A Typology of Long-term Care Systems in Europe.

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A TYPOLOGY OF
LONG-TERM CARE SYSTEMS IN EUROPE

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1.   Introduction

There has been a recent shift in public awareness of the future financial burden associated with ageing and long-term care (LTC). The focus now is no longer solely on the financial sustainability of health systems, but is accompanied by concerns about the challenge of financing *care* rather than *cure* for the senior population. Most developed countries try to meet these needs with a complex system of different services, often with responsibilities for financing, providing and regulating services being decentralized to the regional or even local level of government and administration. Facing a host of assorted systems that are vertically as well as horizontally fragmented, policy-makers and researchers alike need systematized information if they wish to learn from foreign experience. Information on national divergences in LTC systems, however, is harder to obtain than information on health care systems. There is no readily available pool of information like the Health Systems in Transition Series for LTC, and usually this series only covers LTC to a very limited degree. The MISSOC database provides a wealth of system characteristics, but lacks comprehensive data analysis and summaries highlighting differences and common features.

This report aims at contributing to knowledge on LTC system design features by developing a typology of LTC system models in EU countries, which are characterized by diverse arrangements for the provision of care/organization and financing. We seek to provide a typology of comprehensive LTC systems, derived from the systems present in a broad range of EU member states. Thus, our approach deviates from existing typologies in a number of ways:

- We intend to produce a complete portrait of LTC systems without restricting our attention to selected settings, such as 'nursing homes', 'residential care/assisted living' or 'home care', as e.g. in Park et al. (2006).

- In contrast to works by Bettio and Plantenga (2004), Esping-Andersen (1990) and Pacolet et al. (1999) among others, we limit our focus to LTC services rather than cover a broader range of social services.

- We outline a typology on the provision of care/organization and financing. This differs from existing work, which concentrates on comparing design features, such as financing alone (e.g. Wittenberg et al., 2004), building up a system for developing countries (e.g. WHO, 2003) or providing lessons for one national system in particular (e.g. Pommer et al., 2007 for the Netherlands, Glendenning et al., 2004 for the UK).

- We provide a typology of existing systems rather than an overview of theoretically available possibilities. Thus, the theoretical work (e.g. Wendt et al., 2009) provides a background against which to place the typologies we identify, but is not our main focus.

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- Unlike the typologies we know of, we also cover new EU member states. For the following new member states, sufficient data could be obtained to enable inclusion in a typology: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.
- Finally, in deriving country clusters we apply formal methods rather than pursue a purely qualitative analysis. The limited availability of quantitative data, however, forced us to either restrict the number of variables and use more qualitative information, or reduce the number of countries to those with better availability of metric data. We therefore present two approaches, one for each kind of restriction (see sections 4 and 5). This quantitative approach again is in contrast to the existing typologies of comprehensive LTC systems that we know.

The typologies of LTC systems in Europe presented in this report provide the basis for further work in the ANCIEN project. Subsequent analysis of LTC needs and use will be carried out on countries that are deemed representative of each group, and whose selection also takes into account the availability of suitable data.

This report uses two main data sources: first, a questionnaire that was designed and sent to experts for all the countries covered in the project, as explained in section 3 on data collection. Second, these experts produced reports portraying the LTC systems of their respective countries in detail, following a common report structure. These reports are available for downloading at the project webpage (http://www.ancien-longtermcare.eu). For easily obtainable data, such as population statistics, we used international databases like those provided by Eurostat.

2.   Literature review

This short discussion of the literature focuses on research dealing with classifications or typologies of LTC systems and is not exhaustive, as the intention is to identify relevant variables rather than to produce a comprehensive literature review. To our knowledge, even though there are several approaches to grouping LTC systems, most studies have had to follow a qualitative approach. Accordingly, instead of considering the literature an exhaustive set of precisely defined variables, it can be used to determine topics of interest. Several sources broadly agree with the topics of interest when defining LTC systems.

