase or decrease benefit levels depending upon the percentage of pay that is contributed as compared to the replacement rates promised by DB plans.

The question of whether the shift from DB to DC among Kenya's State Corporations will offer adequate retirement income has not been empirically tested. The main concern of this study, however, is not essentially on the shift of the DB schemes to DC schemes rather how these changes affect retirement income.

1.2 Statement of the problem

The transition from DB to DC plans in private sector pensions is shifting investment risk from the corporate (plan sponsor) to the households (participants). Participants are therefore becoming increasingly exposed to financial markets, and retirement income may be subject to greater variability than before.

There is a large body of evidence to suggest that there is considerable inertia and myopia regarding retirement decisions that ultimately threaten the capacity of a DC plans to provide retirement security (Woodman et al, 2006). For example research has shown that retirement security for some participants is threatened by low contribution rates, suboptimal asset allocation, early withdrawals, uncertain rate of returns and failure or inability to annuitize plan assets at retirement that may reflect well documented behavioral biases. The biggest charge against the DC pension plans has been the underlying uncertainty in rates of return shown most recently by the unhappy experiences of Enron employees in USA (E. Woodman et al, 2006). This study is set to establish how DC plans affect retirement income and income disparity among retirees.

1.3 General Objectives

The general objective of this paper was to provide a broad look at some of the measures of adequacy and assess the adequacy of retirement income under the defined contribution pension plan.

1.4 Specific Objectives of the Study

a) To assess the adequacy of retirement income in a DC and DB pension plans.

b) To determine the income disparity between DC and DB pension plans.

c) To recommend ways of cushioning retirees who might face financial insecurity in DC plans.

1.5 Research Questions

a) How is the adoption of a DC plan likely to affect retirees' financial security?

b) How does the adoption of DC plans affect the distribution of retirement income among the different sub group of retirees?

c) How should retirees be cushioned from financial risk in a DC plan?

1.6 Significance of the Study

The Study will be of great interest to the pension fund participants (contributors) who will be keen to know the adequacy of their contributions for future wealth.

a) Plan Sponsors and workers' representatives (trade unions) should be concerned with implications of DC on financial viability/adequacy.

b) Researchers and academicians seek to understand different principles and concepts applicable to both DB and DC pension plans.

c) Regulators of pension sector such as the Retirement Benefit Authority and the Capital Market Authority may also be interested to know the implications of shift from DB to DC on retirement wealth of pensioners.

1.7 Scope the Study

The study focused on adequate retirement income in a defined contribution pensions by comparing the two pension designs; the defined contribution pension plans offered by Jomo Kenyatta Foundation and defined benefit offered by the Teachers Service Commission. The locale of the study was thus the two state corporations within the Ministry of Education, both based in Nairobi area.

There are three pension designs; namely defined contribution, defined benefits and hybrid scheme. These designs are either mandatory or voluntary. This study focused on mandatory defined contribution and defined benefits schemes. The study only looked at the two state corporations within the education sector, although there were about one

hundred and twenty state corporations' schemes registered by the Retirement Benefits Authority (RBA).

1.8 Limitation of the Study

The study used replacement ratio as a measure of adequacy of retirement income. There was no clear or single widely agreed measure of adequacy of retirement income. The other limitation was that the study only focused on income from retirement; a retiree might have other sources of income that can positively influence a retiree's living standard. Besides, the researcher might not have had direct control over the manner respondents answered questions.

1.9 Assumptions of the study

The study was taken under the following assumptions:-

i) An individual's wage growth rate is made up of inflation and merit component. The later is deterministic function of age;

ii) There were no taxes, expenses, or allowances for profit in the financial assets; meaning only gross replacement rates was considered;

iii) The DC design system had a pure design so there were no ancillary benefits such as minimum guarantee. There were also no constraints on members such as a minimum period of vesting;

iv) Retirees did not have any other savings other than retirement income; and

v) The accumulated pensions benefits would be used to purchase an annuity from an insurance company that would guarantee a retiree steady annual or monthly income until his death or the death of his spouse.

CHAPTER TWO
LITERATURE REVIEW

2.1.1 Introduction to Literature review

Most employers including government and quasi – government bodies set up pension plans or provident funds (generally referred to as retirement benefit schemes) to cater for their employees at retirement. The main objectives of retirement benefits schemes are two fold; first is to redistribute income towards low income pensioners and prevent destitution in old age, the second objective is to help workers maintain living standards during retirement by replacing income from work at an adequate level.

When setting up pension plans/provident funds, employers make a promise to employees; to provide income to them on either attainment of retirement or leaving employment, but after benefits have vested. This create a liability for the employer, who in turn is required to establish a pension or provident fund and make periodic deposit in it so as to have to have sufficient assets to meet promised payments as they fall due (Wanyama, 2000). Contributions to the fund come from both employer and employee where the scheme is contributory or from only employer where the scheme is non-contributory. The contributions must be invested well for the fund to yield adequate returns and sustain itself to meet promised retirement benefits.

2.1.2 Adequacy of retirement income

Calculation of retirement income adequacy typically relates retirement consumption to pre-retirement consumption in three possible ways. According to Welter & Wolff (2005), a household may be considered adequately prepared for retirement if it can maintain a similar real level of consumption as its working years. Usually, 60% to 80% of pre-retirement income is considered adequate as per the OECD standard and 40% for developing countries according to the World Bank and ILO standard. This is so because it is assumed the income needs of retirees are likely to be lower than those of workers. Household no longer need to save for retirement, taxes are lower, work-related expenses

disappear, the family size or relatives is smaller than that of the workers, and households eventually pay off their debt.

Welter & Wolff (2005) also look at retirement income adequacy as a constant nominal level of consumption during retirement as during working years. This means that consumption needs during retirement are expected to decline during retirement over time, but in somewhat arbitrary fashion. Engen et al, (1999) posits that real consumption may decline if the marginal utility of consumption is held constant and uncertainty about income and life expectancy are introduced. As households must consider an uncertain future, their marginal utility of certain consumption today is higher than marginal utility of uncertain consumption in the future. In this study, we shall consider Replacement Ratio as standard measure of adequate retirement income.

