

ACTUARIAL ISSUES IN THE DESIGN OF AN OPTIMAL SOCIAL SECURITY SYSTEM

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What Is An Optimal System

Criteria used

- Poverty Alleviation
- Income Adequacy
- Income Equality
- Wealth Distribution
- Sustainability

Only look at Retirement Income Security

Not: Health care

Workers Compensation

Focus on Canada and United States (U.S.)

Economist's View of Social Security

Social Security normally designed by economists not actuaries ☹️

Economists' priorities

- Individual equity
- Minimal labor force distortions
(contributions; age of retirement)
- National savings
- Strong financial institutions
- Wealth creation

Creates a bias toward D.C. plans

Actuaries tend to focus on:

- Insurance and Risk Sharing
(based on Law of Large Numbers)
- Annuitization for the Longevity Risk
- Low expenses per unit
- A long-term view of stability and sustainability
(vs. annual balancing)
- Predictable benefits
- Improvement in societal utility (of wealth)
- Transparency and understandability

Creates a bias toward D.B. plans

Aside (but important)

New Notional Defined Contribution Plans (Sweden, Poland, Italy) are mathematically equivalent to career average D.B. Plans

Actuarial Concerns with Individual Accounts

- All major risks transferred to worker
 - Investment risk
 - Interest - rate risk (annuity price)
 - Longevity risk
 - Inflation risk
- Ignores advantages of risk sharing
- Larger expense ratios for small accounts (regressive)
- Total expenses higher than most government-administered systems

Financing Extremes: Paygo vs. Fully-Funded

Paygo: Required contribution, C :

$$C = \frac{P_t}{A_t} \cdot \frac{B_t}{AIW_t}$$

$P_t \equiv$ # of pensioners

$A_t \equiv$ # of active workers

$B_t \equiv$ average pension benefit

$AIW_t \equiv$ average wage on which contributions are made

$$\frac{P_t}{A_t} \equiv \text{Demographic Ratio}$$

$$\frac{B_t}{AIW_t} \equiv \text{Financial Ratio}$$

e.g. U.S.

$$\frac{P_t}{A_t} \approx \frac{1}{3}$$

$$\frac{B_t}{AIW_t} \approx 39\%$$

$$\Rightarrow C \approx 13\%$$

Another View:

Paygo:

$$C = \frac{\int_{65}^{\infty} e^{-rx} Lx dx}{\int_{20}^{65} e^{-rx} Lx dx}$$

$Lx \equiv$ Real People Alive Aged x

$rx \equiv$ Growth Rate in Covered Earnings
(= Δ Labor Force + Δ Real Wages)

Fully-Funded:

$$C = \frac{\int_{65}^{\infty} e^{-\delta x} l_x dx}{\int_{20}^{65} e^{-\delta x} l_x dx}$$

$\delta \equiv$ Investment Rate of Return

$l_x \equiv$ Life Table Survivorship Probabilities

Financing basis is not remarkably important

- Both dependent on active workers
- Neither is inherently stable (δ vs demographic ratio)
- Both face political risk

(If fully-funded, local dictator can abscond with assets.)

(If paygo, local dictator can only abscond with liabilities !)

Priorities for Well-Designed Social Security

1. Mitigation / alleviation of poverty amongst elderly (requires wealth transfer to those in poverty)
 - Be wary of easily-attained minimum benefits
2. Sustained standard of living in retirement (replacement ratio)
 - In partnership with employer plans and individual plans (may be tax incented)
3. Solidarity
 - Contributors want the social security system to succeed
 - Requires benefits for as many workers as administratively feasible (even the wealthy)

Other Preferred Design Features

Do not create perverse economic incentives

- If contribution rate too high:

Workers go to cash economy (aided by employers)

- Employers prefer overtime to hiring (especially if ceiling on contributory earnings)
 - Employers out source work
- Disincentives to private saving
 - Benefits “too large”
 - Clawbacks too steep

- Incentives to retire too early
 - Max benefits after n years of contributions
 - Early age retirement does not result in full actuarial discount
- Incentives for absence from labor force
 - Exempt periods
 - Better than short qualifying period (n)
- Can't get it perfect

CPP Automatic Stabilizer (excellent feature)

If 75-year projection indicates 9.9% cannot support

Benefits:

- Contribution rate is raised to satisfy half of the deficit
- Benefits are de-indexed until the other half of the deficit disappears

(i.e., Risk sharing between workers and retirees)

Note: Automatic stabilizer in Sweden is 100% on de-indexing of benefits (contributions remain constant).

