

Mapping the Sustainability of Care and Support  
for the Elderly in Developed Countries

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## **Abstract**

This paper develops a method to assess the sustainability of care and support programs for the elderly in developed countries. The programs considered are social security (retirement income), health care and long-term care. The countries assessed are Canada, England, France, Germany, Sweden, and the United States of America. Two measures of sustainability are developed: one in respect of the current financing of programs; the other in respect of the country's potential to finance the programs in the future. The fuzzy set methodology described by Ragin (2000) is used to assess and label the sustainability of each country's programs. The paper discusses the challenges in assessing sustainability, the limitations of this research, and areas for future research. Research from another paper that assesses the adequacy of care and support programs for the elderly is highlighted and the combined assessment of adequacy and sustainability presented for the six countries.

## **1.0 Introduction**

All developed countries have an array of programs, involving government funding, that are designed to provide care and support for the elderly, such as social security, health care, and long term care (LTC). Some countries' programs are more extensive than others. Often the full range of required services is not provided by government programs but individuals and their families are expected to provide some of the care and support. Occasionally the level of care and support provided is income-tested or means-tested. Is there a way in which the complete array of programs in each country can be compared and assessed with respect to sustainability and the results communicated easily and effectively?

This research paper is the second part of a larger research project concerning the adequacy and sustainability of care and support programs for the elderly in developed countries. The main objectives of this large research project are fourfold:

1. To develop an international comparison based on an assessment of the adequacy of the array of care and support programs for the elderly, with reference to a number of developed countries.
2. To develop an international comparison based on an assessment of the sustainability of the array of care and support programs for the elderly, with reference to a number of developed countries.
3. To develop an approach to communicate the results easily and effectively.
4. To contribute to research methods in the social sciences by developing a method that combines quantitative and qualitative research results.

In the first part of this research, an assessment of the adequacy of the array of programs for the elderly and a method by which adequacy can be compared internationally and communicated easily, was prepared. The high level results are presented later in this paper. A

detailed description of this research is presented in a working paper (Andrews, 2013) that will be presented to the Living to 100 Symposium V in January 2014.

In the second part of this research, a method by which sustainability can be compared internationally is developed and an assessment of the sustainability of the array of programs for the elderly is presented. The results of this research are reported in this paper.

This research undertakes to compare the combination of social security, health care, and LTC for the elderly in six developed countries: Canada, England, France, Germany, Sweden, and the United States of America (USA). (The comparisons for England are primarily with respect to the United Kingdom (UK), except for LTC.) The comparison considers both the sustainability of the programs as they exist currently and the country's potential to deliver sustainable programs in the future. The paper describes how the indices for current and potential sustainability were constructed.

The six countries were selected because of the different approaches used to deliver mandated benefits and because the countries appear to have differences in attitudes toward the acceptable level of taxation. By selecting this range of countries a variety of results are illustrated. With more time and effort, the method could be extended to other developed countries.

Such a comparison faces numerous problems, as described herein, such as what benefits to include, as of what date, the time period over which sustainability is measured, and the extent to which taxes may be collected to secure sustainability. Moreover, most international comparisons focus on a single benefit, such as retirement income or LTC. This research breaks new ground by examining a combination of services for the elderly. The methodology is based on fuzzy-set theory. In this regard, it is the first actuarial study to apply fuzzy-set analysis to this problem.

This paper proceeds in the following order. The second section discusses the subject of sustainability. It describes briefly some of the methodological challenges in assessing sustainability and introduces the methodology used in this research. The third section presents the results of the comparison and discusses these results. The fourth section summarizes the results of the adequacy research (*ibid*), combines the sustainability and adequacy results, and discusses implications for the countries considered. The fifth section lists areas for further research and concludes.

## **2.0 How Can Sustainability be Assessed?**

There are a number of considerations in determining how sustainability may be assessed. The considerations that are discussed briefly in the next four subsections are the following.

- Closed group versus open group approach
- The timeframe of the assessment
- Whether allowance is made for any changes to the various programs' parameters
- An assessment of the relative value of various programs

## 2.1 Closed group versus open group approach

A challenge in attempting to use a closed group approach is how to define such a group. At the time of determination of the closed group, would we consider all those living in the country at that might be or subsequently might become eligible, or would we consider only those actually participating in the programs as either benefit recipients or contributors? To illustrate with respect to a closed group for social security benefits, should we consider only those who have contributed or are contributing currently, plus benefit recipients? Such a definition would define a closed group. However, given that most countries' social security retirement programs involve some degree of Pay-go funding, none of these programs would be considered sustainable. Moreover, some programs are universal and funded by general taxation, such as many developed countries' state health care plans. In such situations the whole population would be included. As with Pay-go funded programs, the sustainability of programs funded by general taxation, rely on the ability to tax future (unborn) generations. With respect to a state program with respect to LTC, it might be considered sustainable with respect to the current population of recipients and taxpayers, i.e., a form of closed group assessment. But what would the situation be if the current care recipients live longer than expected and develop care-intensive conditions, such as Alzheimer's disease, which may increase the cost of care? In summary, an assessment of sustainability on a closed group basis is likely to provide very limited information and lead to a conclusion that programs are not sustainable.

An open group approach might use a method of generational accounting. Generational accounting is based on the budget constraints of all levels of a nation's governments. Assuming that existing policies and programs continue indefinitely, it requires that the present value of future net tax payments of current and future generations be sufficient to cover the present value of future government consumption as well as to service the government's initial net indebtedness. A set of generational accounts is established for each birth year to the present and an additional single generational account is established in respect of future unborn generations. The generational accounts reflect taxes paid less transfers received, with government expenditures on health care and education being treated as transfers. Social security taxes, contributions and payments are included in the accounts. However the accounts do not impute to particular generations the value of the government's purchases of goods and services. Therefore the accounts do not show the complete net benefit or burden any generation receives in full (Auerbach et al., 1999).

This method does provide a way to make an assessment of sustainability, but it is dependent on the assumptions made with respect to unborn generations; what fertility rates will

apply, what life expectancies should be assumed, what labour participation rates should be used, what migration should be assumed, what frailty rates assumed, what debt service rates used, what GDP produced per capita. Moreover, it raises a question of how many unborn generations should be considered. The method also requires assumptions about existing cohorts, regarding such items as life expectancy, benefit consumption, labour force participation.