2.2 Conceptual Framework

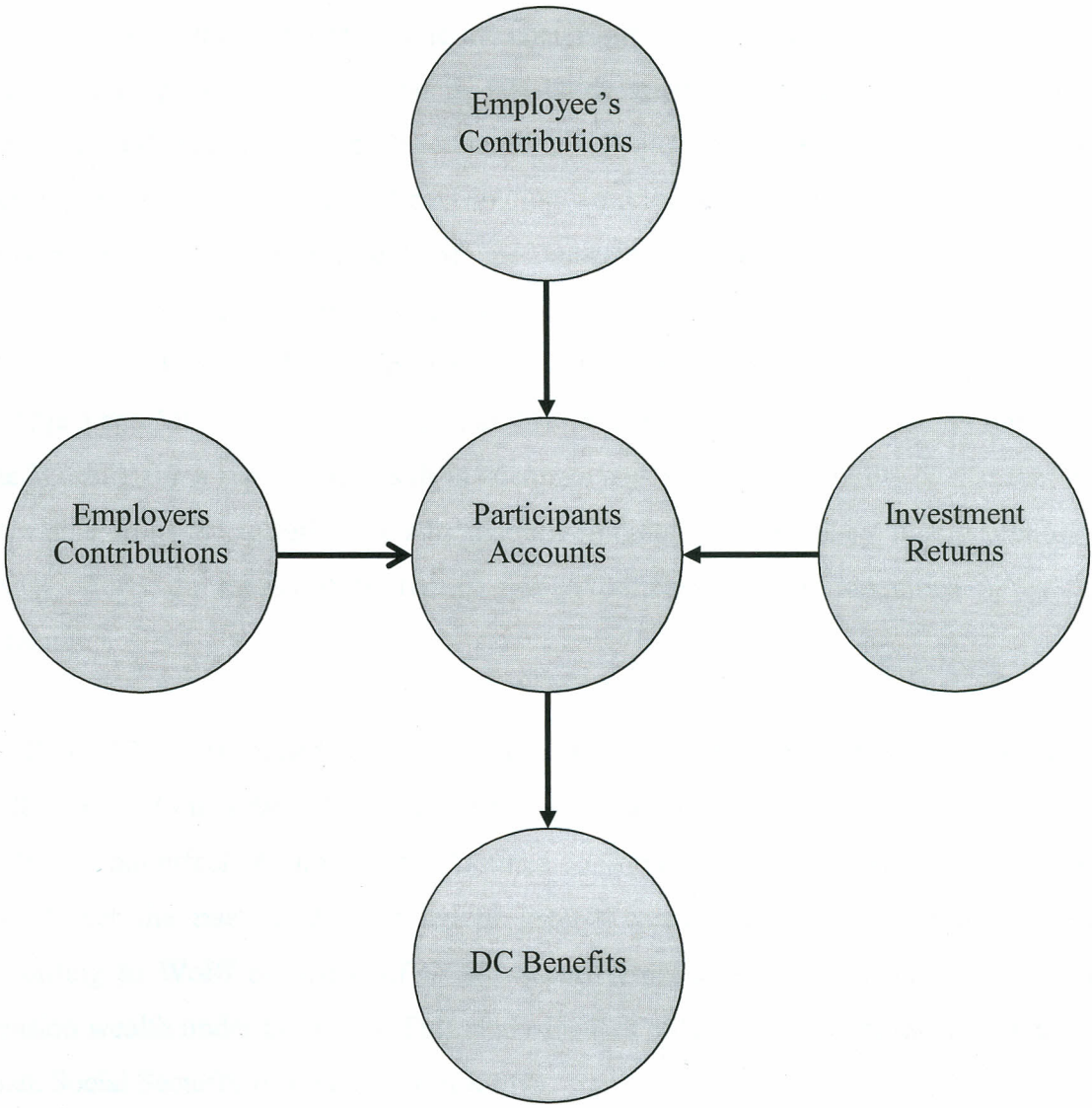
In a defined contribution pension plan, contributions by both employer and employee are paid into an individual's account for each member. The contributions are invested, for example in the stock market, and the returns on investment (which may turn out to be positive or negative) are credited to the participant's account. On retirement, the member's account is used to provide retirement benefits often through purchase of annuity, which provides a regular income.

The benefits paid to a participant therefore depend on the contribution amount and the returns from investment. If the funds are poorly invested, the returns will be low and this will consequently affect the final benefits paid to a participants. Good investment strategy and high contribution rates will lead to higher, benefits, hence good retirement income. The functional relationship between DC benefits, contribution rates and investment returns is given as follows:-

DC benefits = f(Contribution rates & Investment Returns), DC benefits is the dependent variable whereas contribution rates and investment returns are the independent variables or explanatory variables.

The above relationship is depicted in the following diagram:-

Figure 2.1 The Conceptual Framework of the Study



Source: Researcher (2007)

From the diagram above, employer and employee contribute a certain percentage of employee's basic salary, which is put into participant's account. A private fund manager in equity, bonds, and government papers and cash deposits invests the money so contributed. The returns from the said investment are ploughed back into participant account, which is eventually paid as benefits.

2.3 Past studies done in the area

Beattie and McGillivray(1995), on their reflection on the world bank report; averting old age crisis, argue that reliance on a defined contribution scheme does not provide a greater guarantee of pension benefits and in fact holds greater potential risk than a properly designed and administered defined benefits scheme. They also argue that in many developing countries the defined contribution would be impractical, given the absence of developed capital markets and of the capacity to establish effective regulatory institutions. They also regret that the issue of public pension scheme's reform has been mixed up with the wider debate about privatization and the role of the government. Beattie a and MCGillivray conclude that it is not clear at all that the pension proposals in the World Bank's report will result in adequate and acceptable benefits or that they will be viable from the technical or administrative points of view. They finally propose to focus efforts on measures to rectify design deficiencies and inequities in existing schemes.

Wolff (2002) re-examined the distributional effects of retirement wealth based on the SCF from 1983 to 1998 and found that the social security continued to have a mitigating distributional effect. With respect to Defined contribution wealth, however, Wolff (2005) found that the rise in DC has led to greater wealth inequality. Retirement wealth according to Wolff consisted of Social Security, pension income under DB plan and pension wealth under DC plans. This study focuses only on retirement income under DC plan. Social Security is not a factor in Kenya.

Various studies have analyzed the adequacy of savings of people at or near to their retirement using various approaches (R. Haveman et al, 2006). All of them assess adequacy by comparing the level of assets held by these older people to a variety of standards (typically tied to consumption levels prior, taking into account of the number of years of remaining life over which support is required. They reach quite different conclusions.

Engen, Gale and Uccello(1999) develop a stochastic life cycle model in which families save both for retirement and as a precautionary against uncertainty. Adequate wealth

income is defined to be an amount sufficient to enable smoothing of the marginal utility of consumption over the life cycle, a standard that implies the ability to sustain the level of pre-retirement consumption into retirement years. They find that the retirement resources of over 60 percent of married couples exceed this target (relative to an expected 50 percent in a stochastic model), implying that on average the level of private resources is 'optimal', or adequate. They also calculate the annuitized wealth to final earnings indicating an overall average replacement rate of between 70 and 80 percent. Their conclusion is that the overall wealth accumulation of older Americans is "adequate".Wolff (2002) who uses the survey of consumer finances for years 1983, 1985, 1989 and 1998 to examine the savings adequacy question reaches a rather different conclusion. He calculates expected retirement income – a rough estimate of annuitized wealth at the expected age of retirement for each household in each of several annual demographic groups. For those aged 47-64, expected retirement income increases over the period studied, while the share of those whose expected retirement income falls below the nation's poverty line increases from 17 to 19 percent. Similarly, the share of those whose expected retirement income is equal to or less than 50 percent of current income increases from 30 percent to 43 percent. Wolff concludes that there is a serious shortfall in retirement income at the end of the 1990s and that the problem has increased over time

S. Smith (2005) compares levels of pension wealth and pension accruals for DB and DC. Her conclusion is that contrary to popular perception, the level of pension that someone is likely to get from a DC scheme is similar to what they could expect from a DB scheme at least if they are a lower earner. This conclusion is based on an assumption of realistic earnings profile, contribution rates and investment returns.

Research done by W. Karunaranthe (2005) among Sri Lanka corporate firms reveal that accumulated balances under DC plans at the time of retirement are between five to seven times their last drawn salaries. He also finds that the replacement ratio is far below 40 percent.

