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Retirement Benefit Programs

Analysis and a Proposal for Hong Kong

香港亞太研究所

Ho Lok Sang
Lee Jik Jeon
Leung Jin Pang

Hong Kong Institute of Asia-Pacific Studies
The Chinese University of Hong Kong
Shatin, New Territories
Hong Kong

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Ho Lok Sang

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Hong Kong Institute of Asia-Pacific Studies
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About the authors

Ho Lok Sang is a Lecturer in the Department of Economics, The Chinese University of Hong Kong.

Lee Jik Jeon is a Lecturer in the Department of Social Work, The Chinese University of Hong Kong.

Leung Jin Pang is a Lecturer in the Department of Psychology, The Chinese University of Hong Kong.

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Abstract

An analysis of the desirable qualities of retirement benefit programs in the light of both economic theory and the practical experience of countries suggests that a publicly administered, mandatory, and basic income-support program that is fully funded for each age cohort will cause the least distortions and will provide the most security to people facing a variable life span. Unlike most existing schemes which follow more closely the pay-as-you-go model, our proposal recommends a fully funded version under which the contribution formula carries age-cohort-specific parameters. Contributions should rise with income while benefits should be flat in order to achieve desired redistributive objectives and to minimize distortions. An appendix provides numbers to illustrate how the average contribution rate varies with benefits, life expectancy, and other factors.

I. Introduction

Today practically all of the world's industrialized countries have some form of publicly administered income support program for the retired.[1] Among developing countries, the central provident fund (CPF) is more common.[2] Instead of providing a regular income to retirees, the CPF pays out a lump sum to subscribers on their retirement. The prevalence of public administered retirement benefit programs begs the question of what is the rationality behind them. Three possible reasons — among others — readily come to mind. The first is that these programs may provide a better sense of security than private savings. The second is that people's conscience is more at ease knowing that their folks are covered by a publicly administered retirement benefit programs. Finally, people may believe that they would achieve a better risk-return ratio in comparison with their private investments. In any case, surveys of public opinion indicate that these programs are very popular among workers and

even among many employers. Thus a recent survey done in the U.S. has concluded that the U.S. program "is popular and has been well-supported" and that "If participation were optional, about three-fourths of the population would stay in the program" (Sherman, 1989, p.15). A 1989 survey conducted by the authors also shows that a vast majority of labour organizations sampled favour a publicly administered retirement benefit program[3] while no fewer than half of employer organizations support the same.[4] There is little doubt that a well-designed program, one that is not onerous to subscribers, employees, and taxpayers and yet achieves the purpose of providing basic income security to retirees, will be widely supported in Hong Kong.

We see two overriding reasons for introducing an income support program for the elderly in Hong Kong:

(1) without such a program, current demographic trends suggest an imminent surge in the number of retirees falling below the poverty line, calling for more and more public money to relieve their plight. This is both onerous to the future tax-payers and demoralising for the poverty-stricken retirees who are seen as receiving handouts;

(2) if assistance to the retired poor is not automatic, great human suffering will ensue for those who do not know assistance is available or who do not know how to get help.

In addition, potential retirees necessarily will have to face the uncertainty of an unknown life span. They can never know how much savings will be just adequate for their retirement needs. By the same token, a CPF cannot eliminate this uncertainty for retirees. By its nature, a CPF represents only a form of forced savings. In contrast to an income support program, it does not increase the opportunities open to a subscriber. Assuming that employers and employees are both informed participants in a competitive labour market, the requirement for employers to contribute toward a CPF does not really reduce the cost to employees over the long run. Consequently, it is not apparent that a CPF can make employees better off over the long run. The only justification for a CPF — one for which there is little empirical support — is that workers are short-sighted and have to be forced into making adequate savings for their

retirement years. Table I shows that both labour organizations and employer organizations tend to favour an income support program over a CPF.

Table I

Opinion	Labour Organizations	Employer Organizations
Income Support Program Superior to CPF	23	3
CPF Superior to Income Support Program	19	2
Income Support Program Comparable to CPF	26	4

Source: 1989 Survey on Employee and Employer Organizations conducted by the authors.

In the next section we will discuss the qualities that are desirable for retirement benefit programs. Section III will probe the program design choices that are open to us. Finally Section IV will summarize the favoured design based on the criteria enumerated and conclude the paper.

II. Desirable Qualities

The most important quality of income support programs for the elderly is *reliable protection.* In a 1988 USA Today/CNN poll of American workers between the ages 23 and 41, 59 per cent of the respondents said they expected never to collect Social Security retirement benefits (*Wall Street Journal*, Jan. 31, 1990). Although another survey (Sherman, 1989) seems to indicate more confidence, "social security risk" — the risk of changes in the rules of benefit payout in ways not favourable to retirees — is recognized to be one of the major risks facing workers (Bodie, 1990). In a like manner corporate pension plans are also subject to risks. Even though laws may be enacted to require pension funds to be set aside from other corporate funds, less than 1 per cent of the private plans in the U.S. are audited each year. In the U.S. the Pension Benefit Guarantee Corporation (PBGC) is the federal entity that insures more than $800 billion in

private retirement assets for nearly 40 million U.S. workers and more than 100,000 retirees. But the PBGC itself has been subject to tremendous financial pressures lately, to the extent that its very survival seems to be at risk without government injection of cash. Personal savings are similarly subject to investment risks. Thus, the design of income support programs must be such that it is financially sound over the long run and can inspire trust. In order to inspire trust, the provisions of the program should be stable. Surprises regarding benefits or contributions are generally undesirable.

Income support programs should also be *adequate but not generous.* A public retirement benefit program that is too generous distorts choices in at least two ways. It encourages early retirement and reduces labour force participation (see below). It also distorts people's intertemporal choice. Some people may want to get more out of life while they are fit and healthy. Thus the idea of a public retirement benefit program is to enable retirees to live a "decent life." What constitutes a "decent life" would depend on social attitudes. A survey of financial requirements and social attitudes could help define the required income support level.