In summary, both the closed-group and open-group approaches have some difficulty and a host of other considerations is raised.

## **2.2 The timeframe of the assessment**

The foregoing discussion introduces the concept of making the assessment over a specified timeframe. This approach is commonly used for social security retirement programs, e.g., 75 years is used by the federal programs in both Canada and the USA, 50 years is used for the provincial plan in Quebec, and 95 years is used in Japan; yet criticisms have been made that the timeframe selected may not provide sufficient insight into what may happen beyond the selected timeframe.

## **2.3 Whether allowance is made for any changes to the various programs' parameters**

Typically assessments of sustainability are based on the program parameters that are in force at the time of assessment or that have been legislated for implementation, e.g., a legislated increase in the state pension age would be included when it comes into force. However, state programs frequently change over time. Arguably one might include changes in parameters into an assessment of sustainability, especially if one includes assumptions regarding changes in life expectancy, health status, etc.

## **2.4 An assessment of the relative value of various programs**

Most social programs are funded, at least in part, through taxation. This raises two questions:

- how high can taxes be and still be acceptable to the citizenry; and
- are there more desirable uses of the taxes collected than having them allocated to social programs?

There does not appear to be a precise answer to the first question. The acceptability of the level of taxation appears to vary by country and culture. For example, in general Americans are less accepting of relatively higher levels of taxes than are Swedes, and the International Labour Organization would consider it desirable to raise taxes to higher levels to support workers than would the Committee for Responsible Government.

With respect to the second question, regardless of the absolute level of taxes, there are resource constraints, e.g., what has been allocated to health care is unavailable for spending on education, defence, law enforcement, scientific research, etc. Decisions with respect to the allocation of taxes directly impact the assessment of sustainability.

## 2.5 Methodology for Assessment of Sustainability

The method used in this research paper is based on fuzzy set comparative analysis. Certain characteristics are identified that affect sustainability. These characteristics are assessed and assigned a score, which indicates the extent to which the characteristics contribute to sustainability.

Two aspects of sustainability are considered: whether the programs are sustainable currently with their existing cost structures; and whether the country has sufficient financing potential to sustain programs if it choose to allocate funds for such a purpose.

### 2.5.1 Method of Determining Current Sustainability

To determine current sustainability an index was constructed from an assessment of the stability of the current contribution rates for social security based on published reports, and the percentage of GDP being spent on health care. If the contribution rate for social security over the long term is considered to be stable it provides a foundation for a finding of sustainability; however, if the contribution rate is not considered stable then the program in its current form is not sustainable, since contribution increases and/or benefit reductions will be required. The level of spending on health care provides a measure of the extent to which funds are already committed and therefore unavailable for other purposes without affecting the sustainability of health care programs. Given that this research is focusing on retirement, health care and LTC for the elderly, it would have been nice methodologically to have some measure of LTC included in the sustainability index. I was unable to think of a convenient way to incorporate such a component.

The following scoring system was used for each of the stability of the social security contribution rate and the percentage spending on health care, and the average was determined. The average score is the index value that was entered into Table 6 to determine the label with respect to current sustainability.

**Table 1: Current Sustainability Components**

<b>Score</b>	<b>Social Security Funding Likely To Be Stable Over Long Term</b>	<b>Health Care Spending as a % of GDP</b>
<b>1</b>	<b>yes</b>	<b>Less than 10</b>
<b>0.5</b>	<b>possibly</b>	<b>10.0 – 14.9</b>
<b>0</b>	<b>no</b>	<b>15.0 or more</b>

### 2.5.2 Method of Determining Potential Sustainability

To determine an assessment of potential sustainability, the following three components were assessed: old age support ratio (OASR), total tax revenue, and expenditure on public pensions. Each component received a score out of one using the assessment tables, as explained in this

subsection. The index was calculated as the average of the scores on the three components. The label assigned to potential sustainability was determined by entering table 6 with the index score.

OASR is defined as the ratio of the population of working age, i.e., age 20 to 64, to the population age 65 and older. This ratio gives an indicator of the relative size of the tax base. The larger the OASR, the greater is the potential to support programs for the elderly; although there may be significant differences between the population of working age and the actual working population. OASR is a proxy for the likelihood that taxes may be available to transfer for support and care programs for the elderly. A higher OASR indicates that it is more likely that taxes will be available (since a smaller amount of the taxes per individual may be required to be transferred or lower overall tax rates may be required).

Also, OASR gives an indication of the relative size of the elderly population. In this way it does provide some indication of the potential for LTC and how broad a base of working age population there is to support those requiring LTC. In this regard, this measure addresses, at least in part, the concern raised regarding the current sustainability index that it does not include any indication of LTC.

With respect to OASR, three measures were considered and the average calculated to determine the component score. These measures are the:

- OASR in 2008
- projected OASR in 2050
- percentage that the OASR in 2050 is of the OASR in 2008.

The last item is a measure of the extent of the change in OASR. The greater the percentage change the greater the demographic stress on the programs and the less likelihood that the programs can be sustained. The lower the level of the OASR, the lower the likelihood is that the programs will be sustainable. The following two tables show how these measures were evaluated.

**Table 2: Level of OASR Assessment Scale**

<b>OASR (in 2008 or 2050)</b>	<b>Score</b>
4 or higher	1
3.0 – 3.9	0.75
2.0 – 2.9	0.5
1.5 – 1.9	0.25
Less than 1.5	0



**Table 3: Change in OASR Assessment Scale**

<b>OADR 2050 Divided by OADR 2008</b>	<b>Score</b>
60% or higher	1
50% - 59%	.67
40% - 49%	.33
Below 40%	0

For developed countries OASR is expected to decline from 2008 to 2050. This implies that the cost of programs for the elderly will have to be borne by relatively narrow tax base. Total tax revenue as a percentage of GDP measures the extent to which a country is currently taxed and provides an indication of the extent to which taxes could be raised, potentially, to continue to sustain programs, despite a narrowing tax base.

The assessment of total tax revenue was based on the average of the figures for 2004 to 2011, since there can be slight differences between years and this was the most recent information published by the OECD. The total tax revenue includes tax revenue from all levels of government (federal, state, local) and includes social security contributions. The higher the tax revenue as a percentage of GDP, the lower the country's potential to be able to sustain programs dependent on transfer payments or direct taxation. The assessment criteria are shown in Table 4. The logic is that a country with a lower tax level as a percentage of GDP should have more flexibility to raise tax rates to sustain care and support programs. This reasoning does not consider differences in attitudes by country toward the acceptability of tax increases or high levels of tax. However, for an assessment of potential, it was deemed unnecessary to attempt to assess such differences in attitude.