Graphs that follow assume retirees achieve a 70% replacement ratio in total from all sources.

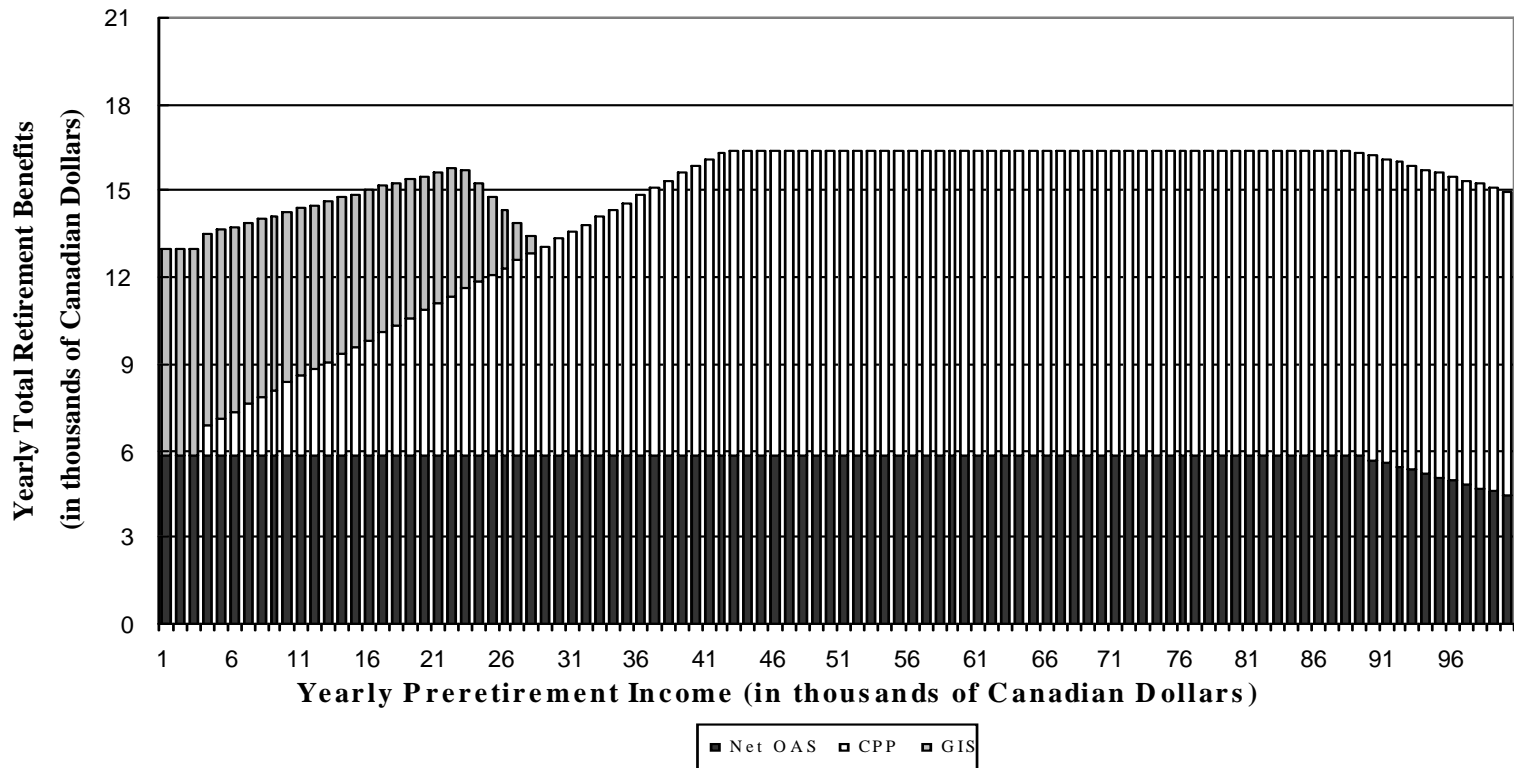
Canadian Social Security

- Guaranteed Income Supplement (GIS)
 - Welfare benefit
 - To poor only (no asset test)
 - Steep clawback (50%)
 - Thus, disincentive for poor to save for retirement
 - Paid from general tax revenues
 - Benefits non-taxable
 - Highly targeted to poverty alleviation