"Adequacy" can have two alternative interpretations. It may refer to an absolute living standard that is regarded as acceptable by society, or it may refer to an "adequate income replacement ratio"[5] for retirees. We will argue that public income support programs should aim at providing a common socially acceptable living standard. In order to avoid distorting people's choices, any mandatory contribution imposed on workers should be as small as possible. Workers can always supplement the social security benefits with private pensions, provident funds, or other savings accumulated over the years. The size of the latter portion will vary with people. The main objective of a public income support program for the elderly is to provide an assurance that the socially acceptable standard of post-retirement living can be maintained without infringing the right of the individual to save more as he sees fit. To ensure an "adequate income replacement ratio" for everyone as well as a minimum income for the poorest retirees would require much greater public involvement. The scope for distortion of choices would therefore also be much greater.

Still another desirable feature of income support programs is *equity.* Generally, equity means different things to different people. Still, some

degree of income redistribution in favour of the poor is usually regarded an important element of equity. In recent years, economists have noted that income redistribution can be a "public good" giving rise to the prospect of Pareto-efficient income redistribution. That is, income redistribution could benefit everybody (Hochman & Rodgers, 1969). Particularly in an affluent democratic society, equity is usually taken to mean the allowance for, or even the requirement of, a certain degree of redistribution, so that the poorest members of society receive transfers from the better-off members. An arbitrary or an "excessive" redistribution[6] of income in favour of the poor, however, is inconsistent with equity. If those contributing for fewer years are entitled to the same benefits as those contributing for more years this would constitute arbitrary redistribution and therefore an instance of inequity. A retirement benefit program should avoid such arbitrary redistribution. As well, it should allow sufficient scope for society to choose a degree of redistribution in favour of the poor as it sees fit.

Yet another desirable feature of income support programs is *non-distortion of the incentive to work.* In the literature there is plenty of evidence of existing pension plans having a significant impact on retirement. According to Hurd and Boskin (1984), increases in Social Security in the early 1970s were responsible for the fall in labour force participation in the U.S. during that period.[7] Similarly, a recent Organisation for Economic Co-operation and Development (OECD) study has also documented the decline in older-worker participation rates from 1960 to 1985 (OECD, 1988a, pp.58-61). With an on-going labour shortage, it is important that any public income support program introduced in Hong Kong should not aggravate the problem.

Finally, it is important that a public income support program *should not be excessively onerous to the public purse or to industry.* If it should lead to excessive financial commitment by the government, taxes would have to be raised and that would hurt the economy — not because the taxes are taken out of the economy, as most of them are in turn paid out in the form of benefits, but because taxes are inherently distorting. If it should lead to significantly higher cost for our employers, it will also hurt Hong Kong's competitiveness.

III. Design Choices

We shall focus on ten key design questions or aspects as follows:

(a) should we opt for public sector provision, private sector provision, or a combination?

(b) should income support programs for the retired elderly be mandatory or not mandatory?

(c) should the plan involve redistributional objectives?

(d) should the plan involve inter-generational transfers?

(e) should the plan be "fully funded" or "pay-as-you-go"?

(f) should benefits be in the form of annuity or lump sum payment?

(g) should the plan be based on "defined benefit," "defined contribution" or some other formula?

(h) what should the entitlement age be?

(i) what should the contribution formula be?

(j) how should the self-employed enroll in the program?

(a) and (b) : Recommendation: Public Provision of A Basic Plan

There are a number of advantages for the public sector to be involved in income support programs. First, the involvement of the public sector, whether financially or not, is the only way to ensure that everyone is covered by some plans. To the extent that some people are not covered by any plan, the risk exists that they will need government assistance in the future, or that they will face great hardship.[8] Public involvement may be in the form of legislation requiring all citizens to be covered by some plans, whether private or public; or in the form of supervision of private plans; or in the form of guarantee for private plans; or still in the form of provider. We shall argue that the public sector should serve as provider of a *basic plan*, leaving the private sector plenty of room to provide supplementary plans of various kinds.[9]

It has been noted in the literature that the private market for life annuities is plagued by the problem of adverse selection. People with a higher-than-average life expectancy have a higher propensity to subscribe to these plans, pushing costs higher and putting the average individual at a disadvantage. Benjamin Friedman and Mark Warshawsky (1988) found private annuities are often priced unattractively for the average individual. Government involvement in providing a mandatory, basic plan removes this problem of adverse selection.

Relying entirely on the private sector to provide income support programs is also dangerous in that the plethora of plans each one of which is usually highly complex guarantees that supervision will be difficult. Already in the U.S. the PBGC has come under increased financial pressure in recent years as the bankruptcy of firms with underfunded pension plans has led to a dramatic increase in underwriting costs. If a public plan is sound workers at least can have the assurance of some basic income support. The presence of a public plan also provides *economies of scale of supervision*: we have the machinery of elected politicians and numerous professional bodies to monitor the basic plan closely. For small private plans supervision is necessarily uneven, posing serious information costs for individuals who could face unpleasant surprises on or when approaching retirement.

(c) : Recommendation: Redistributive Provisions on the Contributions Side Only

In general, public pension plans in industrialized countries are characterized by some redistributive provisions. Higher income workers make larger contributions and collect higher benefits, but their extra benefits are far from being commensurate with the higher contributions that they make. As we have mentioned earlier, in an affluent society a certain degree of income redistribution in favour of the poor is usually regarded as desirable. This degree of redistribution can, of course, be achieved outside of the income support programs that we have been discussing, but it seems both natural and desirable that it be integrated with the income support programs. "Integration" dispenses with the need to set up another redistributive program which will necessarily involve transfer-

ring income from the better-to-do to the poorer members of the aged population. In line with the earlier suggestion for the public pension to provide only "basic" benefits, it is suggested that the redistributive features be achieved by manipulating contributions only. This makes the redistribution more visible and easier to quantify.