**Table 4: Tax Level Assessment Scale**

<b>Total Tax Revenue as % of GDP</b>	<b>Score</b>
Less than 30%	1
30% - 34.9%	0.8
35% - 39.9%	0.6
40% - 44.9%	0.4
45%-49.9%	0.2
50% or higher	0

Another way to assess a country's flexibility to use tax revenues to support required increases in programs for the elderly as the OASR decreases is to consider other commitments of tax revenues. The percentage of GDP on public pension expenditure was considered. Actual values were used for 2010 and the projected values were used for 2030 and 2050. This provides some indication of public expense, which may not be captured by OASR and its projection; the higher the commitment to public pension expenditure the lower the potential for adjustment in

order to make programs sustainable. A score for public pension expenditure as a percentage of GDP for each of 2010, 2030, and 2050 was derived from Table 5 and the average calculated in order to calculate the score on this component.

**Table 5: Public Pension Expenditure as a Percentage of GDP Assessment Scale**

Public Pension Expenditure as a % of GDP	Score
Under 5	1
5.0 – 8.5	0.75
8.6 – 11.5	0.5
11.6 – 14.9	0.25
15 or higher	0

### 2.5.3 Overall Sustainability Assessment

To assess both measures of sustainability, the following scale and labelling system was used.

**Table 6: Sustainability Labels**

Index Score	Label
0 – 0.20	Unsustainable
0.21 – 0.40	Likely unsustainable
0.41 – 0.60	Possibly sustainable
0.61 – 0.80	Likely sustainable
0.81 or higher	Sustainable

## 3.0 Results

Sustainability was assessed in two ways: whether the plans in their current state were sustainable and the extent that the country had flexibility or potential to make the plans sustainable in the future.

### 3.1 Current Sustainability

The component scores, index score, and sustainability assessment with respect to the current situation is shown in the following table.

**Table 7: Assessment of Current Sustainability by Country**

Identification	Canada	England	France	Germany	Sweden	USA
SS stability	1.0	0.5	0	0.5	1.0	0
HC spending	0.5	0.5	0.5	0.5	0.5	0
Index Score	0.75	0.5	0.25	0.5	0.75	0
Label	Likely sustainable	Possibly sustainable	Likely unsustainable	Possibly sustainable	Likely sustainable	Unsustainable

If the social security rate for the USA or France is to remain stable, there will have to be a reduction in benefits or deficit financing. In both England and Germany there are reports showing the current rate can continue, but some commentators have raised concerns regarding this conclusion. According to the Chief Actuary's reports, the Canadian rate is sustainable over the 75 year projection period. Sweden has a Notional Defined Contribution plan with a flat contribution rate and an automatic balancing mechanism to maintain financial stability, ensuring sustainability.

In all countries, the expenditure on health care exceeds 10 per cent of GDP. In the USA it exceeds 15 per cent of GDP.

### 3.2 Potential for Sustainability

The values of the 2008 OASR and the projected OASR in 2050 that were used to develop the composite score in respect of the OASR are shown in Table 8. By 2050 all the countries are showing the effect of aging; although the USA is projected to be less affected than the other countries. Canada will undergo significant aging due to its large baby boom generation. All the European nations have a lower OASR than the North American countries in 2008, but the ranking by OASR among these countries is projected to change by 2050. Germany has the lowest OASR in both periods.

**Table 8: 2008 OADR and Projected OASR 2050**

<b>Country</b>	<b>OASR 2008</b>	<b>Projected OASR 2050</b>
<b>Canada</b>	4.6	2.1
<b>France</b>	3.5	1.9
<b>Germany</b>	3.0	1.6
<b>Sweden</b>	3.3	2.2
<b>UK</b>	3.7	2.4
<b>USA</b>	4.7	2.6

Source: OECD Statistics

The values of the total tax revenues as a percentage of GDP for 2004 to 2011 are shown in Table 9. The average was calculated and used to enter Table 4 to determine the component score. Sweden shows a marked trend of reducing the percentage of total tax revenue, albeit from a relatively high starting point. If this trend continues it would obtain a higher score on this component.

**Table 9: Total Tax Revenue as a Percentage of GDP**

<b>Country</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
<b>Canada</b>	33.3	33.2	33.4	33.1	32.3	32.1	31.0	31.0
<b>France</b>	43.6	44.1	44.4	43.7	43.5	42.5	42.9	44.2
<b>Germany</b>	35.0	35.0	35.7	36.1	36.5	37.3	36.1	37.1
<b>Sweden</b>	48.1	48.9	48.3	47.4	46.4	46.6	45.5	44.5
<b>UK</b>	34.9	35.4	36.3	35.8	35.8	34.2	34.9	35.5
<b>USA</b>	25.7	27.1	27.9	27.9	26.3	24.2	24.8	25.1

Source: Taxation: Key tables from OECD – ISSN 2075-8510

The values of the 2010 public pension expenditure and the projections of this expenditure in 2030 and 2050, which were used to develop the composite score in respect of the public pension expenditure, are shown in Table 10. The USA is the only country to have a figure below 5 per cent of GDP and it has such a figure in all three observation periods. France's figures are higher than any other country's, in every observation period, and are high ranging from 13.5 to 14.2 per cent of GDP. Germany also has high figures, especially by 2050. Sweden's figures exhibit a different pattern than all the other countries', showing a decline in successive observation periods.

**Table 10: Public Pension Expenditure (% of GDP)**

<b>Country</b>	<b>2010</b>	<b>Projected 2030</b>	<b>Projected 2050</b>
<b>Canada</b>	5.0	6.6	6.3
<b>France</b>	13.5	14.2	14.2
<b>Germany</b>	10.2	11.5	12.3
<b>Sweden</b>	9.6	9.5	9.0
<b>UK</b>	6.7	7.6	8.1
<b>USA</b>	4.6	4.9	4.8

Source: OECD Pensions at a Glance 2011

The composite score for each component, the index score calculated as the average of the component scores, and the label summarizing the potential for adjustment to make the programs sustainability is shown in the following table.