C. Monlalto (2001) in his study compares Social and Security and pensions. He finds that Social Security provides a larger share of retirement wealth than savings and the smallest share of retirement wealth is contributed by pensions. The relative importance of Social security as a component of retirement wealth varies by planned age of retirement. Social security as a component of retirement wealth varies by planned age of retirement. Social Security provides a relatively larger share and pension income provides a relatively smaller share of retirement wealth for planned retirement age of 62 or older compared to retirement before 62.

Samwick and Skinner (2004), in their study compare the accumulation of assets in DC and DB plans. They find that for many workers the accumulation of assets in DC plans is likely to exceed the actuarial present value of the benefit entitlements that they would accrue in a DB plan. Schrager(2005), in a similar studies, examines the accumulation of retirement wealth in both DB and DC plans and concludes that DC plans may offer greater opportunities for retirement wealth accumulation for many workers.

R. Chen et al (2006) examined the adequacy of provident fund savings in supporting members' retirement lives. Their main conclusion is that the DC benefits are inadequate to maintain post-retirement consumption expenditure, except at the subsistence level, for most age and income groups under the 0%, 45%, and 60% withdrawal rate, at both retirement ages of 62 and 65. Their adequacy test at the subsistence level reveals that those in the older age groups are likely to face financial problems at high inflation rate.

Chen and Wong (1998) analyzed the adequacy of the DC at individual level for representative agent who starts work at age 25.In addition, they examined the adequacy of the DC with respect to the age of retirement which is variable at 60, 62 and after 65 years old in Singapore. Scenario analysis with salary at US$800, US$1,600 and US$2,400 was used with interest rate of 4%, 5% and 6% and salary growth rating from 4-8%. They found that the DC benefits would be sufficient during the post-retirement period of 20years for most members. Only those with low starting salary (US$800) may have financial problems after retirement.

Porteba et al, (2006) compare the value of retirement wealth accruals under defined benefits (DB) and defined contribution (DC) retirement plans. Their finding is that the defined benefits pension plan in public sector is more generous than defined contribution plan in the private sector. Their studies cover all retirement wealth including income from social security, housing and other savings. This study focuses on retirement income accumulation under the defined benefits and defined contribution pension plans.

2.4 Critical review of major issues

The increasing importance of a DC plans means that it is important that careful consideration should be given to the likely benefits that members can expect from them. The pension benefit that an individual will get from a DC plan depends on many factors including the age they start saving, the age they retire, how much they and their employer contribute, investment returns, investment and administration charges and the cost of buying an annuity at retirement. Of these factors, the one that an individual and scheme sponsor may have control over is the level of contributions.

2.4.1 Contribution rates

Pension benefit in a DC largely depends on the amount both the employer and employee contribute to the plan. The contribution rate is given as a percentage of current annual earnings. Research done by Broadbent et al, (2006) indicates that on average or at the median of the distribution, U.S. participants contribute five percent of gross salary to their accounts and that about a quarter of participants contribute less than four percent of pay. Broadbent et al, (2006) further assert that an annual contribution of six percent would be sufficient to replace about seventy five percent of earnings in retirement if those contributions were made constantly for forty years, if employers matched one half of the worker's contributions each year, and if the account were to earn, a seven and half percent annual (nominal) return.

Parke et al, (2005) posit that contribution rates to DC plans seem to be affected significantly by particular design features of the plan; in particular contribution rates tend to rise significantly when employers match a portion of the worker's contributions, offers

provisions for workers to take loans against account balances, and give workers arrange of investment options too choose from.

In the U.K, how contribution rates have been highlighted as a cause of concern for retirement. The pension Commission (2004), using data from various surveys, found that DB plan contributions are in the 16-20 percent range compared to about 7-11 percent for DC plans. Blake (2000) notes that a modest contribution rate will still provide an adequate retirement income, but this outcome is contingent upon a long period of sustained contributions. He estimates that a contribution rate of 11 percent will provide a retirement income of two-thirds of final salary, for a male retiring at age 65, assuming an average annual salary of 3 percent and nominal rate of return on plan contribution of 6 percent per annum.

Odundo (2006), in his address at World Bank conference in Washington DC, indicated that the average income replacement ratio in Kenya stands at 20% against the minimum 40% recommended by the World Bank and ILO. He attributes the low replacement ratio to low contribution rates, easy access to benefits while in employment and upon changing jobs.

2.4.2 Rate of return

Porteba et al (2006), assert that accrued benefits in defined benefit plans do not depend on financial market returns, except in extreme circumstances that correspond to an insolvent DB plan. Yet benefits in DC plans are tied directly to financial returns. They maintain that DC plans expose prospective retirees to greater risk than DB plans precisely because of this financial market link.

The uncertainty of interest rate is a major concern in the defined contribution pension design. Shiller (2005) posits that individuals in DC plans face the risk that they may retire at a time when equity markets have fallen. This means that they may face double hurt of lower fund at retirement and cost of purchasing annuity. This problem is more acute in a developing economy where the stock market is not well developed.

2.4.3 Replacement Ratio

A commonly used measure of adequacy is the replacement rate, defined as post retirement relative to pre-retirement income (McNair et al 2005). Using this approach, income is considered adequate if it is sufficient to generate given replacement rate. For this study the Macdonald two-thirds retirement models will be used.

The two-thirds retirement model described in the Macdonald and Cairns (2006), states that a DC member retires once their DC accounts can provide a sufficient wage replacement income. For this study, we shall consider retirement income to be adequate if it yields 40% of pre-retirement income. This is the rate recommended for developing economies by World Bank and International Labor Organization (ILO).

The study shall calculate the pension purchasable by dividing the accumulated pension wealth W(t), by a life annuity factor $a_x(t)$. The pension income, divided by the individual's pre-retirement salary, is referred, to as the replacement ratio, RR(t):

$$RR(t) = \frac{W(t)/a_x(t)}{Y(t)}$$

Where,

$a_x(t)$: the annuity factor at time of retirement for an individual aged 55;
W(t): the worker's accumulated DC pension wealth at retirement;

Y(t) : the worker's salary at the time of retirement.

With salary growth rate of g and years of service given as T, Y(t) is estimated using compound formula as follows:-

$Y(t) = Y_0(1+g)^T$, where Y_0 is the annual salary at start of career, g is the annual salary growth rate which has both the merit and the inflation components,
and T years of service.

The two-thirds retirement income benchmark is an adequate salary replacement level according to the range given in a report prepared by the Canadian institute of Actuaries (1996). It is also near the actual average replacement ratio of each of the Organization for Economic Co-operation and Development (OECD) countries. Moreover, MacGill et al. (1996) explained that most retirement income adequacy models assume that workers can

maintain their standard of living after retirement with a pension income between 60-80% of their pre-retirement wages.

2.4.4 A Model for comparing DB and DC benefits

One of the difficulties in comparing a DB and DC plan was that the key parameters that define the plan were framed differently (Even & Macpherson, 2006). A DB plan promises a lifetime benefit at retirement, whereas a DC plan promises a series of contributions to provide an account balance at retirement. In DB plans, the most common formula for determining retirement benefits can be described as:

Annual Benefit = AS*YS*λ,

where AS is annual salary in Kenya Shillings at retirement, YS is years of service , and λ is the generosity rate or pension factor which is equal to 1/40.

In DC plans, the employee is promised rights to an account balance. Over the employee's career, some percentage of the compensation is contributed to the pension fund, the assets earn a rate of return, and at retirement the worker may draw down the account or purchase an annuity (Even and Macpherson 2006).

