German long term care experience and possible applications to other markets

22.04.2016 / Dr. Ulrich Stellmann
Motivation

Some German basics

Social elements in private coverage – this works?
1. Background: a) Reasons for importance of issue

• Longer lifetimes mean more people living to advanced ages
• Medical advances enable chronic patients to live for many years
• Lower fertility rates leading to fewer family caregivers and sources of funding on a pay-as-you-go funding system
• Family - increased mobility, financial/time strain on family members
• Pressures on hospitals and short-stay facilities to reduce stays
• Costs will require an ever increasing share of GDP
• In many countries, inadequate preparation for long-term care
Dimensions of universal health care
Source: WHO 2008
Nations with universal health cover
who is covered, what services are covered, and how much of the cost is covered

Nations with universal health care (determined by proxy of ≥90% skilled birth attendance and ≥90% social insurance coverage)

Nations with legislated mandate for Universal health coverage, but which have not yet reached thresholds above
Age pyramids for the EU25 population in 2004/2050 compared to China 2010/2050
Home alone...even more so for the 80+
Who is the majority in care? Women!
Source: International Expert Meeting “Monitoring Long-Term Care for the Elderly”

More women survive to old-age than men

Gender ratio at the age of 65 (2006)

Gender ratio of the population aged 65+
Source: Eurostat, UNECE, UNPP.

More women than men receive care: the case of home care

Share of women among 65+ beneficiaries of home care (2007 or most recent date)

Source: Own calculations based on national sources, OECD and Eurostat demographic data, Huber et al. (2009, forthcoming).
Who cares? It’s a women’s world!
Source: National sources, OECD (2005) and EUROFAMCARE national reports.
CARP Canada advises to investigate Germany’s LTC Insurance System

October 21, 2011
Long wait lists, few homecare providers, and expensive co-payments characterize feelings toward long-term care (LTC) in Canada……..

The German Case
Germany provides a good test case for alternate ways of funding and providing LTC. Germany’s population is aging even more rapidly than Canada’s. More than 20 percent of the German population is over 65 and 5 percent of the population is over 80, compared to Canada, where the numbers are 15 percent and 4.5 percent respectively. ............

The German model of separate insurance may or may not work in Canada, but as our own population ages and budget deficits increase, we too will have to think hard about creative solutions to healthcare challenges. If nothing else, Canada should take from the German model the understanding that LTC requires political and economic commitment and a common vision for aging.
Motivation

Some German basics

Social elements in private coverage – this works?
Labor force and working people which contributes to the social insurance (in 1,000)

Total population in 2012 = 81.917 Tsd.
Gender dependent age distribution

Quelle: Statistisches Bundesamt: Online-Datenbank: Fortschreibung des Bevölkerungsstandes (Stand: 31.05.2012)
Lizenz: Creative Commons by-nc-nd/3.0/de
The 5 pillar social insurance approach in Germany includes long term care

The Social Long-Term Care Insurance (SLTCI) was introduced in 1995 and is one of the main pillars of the German system of social insurances

Legal basis: The foundation of the German welfare system is laid out in the German Constitution (Grundgesetz) that guarantees living in dignity.
Development of contributions to the social system

Declining situation for the contributions for unemployment insurance, increasing payments for health and LTC-insurance

<table>
<thead>
<tr>
<th>Table 1: Development of Contribution Rates for Social Insurances (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>1995</strong></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Unemployment Insurance</td>
</tr>
<tr>
<td>Health Insurance*</td>
</tr>
<tr>
<td>Long-term Care Insurance</td>
</tr>
<tr>
<td>Pension Insurance</td>
</tr>
<tr>
<td>Employees subject to social insurance contribution (in 1000)</td>
</tr>
</tbody>
</table>

* values in brackets apply to East Germany

** employees’ contribution is 0.25% points higher for childless people

Source: Federal Ministry of Labor and Social Affairs (2009)

Caps for 2015 = 49,500 € p.a. for social health, & LTC (54,900 € p.a. threshold for private cover)
72,600 € (62,400 €) p.a. for pension & unemployment western (eastern) part
The majority of the population (90%) is covered in the SLTCI following the pay-as-you-go principle

**Covered people:**
SLTCI covers roughly 90% of the people. The rest (ca. 10%) are covered in the **private long term care insurance**. Hint: Same benefits but a different contribution scheme

**Contributions:**
- **SLTCI:** A fixed percentage of the salary / pension up to a certain income threshold, the so-called social insurance ceiling. [pay-as-you-go principle]
  Special regulations for unemployed people and other special groups of people (e.g. get payments from welfare etc.)
- **Private:** Premiums calculated by **age and level premium** – limited by the **maximum** premium of SLTCI [deferred benefit coverage principle incl. premium adjustment]
Roughly 70% of the cared people are cared at home in Germany 2009 – 67% women