**Table 11: Assessment of Potential Sustainability by Country**

Identification	Canada	England	France	Germany	Sweden	USA
<b>OASR</b>	0.61	0.75	0.56	0.56	0.75	0.64
<b>Tax revenue</b>	0.8	0.6	0.4	0.6	0.2	1
<b>Public pension expenditure</b>	0.75	0.75	0.25	0.42	0.5	1
<b>Index Score</b>	0.72	0.70	0.40	0.52	0.48	0.88
<b>Label</b>	Likely sustainable	Likely sustainable	Likely unsustainable	Possibly sustainable	Possibly sustainable	Sustainable

### 3.3 Combining the Assessments of Sustainability

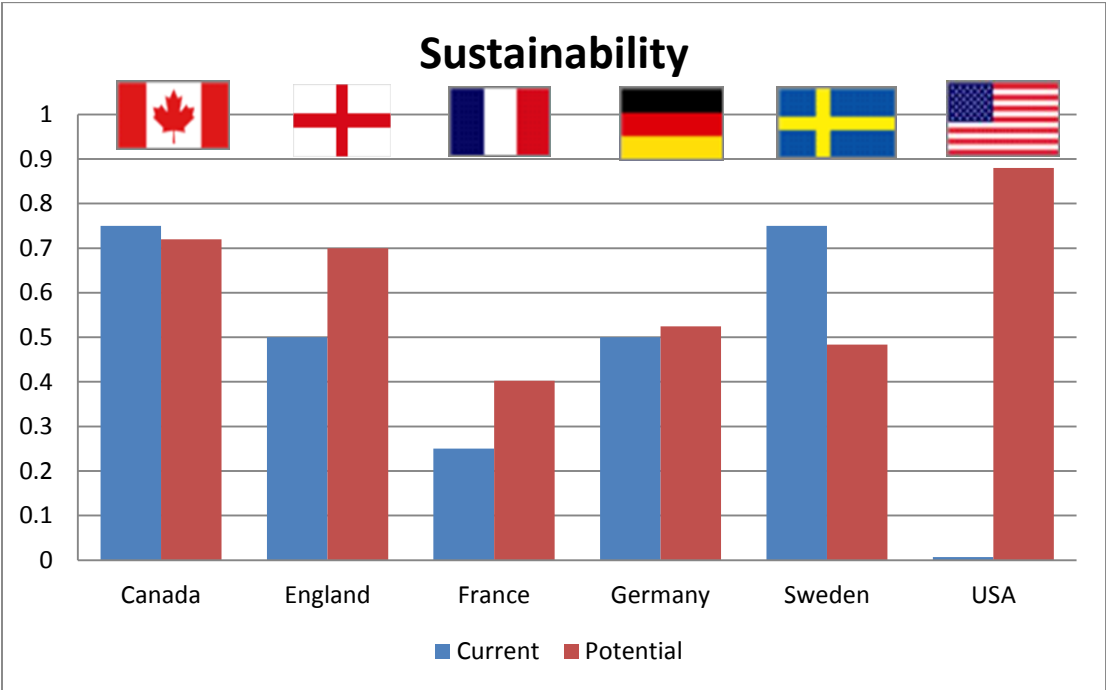
The combination of the current assessment of sustainability and the potential for making the programs sustainable is interesting and shows some stark contrasts. See Chart 1. The assessment of the current situation in the USA is that the programs are completely unsustainable, but the good news is that the USA has greater potential to make its programs sustainable than any other country. The reason that the programs are unsustainable is that the current funding rate for social security is insufficient to provide full benefits over the actuarial projection period of 75 years in combination with a very high level of expenditure on health care, well in excess of 15 per cent of GDP. However, overall the tax burden is relatively very low in the USA, the commitment to public pension expenditure currently and on a projected basis is relatively low, so there is significant fiscal capacity. The aging of the population of the USA through 2050, as measured by the OASR calculations is not as extreme as that experienced by some of the other countries.

Canada and Sweden fair reasonably well. Both countries' programs are assessed as likely sustainable in their current state. Canada is considered to have more potential to make its programs sustainable in the future than is Sweden, if adjustments are required. Canada is aging more rapidly than Sweden; however, its measures of financial flexibility (total tax revenue and public pension expenditure) are much more favourable than Sweden's. Although as noted earlier, if the trend to lower levels of total tax revenue as a percentage of GDP continues in Sweden, the potential sustainability of its programs should improve.

On the current measure, Germany's and England's programs are possibly sustainable. However, with respect to potential sustainability, England is better placed than Germany. England has more favourable demographics as measured by the OASR component and less commitment to public pension expenditures than Germany has. England's programs are likely sustainable whereas Germany's are possibly sustainable. France faces a difficult situation. On the current measure, its programs are likely unsustainable and its potential to make adjustments is limited and so on the potential measure it is assessed as being likely unsustainable. France has

significant commitments to public pension expenditure which will constraint flexibility. Although not included in this analysis, it can be seen from Table 9 that total tax revenue as a percentage of GDP in 2011 is approaching the boundary for a downgrade in this component. The administration of President Hollande, elected in 2012, has been increasing taxes, which may make the potential sustainability of France’s programs even weaker.

**Chart 1: Sustainability Assessments by Country**



**4.0 Implications of the Adequacy Research**

In this section the results of the research on adequacy (Andrews, 2013) are combined with the results of this research on sustainability, and some implications are discussed. Before doing this it is necessary to summarize the results of the research on adequacy.

**4.1 How is adequacy defined?**

Adequacy is a concept that does not have a unique definition in practice. It may vary by country – what is deemed adequate in Canada will be considered more than adequate in India. It may vary within a country – the adequate in the south central part of Canada might be woefully inadequate in the far north of Canada. It may vary by individual – the adequate for a child may not be adequate for an adult. It may vary by family composition – the adequate for a couple may be less than what is adequate for two independently living adults.

It also requires a determination of some minimum standard and the determination of such a standard will require many judgements. For example, should the minimum standard be a measure of poverty, i.e., the minimum level of food and accommodation to subsist? Or should

adequacy include more, such as access to health care when sick, education of children from some minimum age to some other age, freedom from domination by others, protection from criminal acts or wrongful persecution? If the minimum standard is a measure of poverty, should it be an absolute measure or a relative measure?