The WHO, for instance, identifies a set of topics to be decided upon when designing an LTC system (WHO, 2003, Table 1 on p. 253). The authors denote two primary design issues: 1) Does the system target only the poor or the poor and non-poor population alike? 2) Does the system define an entitlement to certain benefits or not, with the possibility of a combination of entitlement to some benefits (for all) and no entitlement for benefits targeted at the poor population? The WHO then identifies seven other design characteristics that have to be determined depending on the two primary design issues: 1) the main source of financing, either tax or insurance contributions; 2) strict or liberal income testing; 3) family support as a criterion for benefits; 4) the flexibility of eligibility criteria; 5) the level of benefits; 6) the coverage of disabilities, either a narrow or broad range; and 7) the availability of cash benefits.

In their list of dilemmas and debates on LTC, Glendenning et al. (2004) raise the same topics and add the question, "What are the roles of different levels of government – particularly the respective responsibilities of central and local government – in creating economically and politically sustainable frameworks for the funding of long-term care?"

Da Roit et al. (2007), in their three-country comparison of cash-for-care systems, subdivide this topic into (de-)centralization of legislation, implementation and financing. Other organizational details they take into account are the questions of if, how and by whom an assessment of care

needs is carried out. This aspect, however, can be seen as a concrete example of the WHO topic on the flexibility of eligibility criteria.

Bettio and Plantenga (2004) look at national strategies for providing care but cannot take much institutional detail into account, for instance on the nature of entitlements. For our (ANCIEN) purposes, their work and empirical findings are of limited value as both kinds of care – for children as well as sick, disabled and elderly persons – are only partly analyzed separately, and some of their most important care variables for the elderly relate to the pension system, a factor we do not analyze in ANCIEN. Their research topic, however, the relationships between the state and the family, and the social problems connected to specific life situations, are of considerable importance. They nonetheless consider a set of variables we deem crucial because an interesting characteristic of care system development is the evolving relationship between informal and formal care arrangements. Therefore, Bettio and Plantenga raise the (in our view critical) question of which patterns emerge if we extend the analysis beyond the social care information traditionally used and also include leave arrangements and financial provisions. They construct indicators based upon the amount of time of informal care provided, using the European Community Household Panel for 1996. But they include no indicator of time-related care provision targeted at older persons because, assessing the situation in the late 1990s, they assume such provision in most countries to be minimal. Analyzing the situation a decade later, we assume that the importance has risen and want to grasp any effects in this area as well.

Using information mostly derived from the SHARE database, Pommer et al. (2007) enrich the picture emerging from the design issues as mentioned above with information displaying how these systems are 'lived in' in the real world. They add information on supply and use of public and private care,[2] health status and family linkages with regard to the support provided and received and challenge the grouping into Scandinavian–Continental–Mediterranean countries with this empirical data. At the practical level, the distinction between these three models of primary responsibility for care provision – the state, the nuclear family and extended family – is not as clearly cut as at the conceptual level. In Mediterranean countries, generally a higher share of care is indeed provided informally and a lower share formally, but these differences do not cancel out and thus leave a higher share of the population with unmet needs.

Pacolet et al. (1999) analyze a broader question than our project does, as they focus on social protection for the dependency of the elderly. Also taking the pension systems into account, they present the variety, availability and affordability of services in the then 15 EU member states plus Norway. As they assume that it "is more instructive to distinguish common characteristics in the social protection of older people in Europe than to highlight and typologize the differences between the Member States" (Pacolet et al., 1998, p. 16), it should not come as a surprise that they end up with the well-known Bismarck and Beveridge dichotomy, and further single out Beveridge-oriented Nordic countries and Bismarck-oriented Mediterranean countries. Surprisingly, also Italy and Spain still factor among Bismarck-oriented countries, even though their *health* systems at least were transformed to national health systems decades earlier.

We do not discuss the seminal work of Esping-Andersen (1990) here, because we share the concerns raised by Wendt et al. (2009, p. 73) referring to health systems:

> Methodology aside, however, as concerns a conceptual approach that is specific to the definition of healthcare systems, the welfare typology is largely inapplicable. That is, the actual dimensions that Esping-Andersen employs to distinguish among system types – 'decommodification', 'stratification' and 'interaction between market, state and family' – fail to establish an adequate basis for differentiating between the key features of healthcare systems.