- Old Age Security (OAS)
 - A “demogrant benefit”
 - Need 40 years residency for full benefit (if less, pro rata)
 - Clawback is less steep (15%)
 - Wealthy Canadians receive no GIS and no OAS
 - OAS is taxable income

- Canada / Quebec Pension Plans
 - Virtually identical
 - Worker at average wage gets 25% benefit (based on 40 years of contributions)
 - Contributions and benefit accrual stop at average wage
 - $OAS + C/QPP = 40\%$ replacement for worker at average wage
 - Taxable income
 - No clawback
 - Leaves room for occupational pensions and individual savings

Figure 1
Canadian Security System in 2006-Total Benefits



- Wide range of Canadians get same \$ benefits

Figure 5
Canadian Security System in 2006 (\$1,000-\$10,000)

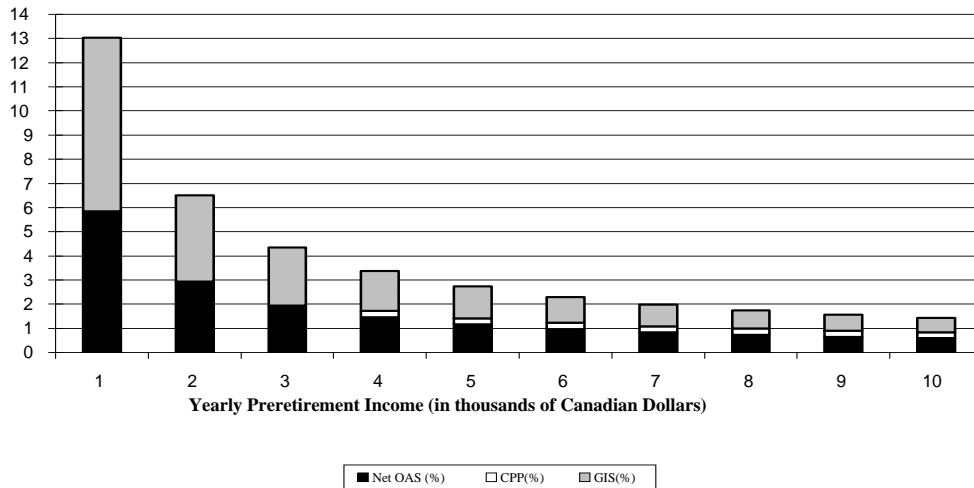
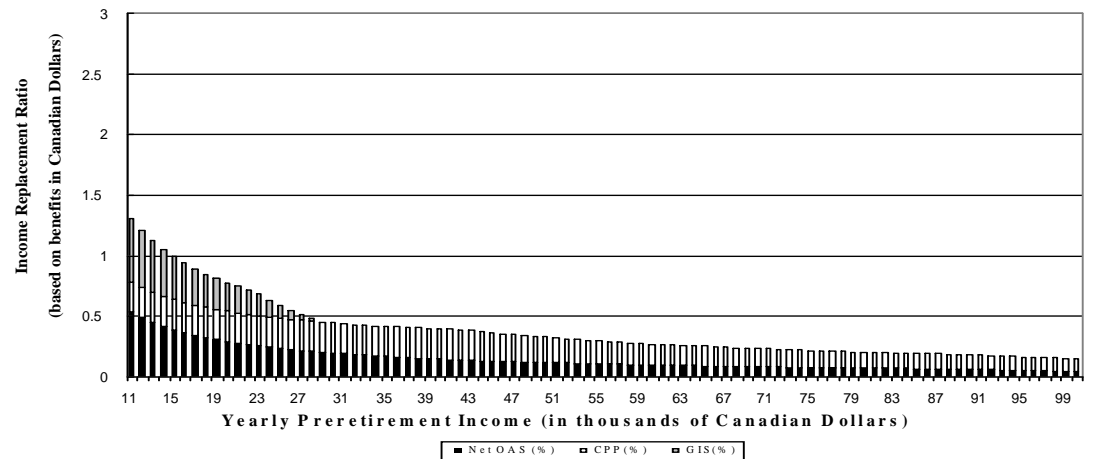