Individuals will answer such questions differently. Countries will answer such questions differently. The answers may depend on the country's resources and on its political structure, e.g., representative democracy or authoritarian rule. It may also depend on the country's dominant philosophy or religion. Are all individuals considered to have a right to an adequate living or does one's caste or class at birth influence what might be considered adequate?

The approach used in this research (Andrews, 2013) is to look at the income and benefits provided by social security (retirement income), health care, and LTC and to compare it to the level of expenses generally incurred for two different family compositions (C and S) in two different health states (N, Y), for a total of four combinations (CN, CY, SN, SY). The two family compositions are:

- Married couple both aged 65 to 70 (C)
- Surviving female spouse aged 85 (S).

For each of these two compositions, I consider two health states:

- Living in private rental accommodation (N)
- Female spouse in institutional care (Y).

Finally, I assume that the male spouse had a full career of work and earned the average wage in each year and that the female spouse did not work. It was also assumed that no other savings or income was available.

For each family composition, the extent to which general living expenses associated with food, transportation, accommodation, entertainment, and taxes could be met was considered. If these expenses as well as a specified level of drug and care expenses could be met a higher score was assigned. The average of the four family composition scores was calculated and an overall assessment of adequacy was assigned as shown in the following table.

**Table 12: Method of Summarizing Country’s Adequacy Scores and Label**

<b>Overall Score And</b>	<b>At Least 1 Raw Score of 1</b>	<b>Label</b>
0	No	Completely inadequate
.20 > score > 0	No	Mainly inadequate
.40 > score > .20	No	Often inadequate
.40 > score > .20	Yes	More inadequate than not
.60 > score > .40	No or Yes	Not adequate or inadequate
.80 > score > .60	No	More adequate than not
.80 > score > .60	Yes	Often adequate
1 > score > .80	Yes or No	Mainly adequate
1	Yes	Completely adequate

## 4.2 Limitations in Assessing Adequacy

Certainly this approach to assessing adequacy has limitations and these are discussed in detail in Andrews (ibid). Three of the major limitations are described below.

Different countries have designed their systems to provide different levels of social protection, in line with the country’s culture, social philosophy, and beliefs in the objectives of state-financed welfare systems. For example, social security systems in Scandinavian countries tend to be designed to deliver more generous benefits than the social security systems of the England, USA and Canada. Esping-Andersen (1990) has written the classic text on this subject and categorizes the systems by design philosophy. Nonetheless, the designers of the social security systems in each country might maintain that the social security system is adequate for the purpose for which it was designed. However, for the purpose of this comparative research, a common definition of adequacy has been selected. The level established may be considered adequate by the country but fail the test of adequacy as defined in this research.

Moreover, only state provided or state mandated benefits and programs are considered. It is acknowledged that certain countries expect that the individual will save for future contingencies and to ensure that benefits are adequate. It is intended that the fuzzy-set methodology, where countries are assessed on adequacy with respect to membership in a set will mitigate to some extent these limitations.

The selection of the family compositions based on a one-earner male head of household model could be criticized as being old fashioned and not representative of the modern work force, which has high female participation rates, single parent structures, and marriages that end in divorce. That is valid. However, for individuals who are currently retired the one-earner male head of household model was much more prevalent than it is among today’s work force.



### 4.3 Results of the Adequacy Research

The following table summarizes the calculations for the four family compositions for each country, showing the raw score, the overall score, and the applicable label, as specified in Table 12.

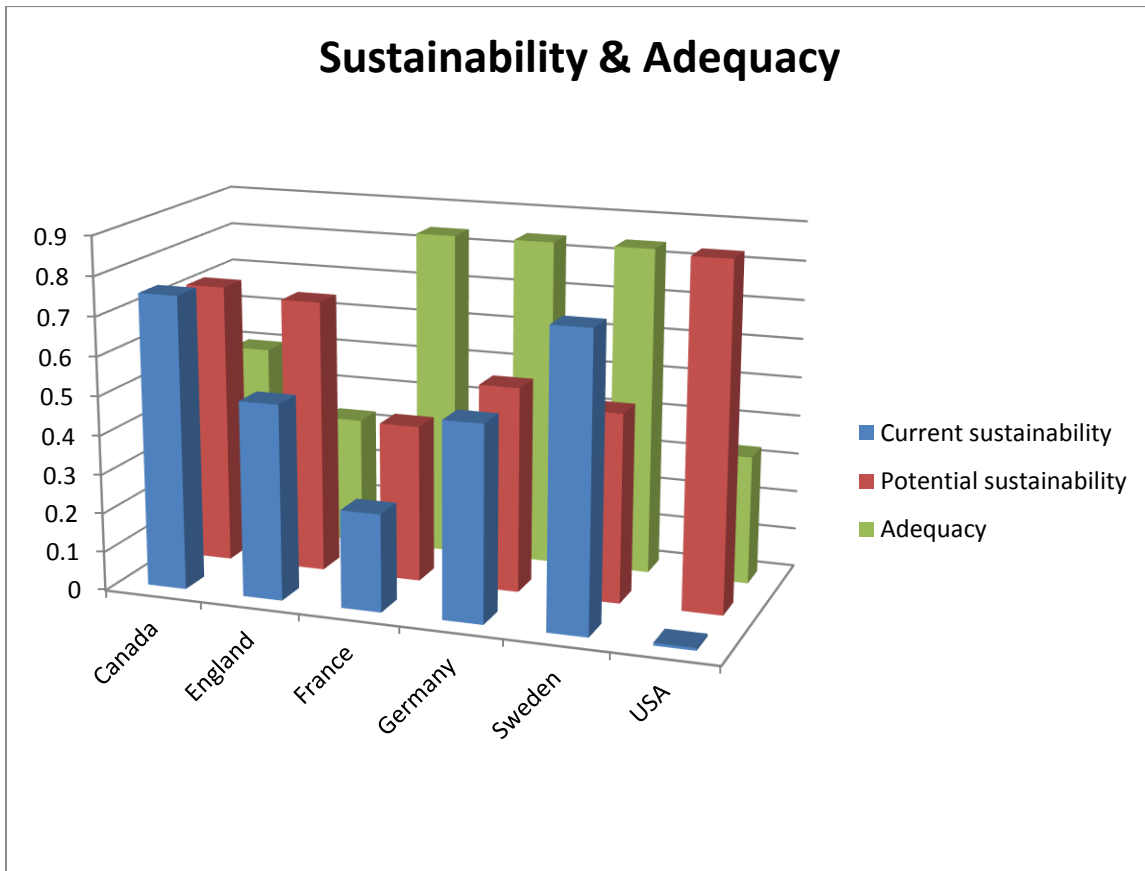
**Table 13: Summary of Adequacy Assessment and Assignment of Label**