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[2] This can be found as well in earlier studies like Pacolet et al. (1999). Owing to the more recent evaluation of Pommer et al. (2007), we prefer to discuss their findings.

They further identify a lack of concern for social and health care services in Esping-Andersen's approach, a criticism that also applies when thinking of the provision of LTC. While other areas of the welfare state, such as pensions or unemployment schemes, mainly concentrate on monetary transfers, the major task of health care and LTC systems is the provision of services. As such, the creation of system types within the framework of the ideal-typical method requires recourse to aspects other than those more generally applied to welfare systems. Table 1 summarises the topics the empirical literature suggests for a typology of LTC systems. The literature cited is to be seen as an example for reference rather than an exhaustive list of studies having used this information.

Table 1. Topics for a typology from the literature

Topic	Literature sources
Entitlement	WHO (2003), Da Roit et al. (2007)
Financing: Tax (Beveridge)/insurance contribution (Bismarck)	Pacolet et al. (1999), WHO (2003), Pommer et al. (2007)
Target: Poor/non-poor, income testing	WHO (2003), Pommer et al. (2007), Da Roit et al. (2007)
Family support as a criterion	WHO (2003)
Flexibility of criteria, e.g. assessment process	WHO (2003), Da Roit et al. (2007)
Level of benefits, e.g. level of cash allowance	WHO (2003), Da Roit et al. (2007)
Coverage by disability	WHO (2003)
Cash benefits	WHO (2003)
Informal carer: Time provided, time off work, subsidies	Bettio and Plantenga (2004)
(De-)Centralisation of legislation, implementation and financing	Glendenning et al. (2004), Da Roit et al. (2007)
Capacities for formal care	Pacolet et al. (1999), Pommer et al. (2007)
Take-up of care by care setting	Pommer et al. (2007), Da Roit et al. (2007)

Source: Authors' compilation.

3. Data collection

This section describes the data collection process. The data required to achieve the goal of this report come from a variety of sources. Whereas the main demographic indicators, such as the population by age and gender, can and were easily obtained from standard national sources and Eurostat, the core data pertaining to LTC are scarce and difficult to access. Another joint data source is the SHARE database, which is described in Börsch-Supan et al. (2008). SHARE is a survey concentrating on the population aged 50+, currently covering 11 countries of our sample (Austria, Belgium, the Czech Republic, Denmark, France, Germany, Italy, the Netherlands, Poland, Spain and Sweden) and is designed in a similar way as the British ELSA survey, thus offering a further country with comparable data. The use of SHARE data seemed promising in

the beginning, as this survey covers questions of receiving and providing informal care; however, the precise wording of several questions rendered it rather difficult to use SHARE data in the framework of a predefined research question.

3.1. Procedure for data collection

To deal with these circumstances, the Institute for Advanced Studies (HIS) drafted a questionnaire that has been discussed with the project partners. The updated draft version was sent to partner institutes responsible for data collection in the countries covered (namely CASE, CEPS, CPB, DAUPHINE-LEGOS, DIW, ETLA, FEDEA, FPB, IER, ISAE, LSE, PRAXIS, SAS BIER, TARKI, SU and KI) for further discussion and improvement. Their inputs and responses led to the final version distributed to partners in March 2009. The questionnaire was organized in several blocks of questions covering macrostructure (71 questions), funding and financing (44 questions), informal care (28 questions), formal institutional care (38 questions), formal home-based care (65 questions) and policy issues (18 questions). It was fairly comprehensive and comprised a total of 264 questions. An additional set of questions aimed at providing the information necessary to judge the data comparability. The questionnaire was designed as an electronic rather than printer-friendly document and can be obtained from the authors upon request. The first set of country information was available to IHS by the end of June 2009. Data difficulties led us to collect a restricted dataset. IHS communicated with all the partner institutes to clarify the country information provided. The derivation of the typology based upon these data was performed in autumn 2009.