Comparing the two types of pension, we define the following parameters:-

W_0	=	annual salary at start of career
g	=	annual rate of growth in salary
r	=	nominal interest rate
T	=	number of years of service at retirement
λ	=	percent of final salary replaced per year of service in DB plan
c	=	percent of salary contributed to DC plan annually
$\alpha(r_a, R)$	=	annuity factor representing the size of a life annuity that can be purchased with at retirement assuming interest rate r_a and retirement age R
t	=	refers to the age at the start of career
e	=	exponent(meaning annual salary changes exponentially with respect to growth rate and time)
$\int$	=	the integral symbol

dt = change with respect to time.

Assuming that a person contributes the fraction c salary into a DC plan for T years with his employer and earns the rate of return on r on pension assets, he will be able to purchase a lifetime annuity at retirement given by:

$$\text{DC-ANNUITY} = \alpha(r_{a,R}) \int W_0 e^{gt} e^{r(T-t)} dt \quad (1)$$

For a person in a DB that replaces the fraction λ of the final salary per year of service, the annual benefit at retirement can be written as:

$$\text{DB-ANNUITY} = W_0 e^{gT} T\lambda \quad (2)$$

To determine which plan gives adequate retirement income, we calculate the accumulated retirement income in each plan and compare the replacement rate in the two plans. In each category retirement age shall be assumed at age 55 years.

2.4.5 A model for measuring Income disparity (Gini Coefficient)

The Gini Coefficient, invented by the Italian statistician Corado Gini, is a number between zero and one that measures the degree of inequality in the distribution of income of society. The coefficient would register zero (0.0 = minimum inequality) for a society in which each member received exactly the same income and it would register a coefficient of one (1.0 = maximum inequality) if one member got all the income and the rest got nothing (http://en.wikipedia.org).

For a random sample S consisting of values of y_i , i = 1 to n, the statistic is given as follows:-

$$G(S) = 1/n\text{-}1(n+1\text{-}2\frac{(\sum^n (n+1-i)y_i)}{\sum^n y_i},$$

where G(S) is the Gini Coefficient, n is the sample size, y_i is the pension income.

To determine which pension design has the least disparity; the Gini Coefficient will be calculated in each pension design. The design with the highest coefficient, ie the one whose coefficient is closer to one (1.0) will be considered to be having greater pension inequality.

2.5 Summary and the gap to be filled

A lot of research has been done on adequacy of retirement income, more specifically in developed countries. From the literature, most OECD achieve adequate replacement ratio of 66% to 100%. However, the retirement income covered defined benefits, the defined contribution pension plans, social security and housing as part of retirement income. No comparative study had been done focusing on the adequacy of retirement income and the income disparity among retirees in both the defined contribution and defined benefits pension designs. This study tries to establish which pension design offers retirees adequate retirement income and with least disparity of pension income among retirees.

2.6 Expected Output

The study aimed at establishing adequacy of retirement income in DC pension design. It was also expected to find which pension design ie DC or DB would yield the least income inequality among retirees. Pension design with a replacement ratio of forty percent (40%) would be adequate for the study. A replacement income of less than forty percent (40%) would be inadequate.

On income disparity among pensioners, a gini coefficient closer to zero (0) will give indication of income equality whereas a coefficient closer to one or equal to one (1) will imply greater income inequality among pensioners.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Research Design

The study used survey technique as research design. Survey design gave a numeric description of part of the population called the sample on the basis of the data that was collected. The data that was collected was quantitative and allowed for comparative analysis to be done between a Defined Contribution (DC) pension plan and Defined Benefits (DB) pension design.

3.2 Target Population

The population of the study comprised of 2,467 employees of the Teachers Service Commission and 162 employees of the Jomo Kenyatta Foundation. Teachers Service Commission has at its headquarters 1,667 employees and 804 distributed in its Units distributed all over the country. The accessible population was therefore 1,667 secretariat staff based at the Teachers Service Commission Headquarters and 162 staff of Jomo Kenyatta Foundation from which a suitable sample was drawn.

The two organizations have been chosen partly because they have almost similar salary structures and partly because the retirement age in both organizations is set at age 55 years.

The tables below shows the population characteristics of the two organizations:-

Table 1: Population characteristics of the Teachers Service Commission Secretariat Staff (2007)

DIVISION	NO. EMPLOYEES	JOB GROUP	
		A-N	P-T
Finance	401	394	7
Audit	68	65	3
Administration	802	778	24
Human Resource	306	299	7
Staffing	86	79	7
TSC Units	804	804	-
Total	**2,467**	**2,419**	**48**

Source: TSC Data Base(2007)

Table 2: Population Characteristics of Jomo Kenyatta Foundation Employees.

Levels	No. Employees	Scale
Senior Management	**5**	**1- 2**
Middle Level Management	**48**	**3-5**
Supervisory Level	**36**	**6**
Clerical Staff	**37**	**7**
Support Staff	**46**	**8-9**
Total	**162**	

Source: Jomo Kenyatta Foundation Data Base (2007)

3.3 Sampling design

The Sampling Units for this study was one hundred and seventy (170) employees of the Secretariat Staff of the Teachers Service Commission and forty eight (48) Staff from JomoKenyatta Foundation. According to Mugenda and Mugenda (1999), 10% sample size of a population of 300 and above is adequate whereas a population of less than 300 required a sample size of 30%. Hence Sample Sizes for the Teachers Commission and Jomo Kenyatta Foundation were 170 and 48 respectively.

From the two sample sizes selected, the study employed stratified proportionate random sampling procedure since comparisons between various sub groups was necessary. The groups in each organization was sub-divided into two classes, the low-income group that falls within jobs group A-N or Scale 6-9 and the higher income bracket that lied between job groups P-T or Scale 1-5. Of the lower income groups of each organization, sixty percent (60%) was studied while forty percent (40%) was drawn from the higher income category. The basis of this selection is that majority of employees fall within the lower income bracket. Employees from all sections were proportionally selected. The sections for the Teachers service Commission in this case referred to Finance, Audit, Administration, Human Resource and Staffing. For the Jomo Kenyatta Foundation, the study was carried out on the basis of levels; that are senior management, Middle Level Management, Supervisory, clerical and Support staff. The senior level and Middle level management formed the upper income brackets which fall in the salary scale of one to five (1-5) and the supervisory to support staff formed the lower income level that fall within scales six to nine (6-9).

3.4 Data Collection Procedure.

Structured questionnaires were used to collect primary data on employee's earnings, age, year of entry into service, current earnings and contribution rates. Secondary data was obtained from published records. Such data included returns on bonds, equity, bank interest rates, inflation rates and annual salary increment. The questionnaire was personally administered.

3.5 Data Analysis

The study used both descriptive and inferential statistics to assess the adequacy of retirement income under defined contribution pension plan. Comparative analysis was done to assess the accumulated assets both in the defined contribution and the defined contribution pension plans. Gini Coefficient was used to compare pension income disparity between the two pension designs.

Earnings profiles and age of individual employees and returns from investment were used to determine the amount of accumulated fund in Defined contribution plan. Excel, a computer package was used to calculate the accumulated benefits in both defined benefits and defined contribution pension plans. The same package was used to calculate the disparity among retirees in both defined contribution and defined benefits pension plans.