2.34 million total number of cared people in 2009

Provided at home: 1.62 million (69%)  
- by relatives: 1.07 million
- with the help of professionals: 555 000

Provided inpatient: 717 000 (31%)  
[75% women]
- 12 000 care provider with 269 000 employees
- 11 600 institutions with 621 000 employees

If we assume that one relative takes care of the cared person, than the rational of cared people and people providing the service is 1:1
Questions: Is this market relevant for the GDP?
Long-term care is a partially comprehensive insurance with the aim to cover the basic needs.

Therefore, special public long-term care assistance as part of social welfare was not abolished but its relevance decreased significantly.

Figure 1: Special Public Long-term Care Assistance: Recipients and Expenses (1991 to 2007)

• Motivation

• Some German basics

• Social elements in private coverage – this works?
1. Gender independent premiums

2. No payments for child

3. Special regulations for other groups:
   - Students
   - Unemployed
   - Civil servants
   - ...........

4. Payment for married couples = 2x or 1x contributions*

5. Contributions of the salary (~2% with cap**) are shared with the employer (50|50)***

* The none working part is free of charge

** Cap for 2015 = 69,600 € p.a. [ x 2% / 12 ~ 116 € → 58 € p.m. (= 50|50)]

*** For retires instead of the salary their pensions are used
Traditional private calculus for long term insurance *individual* based

Whole life level premiums - Building of age provisions

![Diagram showing whole life level premiums and building of old age provisions over age and age of inception.](image-url)
Gender dependent net premium $P_x$ resp. $P_y$
Gender independency:
→ Not so complicated, use “interpolation”

Shift the male premium a little bit upwards (multiply with the factor $C_{gender}$) and add for all ages the mistake (equalization)

$\rightarrow P_1(\text{age}):=0.6 \times P(\text{female}) + 0.4 \times P(\text{male})$*

* For private German LTC a slightly different algorithm is used
Shift the age independent premium a little bit upwards (add amount for child)

$P_2(\text{child+special groups}) := P_1(\text{age}) + C_{\text{child+special groups}}$

Children are for free and special groups e.g. students has reduced contributions.
For married couples the maximum is set to 1.5 x maximum amount of SLTCI

\[ P_3(\text{married couples}) := P_2(\text{child+special groups}) + C_{\text{married couples}} \]

SLTCI married couples: Payment for married couples = 2x or 1x contributions. The none working part is free of charge.
Capped premium via SLTCI: → Challenging job (iteration used)

For including the cap from SLTCI iteration algorithm is necessary, to find the right age

\[ P_{\text{LTCI}} := P_{3(\text{married couple})} + C_{\text{SLTCI Cap}} \]

Cap for 2015 = 69,600 € p.a. [ x 2% / 12 ~ 116 € → 58 € p.m. (≈ 50|50)]

Hint: For the above cap costs must be taken into account.
Why there is a need for a pooling mechanism?

Insurance companies may have:
- different age structure of the insured portfolio,
- different financial burden because
  - premium-free children,
  - premium limitations for married couples,
  - premium limitation for single persons,
- different portfolio mix of males and females,
- different mix of the risk structure

Hint: Roughly 40 private health insurer are within the pool
Strong development of the aging reserve in private LTC. Starting at 500 Mio. raising up to approximately 25 bn € in 2013
After evaluating the last 20 years, following improvements are identified:
- Include a care level for dementia
- Adjust the care levels and payments
- Improve the categorization mechanism
  → SLTCI-Reform 2016

→ The private LTCI has to follow. Again a challenging job, but today a strong data base is available

→ Some consequences for the calculus in case of an adverse scenario (increased length of stay in each care level)
Capped premium via SLTCI:
→ First non cap age moves to the left (ok)
→ No solution because all ages are caped (?)

For including the cap from SLTCI iteration algorithm is necessary, to find the right age

\[ P(LTCI) := P_3(married\ couple) + C_{SLTCI\ Cap} \]

Cap for 2015 = 69,600 € p.a. \[ \times 2\% \/ 12 \sim 116 \text{ €} \rightarrow 58 \text{ € p.m.} \ (= 50\,50) \]

Hint: For the above cap costs must be taken into account.
Current situation in other markets:
- Rapidly aging population (≈ GER 1995)
- No social scheme for LTC coverage (≈ GER 1995)
- Private LTC (sum insured) insurance products available (≠ GER 1995)
- Low infrastructure to provide professional care (≈ GER 1995)
- Care giving activities are provided mostly by relatives (≈ GER 1995)
- Weak statistical information available (≈ GER 1995)

→ Similar to GER 1995 ?