3.2. General data definitions

To achieve the greatest possible comparability among the data collected, we asked the participating institutes to follow as far as possible a given set of definitions, discussed at the kick-off meeting and displayed in *Table 2*. As we aimed at producing results that are largely comparable with important international literature (first of all OECD, 2005 and System of Health Accounts (SHA) definitions for expenditure-related data – see OECD, 2008) we tried to stick to definitions from these sources. In some cases, however, we had to deviate from the international definitions. One example is formal care. We define formal care as follows: LTC services supplied in some kind of contractual relationship (e.g. by the employees of an organization or of the care recipient) in either the public or the private sector, including care provided in institutions like nursing homes, as well as care provided to persons living at home by either professionally trained care assistants, such as nurses or untrained care assistants.

In contrast to this, OECD (see OECD, 2005, p. 17) applies a narrower concept for providers of formal care services: "services supplied by the employees of any organization". We extended this definition in order to include two groups of providers: self-employed carers who provide formal care based upon some other kind of contract rather than an employment contract, and carers employed by the care recipient or his/her family instead of some care organization. Formal and informal care are distinguished by the relationship between the care recipient and the caregiver: informal care is care provided in a non-contractual relationship. The caregiver provides care without remuneration, or is at least willing to provide it even when there is no remuneration. At the same time, there might also be financial support for the informal caregiver. Formal care is care provided by caregivers in any form of contractual relationship. The caregiver would not provide the service without remuneration or would provide considerably fewer hours of care.

To ensure the comparability of the data, the questionnaire included an overview of forms of care that were and were not to be included under the concept of LTC. This was explained as follows:

Specifically, if questions do not specify otherwise, LTC in this project should include services necessary over an extended period of time, i.e. chronic in nature or [for] more than [a] 6-month duration, for the population 65+ in the following fields:

- palliative care
- long-term nursing care
- personal care services
- home help and care assistance
- services and financing in support of informal (family) care
- residential care services other than nursing homes • other social services provided on a long-term care context.

LTC in this project should not include...

- services of curative and rehabilitative care
- LTC services connected with congenital chronic disabilities or chronic disabilities that already existed at a younger age.

Table 2. Set of definitions for terms used for data collection

Term	Definition
Long-term care	LTC is a range of services needed for persons who are dependent on help with basic activities of daily living (ADL). This central personal care component is frequently provided in combination with help with basic medical services, such as help with wound dressing, pain management, medication, health monitoring, prevention, rehabilitation or palliative care services (see OECD, 2005, p. 17).
Informal care	Informal care is that provided by informal caregivers (= informal carers), such as spouses/partners, other members of the household and other relatives, friends, neighbours and others, usually but not necessarily associated with an already existing social relationship with the care recipient. Informal care tends to be provided in the home and is typically unpaid (see OECD, 2005, p. 17).
Formal care	Formal LTC services are supplied in some kind of contractual relationship (e.g. by the employees of an organization or of the care recipient) in either the public or private sector, including care provided in institutions like nursing homes, as well as to persons living at home by either professionally trained assistants, such as nurses, or untrained assistants.
Institutional care	This form of LTC is provided in an institution that at the same time serves as a residence of the care recipient (see OECD, 2005, p. 17).
Nursing home (care)	This LTC institution provides nursing and personal care to persons with ADL restrictions (see OECD, 2005).
Residential care	Residential care refers to services of care and social support, other than nursing homes, provided in supported living arrangements (see OECD, 2008, p. 1).
Home nursing care	This type of long-term nursing care (intensive, high-level care and assistance with ADL restrictions) is provided at home (see OECD, 2008, p. 8).
Home care	Home care covers personal care services (assistance with ADL restrictions) and home help and care assistance (help with instrumental ADL restrictions, including housekeeping and meals on wheels) (see OECD, 2008, p. 8). Both personal care and home help can be supplied in a formal or informal setting.
Entitlement	Entitlement refers to the legal right to receive certain benefits.
Eligibility	Eligibility refers to the fulfilment of the conditions necessary to become a beneficiary without necessarily constituting a legal right to the respective benefit.

Source: Authors' compilation.

3.3. Data availability

In general, data availability on LTC is much worse than on health care. In the LTC literature only qualitative system descriptions and 'standard' quantitative data (e.g. the number of care recipients and the number of institutionalized beds) can be found easily. It is even more difficult to obtain setting-specific data, e.g. number of persons receiving institutional care/home-based care/informal care or number of staff in institutional care/home-based care. This situation was also reflected in the responses to our questionnaire.