3.5.1 Model Specification:-

The study shall use the two – thirds Macdonald and Cairn (2006) Model to determine the Replacement Ratio. The model is given thus:-

$$RR(t) = \frac{W(t)/a_x(t)}{Y(t)}$$

Where; $a_x(t)$: the annuity factor at the time of retirement; W(t): the worker's accumulated DC pension income at the time of retirement; and Y(t) : the worker's annual salary at the time of retirement; With salary growth rate of g and years of service given as T, Y(t) is estimated, using compound method as follows:-

$Y(t) = Y_0(1+g)^T$, where Y_0 is the current annual salary, g is the annual growth of salary and T years of service to retirement .

The two-thirds retirement income benchmark is an adequate salary replacement level according to the range given in a report prepared by the Canadian institute of Actuaries (1996). It is also near the actual average replacement ratio of each of the OECD countries. However, for this study, a replacement income of forty percent (40%) will be considered adequate since it is the rate recommended by World Bank and International Labor Organization (ILO) for developing countries.

To determine the amount accumulated in DC and DB, the study shall use the model used by Even and Macpherson(2006):-

In DB plans, formula for determining retirement benefits can be described as:

Annual Benefit = AS*YS *λ,

Where AS is annual salary at retirement, YS years of service, and λ is the generosity rate or pension factor, which is 1/40.

In DC plans, the employee is promised rights to an account balance. Over the employee's career, some percentage of the compensation is contributed to the pension fund, the assets earn a rate of return, and at retirement the worker may draw down the account or purchase an annuity (Even and Macpherson 2006).

Comparing the two types of pension, we define the following parameters:-

W_0	=	annual salary at start of career
g	=	annual rate of growth in salary
r	=	nominal interest rate
T	=	number of years of service at retirement
λ	=	percent of final salary replaced per year of service in DB plan
c	=	percent of salary contributed to DC plan annually
$\alpha(r_a, R)$	=	annuity factor representing the size of a life annuity that can be purchased with at retirement assuming interest rate r_a and retirement age R
t	=	the age at start of career;
e	=	exponent (meaning annual salary changes exponentially with respect to growth rate and time)
$\int$	=	integral symbol

dt = change with respect to time.

Assuming that a person contributes the fraction c salary into a DC plan for T years with his employer and earns the rate of return on r on pension assets, he will be able to purchase a lifetime annuity at retirement given by:

$$\text{DC-ANNUITY} = \alpha(r_{a,R}) \int W_0 e^{gt} e^{r(T-t)} dt \quad (1)$$

For a person in a DB that replaces the fraction λ of the final salary per year of service, the annual benefit at retirement can be written as:

$$\text{DB-ANNUITY} = W_0 e^{gT} T\lambda \quad (2)$$

To determine which plan gives adequate retirement income, we calculate the accumulated retirement income in each plan and compare the replacement rate in the two plans. In each category retirement age shall be assumed at age 55 years.

To calculate the income inequality between DB and DC pension designs, we use the Gini Coefficient which is given as follows:-

$$G(S) = 1/n\text{-}1(n+1 - 2(\frac{\sum^n (n+1-i)y_i}{\sum^n y_i}),$$

where G(S) is the Gini Coefficient, n is the sample size, y_i is the value of pension income of individual retirees.

Calculations was done with the help of excel, a powerful computer package for mathematical computations.

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION OF FINDINGS

4.1 Introduction

The study focused on adequacy of retirement income in a defined contribution (DC) pension by comparing the two pension designs; the defined contribution pension plans offered by the Jomo Kenyatta Foundation and defined benefits (DB) pension design offered by the Teachers Service Commission. The study also sought to establish the pension design with the least income disparity among pensioners. Primary data were obtained through the administration of questionnaires to both Jomo Kenyatta Foundation and Teachers Service Commission. The data collected were on employee's income; employment date, age of the employee at entry to service; current annual salary; contribution rates and years of service to retirement.

4.2 Analysis of the Responses rate

The study distributed a total of 48 questionnaires to a sampled staff of Jomo Kenyatta Foundation and 170 questionnaires to Teachers Service Commission. Forty (40) and one hundred and eighteen (118) questionnaires were received from the respondents of Jomo Kenyatta Foundation and Teachers Service Commission respectively. This represented response rates of seventy seven percent (77%) for Jomo Kenyatta and sixty nine percent (69%) for Teachers service Commission. These are shown on tables 4.1 and 4.2 respectively.

Table 4.2.1 Jomo Kenyatta Foundation Respondents as per grade

Category of respondents	No. Questionnaire	No. Questionnaire Received	% rate of response
Lower cadre (JG D-K)	32	32	66%
Middle level (L, M, N)	8	8	16%
Top management (P & above)	8	-	
Total	48	40	82%

Source Researcher (2007)

Table 4.2.2 Teachers Service Commission – respondents as per job Group

Category of respondents	No.of Questionnaires	No. Questionnaire Received	% rate of response as per group	% rate of response
JG D-K	80	69	86.25%	40%
J/Group L,M,N	50	29	58%	17%
JG P & above	40	20	50%	12%
	170	118	69%	69%

Source Researcher (2007)

There were no responses for top-level management of Jomo Kenyatta Foundation; however, this didn't comprise the results since calculation of retirement income was based on projection of annual earnings. Lower and middle level cadres of the Teachers Service Commission had individual response rates of 40% and 17% respectively, representing 57% of the total response rate.

4.3.0 Quantitative Data Analysis

Quantitative approach in this study has yielded quantifiable data such as replacement ratios, gini coefficient and accumulated retirement benefits both for defined benefits (DB) pension plans and defined contribution (DC) pension design.

4.3.1 Descriptive Statistics

The descriptive statistics are for basic annual salary; average accumulated benefits for both defined contribution and defined benefits pension design, accumulated defined benefits and defined contribution pension plans.

Regression analyses were conducted to test the relationship between years of service, annual salary and accumulated DC benefits; years of service, annual salary at the time of retirement and accumulated benefits in defined (DB) pension plan. The results are shown in the table below; -

Table 4.3.1 Summary Statistics for the DB and DC benefits

Variable/Statistic	Accumulated DC Benefits	Accumulated DB Benefits
Sample Size	40	118
Mean	522692.6600	834490.30
Replacement Ratio	43.54665	76.20763
Gini Coefficient	0.59709995	0.4279

Correlation Coefficient (r^1)	0.791637	
Correlation Coefficient (r^2)		0.854971
Standard Deviation	341104.235	536477.8664

Source: Researcher (2007)

Notes: r^1 refers to regression coefficient when annual salary and years of service are used as ndependent variable and **r^2** is the regression coefficient when years of service and annual salary at retirement are used as independent variables

From the table, the mean accumulated benefit for defined benefits is higher than the mean accumulated defined contribution under the defined contribution pension plan. Meaning, retirees on average are better off under the DB pension design than under the DC pension plan. Results further reveal that retirees under the DB tend to enjoy adequate retirement income with earning 76% of pre-retirement income. Under the DC, retirees on average attain 43% of pre-retirement income.

Income inequality is greatest under the defined Contribution pension plan with Gini Coefficient of 0.5909995 than the defined benefits, which yields gini Coefficient of 0.4279. Inequality is said to be greatest when the coefficient is closer to 1 and least when the coefficient is closer to zero.

The relationship between investment returns, contribution rates and accumulated benefits under DC was tested via the current annual salary and years of service to retirement. A Correlation coefficient of 0.791637 was obtained, implying a strong positive correlation between DC benefits, investment returns and contribution rates.