Figure 6

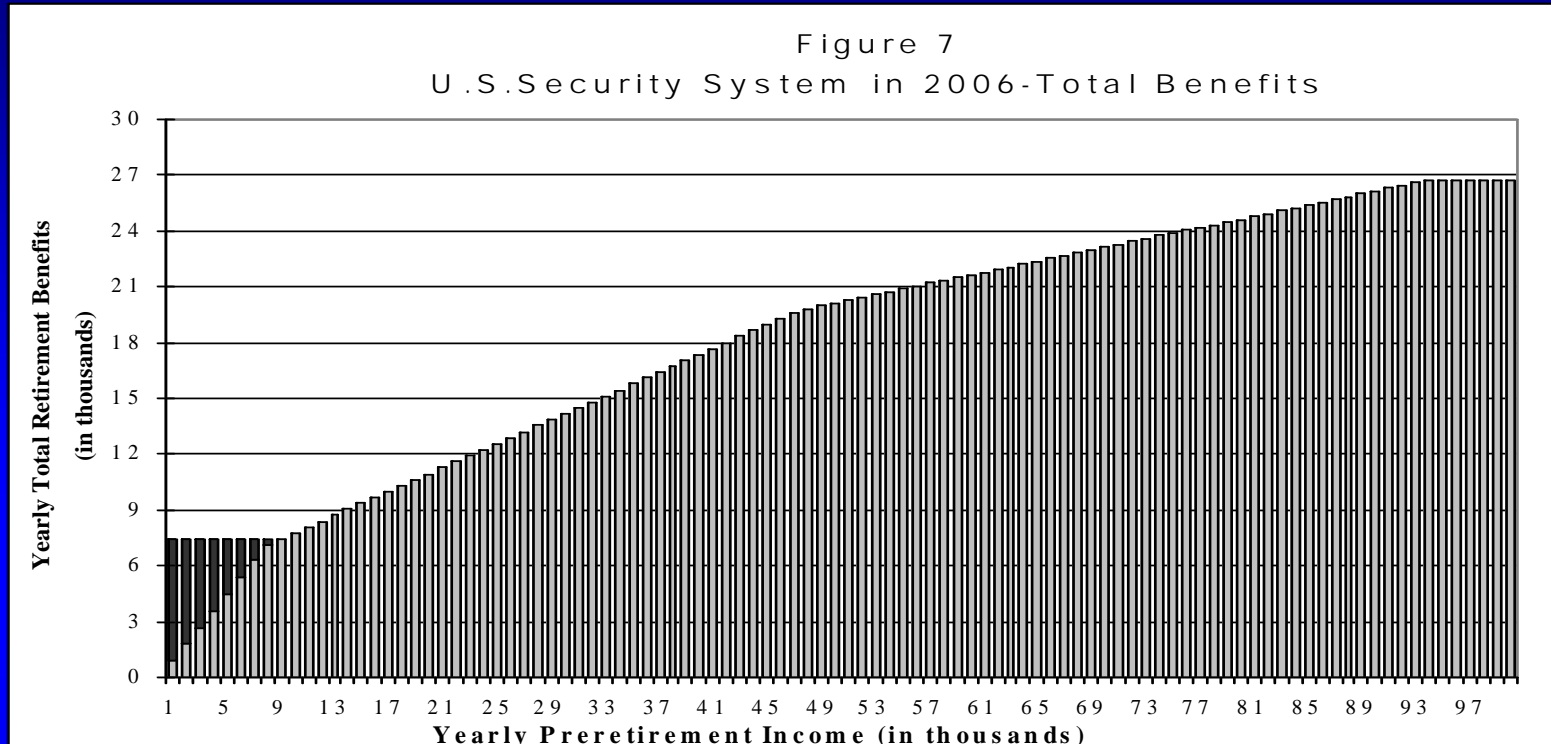
Canadian Security System in 2006 (\$11,000-\$100,000)