The response rate to the block of questions concerning macrostructure and policy issues was above 75%. Nearly all of these questions had a qualitative character. Thus, the partners could respond to these questions adequately. Only two questions were rather difficult to answer: 1) "persons in need of care according to national definitions of long-term care", and 2) "persons in need of care, total (including lower levels of care)". This information is lacking in most countries, as they do not have a national definition of long-term care and do not register the persons in need of care below the national minimum threshold required for eligibility for LTC services.

The response rate to the block of questions concentrating on formal institutional care (53%) as well as funding and financing (44%) was considerably lower. Many partners could not provide exact and reliable figures for total funding/financing for their country. We therefore decided to use public spending on LTC, which is available for all EU member states (see European Commission, 2009). Roughly one-third of the questions concerning formal home-based care and informal care were answered. This low response rate corresponds with the poor data availability as reported in the literature. Partners provided hardly any quantitative information for these two settings of care.

Data availability is not only dependent on the kind of data (qualitative vs. quantitative) but is also country-specific (Western vs. Eastern European countries). In general, the data availability is much better in Western European countries than in Eastern ones. In most Western countries, databases, systematic collections or different reports/statistics are available. The majority of the Eastern European countries do not offer such tools. As most of them do not yet have an adequate LTC system, priority is being given to developing the system and not to data collection.

3.4. Data comparability

Data comparability is another important point in the data collection process. Reliable results can only be obtained if the data are comparable. Otherwise, country groupings would be the result of the characteristics of LTC data collection, rather than of LTC systems. Critical aspects regarding the comparability of data are reference year, sources of funds/financing data and the settings of care covered. Thus, we place special emphasis on them.

- Settings of care

    We asked the partners to provide institutional care data (referring to nursing and residential homes) and home-based care data (referring to home care and home nursing care). Yet the data provided do not always refer to the defined settings, which again raises the issue of incomparable data.

- Sources of funding and financing data

    We asked the partners to provide data according to the OECD System of Health Accounts, given its more or less comparability. As this data source is not available for all European countries, the partners also used other sources to complete this block of questions, e.g. national health accounts and national reports/statistics. Therefore,

comparisons between countries require caution and we mostly use broad ranges of values instead of seemingly (and perhaps faulty) exact values.

• Reference year

We chose 2006 as the reference year. Around two-thirds of the partners were able to comply. Fortunately for the remaining third, the data are sufficiently comparable because the figures for population, supply and demand typically do not change significantly within one or two years.

3.5. Summary

Two main problems arose during the data collection process. We found the availability of quantitative data to be rather limited, even when cooperating with national experts. This is particularly true when more detailed or setting-specific information was requested. Often partners could provide only some of the most basic data, which should not be seen as the partners' fault. In many countries, especially in the Eastern European ones, such data simply do not exist. The other main problem was the comparability of the data. Most of the quantitative data provided do not refer to a single source and do not cover the same settings of care. Thus, we decided to pursue a twofold strategy using two different approaches: both approaches seek to make a sensible classification of countries into groups according to the similarity of their LTC systems based on formal cluster analysis. The first approach focuses on system characteristics. As it relies on qualitative information and uses only ordinal scaled/pseudo-metric variables, there is no need to exclude any countries from this approach. The second approach describes the uptake of care. It is based on quantitative characteristics and uses metric and pseudo-metric variables. Due to data limitations in the area of metric variables, only a limited number of countries could be included. The two approaches are described in detail in the following sections.

4. Approach 1: An LTC typology focused on system characteristics

The aim behind this approach is to portray LTC systems as broadly as possible without excluding any of the countries. In the data collection process, it turned out that the lack of data is severe in many countries, especially with regard to metric variables in the areas of financing, supply and demand. Nevertheless, we were able to collect data on various features of care provision/organization and financing, if not all of the specific information we would have liked to include. For example, aspects of the assessment process for benefits in cash or in kind (or both), the influence of stakeholders or the percentage of costs covered by the care recipient in institutional care would have been of great interest, but had to be left out due to lack of data.