Regression test was also conducted on the relationship between annual salary at retirement, years of service and accumulated defined (DB) benefits. The test yielded a coefficient of 0.854971. The result revealed a strong relationship between annual salaries at the time of retirement, years of service and retirement benefits under defined pension plans.

4.3.2 Analysis of Adequacy of retirement income under the defined Contribution pension design.

In determining the accumulated defined contribution pension benefits, contribution rate of 20% of basic salary; comprising 5% contribution rate by the employee and 15%

contribution rates by the employer was used, with 10% rate of investment returns and annuity factor of 0.107.

The model used to estimate the defined contribution benefits is given thus:-

DC –Annuity = $\alpha(r_a, R) \int W_0 e^{gt} e^{r(T-t)} dt$; where $\alpha(r_a, R)$ = annuity factor at the time of retirement; $\int$= integral symbol; W0 = current annual salary; g = annual rate of growth in salary; r nominal interest rate; T = number of years of service to retirement; t = current age; e = exponent(meaning salary changes exponentially with respect to growth and time) and dt = change with respect to time.

Table 4.3.2 Computation of DC and Replacement ratio

S/No	Birth Date	Annual Salary	Yrs to Retire	Annual Salary at Retirement	Acc. DC Benefits	Replacement Ratio
1.	1965	239,796	13	652,154.89	106,883.50	16.3892926
2.	1973	186,816	21	940,400.68	351,772.8	37.4066992
3.	1968	404,796	16	1,386,807.80	309,722.2	22.3334672
4.	1961	268,836	9	537,404.41	58,299.77	10.8483982
5.	1971	230,796	19	996,046.54	303,131.9	30.4335134
6.	1968	292,200	16	1,001,060.40	223,571.50	22.3334672
7.	1973	188,816	21	940,400.68	351,772.8	37.4066992
8.	1971	198,758	19	857,771.48	261,050.0	30.4335134
9.	1972	169,476	20	789,920.37	266,522.6	33.740399
10.	1974	210,744	22	1,145,718.2	475,144.6	41.4713368
11.	1971	361,596	19	1,560,540.2	474,927.2	30.4335134
12.	1974	229,116	22	1,245,598.3	516,566.3	41.4713368
13.	1971	268,836	19	1,160,215.8	353,094.4	30.4335134
14.	1973	200,076	21	1,007,149.3	376,741.3	37.4066992
15.	1971	221,856	19	957,464.17	291,389.9	30.4335134
16.	1973	192,816	21	970,603.68	363,070.8	37.4066992
17.	1972	198,756	20	926,393.20	312,569.1	33.7404399
18.	1978	186,816	26	1,381,757.1	865,713.7	62.6531086
19.	1977	192,816	25	1,320,495.5	746,244.1	56.5124293
20	1970	160,680	18	642,080.41	176,255.5	27.4507014
21.	1975	174,816	23	1,026,425.7	471,926.3	45.9776407
22.	1977	122,604	25	839,650.45	474,506.8	56.5124293
23	1974	248,604	22	1,351,545.6	560,504.0	41.4713368
24.	1974	186,816	22	1,015,632.7	421,196.4	41.4713368
25.	1979	150,960	27	1,205,877.7	837,615.2	69.4610384
26.	1977	186,816	25	1,279,404.7	723,022.7	56.512493
27.	1978	210,984	26	1,560,512.1	977,709.4	62.6531086
28.	1970	280,404	18	1,120,499.8	307,585.0	27.4507014

29.	1978	186,756	26	1,381,313.3	865,435.7	62.6531086
30	1975	186,756	23	1,096,531.0	504,159.1	45.9776407
31	1975	224,196	23	1,316,358.6	605,230.6	45.9776407
32.	1978	164,136	26	1,214,007.8	760,613.6	62.6531086
33.	1979	153,456	27	1,225,815.9	851,464.5	69.4610384
34.	1979	192,756	27	1,539,746.7	1,069,524	69.4610384
35.	1973	230,604	21	1,160,822.1	434,225.2	37.4066992
36.	1974	131,880	22	7816,970.95	297,337.4	41,4713368
37.	1972	109,104	20	508,529.07	171,579.9	33.7404399
38.	1981	131,880	29	1,228,762.2	1,049,074	85.3765430
39.	1979	153,456	27	1,225,815.9	851,464.5	69.4610384
40.	1975	551,604	23	3,238,722.8	1,489,088	45.9776407
Total Replacement Ratio						**1741.8660783**
Average Replacement Ratio						**43.5467**
Average DC Benefits						**522,692.66**

Source: Author (2008)

N/b Replacement Ratio = Accumulated DC Benefits/Annual Earnings at retirementX100%

Average DC benefits = Total Accumulated DC Benefits/Sample Size (40)

4.4.0 Analysis of Adequacy of Retirement Income under the Defined Benefit Pension plan.

In determining the adequacy of retirement income under the defined benefit (DB) pension design, data from 118 employees of the Teachers Service Commission was used. The variables that were critical to the computation included employee's employment date, date of birth; current annual salary and years of service to retirement. Employees were assumed to retire upon attainment of age 55 years.

Estimation of the pension wealth/pension benefits that would accumulate at the time of retirement involved a number of steps;-

First step was projection of annual earnings to the time of retirement. Since the study was conducted among employees who would retire in future annual salary at retirement was obtained by using compound formula; thus

Annual Salary at retirement (Yt) = $Y_0(1+g)^T$ where Y_0 = current annual salary(excluding allowances); g = annual salary growth rate which has two components; merit and inflation components. In this study, g was assumed at 8%;

comprising 3% merit growth and 5% inflation index (Jubilee and Minet Insurance Brokers use salary growth rate of 8% and investment returns of 10%). Jubilee Insurance and Minet Insurance Brokers manage Jomo Kenyatta Foundation pension scheme and Teachers Service Commission superannuation scheme respectively.

The second step involved generation of individual accumulated defined benefits by simulating the age earning profile for each employee in the sample. The estimated DB wealth/pension benefits was obtained by the use of pension formula; thus; annual DB benefits = AS*YS*λ, where AS = annual salary in Kenya shillings at retirement; YS = years of service, and λ = the generosity/pension factor taken as 1/40 or 0.02

The third step in the analysis was the generation of estimates of individual replacement ratios. From the individual ratios, total computed and an average determined for the overall replacement ratio. The two-thirds retirement model described in the Macdonald and Cain (2006) was used to test adequacy of retirement income. According to the model, a retirement income is adequate if it's two third of pre-retirement income. Table 4.2.2 shows results generated for DB benefits and average replacement ratio of 76.2076%

Table 4.4.1 Computation of DB and Replacement ratio

S/No.	Birth Date	Annual Salary	Year to Retire	Years of Service	Annual Salary at retirement	DB:	R. Ratio
1.	1975	98,784	23	28	580,006.66	406,004.6	70
2.	1960	132,384	8	13	245,033.54	79,635.90	32.5
3.	1978	103,728	26	34	767,208.93	652,127.5	85
4.	1978	103,728	26	34	767,208.93	652,127.5	85
5.	1971	108,912	19	27	470,031.63	317,271.3	67.5
6.	1978	103,728	26	34	767,208.93	652,127.5	85
7.	1978	103,728	26	34	767,208.93	652,127.5	85
8.	1978	103,728	26	33	767,208.93	632,947.3	82.5