Note:

- Extreme focus on poverty alleviation

U.S. OASDI + SSI



- SSI (Supplemental Security Income), a welfare scheme
 - minimal with \$1 for \$1 clawback
- OASDI takes on three responsibilities
 - Poverty alleviation
 - Predictable post-retirement standard of living
 - Participant solidarity

Figure 10
U.S. Security System in 2006 (\$1,000-\$10,000)

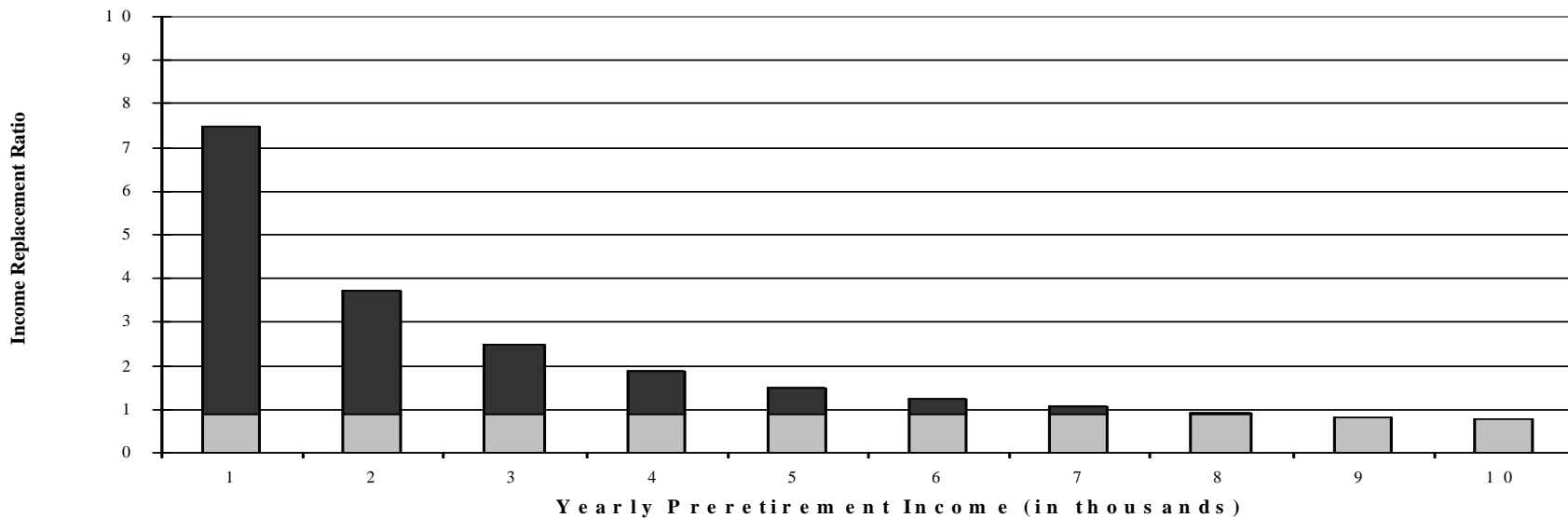
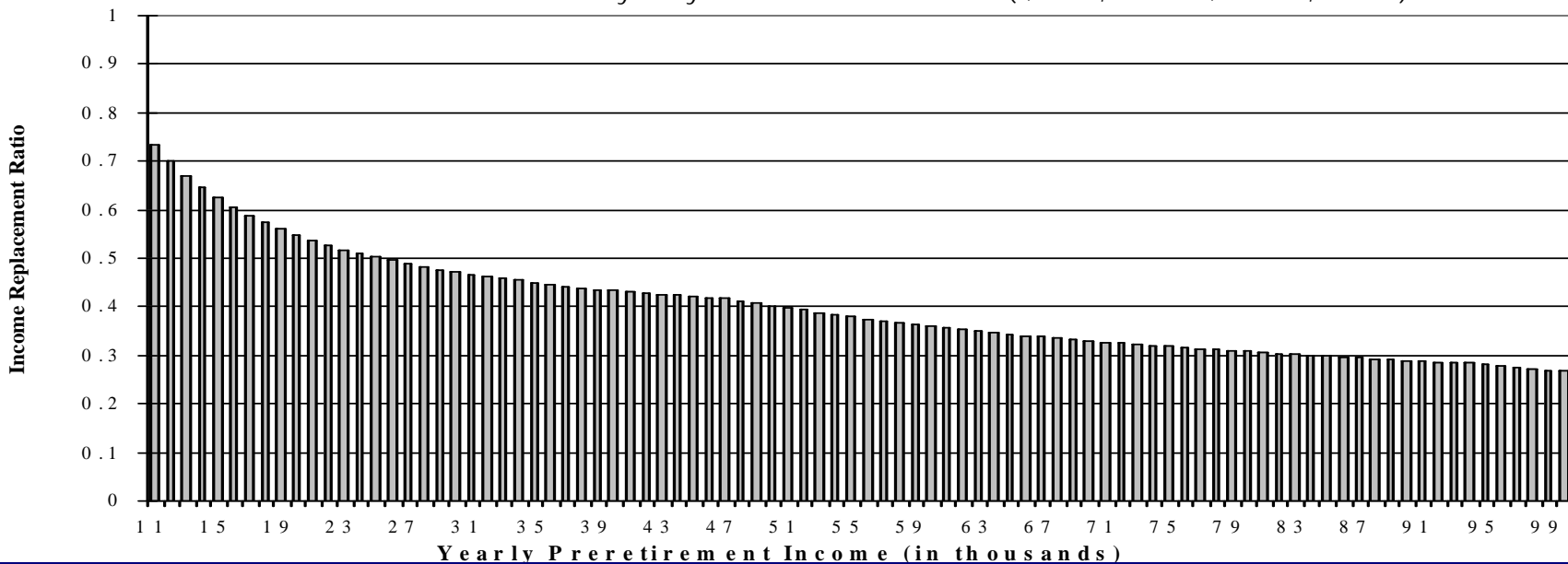