Application possible? Yes! How?
- SLTCI for people with a salary lower some threshold X on a “pay as you go principle” similar to the German SLTCI
- Private LTCI (same benefit = SLTCI) for people with a salary > X level premium based
- All people should be insured (e.g. child, civil servants, self employed etc.)
- ……
Some advantages
- Move forward to an universal heath system
- Managing active on of the aging problems
- Improve the situation of the elderly and the care givers
- Creates a quite huge industry (professional care provider, care giver, impatient care, care article supplier etc.)
- Private / social partnership to balance the payments
- Relax the situation of the relatives

....

Some necessary pre-requisites and conditions
- Right on SLTCI must be fixed in the social scheme - legal aspects must be solved (contributions for LTC insurance are tax deducting)
- Private LTCI must include the right to adjust the premium under some predefined given conditions (regulatory aspects needs to be solved)
- ....
Questions

E-Mail: ulrich.stellmann@ergo.de
Back up

Application of K-means clustering
1. In a first step we used ordinal scaled/pseudo-metric variables to obtain an index for the organizational depth \((X_i)\) and the financial generosity \((Y_i)\) of LTC systems. The indices were derived as follows:

\[
\text{Organization dept}: \quad X_i = \sum_{j=1}^{n} O_{ji}, \quad i = 1, \ldots, 22, \\
\text{Financial generosity}: \quad Y_i = \sum_{k=1}^{m} F_{ki}, \quad i = 1, \ldots, 22,
\]

Where \(i\) indexes the 22 countries of our dataset, \(O_{ij}\), are the organizational variables and \(F_{k}\) are the financial variables using the following variables.

2. In the second step, the results was clustered using usual cluster algorithms (for example: K-means clustering)

Source: A Typology of Long-Term Care Systems in Europe ENEPRI Research Report No. 91/August 2010
ENEPRI = European Network of Economic Policy Research Institutes
The selection of variables is crucial when designing a typology. To identify and select the variables for deriving the indices of organizational depth (Xi) and financial generosity (Yi), we applied a four-step process:

1) identification of relevant topics from the literature plus some additions we deemed necessary;
2) definition of variables that a) describe those topics and b) can be used in the typology;
3) checks on the availability, quality and comparability of the corresponding information; and
4) attempts to find close substitutes for desirable variables with insufficient availability or quality of information

This procedure resulted in six variables describing the organization of LTC systems - means-tested access, entitlement, the availability of cash benefits, the choice of provider, quality assurance and integration and two variables characterizing the financing of LTC systems - public expenditures for LTC as a share of GDP and cost sharing

Source: A Typology of Long-Term Care Systems in Europe ENEPRI Research Report No. 91/August 2010
ENEPRI = European Network of Economic Policy Research Institutes
Availability of cash benefits:
Overall, 16 out of the 21 countries have some form of cash benefit. Only in Bulgaria, Denmark, Hungary, Romania and Sweden do cash benefits not exist.

Choice of provider (depends on national definition):
Generally, free choice of provider is widespread in European LTC systems. The majority of the systems offer free choice of provider in both institutional and home-based care. In Denmark, Italy and Spain free choice of provider is limited to home-based care. It is only in Finland that care recipients cannot freely choose a provider.

Quality assurance:
In general, the vast majority of the European LTC systems have introduced mandatory quality assurance in institutional care and home-based care. The Czech Republic and Hungary have mandatory quality assurance only in home-based care, while Latvia has it only in institutional care. In Austria, Finland and Slovenia, mandatory quality assurance does not exist in any setting of care.

Source: A Typology of Long-Term Care Systems in Europe ENEPRI Research Report No. 91/August 2010
ENEPRI = European Network of Economic Policy Research Institutes
Cost sharing:
This variable describes the financial burden of private households/care recipients for LTC services. Private households not only provide informal care but also substantial financial means for care provided in institutions and at home. LTC services provided in institutions are usually covered partly by the public system and partly by private households. Cost sharing by the care recipients may be linked to the retirement income or the care recipients may pay an accommodation charge.

Public expenditures as a share of GDP:
This variable can be seen as a measure of the generosity of an LTC system. The more a country spends on LTC the more services/service capacity are supposedly available. Public expenditures are the most important source of financing for LTC services in almost all countries. Nevertheless, public spending on long-term care is still relatively low as a proportion of GDP, when compared with public spending on health care (OECD, 2005).