(d) and (e) : Recommendation: A Fully-funded Scheme without Inter-generational Transfer

By definition a fully-funded scheme is one in which the benefits received by retirees are fully covered by the contributions that they have made in the past. It therefore will not involve any inter-generational transfer. To opt for a fully-funded scheme is to opt for no inter-generational transfer. Yet we have posed two separate questions because they reflect two different concerns: stability and equity.

From the distribution (equity) point of view it will be desirable to design incomes support programs which involve transfers from the future generation to the current generation, if the future generation is known to be better-off than the current generation. This is, however, by no means certain. Although the past fifty years did witness a dramatic rise in the standard of living of Hong Kong people, future changes in living standards are subject to tremendous uncertainty,[10] even if for no other reason than the transfer of sovereignty in 1997. A social security program with built-in inter-generational transfer relies in part on the future generation's incomes for financing and thus will be subject to risks of instability. This risk is compounded by any unforeseen demographic change. Even demographic changes that are anticipated may call for program revisions from time to time (Heller, 1989, p.151). This clearly makes a strong case against pay-as-you-go schemes, under which current benefits are paid for by current taxes. Changes in the number of tax-payers and the number of recipients of benefits will render the system unstable.[11] As reliability of the program is crucial, we do not recommend programs involving inter-generational transfers. "Pay-as-you-go" schemes should be rejected in favour of "fully-funded" schemes.

The approach that we recommend is to set up a fully-funded scheme for each age cohort of the population. At the introduction of the program,

the working population will be divided into different cohorts. For example, those currently aged 16 to 25 will be referred to as cohort A; that aged 26 to 35 will be referred to as cohort B; and the higher age population will be referred to as cohort C (36 - 45), D (46 - 55), E (56 - 65), and F (66 and above) respectively. In the following year, a new group of people will be aged 16, while cohorts A to F will all become one year older. This new group will make a cohort with the label F'. The idea is that since each age cohort has its unique age expectancy, a unique, stable program can be designed for it. In particular, the total contributions collected during the working years can be worked out to cover the expected payments for the same age cohort after it has retired. This feature shelters the programs from possible instability due to longer life expectancy of younger generations resulting from medical and technological advances. Under this arrangement, those aged higher when enrolling in the program will have fewer years of contributions and they will have proportionately smaller benefits.[12]

(f), (g) and (h) : Recommendation: An Age-Cohort-Specific Benefit-Contribution Formula

To the extent that "reliable protection" of post-retirement standard of living is regarded as important, the annuity form of benefits (pension) must take precedence over the lump sum form of benefits (provident fund). The lump sum form of benefits will expose retirees to the uncertainty of longevity. Although individuals could buy annuities in the market the problem of adverse selection as mentioned earlier means that prices tend to be unfavourable to the average individual. Moreover, there is no guarantee that everyone will buy annuities. In the event that retirees exhaust their provident fund payout and other financial resources the government may have to step in to provide assistance. This is both harmful to the public purse and the self-image of individuals, who will certainly have preferred entitlements to handouts.

Under traditional plans, the choice between "defined benefit" and "defined contribution" must be made, and the worker is either exposed to the risk of uncertain contributions or uncertain benefits. Because of the "intra-generational self-sufficiency" feature in our proposal, this uncer-

tainty can be reduced dramatically. Thus, we *can*[13] have *both* defined contribution and defined benefit, with the residual risk taken up by government. In general, the life expectancy for an age cohort is relatively accurate. The size of that cohort and its economic characteristics are also known. Then, given the average entitlement age, it is possible to estimate the contribution formula required to achieve the stated benefits. While the estimation is subject to some margin of error, the error should be small and may be positive or negative, with the result that over the long run any burden on the government is likely to be small.

Naturally, the entitlement age should rise with life expectancy so that accumulated contributions will be adequate for covering the cost of benefits. Given the life expectancy and contribution formula, a higher entitlement age would allow higher benefits; while a lower entitlement age would call for lower benefits. It is possible to allow some flexibility in the age of retirement — by adjusting the pension payout such that there is no expected advantage for early retirement for a worker and no penalty for postponement of retirement. Thus workers are given the option to retire early or later as they see fit. It is important, however, to note that different cohorts may have different life expectancies. Thus each cohort should be subject to its own contribution-benefit formula. In particular, assuming that life expectancy rises over time, if contributions are the same, someone retiring at age 65 from an earlier cohort will enjoy higher benefits than someone retiring at the same age from a later cohort.

(i) : Recommendation: An Income-Redistributive Contribution Formula

To the extent that everyone from the same age cohort retiring at the same age is entitled to the same basic benefit, contributions should also be the same if we do not allow for the income-redistribution objective. If income-redistribution is desired, we recommend using the following formula:

$$a + b\,y + c\,y'$$

where a is the basic charge which all workers must pay,[14] y is income in excess of some income level Y1 but below Y2, while y' is income in excess of Y2. Thus low income people pay only $a per month. Middle

income people pay a + b y while richer people pay a + b y + c y'. In order that income redistribution not be excessive c should be smaller than b. Notwithstanding a declining marginal contribution rate, such a scheme still favours the poor and is in this sense "progressive." This feature can also be justified by reference to the better food and medical care available to the richer people, which tend to raise life-expectancy. Thus Aaron (1977) found that the working of demographic forces has turned the U.S. social security scheme into one favouring upper-income households. He recommended a progressive payroll tax effectively raising c above b. That may be appropriate if benefits are positively related to contributions as in the U.S.