The variables selected are all ordinal scaled/pseudo-metric.[3] Based on this dataset we constructed a typology that, while not giving a picture of the system as a whole, still provides detailed insight on organizational and financial matters. The focus of this approach has thus shifted towards a characterization of system features.

4.1. Method

To derive a typology of the provision of LTC/organization and financing, we used a two-step procedure, as set out below.

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 variables were

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[3] 'Pseudo-metric' refers to scores obtained from qualitative information in such a way as to obtain an ordinal measure, which is treated as a metric variable in the analysis (as is typically done with Likertscale types of variables).

coded in an ordinal way for the sake of easier interpretation of the results. The underlying rationale for the coding was that all variables should be interpretable in a common way. As a common yardstick we chose the question, "Which system characteristic is more preferable from the patient's point of view?" to obtain the degree of patient-friendliness of an LTC system. The most preferable option in general was coded '3'[4] and the least preferable option was coded '1'. By summing the organizational variables we obtained an index in which countries with high values could be interpreted as countries with a high degree of patient-friendliness and vice versa. In the same way, the funding variables were summed to construct a second index.

The indices were derived as follows:

Organization depth: $\qquad X_i = \sum_{j=1}^{n} O_{ji}\,, \qquad i = 1, \dots, 22,$ $\qquad\qquad$ (1.1)

Financial generosity: $\qquad Y_i = \sum_{k=1}^{m} F_{ki}\,, \qquad i = 1, \dots, 22,$ $\qquad\qquad$ (1.2)

Where i indexes the 22 countries of our dataset, are the *organizational variables* and are the *financial variables*.

In the **second step** we used a formal cluster analysis based on the two indices derived in the first step to obtain a typology of LTC systems. We decided to compute the cluster analysis with the SPSS K-means clustering algorithm: this method does not require the computation of all possible distances. K is the number of clusters that is defined at the beginning of the procedure. In our case, a country is assigned to the cluster of the nearest cluster mean. The algorithm is oriented towards finding the K means and it repeatedly reassigns countries to clusters; as a consequence it is possible that the same country can move from cluster to cluster during the analysis and that the result has a degree of arbitrariness depending on the random choice of the initial cluster solution.

4.2. Selection of variables

The selection of variables is crucial when designing a typology. As mentioned above, the emphasis of this approach is on the system characteristics of care provision/organization and financing. To identify and select the variables for deriving the indices of organizational depth (X_i) and financial generosity (Y_i), we applied a four-step process:

1) identification of relevant topics from the literature plus some additions we deemed necessary (see section 2);

2) definition of variables that a) describe those topics and b) can be used in the typology;

3) checks on the availability (see section 3.3), quality and comparability (see section 4) 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) (see *Table 3* near the end of this subsection).

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[4] Note that the only exception here is the funding variable 'Public expenditures', with values from '5' to '1'.

In the following discussion, we briefly discuss the selected variables. We also explain why we assume that some characteristics are preferable to others from a patient's point of view, because we later aggregate variables according to these preferences. While it is easy to explain likely preference orderings for some variables, preference orderings for other variables are less easily defendable. Thus, our resulting preference ordering is conditional on these assumptions. Furthermore, we stress that preferences are assumed from the viewpoint of LTC users, not that of potential users, taxpayers or the insured population.

Means-tested access and entitlement

These variables characterize how easy it is to obtain access to publicly financed services. Two basic strategy decisions have to be made when regulating access: 1) Should LTC services be means tested? 2) Should access to LTC services be based on entitlement? (See WHO, 2003.) LTC systems that solely target the poor require some kind of means-tested access. In LTC systems that include the poor and the non-poor, there can still be some degree of means testing, e.g. to exclude the population with very high income levels or to vary the level of benefits (WHO, 2003). The second basic decision concerns entitlement. Entitlement implies that everyone who fulfils the eligibility criteria must be granted services, which are almost always established through specific legislation. Costs can be contained only through changes in eligibility criteria. Non-entitlement implies that services do not have to be provided when the budget runs out, even for those who meet the eligibility criteria (WHO, 2003). In our typology, these variables can be seen as a measure of accessibility.