Identifier	Canada	England	France	Germany	Sweden	USA
CN	0.33	0.33	1.0	1.0	1.0	0.33
CY	0.67	0.33	0.67	1.0	1.0	0.33
SN	0.33	0.33	1.0	0.33	0.33	0.33
SY	0.67	0.33	0.67	1.0	1.0	0.33
Index Score	0.5	0.33	0.84	0.84	0.84	0.33
Label	Not adequate or inadequate	Often inadequate	Mainly adequate	Mainly adequate	Mainly adequate	Often inadequate

### 4.4 Implications

The following chart combines the adequacy research with the findings of this research on sustainability. The front two columns show current and potential sustainability respectively and the back column shows adequacy. The height of each column is based on its index score on the respective measure.

**Chart 2: Sustainability and Adequacy**



The chart shows that England and the USA have programs that are often inadequate; however, the situation with respect to sustainability differs. In England the programs are possibly sustainable, whereas in the USA they are unsustainable. Both countries have strong potential for sustainability. The potential for sustainability is very strong in the USA because of its relatively low levels of taxation, its relatively low public pension commitment, and its more moderate rate of aging. But there is strong resistance to tax increases in the USA, so whether this potential can be realized is debatable. Sweden provides a contrast to these two countries. Its programs are mainly adequate and its programs are currently likely sustainable. Yet its potential sustainability is less than both of England and the USA. An immediate reaction might be to scoff at Sweden because of its welfare state – that such a situation could not be implemented elsewhere. But the evidence suggests that the Swedish welfare state is changing – to improve productivity and to incorporate private companies in the delivery of public services (Schumpeter, 2013).

This research suggests that among the countries with a substantial welfare state (Sweden, Germany and France), it is not Sweden that is the concern, but France. Both its current and potential sustainability is considered likely unsustainable. Germany's programs, on both a current and potential assessment, are considered possibly sustainable. This should be a major concern for the European project, for which Germany is considered the linchpin, with France by

its side. How will these countries react nationally if their programs prove unsustainable? What will their reaction to Europe be? What will Europe's reaction to them be?

Canada is in a different space in the sustainability-adequacy grid. Its programs are not adequate or inadequate and are assessed as likely sustainable on both current and potential measures. Its retirement program philosophy is to provide considerable room for individual saving and employer-provided pension plans. There is a growing divide in pension plan coverage between public sector workers, with coverage, and private sector workers without access to defined benefit pension plans. If individual savings plays the role contemplated by the philosophy, then the status quo may continue. However, if individual savings are inadequate then there will be pressure to improve the adequacy of the coverage. This could prove challenging for governments if some workers have adequate coverage and others do not. There will not be a one-size-fits-all solution. The positive aspect is Canada's position with respect to sustainability gives it flexibility to adapt.

## 5.0 Future Research

Before making some concluding observations I identify four areas for further research. First, the measures used to construct the indices for current and potential sustainability are intended to illustrate an approach to assessing sustainability. It is not suggested that this is the only approach that might be used, or that the method of calculating the average to determine the index value is the only appropriate method of combining the various components. It would be useful to consider other measures of sustainability and to study the impact on the findings of using different weightings of components in calculating the index score. Moreover, the fuzzy set approach is used because there are not clear boundaries between being in or being out of adjacent sets. It would be interesting to change the boundaries by small amounts and see how the findings are affected.

Second, the assessment of potential sustainability does not consider social attitudes with respect to levels of taxation and government involvement. It would be interesting to analyse such factors in order to refine the measure of potential sustainability.

Third, it would be useful to be able to include factors such as private savings, employer-provided benefits that are not mandated, and other support provided by families, as described below. The inclusion of such benefits might affect the assessment of adequacy. If adequacy were increased then sustainability, especially potential sustainability, might be impacted.

Historically, the family has been expected to bear the responsibility for LTC provision. In the LTC programs of many developed countries, most of the expense of LTC provision outside an institution is the individual's or the family's responsibility. Many countries are experiencing below-replacement levels of fertility, resulting in smaller family sizes. Moreover, the average age of (extended) families is rising. As individuals age they become more likely to experience

dementia or Alzheimer's disease, which can make caring issues even more challenging. All of these factors jeopardize the ability of families to deliver LTC in accordance with historical expectations. Such changes have implications for the sustainability of any country's programs.

Fourth, it would be useful to develop a sustainability model that would permit the testing of various assumptions. Sustainability will be impacted by health status of the population as well as by the type of care that is required. It would be useful to have a model that would permit testing of questions such as the following:

- What is the implication on sustainability if life expectancy increases or if health status deteriorates?
- What are the implications of the changing burden of non-communicable disease, e.g., obesity, or an aging population may have more chronic conditions and may be more likely to experience dementia?
- What are the implications of raising retirement ages – not only might it make care and support more affordable but it might lead to a more healthy population entering retirement?

The manner in which current and potential sustainability are assessed in this paper does make some allowance for future changes. The stability of social security contribution rates typically makes some consideration of mortality improvements. The use of projected OASR and projected expenditures for public pensions makes some allowance for population aging. Nonetheless, it would be useful to have a sustainability model that permitted the assessment of changes in particular assumptions.

This research has made several contributions to the study of the sustainability of care and support systems for the elderly in developed countries.

1. It has considered the combined effect of social security, health care and LTC in assessing sustainability.
2. It has employed the fuzzy set methodology to this issue, resulting in a combination of a quantitative and qualitative assessment.
3. It has constructed separate indices to measure current and potential sustainability.
4. In combination with the adequacy research, it has shown how different countries face different challenges, i.e., the USA has current issues regarding adequacy and sustainability, Sweden's programs are mainly adequate and likely sustainable, and France's programs although mainly adequate are likely unsustainable.

In all these ways, this research sets the stage for further investigation, which may lead to social policy development.

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## 7.0 References

Andrews, D. 2013. Mapping the Adequacy of Care and Support for the Elderly in Developed Countries. Working Paper prepared for the Society of Actuaries' Living to 100 Symposium 2014.

Auerbach, A.J., L.J. Kotlikoff, and W. Leibfritz, Eds. 1999. *Generational Accounting around the World*. The University of Chicago Press, Chicago and London.