(j): Recommendation: A Plan for the Self-Employed

We recommend that the self-employed pay $d per month per pension where d is larger than a. It is difficult to monitor the incomes of the self-employed. Imposition of a uniform charge $d (>$a) simplifies administrative matters tremendously while preserving the objective of mild income redistribution toward the low income, employed workers.[15]

Conclusions

We have studied existing retirement benefit programs in a number of countries and have found them unsatisfactory in a number of respects:

(1) they are inherently unstable, requiring adjustments either in the contribution formula or benefits from time to time; we have recommended an age-cohort-specific pension formula to restore stability;

(2) they tend to distort incentives, particularly the age of retirement; we have recommended scaling down the pension scheme to provide for basic needs only in order to minimize distortion; the retirement age should also be neutral with respect to the present value of expected benefits received;

(3) the provident fund type of retirement benefit program is most distortionary of incentives and it fails to achieve either the objective

of reducing longevity risk or the redistributive objective; it should be rejected.

In summary, we recommend a mandatory, basic public pension plan that is fully funded for each age cohort. To illustrate how this can be done for a given age cohort with expected benefit years equal to n and expected contribution years equal to N, the required average contribution C per year to support a benefit stream at B per year can be calculated using the following formula, where r is the real interest rate and both C and B are expressed in real terms:

$$\sum_{t=0}^{N-1} C\,(1+r)^t = \sum_{j=1}^{n} \frac{B}{(1+r)^j}$$

If redistribution is required, we can use the formula

$$\sum_{t=0}^{N-1} [\,aw + b\sum_{i=1}^{w} y_{it} + c\sum_{i=1}^{w} y_{it}\,]\,(1+r)^t = \sum_{j=1}^{n} \frac{Bw}{(1+r)^j}$$

where w is the number of workers in the age cohort. From this formula, of the three parameters a, b, and c, any one can be solved given values assumed for the other two, provided we know the incomes of all the participating workers. Admittedly, there is uncertainty over the growth of incomes. A more conservative assumption about income growth than what is eventually realized will lead to a surplus of revenues over payments. A more optimistic assumption about income growth than what is eventually realized will lead to a deficit. These budget imbalances, however, are much less serious than will occur under most of the existing plans prevalent in today's industrialized countries. Two alternative strategies can be adopted. The first would have the government bear the residual risk, taking over the profit when there is a surplus or "chipping in" when there is a shortfall. The second would have the contribution rates adjusted moderately as the cohort ages. Either approach, as well as a combination of both approaches, should be acceptable, as the risks are nowhere near those inherent in any of the existing programs that are

subject to the risks of demographic changes.

Notes

1 See *Social Security Programs Throughout the World. U.S.* Department of Health and Human Services, Washington, published biennually.

2 For a survey, see John Dixon (1986).

3 69 in favour, 0 against, 9 neutral.

4 6 in favour, 2 against, 4 neutral.

5 This is the ratio of post-retirement income to pre-retirement income.

6 Judgments regarding what constitutes an excessive redistribution in favour of the poor vary. But there is little disagreement that redistribution will become excessive when pushed too far.

7 Hurd (1990) noted that the Hurd & Boskin (1984) estimates of the effects of social security on retirement were higher than most of the other estimates in the literature. Still, the direction of the impact is not in dispute, and the risks for Hong Kong cannot be ignored.

8 According to Sheshinski and Weiss (1981), "Voluntary private investment in annuities may be less than the socially desirable amount if individuals expect public assistance or neglect the social externality of their potential poverty." (p.190)

9 The subject of guarantee for private pension plans is out of the scope of this paper beyond the short discussion to follow.

10 Stiglitz (1988) made a similar argument for the U.S. (p.340).

11 According to OECD (1988a), "All public (pension) schemes nowadays operate more or less on a Pay-As-You-Go basis .... [A]round the year 2010, almost all OECD countries will be confronted with a substantial increase in the ratio of aged to working population. ...

[T]he old age dependency ratio for the OECD as a whole will more than double between now and 2040, implying, *ceteris paribus*, a doubling of the pension burden." (pp.101-102)

12 Presumably they would have more personal savings accumulated over the years to provide for their post-retirement needs.

13 Occasional moderate adjustments in contribution rates may be necessary if the government does not take up the residual risk. See the concluding section.

14 "a" could take the value of zero in the special case.

15 Japan has a similar system for the self-employed. For a discussion of this scheme ("Kokumin Nenkin" or People's Pension) as well as the Employees' Pension ("Kosei Nenkin") see Noguchi (1983). Since 1985 the flat-rate People's Pension (also known as National Pension Scheme) has been extended to salaried workers who in addition are entitled to an earnings-related pension. See OECD (1988a).

References

Aaron, Henry J. (1977) "Demographic Effects on the Equity of Social Security Benefits," in M. Feldstein & R. Inman (eds.) *Economics of Public Service*. New York: Macmillan, 151-173.

Ballantyne, Harry C. (1989) "Social Security Financing in North America," *Social Security Bulletin*, 52 (4, April).

Bhattarai A. K. (1989) "Social Security Programmes in India," *ISSR*, April, 479-488.

Bodie, Zvi (1990) "Pensions as Retirement Income Insurance," *Journal of Economic Literature*, 28 (March), 28-49.

Bodie Zvi, Alan Marcus and Robert Merton (1988) "Defined Benefit Versus Defined Contribution Pension Plans: What are the Real Trade-Offs?" in Bodie, Shoven, and Wise (eds.) (1988), 139-160.

Bodie, Zvi, John Shoven, and David Wise (1987) (eds.) *Issues in Pension Economics*. Chicago: University of Chicago Press for NBER.

Bodie, Zvi, John Shoven, and David Wise (1988) (eds.) *Pensions in the U.S. Economy*. Chicago: University of Chicago Press for NBER.