9.	1968	103,728	16	24	355,366.18	213,219.7	60
10.	1977	132,384	25	27	906,628.54	611,974.2	67.5
11.	1981	138,996	29	31	1,295,063.9	1,003,674	77.5
12.	1972	126,072	20	22	587,616.19	323,188.9	55
13.	1985	132,384	33	35	1,678,106.1	1,468,342	87.5
14.	1981	132,384	29	31	1,233,458.1	955,930.0	77.5
15.	1984	126,072	32	34	1,479,717.5	1,257,759	85
16.	1986	132,384	34	36	1,812,354.6	1,631,119	90
17.	1970	132,384	18	20	529,009.05	264,504.5	50
18.	1979	132,384	27	29	1,057,491.5	766,681.3	72.5
19.	1980	132,384	28	30	1,142,090.8	856,568.1	75
20.	1974	145,944	22	31	793,430.45	614,908.6	77.5
21.	1975	145,944	23	32	856,904.89	685,523.9	80
22.	1973	145,944	21	30	734,657.83	550,993.3	75
23.	1974	145,944	22	31	793,430.45	614,908.6	77.5
24.	1974	145,944	22	31	793,430.45	595,072.8	75
25.	1972	145,944	20	28	680,238.73	476,167.1	70
26.	1975	145,944	23	31	856,904.89	664,101.2	77.5
27.	1969	145,944	17	23	539,995.43	310,497.3	57.5
28.	1975	145,944	23	29	856,904.89	621,256.0	72.5
29.	1976	145,944	24	29	925,457.28	670,956.5	72.5
30.	1963	173,028	11	16	403,438.83	161,375.5	40
31.	1970	173,028	18	23	691,423.26	397,568.3	57.5
32.	1972	173,028	20	25	806,476.09	504,057.5	62.5
33.	1982	173,028	30	35	1,741,121.4	1,523,481	87.5
34.	1979	173,028	27	32	1,382,158.3	1,105,726	80
35.	1980	181,680	28	33	1,567,372.6	1,293,082	82.5
36.	1978	173,028	26	31	1,279,776.2	991,826.5	77.5
37.	1983	173,023	31	36	1,880,411.1	1,692,370	90
38.	1976	173,028	24	29	1,097,201.8	795,471.1	72.5

39.	1977	173,023	25	30	1,184,977.90	888,733.4	75
40.	1966	243,468	14	34	715,112.66	607,845.7	85
41.	1967	243,468	15	35	772,321.67	675,781.4	87.5
42.	1967	200,304	15	35	635,398.16	555,973.3	87.5
43.	1967	243,468	15	35	772,321.67	675,781.4	87.5
44.	1968	243,468	16	36	834,107.40	750,696.6	90
45.	1965	243,468	13	33	662,141.35	546,266.6	82.5
46.	1963	243,468	11	31	567,679.48	439,951.6	77.5
47.	1965	243,468	13	33	662,141.35	546,266.6	82.5
48.	1968	243,468	16	36	834,107.40	750,696.6	90
49.	1963	243,468	11	31	567,679.48	439,951.6	77.5
50.	1963	310,740	11	28	724,533.50	507,173.4	70
51.	1967	268,428	15	32	851,499.01	681,199.2	80
52.	1968	281,844	16	33	965,581.38	796,604.6	82.5
53.	1968	295,944	16	33	1,013,887.1	836,456.9	82.5
54.	1969	268,428	17	34	993,188.45	844,210.1	85
55.	1968	268,428	16	33	919,618.93	758,685.6	82.5
56.	1970	255,648	18	35	1,021,574.3	893,877.5	87.5
57.	1968	281,844	16	33	965,581.38	796,604.6	82.5
58.	1964	310,740	12	29	782,496.18	567,309.7	72.5
59.	1968	268,428	16	33	919,618.93	758,685.6	82.5
60.	1953	365,664	1	33	394,917.12	325,806.6	82.5
61.	1953	365,664	1	33	394,917.12	325,806.6	82.5
62.	1957	365,664	5	36	537,280.38	483,552.3	90
63.	1958	365,664	6	37	580,262.81	536,743.1	92.5
64.	1953	331,668	1	32	358,201.44	286.561.1	80
65.	1958	365,664	6	36	580,262.81	522,236.5	90
66.	1955	365,664	3	33	460,631.33	380,020.8	82.5
67.	1957	365,664	5	33	537,280.38	443,256.3	82.5
68.	1954	348,252	2	31	406,201.13	314,805.8	77.5

69.	1958	331,668	6	33	526,315.43	434,210.2	82.5
70.	1953	423,300	1	31	457,167.00	354,302.1	77.5
71.	1956	423,300	4	34	575,894.98	489,510.7	85
72.	1959	423,300	7	34	725,461.81	616.642.5	85
73.	1954	423,300	2	29	493,737.12	357,959.4	72.5
74.	1962	423,300	10	33	913,872.95	753,945.1	82.5
75.	1964	423,300	12	14	1,065,941.4	373,079.4	35
76.	1965	403,140	13	33	1,096,389.1	904,521.0	82.5
77.	1965	423,300	13	33	1,151,216.7	949,753.8	82.5
78.	1960	383,952	8	30	710,668.36	533,001.2	75
79.	1966	383,952	14	31	1,127,741.3	873,999.5	77.5
80.	1956	490,020	17	29	1,813,082.8	1,314,485	72.5
81.	1972	466,692	20	47	2,175,231.4	2,555,896	117.5
82.	1971	466,692	19	32	2,014,103.1	1,611,282	80
83.	1969	423,300	17	29	1,566,217.6	1,135,507	72.5
84.	1970	466,692	18	30	1,864,910.3	1,398,682	75
85.	1968	490,020	17	29	1,813,082.8	1,314,485	72.5
86.	1973	466,692	21	32	2,349,249.9	1,879,399	80
87.	1969	444,468	17	29	1,644,539.6	1,192,291	72.5
88.	1968	490,020	16	28	1,678,780.4	1,175,146	70
89.	1970	466,692	18	30	1,864,910.3	1,398,682	75
90.	1959	567,264	7	10	972,190.81	243,047	25
91.	1959	567,264	7	28	972,190.81	680,533.5	70
92.	1961	567,264	9	32	1,133,963.3	907,170.6	80
93.	1959	567,264	7	29	972,190.81	704,838.3	72.5
94.	1958	567,264	6	28	900,176.68	630,123.6	70
95.	1959	567,264	7	29	972,190.81	704,838	72.5
96.	1961	567,264	9	30	1,133,963.3	850,472.5	75
97.	1962	540,252	10	31	1,166,363.5	903,931.7	77.5
98.	1960	567,264	8	29	1,049,966.0	761,225.4	72.5
99.	1960	567,264	4	34	1,148,035.0	975,829.7	85
100	1954	843,840	2	33	984,254.98	812,010	82.5
101	1953	843,840	1	31	911,347.20	706,294.0	77.5
102	1957	976,848	5	29	1,435,310.1	1,040,599	72.5
103	1952	976,848	0	28	976,848.00	683,793.6	70
104	1956	765,384	4	30	1,041,296.4	780,972	75
105	1957	843,840	5	29	1,239,877.8	898,911.4	72.5
106	1962	843,840	10	34	1,821,787.2	1,548,519	85
107	1963	976,848	11	31	2,277,656.8	1,765,184	77.5
108	1958	930,324	6	29	1,476,307.2	1,070,322	72.5
109	1961	1,076,976	9	29	2,152,880.0	1,560,838	72.5
110	1963	1,025,688	11	31	2,391,534.1	1,853,438	77.5
111	1956	976,848	4	27	1,328,990.9	897,068.8	67.5
112	1959	1,025,688	7	11	1,757,848.9	483,408.4	27.5
113	1956	1,265,184	4	35	1,721,268.8	1,506,110	87.5