Baroni, Elisa, and Axelsson, Runo. 2012. *Annual National Report 2012 Pensions, Health Care and Long-term Care Sweden*. European Commission, DG Employment, Social Affairs and Inclusion.

Bertelsmann Stiftung. 2011. SGI Sustainable Pension Indicators 2011. [http://www.sgi-network.org/index.php?page=indicator\\_quant&indicator=S13\\_4](http://www.sgi-network.org/index.php?page=indicator_quant&indicator=S13_4)

Borsch-Supan, Axel, Reil-Held, Anette, and Schabel, Reinhold. 2001. Pension Provision in Germany. in *Pension Systems and Retirement Incomes across OECD Countries*. 2001. edited by Richard Disney and Paul Johnson. Edward Elgar, Cheltenham, U.K.

Brown, John. 1995. *The British Welfare State A Critical History*. Blackwell Publishers, Oxford, U.K.

Chevreur, Karine, Durand-Zaleski, Isabelle, Bahrami, Stephane, Hernandez-Quevedo, Cristina, and Mladovsky, Philipa. 2010. France: health system review. *Health Systems in Transition* Vol. 12 No. 6. European Observatory on health Systems and Policies.

Desrosieres, Alain. 1996. Statistical traditions: an obstacle to international comparisons? in *Cross-National Research Methods in the Social Sciences*. 1996. edited by Linda Hantrais and Steen Mangen. Pinter, London, U.K.

Directorate-General for Economic and Financial Affairs. 2007. Pension Schemes and Projection Models in EU-25 Member States. *European Economy Occasional Papers* Number 35. European Commission. Brussels, Belgium.

Disney, Richard, and Johnson, Paul. 2001. An Overview. in *Pension Systems and Retirement Incomes across OECD Countries*. 2001. edited by Richard Disney and Paul Johnson. Edward Elgar, Cheltenham, U.K.

Dutton, Paul V. 2002. *Origins of the French Welfare State: The struggle for social reform in France 1914-1947*. Cambridge University Press, Cambridge, U.K.

Eardley, Tony. 1996. Lessons from a study of social assistance schemes in OECD countries. in *Cross-National Research Methods in the Social Sciences*. 1996. edited by Linda Hantrais and Steen Mangen. Pinter, London, U.K.

Emmerson, Carl, and Johnson, Paul. 2001. Pension Provision in the United Kingdom. in *Pension Systems and Retirement Incomes across OECD Countries*. 2001. edited by Richard Disney and Paul Johnson. Edward Elgar, Cheltenham, U.K.

Ervik, Rune. 2009. A Missing Leg of Ageing Policy Ideas: Dependency Ratios, Technology and International Organizations. [http://www.cccg.umontreal.ca/rc19/PDF/Ervik-R\\_Rc192009.pdf](http://www.cccg.umontreal.ca/rc19/PDF/Ervik-R_Rc192009.pdf)

Esping-Andersen, Gosta. 1990. *The Three Worlds of Welfare Capitalism*. Polity Press, Cambridge, U.K.

Evans, Martin. 1996. Exploring statistics and national rules on social security. in *Cross-National Research Methods in the Social Sciences*. 1996. edited by Linda Hantrais and Steen Mangen. Pinter, London, U.K.

Genworth. 2012. Cost of care survey. [https://www.genworth.com/dam/Americas/US/PDFs/Consumer/corporate/coc\\_12.pdf](https://www.genworth.com/dam/Americas/US/PDFs/Consumer/corporate/coc_12.pdf)

Glendinning, Caroline and Moran, Nicola. 2009. Reforming Long-term Care: Recent lessons from other Countries. Working Paper No. DHP 2318. Social policy research Unit. University of York.

Glover, Judith. 1996. Epistemological and methodological considerations in secondary analysis. in *Cross-National Research Methods in the Social Sciences*. 1996. edited by Linda Hantrais and Steen Mangen. Pinter, London, U.K.

Gordon, Margaret S. 1988. *Social Security Policies in Industrial Countries*. Cambridge University Press, new York, U.S.A.

Government of Canada. 2013. Canada Pension Plan - Payment Amounts. <http://www.servicecanada.gc.ca/eng/isp/pub/factsheets/rates.shtml>

----- . 2013. Old Age Security Payment Amounts. <http://www.servicecanada.gc.ca/eng/isp/oas/oasrates.shtml>

- Hantrais, Linda. 2009. *International Comparative Research Theory, Methods and Practice*. Palgrave MacMillan, Basingstoke, U.K.
- Heritage Foundation. 2013. 2013 Index of Economic Freedom. <http://www.heritage.org/index/explore?view=by-variables>
- Hoffman, Michael, and Dahlby, Bev. 2001. Pension Provision in Canada. in *Pension Systems and Retirement Incomes across OECD Countries*. 2001. edited by Richard Disney and Paul Johnson. Edward Elgar, Cheltenham, U.K.
- Jenkins, W.I. 1978. *Policy Analysis A Political and Organisational Perspective*. Martin Robertson & Company Limited, London, U.K.
- Jousten, Alain. 2001. Pension Provision in the United States. in *Pension Systems and Retirement Incomes across OECD Countries*. 2001. edited by Richard Disney and Paul Johnson. Edward Elgar, Cheltenham, U.K.
- Legendre, Nadine, and Pele, Louis-Paul. 2001. Pension Provision in France. in *Pension Systems and Retirement Incomes across OECD Countries*. 2001. edited by Richard Disney and Paul Johnson. Edward Elgar, Cheltenham, U.K.
- Levi-Faur, David. 2006. A Question of Size? A Heuristics Stepwise Comparative Research Design. in *Innovative Comparative Methods for Policy Analysis*. 2006. edited by Benoit Rihoux and Heike Grimm. Springer, New York, U.S.A.
- MacDonald, Bonnie-Jeanne, Andrews, Doug, and Brown, Robert L. 2010. The Cost Of Basic Needs For The Canadian Elderly. *Canadian Journal On Aging/Revue canadienne du vieillissement*, Volume 29, Issue 01, pp. 39 – 56.
- McKay, Stephen, and Rowlingson, Karen. 1999. *Social Security in Britain*. MacMillan Press Ltd, Basingstoke, U.K.
- Miller, Gale and Dingwall, Robert. 1997. *Context & Method in Qualitative Research*. Sage Publications, London, U.K.
- Monticone, Chiara, Ruzik, Anna, and Skiba, Justyna. 2008. Women's Pension Rights and Survivor's Benefits: A Comparative Analysis of EU Member States and Candidate Countries. ENEPRI Research Report No. 53. ISBN 978-92-9079-787-6. [www.enepri.org](http://www.enepri.org).
- OECD. 2012. *Pensions at a Glance 2011: Retirement-Income Systems in OECD and G20 Countries*. OECD Publishing. [http://dx.doi.org/10.1787/pension\\_glance-2011-en](http://dx.doi.org/10.1787/pension_glance-2011-en).
- . 2012. Taxation: Key tables from OECD – ISSN 2075-8510. [http://www.oecd-ilibrary.org/taxation/total-tax-revenue\\_20758510-table2](http://www.oecd-ilibrary.org/taxation/total-tax-revenue_20758510-table2)