Burkhauser, Richard V. (1979) "The Pension Acceptance Decision of Older Workers," *Journal of Human Resources*, 14 (1, Winter), 63-75.

Burkhauser, Richard V. and John Turner (1982) "Labour Market Experience of the Almost Old and the Implications for Income Support," *American Economic Association Papers & Proceedings*, May, 304-308.

Chau, L. C. et al. (1988) "Symposium on Central Provident Fund," *Hong Kong Economic Papers*, No. 18.

Chow, Nelson W. S. (1988) *The Administration and Financing of Social Security in China*. Hong Kong: Centre of Asian Studies, University of Hong Kong.

Cuisia, José (1989) "Current Problems and Issues in the Financing of Social Security Short-term Benefits in the Philippines," *International Social Security Review*, April, 422-446.

Dixon, John (1986) "Provident Funds: An Assessment of Their Social Security, Social and Economic Performances and Prospects." A paper presented at the International Forum on Aging, Beijing, 1986.

Education and Manpower Branch, Government Secretariat (1986) "The Implications of Establishing a Central Provident Fund in Hong Kong." Hong Kong: Government Printer.

Ferrara, Peter J. (1985) *Social Security: Prospects for Reform*. Washington, D.C.: CATO Institute.

Friedman, Benjamin and Mark Warshawsky (1988) "Annuity Prices and Savings Behaviour in the U.S.," in Bodie, Shoven and Wise, (eds.) (1988).

Guest, Dennis (1980) *The Emergence of Social Security in Canada*. Vancouver: University of British Columbia Press.

Haanes-Olsen, Leif (1990) "Investment of Social Security Reserves in Three Countries," *Social Security Bulletin*, 53 (2, February.), 3-8.

Health & Welfare Canada (1988) *Overview: The Income Security Pro-*

grams of Health and Welfare Canada. Ottawa: Income Security Branch.

Heller, Peter (1989) "Aging, Saving, and Pensions in the Group of Seven Countries: 1980-2025," *Journal of Public Policy*, 9, 127-153.

Hemming R. & J. A. Kay (1982) "The Costs of the State Earnings Related Pension Scheme," *Economic Journal*, 92 (June), 300-319.

H. M. Treasury (1989) "Changes to National Insurance and Social Security," *Economic Progress Report*, 1-5, (No. 204, October).

H. M. Treasury (1989) "Pensions for the Enterprise Economy," *Economic Progress Report*, 1-3 (No. 203, August).

Ho, Lok-sang (1987) "The Public Pension is More Practicable than the Central Provident Fund," *Hong Kong Economic Journal Monthly*, March, 74-75.

Hochman, H. M. and J. D. Rodgers (1969) "Pareto Optimal Redistribution," *American Economic Review*, 59, 542-557.

Hurd, M. D. (1990) "Research on the Elderly: Economic Status, Retirement, and Consumption and Saving," *Journal of Economic Literature*, XXVIII (2, June), 565-637.

Hurd, M. D. and M. S. Boskin (1984) "The Effect of Social Security on Retirement in the Early 1970s," *Quarterly Journal of Economics*, 99 (4, November), 767-90.

International Social Security Association (1987) *Relationship Between Pensions and Occupations.* Geneva: the Association. Social Security Documentation, European Series No. 13.

Kottikoff, Lawrence J. and David A. Wise (1987) "The Incentive Effects of Private Pension Plans," in Bodie, Shoven and Wise (eds.) (1987), 283-336.

Noguchi, Yukio (1983) "Problems of Public Pensions in Japan," *Hitotsubashi Journal of Economics*, 24, 43-68.

OECD (1988a) *Reforming Public Pensions.* Social Policy Studies No. 5, Paris: OECD.

OECD (1988b) *The Future of Social Protection.* Social Policy Studies, No. 6, Ch. 3: Retirement Pensions, 31-37. Paris: OECD.

Sherman, Sally R. (1989) "Public Attitudes Toward Social Security," *Social Security Bulletin*, 52 (12, December), 2-16.

Sheshinski, Eytan and Yoram Weiss (1981) "Uncertainty and Optimal Social Security Systems," *Quarterly Journal of Economics*, 96 (2, May), 190-205.

Stiglitz, Joseph E. (1988) *Economics of the Public Sector.* New York: W.W. Norton & Co.

Tracy M. B. and Paul Adams (1989) "Age at which Pensions are Awarded under Social Security: Patterns in Ten Industrial Countries, 1960-1986," *International Social Security Review*, April, 447-461.

U. S. Department of Health and Human Services (1987, 1989) *Social Security Programs Throughout the World.* Washington, D.C.

U. S. Social Security Administration (1989) "Social Security Programs in the U.S.," *Social Security Bulletin*, 52 (7, July), 2-79.

Werin, Lars (1986) "The Social Welfare System in Sweden — A Survey," Department of Economics Working Paper, University of Stockholm.

Appendix 1

Summary of Survey Results

In support of a centrally administered program of social security for retirees:

— half of employer-respondents (6 out of 12)
— 69 out of 78 labour-respondents

In support of tapping general revenue for financing towards a social security system:

— 9 of 12 employer-respondents
— 54 of 79 labour-respondents

In support of the prototype CPF scheme:

— 10 of 13 employer-respondents
— 64 of 73 labour-respondents

Find a public pension system equally or more attractive than the CPF:

— 7 of 14 employer-respondents
— 49 of 72 labour-respondents

Agree to postponing retirement to enable a public pension scheme to be financially viable if people's life expectancy increases:

— 7 of 9 employer-respondents
— 45 of 62 labour-respondents

Oppose increasing contribution to support scheme when life expectancy increases:

— 4 out of 5 employer-respondents
— 37 out of 50 labour-respondents

Agree to pro-rata enjoyment of pensions benefits for retirees contributing for less than 40 years:

— 7 of 10 employer-respondents
— 44 of 63 labour-respondents

In favour of contribution ceilings:

— 7 of 11 employer-respondents
— 45 of 60 labour-respondents

In favour of social security for the self-employed along the line of a pension scheme:

— 3 out of 10 employer-respondents
— 40 out of 70 labour-respondents

Appendix 2

This appendix illustrates the relationship between average contribution rates and benefits under alternative assumptions of interest rates and income growth rates.