Figure 11
U.S. Security System in 2006 (\$11,000-\$100,000)



U.S. Vs. Canada

U.S. emphasizes individual equity more

Canada emphasizes social adequacy more (poverty alleviation)

Ratio of "Income Replacement Ratios of the U.S. System" to "Income Replacement Ratios of the Canadian System" in 2006	
Pre-Retirement Income	Ratio
\$ 1,000	0.57416
\$ 5,000	0.54786
\$ 10,000	0.54417
\$ 15,000	0.62875
\$ 20,000	0.70652
\$ 25,000	0.84952
\$ 30,000	1.06107
\$ 35,000	1.07981
\$ 40,000	1.09560
\$ 45,000	1.15818
\$ 50,000	1.22952
\$ 60,000	1.32113
\$ 70,000	1.41272
\$ 80,000	1.50432
\$ 90,000	1.61078
\$100,000	1.78556

Other Points of Reflection

In Figure 1 (Canada) and Figure 7 (U.S.)

- Area under curve = cost
 - paid by contributions, general tax revenues, investment income
 - Has to be some maximum cost to which workers can agree
- To lower cost
 - put in sharper clawbacks (Canada)
 - lower benefits to wealthy (erodes solidarity)
- Cost must be sustainable
- Benefit formulation should be understandable to participants

Maximum Benefits and Impact on Labor Force

- Canada: OAS and C/QPP require 40 years in economy for max benefits
 - some exceptions such as child-rearing dropout / disability
 - + strange formula if you retire early
- U.S.: OASDI requires at least 35 years of contributions for max benefits
- Do these formulae create disincentives to work longer ?

How do you define “Success”?

- Two Goals:
- Income Security Post-Retirement
- Minimal Government Intervention

How do you define “Success”?