Source: A Typology of Long-Term Care Systems in Europe ENEPRI Research Report No. 91/August 2010
ENEPRI = European Network of Economic Policy Research Institutes
Comparing LTC Systems in Europe
Transfer qualitative data into quantitative system

<table>
<thead>
<tr>
<th>Table 3. Description and coding of variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>Means-tested access to publicly financed FIC/HBC</td>
</tr>
<tr>
<td>Is there an entitlement that applies to FIC/HC/HNC?</td>
</tr>
<tr>
<td>Availability of cash benefits</td>
</tr>
<tr>
<td>Can recipients choose the provider freely in FIC/HNC?</td>
</tr>
<tr>
<td>Quality assurance in FIC/HC/HNC is mandatory</td>
</tr>
<tr>
<td>Quality of coordination between LTC and other services is...</td>
</tr>
<tr>
<td>Formal care recipients have to share costs for FIC/HC/HNC</td>
</tr>
<tr>
<td>Public expenditure on LTC as a share of GDP</td>
</tr>
</tbody>
</table>

| Source: A Typology of Long-Term Care Systems in Europe ENEPRI Research Report No. 91/August 2010 |
| ENEPRI = European Network of Economic Policy Research Institutes |
### Comparing LTC Systems in Europe

Results in detail for the two indices

<table>
<thead>
<tr>
<th>Countries</th>
<th>Organisational depth</th>
<th>Xᵢ Total</th>
<th>Financing generosity</th>
<th>Yᵢ Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Meantested</td>
<td>Entitlement</td>
<td>Cash benefits</td>
<td>Choice</td>
</tr>
<tr>
<td>Austria</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Belgium</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Denmark</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>England</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Estonia</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Finland</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>France</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Germany</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Hungary</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Italy</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Latvia</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Lithuania</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>The</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Poland</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Portugal</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>Romania</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Slovakia</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Slovenia</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Spain</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Sweden</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
K-means a simple unsupervised learning algorithms that solve the well known clustering problem. The procedure follows a simple and easy way to classify a given data set through a certain number of clusters (assume k clusters) fixed a priori. The main idea is to define k centroids, one for each cluster. These centroids should be placed in a cunning way because of different location causes different result. So, the better choice is to place them as much as possible far away from each other. The next step is to take each point belonging to a given data set and associate it to the nearest centroid. When no point is pending, the first step is completed and an early groupage is done. At this point we need to re-calculate k new centroids as barycenters of the clusters resulting from the previous step. After we have these k new centroids, a new binding has to be done between the same data set points and the nearest new centroid. A loop has been generated. As a result of this loop we may notice that the k centroids change their location step by step until no more changes are done. In other words centroids do not move any more. Finally, this algorithm aims at minimizing an objective function, in this case a squared error function. The objective function
The algorithm is composed of the following steps:

1. Place **K** points into the space represented by the objects that are being clustered. These points represent initial group centroids.
2. Assign each object to the group that has the closest centroid.
3. When all objects have been assigned, recalculate the positions of the **K** centroids.
4. Repeat Steps 2 and 3 until the centroids no longer move. This produces a separation of the objects into groups from which the metric to be minimized can be calculated.

Finally, this algorithm aims at minimizing an objective function, in this case a squared error function. The objective function

\[ J = \sum_{j=1}^{k} \sum_{i=1}^{n} \| x_i^{(j)} - c_j \|^2, \]

where \( \| x_i^{(j)} - c_j \|^2 \) is a chosen distance measure between a data point \( x_i^{(j)} \) and the cluster centre \( c_j \), is an indicator of the distance of the \( n \) data points from their respective cluster centres.
An example

Suppose that we have $n$ sample feature vectors $x_1, x_2, ..., x_n$ all from the same class, and we know that they fall into $k$ compact clusters, $k < n$. Let $m_i$ be the mean of the vectors in cluster $i$. If the clusters are well separated, we can use a minimum-distance classifier to separate them. That is, we can say that $x$ is in cluster $i$ if $||x - m_i||$ is the minimum of all the $k$ distances. This suggests the following procedure for finding the $k$ means:

- Make initial guesses for the means $m_1, m_2, ..., m_k$
- Until there are no changes in any mean
  - Use the estimated means to classify the samples into clusters
  - For $i$ from 1 to $k$
    - Replace $m_i$ with the mean of all of the samples for cluster $i$
  - end_for
- end_until

Here is an example showing how the means $m_1$ and $m_2$ move into the centers of two clusters.
Comparing LTC Systems in Europe
Results after cluster analysis