Let Z be the pension income in constant dollars;
Y_t be the real income of the representative individual in year t;
ρ be the contribution rate required (the percentage of real income that must be paid into the fund);
λ be the average required (real) contribution per year per constant dollar of pension benefit;
r be the rate of return to investment, assumed to be constant and is also equal to the rate of discount;
y_t be the contribution of the representative individual in year t;
N be the total years of contribution;
n be the total years of benefits = expected post-retirement years.

In order that a pension scheme be actuarially fair, the terminal value of actual contributions at the time of retirement for a typical worker must equal the present value of all post-retirement benefits. This means

$$\sum_{i=0}^{N-1} y_{N-i}(1+r)^i = \sum_{i=1}^{n} Z\frac{1}{(1+r)^i}$$

The terminal value of actual contributions can be rewritten

$$\sum_{i=0}^{N-1} \rho\, Y_{N-i}(1+r)^i$$

By definition it is also equal to

$$\sum_{i=0}^{N-1} \lambda Z(1+r)^i$$

$$\rho = \frac{\sum_{i=0}^{N-1} \lambda Z(1+r)^i}{\sum_{i=0}^{N-1} Y_{N-1}(1+r)^i}$$

where λ, the average required contribution per year per constant dollar of pension benefit, is equal to

$$\lambda = \frac{\sum_{i=1}^{n} \frac{1}{(1+r)^i}}{\sum_{i=0}^{N-1} (1+r)^i}$$

Assuming that r = 2 per cent, the λ values for alternative values of N and n are shown in Table 1. If r rises to 3 per cent, λ declines significantly, as shown in Table 2. Naturally, if returns to investment are higher, contribution rates can be lower. These λ values can serve as the basis for a pension plan for the self-employed who contribute a fixed amount per year.

Assuming the expected number of benefit years to be 20 and using the 1986 mean income from by-census data as the base and further assuming that the mean income rises in real terms by 1 per cent per year while the rate of return on investment stands at 2 per cent, then the contribution rate out of actual income (ρ) is shown in Table 3a for alternative pension income levels. Table 3b presents the contribution rates if the number of benefit years rises to 25.

If the rate of return on investment r is higher and stands at 3 per cent, contribution rates will be lower (Table 4a and 4b).

According to the Tables, if the typical worker contributes for 45 years (from age 20 to age 65) and expects to live until 85 (20 years of benefits), then the contribution rate would be about 8.7 per cent if the monthly stipend stands at $2,000 (at 1986 prices) while the rate of return on investment stands at 2 per cent per year. The contribution rate would drop to about 6.0 per cent if the rate of return on investment rises to 3 per

cent per year. As life expectancy is much lower than 85 the actual required contribution rates should be much lower.

Appendix 3 : Tables

Table 1 Average Required Contribution Per Year Per Constant Dollar of Pension Benefit (λ)
Rate of Return = 2 per cent

N\n	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
40	0.270710	0.281633	0.292342	0.302841	0.313134	0.323226	0.333119	0.342818	0.352327	0.361650	0.370790	0.379751	0.388536	0.397149	0.405593	0.413871	0.421987	0.429944	0.437745	0.445393	0.452890
41	0.261163	0.271701	0.282032	0.292161	0.302091	0.311826	0.321371	0.330728	0.339902	0.348896	0.357714	0.366358	0.374834	0.383143	0.391289	0.399275	0.407105	0.414781	0.422307	0.429685	0.436919
42	0.252095	0.262267	0.272239	0.282016	0.291602	0.300999	0.310212	0.319244	0.328100	0.336781	0.345293	0.353637	0.361818	0.369839	0.377702	0.385411	0.392969	0.400379	0.407643	0.414765	0.421748
43	0.243472	0.253296	0.262927	0.272370	0.281627	0.290703	0.299601	0.308324	0.316877	0.325262	0.333482	0.341541	0.349442	0.357188	0.364782	0.372228	0.379527	0.386683	0.393699	0.400578	0.407321
44	0.235263	0.244756	0.254063	0.263187	0.272133	0.280902	0.289500	0.297930	0.306194	0.314296	0.322239	0.330026	0.337661	0.345146	0.352484	0.359679	0.366732	0.373647	0.380426	0.387073	0.393589
45	0.227442	0.236619	0.245617	0.254438	0.263086	0.271564	0.279876	0.288025	0.296014	0.303847	0.311526	0.319055	0.326436	0.333672	0.340766	0.347721	0.354540	0.361225	0.367779	0.374205	0.380504
46	0.219983	0.228859	0.237561	0.246093	0.254457	0.262657	0.270697	0.278579	0.286306	0.293882	0.301309	0.308591	0.315729	0.322728	0.329590	0.336317	0.342912	0.349378	0.355717	0.361932	0.368025
47	0.212862	0.221451	0.229871	0.238127	0.246220	0.254155	0.261934	0.269561	0.277038	0.284369	0.291555	0.298601	0.305509	0.312281	0.318921	0.325430	0.331812	0.338068	0.344202	0.350216	0.356112
48	0.206058	0.214373	0.222524	0.230515	0.238350	0.246031	0.253562	0.260945	0.268183	0.275279	0.282237	0.289057	0.295744	0.302300	0.308727	0.315029	0.321206	0.327263	0.333201	0.339022	0.344729
49	0.199552	0.207604	0.215498	0.223237	0.230825	0.238264	0.245556	0.252706	0.259716	0.266588	0.273326	0.279931	0.286407	0.292756	0.298980	0.305082	0.311065	0.316930	0.322681	0.328318	0.333845
50	0.193326	0.201127	0.208775	0.216273	0.223623	0.230830	0.237895	0.244822	0.251613	0.258271	0.264798	0.271197	0.277471	0.283622	0.289652	0.295564	0.301360	0.307042	0.312613	0.318075	0.323430