- Will review two papers by Brown/Prus looking at Income Inequality post-retirement

Summary

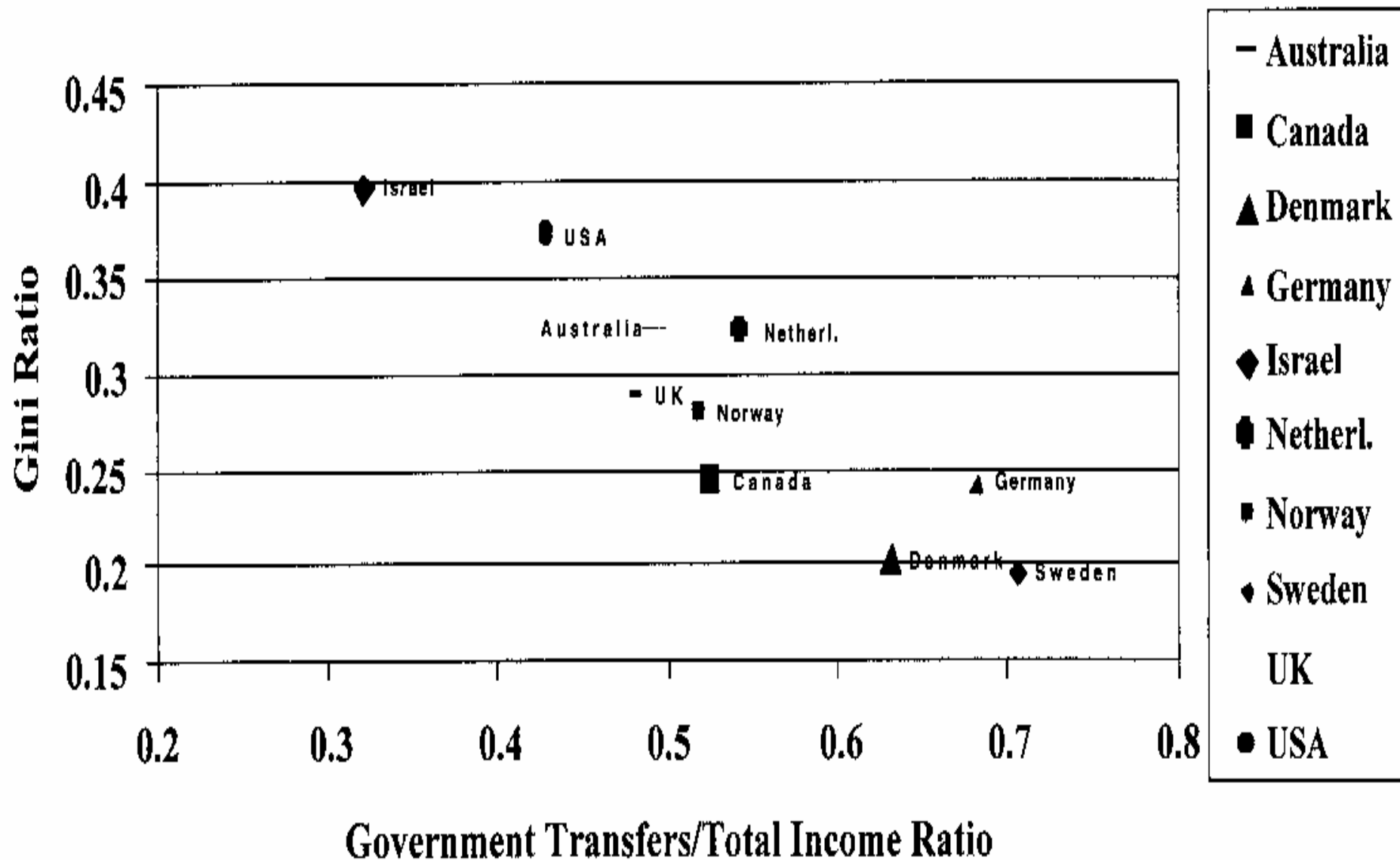
- The papers test two hypotheses:
 - In most countries income inequality declines after retirement since public benefits are more equally distributed than work income
 - The larger the public benefits, the less the income inequalities in old age
 - Used seven OECD countries to test hypotheses
- The analysis supports the hypotheses
 - Several conclusions are drawn

To Measure Income Inequality:

Used Gini Ratio

- If $Gini = 1$, one person has all the income
- If $Gini = 0$, everyone has equal income
- So, the larger the Gini, the more inequality

Figure 1 Percentage of Household Income from Government Transfers by Gini Coefficient, for Selected Countries, Household Heads Aged 65+.