-----, 2013. Statistics. <http://www.oecd.org/statistics/>

Office of Retirement and Disability Policy. 2012. *Social Security Programs Throughout the World: Europe 2012*. U.S. Social Security Administration.

<http://www.ssa.gov/policy/docs/progdesc/ssptw/2012-2013/europe/germany.html>.

<http://www.ssa.gov/policy/docs/progdesc/ssptw/2010-2011/europe/sweden.html>.

Ontario Seniors Secretariat. 2013. Health and Wellness: Ontario Drug Benefit Program.

[http://www.seniors.gov.on.ca/en/seniorsguide/health\\_9.php](http://www.seniors.gov.on.ca/en/seniorsguide/health_9.php)

Oyen, Else (ed.). 1990. *Comparative Methodology Theory and Practice in International Social Research*. SAGE Publications Ltd, London U.K.

Pfarr, Christian and Schmid, Andreas. 2013. The political economics of social health insurance: the tricky case of individuals' preferences. Discussion Paper 01-13. Universitat Bayreuth.

<http://ssrn.com/abstract=2222550>

Purcell, Patrick J. 2012. Income Replacement Ratios in the Health and Retirement Study. *Social Security Bulletin* Vol. 72, No. 3, 37-58.

Ramage-Morin, Pamela L. 2009. Medication use among senior Canadians. Component of Statistics Canada Catalogue no. 82-003-X Health Reports. Statistics Canada

<http://www.statcan.gc.ca/pub/82-003-x/2009001/article/10801-eng.pdf>

Ragin, Charles C. 1991. Introduction: The Problem of Balancing Discourse on Cases and Variables in Comparative Social Science. in *Issues and Alternatives in Comparative Social Research*. 1991. edited by Charles C. Ragin. E.J. Brill, Leiden, The Netherlands.

----- 1994. *Constructing Social Research The Unity and Diversity Method*. Pine Forge Press, Thousands Oaks, U.S.

----- 2000. *Fuzzy-set Social Science*. The University of Chicago Press, Chicago, U.S.

----- 2006. The Limitations of Net-Effects Thinking. in *Innovative Comparative Methods for Policy Analysis*. 2006. edited by Benoit Rihoux and Heike Grimm. Springer, New York, U.S.A.

Rein, Martin and Schmahl, Winfried. 2004. *Rethinking the Welfare State: The Political Economy of Pension Reform*. Edward Elgar Publishing Limited, Cheltenham, U.K.

Ribbe, Miel W., Ljuggren, Gunnar, Steel, Knight, Topinkova, Eva, Hawes, Catherine, Ikegami, Naoki, Henrard, Jean-Claude, and Jonnson, Palmi, V. 1997. Nursing homes in 10 nations: a comparison between countries and settings. *Age and Ageing*; 26-S2: 3-12.



Rihoux, Benoit and Grimm, Heike. 2006. *Innovative Comparative Methods for Policy Analysis*. 2006. Springer, New York, U.S.A.

Rys, Vladimir. 2010. *Reinventing social security worldwide: Back to essentials*. The Policy Press, Bristol, U.K.

Scarbrough, Elinor and Tanenbaum, Eric. 1998. *Research Strategies in the Social Sciences: A Guide to New Approaches*. Oxford University Press, Oxford, U.K.

Schmahl, Winfried. 2004. Paradigm shift in German pension policy: measures aiming at a new public-private mix and their effects. in *Rethinking the Welfare State The Political Economy of Pension Reform*. edited by Rein, Martin and Schmahl, Winfried. 2004. Edward Elgar, Cheltenham, U.K.

Schumpeter. 2013. A hospital case. *The Economist*, Volume 407, Number 8836. The Economist, London, U.K.

Schunk, Michaela. 1996. Constructing models of the welfare mix: care options of frail elders. in *Cross-National Research Methods in the Social Sciences*. 1996. edited by Linda Hantrais and Steen Mangel. Pinter, London, U.K.

Silverman, David. 2000. *Doing Qualitative Research A Practical Handbook*. SAGE Publications, London, U.K.

Simonin, Bernard. 1996. Evaluating European observatories and networks on social policy. in *Cross-National Research Methods in the Social Sciences*. 1996. edited by Linda Hantrais and Steen Mangel. Pinter, London, U.K.

Society of Actuaries, Urban Institute, and WISER. 2012. *The Impact of Running Out of Money in Retirement*.

<http://www.soa.org/search.aspx?go=True&q=reports+of+committee+on+Post+retirement+needs+and+risks&page=2&pagesize=10&or=True>

Spicker, Paul. 1993. *Poverty and social security Concepts and principles*. Routledge, London, U.K.

-----1996. Normative comparisons of social security systems. in *Cross-National Research Methods in the Social Sciences*. 1996. edited by Linda Hantrais and Steen Mangel. Pinter, London, U.K.

The National Commission on Fiscal Responsibility and Reform. 2010. *The Moment of Truth*. The White House, Washington, U.S.A.

Valdes-Prieto, Salvador. 1997. *The Economics of Pensions*. Cambridge University Press, Cambridge, U.K.

Walker, Robert. 1985. *Applied Qualitative Research*. Gower Publishing Company Limited, Aldershot, U.K.

Walliman, Nicholas. 2011. *Research Methods The Basics*. Routledge, Abingdon, U.K.

Williams, Karel and Williams, John. 1987. *A Beveridge Reader*. Allen & Unwin Ltd, London, U.K.