N = number of contribution years
n = number of benefit years

Table 2 Average Required Contribution Per Year Per Constant Dollar of Pension Benefit (λ)
Rate of Return = 3 per cent

N\n	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
40	0.197311	0.204440	0.211361	0.218081	0.224606	0.230940	0.237089	0.243060	0.248857	0.254485	0.259948	0.265253	0.270404	0.275404	0.280258	0.284972	0.289548	0.293990	0.298304	0.302491	0.306557
41	0.189129	0.195962	0.202597	0.209038	0.215292	0.221363	0.227258	0.232981	0.238537	0.243931	0.249169	0.254254	0.259190	0.263983	0.268637	0.273154	0.277541	0.281799	0.285933	0.289947	0.293844
42	0.181381	0.187935	0.194298	0.200475	0.206473	0.212295	0.217949	0.223437	0.228766	0.233939	0.238962	0.243839	0.248573	0.253170	0.257632	0.261965	0.266172	0.270256	0.274221	0.278070	0.281806
43	0.174038	0.180327	0.186432	0.192359	0.198114	0.203701	0.209125	0.214392	0.219505	0.224469	0.229288	0.233967	0.238510	0.242921	0.247203	0.251360	0.255396	0.259315	0.263119	0.266813	0.270399
44	0.167072	0.173108	0.178969	0.184659	0.190184	0.195547	0.200754	0.205810	0.210718	0.215483	0.220110	0.224602	0.228963	0.233197	0.237307	0.241298	0.245173	0.248935	0.252587	0.256133	0.259575
45	0.160456	0.166254	0.171882	0.177347	0.182653	0.187804	0.192805	0.197660	0.202374	0.206951	0.211394	0.215708	0.219896	0.223963	0.227911	0.231743	0.235465	0.239078	0.242585	0.245991	0.249297
46	0.154168	0.159739	0.165147	0.170398	0.175495	0.180444	0.186249	0.189915	0.194444	0.198841	0.203110	0.207255	0.211279	0.215186	0.218979	0.222662	0.226238	0.229709	0.233079	0.236351	0.239528
47	0.148187	0.153541	0.158740	0.163787	0.168687	0.173444	0.178062	0.182547	0.186900	0.191127	0.195230	0.199214	0.203082	0.206838	0.210484	0.214024	0.217460	0.220797	0.224036	0.227181	0.230235
48	0.142493	0.147642	0.152640	0.157493	0.162205	0.166779	0.171220	0.175532	0.179718	0.183783	0.187729	0.191560	0.195279	0.198890	0.202396	0.205800	0.209104	0.212313	0.215428	0.218452	0.221388
49	0.137068	0.142021	0.146829	0.151497	0.156030	0.160430	0.164702	0.168849	0.172876	0.176786	0.180582	0.184267	0.187845	0.191318	0.194691	0.197965	0.201144	0.204230	0.207226	0.210135	0.212960
50	0.131896	0.136662	0.141289	0.145781	0.150142	0.154376	0.158487	0.162478	0.166353	0.170115	0.173768	0.177314	0.180756	0.184099	0.187344	0.190495	0.193554	0.196524	0.199407	0.202206	0.204924

N = number of contribution years
n = number of benefit years

Table 3a Required Contribution Rate (ρ) (Benefit Years = 20; Rate of Return = 2 per cent)

NVZ	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
40	0.106927	0.112273	0.117619	0.122966	0.128312	0.133658	0.139005	0.144351	0.149697	0.155044	0.160390
41	0.102479	0.107603	0.112727	0.117851	0.122975	0.128099	0.133223	0.138346	0.143470	0.148594	0.153718
42	0.098268	0.103181	0.108095	0.113008	0.117921	0.122835	0.127748	0.132662	0.137575	0.142488	0.147402
43	0.094277	0.098991	0.103704	0.108418	0.113132	0.117846	0.122560	0.127274	0.131987	0.136701	0.141415
44	0.090491	0.095015	0.099540	0.104064	0.108589	0.113113	0.117638	0.122162	0.126687	0.131211	0.135736
45	0.086895	0.091240	0.095585	0.099930	0.104275	0.108619	0.112964	0.117309	0.121654	0.125998	0.130343
46	0.083479	0.087653	0.091827	0.096001	0.100174	0.104348	0.108522	0.112696	0.116870	0.121044	0.125218
47	0.080229	0.084240	0.088252	0.092263	0.096275	0.100286	0.104298	0.108309	0.112320	0.116332	0.120343
48	0.077135	0.080992	0.084849	0.088706	0.092562	0.096419	0.100276	0.104133	0.107989	0.111846	0.115703
49	0.074188	0.077898	0.081607	0.085317	0.089026	0.092735	0.096445	0.100154	0.103864	0.107573	0.111282
50	0.071379	0.074948	0.078517	0.082086	0.085655	0.089223	0.092792	0.096361	0.099930	0.103499	0.107068

N = number of contribution years
Z = benefit per month in dollars at 1986 prices

Table 3b Required Contribution Rate (ρ) (Benefit Years = 25; Rate of Return = 2 per cent)