We assume that users of LTC services/persons in need of care prefer easy and transparent access to services over access procedures that require more administrative effort. Means testing can involve administrative burdens and necessitates that individuals make their financial situation clear; both can be seen as unpleasant. An entitlement to services reduces the degree of uncertainty about the access to and funding of services, and risk-averse individuals are likely to prefer such a system to one involving greater uncertainty.

In general, access to publicly-financed LTC services is really high in most European LTC systems. The highest possible level of accessibility (no means-tested access plus entitlement to LTC services) can be found in 13 of the 21 countries. Measured along the lines discussed above, access is most difficult in England and Romania.

Availability of cash benefits

This variable indicates whether cash benefits are available in a country, and if so, in which setting of care. The existence of cash benefits supports the possibility for individual choice as they improve the opportunity to choose among different settings of care (e.g. either to buy formal care services or to support informal care-giving). In our typology, this variable can be seen as one indicator of the freedom of choice of the care recipients (OECD, 2005; WHO, 2003).

Owing to these facts, our preference ordering assumes that persons in need of care prefer the availability of benefits in cash to the exclusive availability of benefits in kind. We are aware that the mere information on whether cash benefits are available is a weaker indicator than information on the (average or median) amount of paid cash benefits. Such information, however, is not yet available for a sufficient number of countries. We therefore chose to use the weaker indicator than altogether omitting the topic 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

This variable serves as another indicator of the care recipient's freedom of choice. The possibility to choose among alternative providers empowers care recipients and strengthens their role in the care process (OECD, 2005; WHO, 2003).

For this reason, we assume in our preference ordering that having the opportunity to choose the provider freely is preferable from the patient's point of view compared with not having this opportunity.

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. Still, one has to keep in mind that the definition of the variable refers to the regulatory definition, regardless of whether the choice is possible. Systems where choice is allowed in theory are coded in the same way whether or not the supply of services is sufficient to actually offer choices to care recipients. Again, data limitations prevented the use of more quantitative data, such as the average waiting time for access to nursing homes.

Quality assurance

This variable shows how widespread mandatory quality assurance is in European LTC systems. In principle, quality assurance is one of the most challenging issues, as in many LTC systems quality deficits are a matter of public concern. There have been several reports describing inadequacies in institutional care, such as in housing, treatment of depression and use of restraints (e.g. OECD, 2005; WHO, 2003). Quality problems in home-based care have also been reported in a number of surveys, e.g. care recipients receive grossly insufficient care or care that puts them at risk. Furthermore, frequently reported shortcomings are a lack of information about the range of services available and limited access to services that support informal caregivers (OECD, 2005). Consequently, approaches to quality assurance have been developed in many LTC systems. In our typology, the existence of mandatory quality assurance is an indicator of the technical depth of LTC systems.

As examples of inadequate care in institutional and home-based settings are numerous, we expect that persons in need of care have a preference for mandatory 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.

Integration/coordination of care

This variable describes the integration between LTC and other services and is a further indicator of the technical depth of LTC systems: LTC services can be integrated either fully or partly with the health system, the social system or be independent of these general systems. The main goals of integration are to enhance the quality of care and to improve system efficiency for clients whose complex problems cut across multiple systems and providers. Integration leads to an increase in the quality and efficiency of care, e.g. in providing coordinated care packages, in providing services in the most appropriate and optimal way and for improving the access to services (WHO, 2003). Put differently, lack of integration can pose severe problems for the coordination of services and thus reduce the quality of the overall system from the care recipient's perspective.

We examined the question of whether there are widespread problems in the coordination of care. This facilitates the interpretation of a care recipient's most likely preferences (see Table 3).

Overall, the degree of integration is quite diverse when looking at the European LTC systems. No LTC system claims to have a very high level of integration between LTC and other services. In Austria, Belgium, Denmark, Finland, Latvia and Sweden, the degree of integration between LTC and other services is rather good, while in all other countries it is rather poor or very poor.