Brown-Prus NAAJ Paper

- Canada, Denmark and Sweden on “Optimal Frontier”
- Mix of public/private is political choice of citizens
- Other seven nations analyzed could do better

Table 1: Replacement Ratios by Decile

Decile	Ca	Fi	Ge	It	Ja	Ne	Sw	UK	US
1	148	101	102	128	72	83	89	76	80
2	107	83	90	92	73	77	84	69	78
3	94	78	84	86	75	74	81	66	77
4	87	75	82	81	77	72	80	64	78
5	85	73	80	78	77	74	79	64	78
6	86	72	79	76	78	77	79	65	81
7	86	72	78	76	81	80	79	67	83
8	86	72	79	77	84	82	83	72	94
9	87	73	81	77	87	80	79	67	83
10	96	75	79	75	94	82	83	72	94

Comments on Table 1

- General replacement rates are very high (acceptable)
- In some countries (Canada) benefits are highly targeted (to low income earners)
- Others are not (Japan and UK)
- This Table comes from an OECD report

Brown/Prus (2) Data

- Luxembourg Income Study (LIS)
- Most recent surveys (Y2000)
- For seven countries (defined in next slide)
- Uses total household income by age of head
- Adjusted to reflect size of household using $n^{**0.5}$ (approximates per capita indicator)

Table 2: Gini Coefficients of Disposable Household Income and Changes

	Age			
	45 - 54	55 - 64	65 - 74	75 +
Canada	.301	.330(+ 9.6%)	.266(- 19.4%)	.259(- 2.6%)
Germany	.239	.282(+ 18.0)	.256(- 9.2)	.254(- 0.1)
Netherlands	.238	.261	.241(- 11.1)	.238(- 1.2)
Norway	.255	.281(+ 10.2)	.224(- 20.3)	.209(- 6.7)
Sweden	.226	.273(+ 20.8)	.231(- 15.4)	.201(- 13.0)
U.K.	.339	.357(+ 5.3)	.301(- 15.7)	.286(- 5.0)
U.S.	.351	.385(+ 9.7)	.375(- 2.5)	.370(- 1.3)

Comments on Table 2

- Levels of Income Inequality Decline after Retirement
- Sweden, Canada, UK and Norway decline the most (but at different ages)
- The US declines the least
- Post-retirement, Sweden and Norway have lowest income inequality
- US: the highest income inequality

Further Analysis (in Paper) shows:

- Sweden and Norway transfer income from top quintile to all lower quintiles of income
- Canada, Netherlands and UK transfer income from top quintile to the lowest quintiles only (highly targeted)
- Countries with the largest public pension systems have the least income inequality post-retirement
- Sweden has the largest public pension reliance and the lowest inequality in post-retirement income
- The US has the smallest reliance on public pensions but the highest inequality in post-retirement income

Conclusions:

- Negative Correlation between Level of Publicly Provided Retirement Income and Income Inequality
- Overall Income Replacement Ratios are Acceptably High
- Some Systems use Heavily Targeted Income Redistribution

Caveats:

- Living Expenses, Especially Health Care Costs Vary Widely across Countries
- Differing Levels of Home Ownership have not been measured
- Differences in Workforce Participation (especially by women) have an impact on both Income and Expenditures

Final Conclusions

- Area under curve = cost
 - There must be a maximum acceptable cost (will vary from country to country)
 - Must be sustainable
- Plan benefit formulation should be understood by participants
- Preferable to have drop-out periods (exemptions) rather than a short overall benefit qualification period
- Benefits / contributions should not encourage evasion of participation (e.g., cash economy)

Final Conclusions

- Clawbacks lower cost but create disincentives to private saving for retirement
- To achieve solidarity, the wealthy must also benefit
- Benefit formulation should not incent early retirement (very important in aging populations)

Final Conclusions

- Goals in conflict one to another
- Compromise must occur
- Can't achieve all goals fully
- Design will fit local culture

Figure 1 Percentage of Household Income from Government Transfers by Gini Coefficient, for Selected Countries, Household Heads Aged 65+.