N\Z	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
40	0.127669	0.134053	0.140436	0.146820	0.153203	0.159587	0.165970	0.172354	0.178737	0.185121	0.191504
41	0.122359	0.128477	0.134595	0.140713	0.146831	0.152949	0.159066	0.165184	0.171302	0.177420	0.183538
42	0.117331	0.123197	0.129064	0.134930	0.140797	0.146664	0.152530	0.158397	0.164263	0.170130	0.175996
43	0.112566	0.118194	0.123822	0.129450	0.135079	0.140707	0.146335	0.151964	0.157592	0.163220	0.168848
44	0.108045	0.113447	0.118849	0.124252	0.129654	0.135056	0.140458	0.145861	0.151263	0.156665	0.162067
45	0.103752	0.108940	0.114128	0.119315	0.124503	0.129690	0.134878	0.140066	0.145253	0.150441	0.155629
46	0.099673	0.104656	0.109640	0.114624	0.119607	0.124591	0.129575	0.134558	0.139542	0.144526	0.149509
47	0.095793	0.100582	0.105372	0.110161	0.114951	0.119741	0.124530	0.129320	0.134110	0.138899	0.143689
48	0.092099	0.096704	0.101309	0.105914	0.110519	0.115124	0.119729	0.124333	0.128938	0.133543	0.138148
49	0.088580	0.093009	0.097438	0.101867	0.106296	0.110725	0.115154	0.119583	0.124012	0.128441	0.132870
50	0.085226	0.089487	0.093748	0.098009	0.102271	0.106532	0.110793	0.115055	0.119316	0.123577	0.127838

N = number of contribution years
Z = benefit per month in dollars at 1986 prices

Table 4a Required Contribution Rate (ρ) (Benefit Years = 20; Rate of Return = 3 per cent)

N\Z	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
40	0.077001	0.080851	0.084701	0.088551	0.092401	0.096251	0.100101	0.103951	0.107801	0.111651	0.115501
41	0.073282	0.076946	0.080610	0.084274	0.087938	0.091602	0.095266	0.098930	0.102594	0.106258	0.109922
42	0.069776	0.073265	0.076753	0.080242	0.083731	0.087220	0.090708	0.094197	0.097686	0.101175	0.104664
43	0.066468	0.069791	0.073114	0.076438	0.079761	0.083085	0.086408	0.089731	0.093055	0.096378	0.099702
44	0.063344	0.066511	0.069678	0.072845	0.076012	0.079180	0.082347	0.085514	0.088681	0.091848	0.095015
45	0.060391	0.063410	0.066430	0.069449	0.072469	0.075488	0.078508	0.081527	0.084547	0.087567	0.090586
46	0.057598	0.060477	0.063357	0.066237	0.069117	0.071997	0.074877	0.077757	0.080637	0.083516	0.086396
47	0.054953	0.057701	0.060449	0.063196	0.065944	0.068692	0.071439	0.074187	0.076935	0.079682	0.082430
48	0.052449	0.055071	0.057693	0.060316	0.062938	0.065561	0.068183	0.070806	0.073428	0.076050	0.078673
49	0.050074	0.052578	0.055082	0.057585	0.060089	0.062593	0.065096	0.067600	0.070104	0.072608	0.075111
50	0.047822	0.050213	0.052604	0.054995	0.057386	0.059777	0.062169	0.064560	0.066951	0.069342	0.071733

N = number of contribution years
Z = benefit per month in dollars at 1986 prices

Table 4b Required Contribution Rate (ρ) (Benefit Years = 25; Rate of Return = 3 per cent)

N\Z	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
40	0.090124	0.094631	0.099137	0.103643	0.108149	0.112655	0.117162	0.121668	0.126174	0.130680	0.135186
41	0.085771	0.090060	0.094349	0.098637	0.102926	0.107214	0.111503	0.115791	0.120080	0.124369	0.128657
42	0.081668	0.085751	0.089835	0.093918	0.098002	0.102085	0.106168	0.110252	0.114335	0.118419	0.122502
43	0.077796	0.081686	0.085576	0.089466	0.093356	0.097245	0.101135	0.105025	0.108915	0.112805	0.116694
44	0.074140	0.077847	0.081554	0.085261	0.088968	0.092675	0.096382	0.100089	0.103796	0.107503	0.111210
45	0.070684	0.074218	0.077752	0.081286	0.084820	0.088354	0.091889	0.095423	0.098957	0.102491	0.106025
46	0.067414	0.070785	0.074156	0.077526	0.080897	0.084268	0.087639	0.091009	0.094380	0.097751	0.101121
47	0.064319	0.067535	0.070751	0.073967	0.077183	0.080399	0.083615	0.086831	0.090047	0.093263	0.096479
48	0.061388	0.064457	0.067527	0.070596	0.073665	0.076735	0.079804	0.082873	0.085943	0.089012	0.092082
49	0.058609	0.061539	0.064470	0.067400	0.070330	0.073261	0.076191	0.079122	0.082052	0.084983	0.087913
50	0.055973	0.058771	0.061570	0.064369	0.067167	0.069966	0.072764	0.075563	0.078362	0.081160	0.083959

N = number of contribution years
Z = benefit per month in dollars at 1986 prices

怎樣的退休保障制度最適合香港的需要？
——一些分析和建議

何濼生　李翊駿　梁展鵬著

（中文摘要）

本文參考多個國家的實際經驗，對不同特色的養老制度進行經濟分析。結論是：一個既能提供保障又能避免對選擇行爲產生扭曲效果的養老制度，所提供的退休年金不應超越基本生活需要；行政必須由政府統籌；並應具有强迫性及「完全支付」（fully funded）等特徵。本文指出，一般的退休年金制度均較爲接近「隨支隨資」（pay-as-you-go）模式。要達到眞正的「完全支付」的養老金制度，每個同齡羣（age chort）均應自給自足，供款公式即按照每個同齡羣分別計算。爲達致對低收入人士實行再分配的目的，本文建議供款額應隨收入增加而遞增，而支款額則爲固定之數。本文附錄試擧例以表明支款額、預期壽命、投資回報率等因素對供款率的影響。