114	1953	1,322,928	1	31	1,428,762.2	1,107,290	77.5
115	1954	1,443,240	2	30	1,683,395.1	1,262,546	75
116	1966	1,130,820	14	31	3,321,437.2	2,574.113	77.5
117	1961	1,187,364	9	30	2,373,546.1	1,780,159	75
118	1955	4,095,000	3	32	5,158,520.6	4,126,816	80
Total Replacement Ratio							**8992.5**
Average Replacement Ratio							**76.2076**
Average DB benefits							**ksh. 841091.84**

Source: Author (2007)

N/b Average RR = Total DB benefits/Total Annual salary at retirementX100%

Average DB benefits = Total DB benefits/Sample size

4.4.3 Analysis of income disparity among pensioners within two different pension designs.

The study applied Gini Coefficient to establish the degree of income disparity within each of the two pension designs; the defined contribution and defined benefit pension plans. Using individual retirement benefits of 118 employees of the Teachers Service Commission and 40 employees of Jomo Kenyatta Foundation, Gini Coefficients of 0.4279 and 0.59709995 were obtained respectively. This means, the defined benefit pension plan offered by TSC yielded a lower gini coefficient than the defined contribution pension plan offered by the Jomo Kenyatta Foundation. Hence, the disparity of income is greatest with a DC pension plan than a DB pension design. The study went further to analyze the mean distribution of pension benefits. Defined benefit had a higher mean distribution of pension benefit of ksh. 834490.40 compared to defined contribution pension benefit of ksh.522692.66

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Summary and conclusion

The study has assessed the adequacy of retirement income under the two pension designs; the Defined Contribution and Defined Benefits within Jomo Kenyatta Foundation and the Teachers Service Commission respectively. The two-thirds Macdonald and Cain (2006) model was used to measure adequacy of retirement income. The study further examined the disparity of retirement income as measured by the gini coefficient among retirees within the two pension plans.

The analysis of the chosen sample shows that under the DB pension design, retirees attain 76% of pre-retirement income while under the DC pension plan; retirees earn 43% of the pre-retirement income. According to the MacDonald and Cain (2006) model, Defined Benefits has achieved the two-third-bench mark of adequate income, whereas the DC fails the two-third-bench mark, but is above the 40% of what the World Bank and ILO recommended for developing economies.

The findings support the general hypothesis that, there is greater disparity of retirement income under the defined contribution pension design than the DB pension plan. This is so because the DC accumulated benefits depend greatly on investment returns, which in turn depend on performance of the stock market. In an economy like Kenya, where the stock market is not well developed, returns from investment can hardly be predicted. The other reason which could explain why DB appears to be superior to DC both in terms of adequacy and income distribution is that contribution to DC plan is fixed at 20%; where employer contributes 15% and employee contribute 5% of ones basic earnings. Accumulated DC benefits are thus determined largely by investment returns and length of time an employee has to be in service before retirement.

The overall conclusion of the study is that investment returns and length of service to retirement are important elements in explaining the adequacy of retirement income under

the defined pension plan, although they are not the only factors affecting retirement income. In this study, defined benefits appear to be more superior to defined contribution pension plan.

5.1 Recommendations

Empirical evidence preceding this study show massive shifts from Defined Benefits to Defined Contribution pension design. This shift may be largely attributed to the desire to reduce cost of financing pension benefits. There has been an increase in the aging population that cannot be supported by current working population as a result; most of DB plans have faced under funding. Employers thus feel that employees should also share the burden of meeting pension cost. It would be ridiculous therefore for the study to suggest that owing to the inadequacy and income disparity depicted in the DC design that a reversal of the shift should occur. The study recommends that the level of contribution be made flexible enough to allow employees adjust their contribution rates. Salaries among employees should be harmonized to reduce income disparities. The problem of under funding can also be addressed by introducing hybrid scheme; that is a scheme to have both elements of DC and DB plans. The employer might otherwise consider concessions to increase wealth created especially for older employees in the form of guaranteed benefits. Since years of service greatly affect DC accumulation, increasing age of retirement from 55 years to 60 can also have positive impact on retirement income. Diversification correct portfolio selection will also reduce the variability of retirement income under the defined contribution pension plan.

5.2 Suggestion for Further Research

This study has indicated the adequacy of a DC scheme independently and in comparison to a DB plan. A major assumption was that the retirement age is 55 years. Further studies may be done profiling DC adequacy over across section of varying retirement ages and showing its implications on retirement wealth created. The study also limited itself to only two states corporations; there is need for further research among all State Corporations offering both DB and DC pension designs.

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APPENDIX I

QUOTATION FROM JUBILEE INSURANCE COMPANY

Annuity of	Male yearly	102.436	Annuity	Male yearly	106.751
$1 at Age 60	Female yearly	110.708	of $1	Female yearly	113.388
with five	Male monthly	8.979	at age 60	Male monthly	9.323
years	Female Monthly	9.678	with 10	Female monthly	9.891
guarantee			years		
			guarantee		

Source: Jubilee Insurance (2007)

APPENDIX II

LETTER OF INTRODUCTION

I am a postgraduate student at Kenyatta University, pursuing Master of Business Administration in Finance.

I am carrying out a survey for my study entitled "Adequacy of Retirement Income in defined contribution pension plans" among selected state corporations as partial fulfillment for the requirement of my degree.

Your participation in this exercise will be highly appreciated as an integral part of this study, hence the request for your assistance to fill out this questionnaire.

The information provided for this study will be treated in strict confidence and used purely for academic purposes.

Sincerely,

Calleb O. Ogot,
Graduate Student- KU

APPENDIX III

QUESTIONNAIRE (EMPLOYEES)

Name of the Organization _____

Position in the Organization _____

Professional Qualification _____

1. Indicate Gender

   ☐ Male

   ☐ Female

2. Indicate the section/department you are assigned _____

3. Employment terms

   ☐ Permanent and pensionable

   ☐ Temporary

   ☐ Contract

4. Educational level

   ☐ `O` Level

   ☐ College Level

   ☐ University level

   ☐ Other (specify) _____

5. Age Bracket

   ☐ Below 30 years

   ☐ 30 – 40 years

   ☐ 40 – 50 years

   ☐ Above 50 years

6. Marital Status
   - ☐ Married
   - ☐ Single
7. When did you join the Service? _____
8. Approximately how old were you when you joined the service? _____
9. On what job group did you join the service? _____
10. Indicate the average monthly salary when you joined the service _____
11. Which retirement Scheme does your organization sponsor?
    - ☐ Defined Benefit plan
    - ☐ Defined Contribution
    - ☐ Cash Balance/Hybrid
12. What % of your monthly salary do you and your employer contribute?
    - ☐ Employer Contribution _____ %
    - ☐ Own Contribution _____ %
13. What is your current monthly salary? _____

I do indeed appreciate the time you have taken to answer all the questions to the best of your ability.

Calleb Odhiambo Ogot

Thank you and God bless you.