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. Often care recipients are also charged for care at home. In general, private spending plays a more important role for funding LTC provided in institutions than at home (OECD, 2005). In our typology, the presence of cost sharing per setting of care serves as a measure of how widespread cost sharing is. Obviously, we would have preferred a variable that indicates how much of the total expenditure on LTC in each setting is covered by private means. The situation concerning the availability of data, however, precludes sufficiently detailed information. We therefore use categorical data on the share of private financing for a selection of countries in approach 2 (see section 5).

Based on the assumption that people value solidarity and are risk-averse, we expect that persons in need of care prefer a regime where cost sharing is less widespread.

In general, cost sharing is mandatory for institutional care in all 21 countries. Only care recipients in Denmark, Germany and Latvia are neither charged for home care nor for home nursing care.

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).

We expect that persons in need of care have a preference for a larger share of public LTC expenditures compared with a lower one. It should be noted that the preference ordering is based on the assumption that a majority of the population favours solidarity in LTC funding to an individualistic system. Sweden spends by far the most on LTC (3.5% of GDP). Apart from Sweden, notably Denmark, Finland, Italy and the Netherlands are also big spenders (the percentage of GDP spent on LTC > 1.5%). Spending is very low in most of the Eastern European countries.

Financing model

Although the financing model (tax-based vs. insurance-based) is a common starting point when analyzing health or LTC systems, we decided not to include this variable. One reason is that with regard to LTC the distinction between systems that are predominantly funded by social insurance and those mainly funded by taxes is less clear than in the case of health care (see also Figures 9 and 10 in section 6). In general, the role of insurance funding is smaller and that of tax funding larger than in health care. There are countries with traditional, insurance-based systems

like Austria and France, whose LTC systems attribute only a small (France) or no (Austria) financial role to social insurance. Furthermore, one of the reasons for the importance of the financing model as a system characteristic is the different way in which access to services is regulated in the two models. This aspect, however, is dealt with by other variables in our analysis. A description of the selected variables as well as the coding for the derivation of the indices (X_i and Y_i) is presented in Table 3.

Table 3. Description and coding of variables

Variable	Value		
	3	**2**	**1**
Means-tested access to publicly financed FIC/HBC	No means-tested access to either FIC or HBC	No means-tested access to FIC; means-tested access to HBC	Means-tested access to both FIC and HBC
Is there an entitlement that applies to FIC/HC/HNC?	Entitlements apply to both FIC and HBC	No entitlement applies to FIC; entitlement applies to HBC	No entitlement applies to either FIC or HBC
Availability of cash benefits	Cash benefits in both FIC and HBC	Cash benefits in either FIC or HBC	No cash benefits
Can recipients choose the provider freely in FIC/HBC?	Free choice of provider in both FIC and HBC	No provider choice in FIC; free choice of provider in HBC	No provider choice in either FIC or HBC
Quality assurance in FIC/HC/HNC is mandatory	Mandatory quality assurance in both FIC and HBC	Mandatory quality assurance in FIC or HBC	No mandatory quality assurance in either FIC or HBC
Quality of coordination *between* LTC and other services is…	Rather good – there might be some organizational challenges for the individual but they are usually not too severe	Rather poor – provision of care is fragmented and often can pose a challenge for (prospective) care recipients	Very poor – provision of care is very fragmented and poses regular or severe challenges for (prospective) care recipients
Formal care recipients have to share costs for FIC/HC/HNC	Cost sharing in FIC; no cost sharing in HC or HNC	Cost sharing in FIC and HC; no cost sharing in HNC	Cost sharing in FIC, HC and HNC
	5	**4**	**3**	**2**	**1**
Public expenditure on LTC as a share of GDP	2% or more	1.5–2%	1–1.5%	0.5–1%	Less than 0.5%

Note: FIC refers to formal institutional care, HC to home care, HBC to home-based care (home care + home nursing care) and HNC to home nursing care. *Source*: Authors' compilation.

Table 4 describes LTC provision in Europe using the variables from Table 3. As mentioned above, the most preferable option from a patient's point of view has been coded '3' (public expenditure at '5') and the least preferable option coded '1'.

Table 4. LTC system characteristics by country

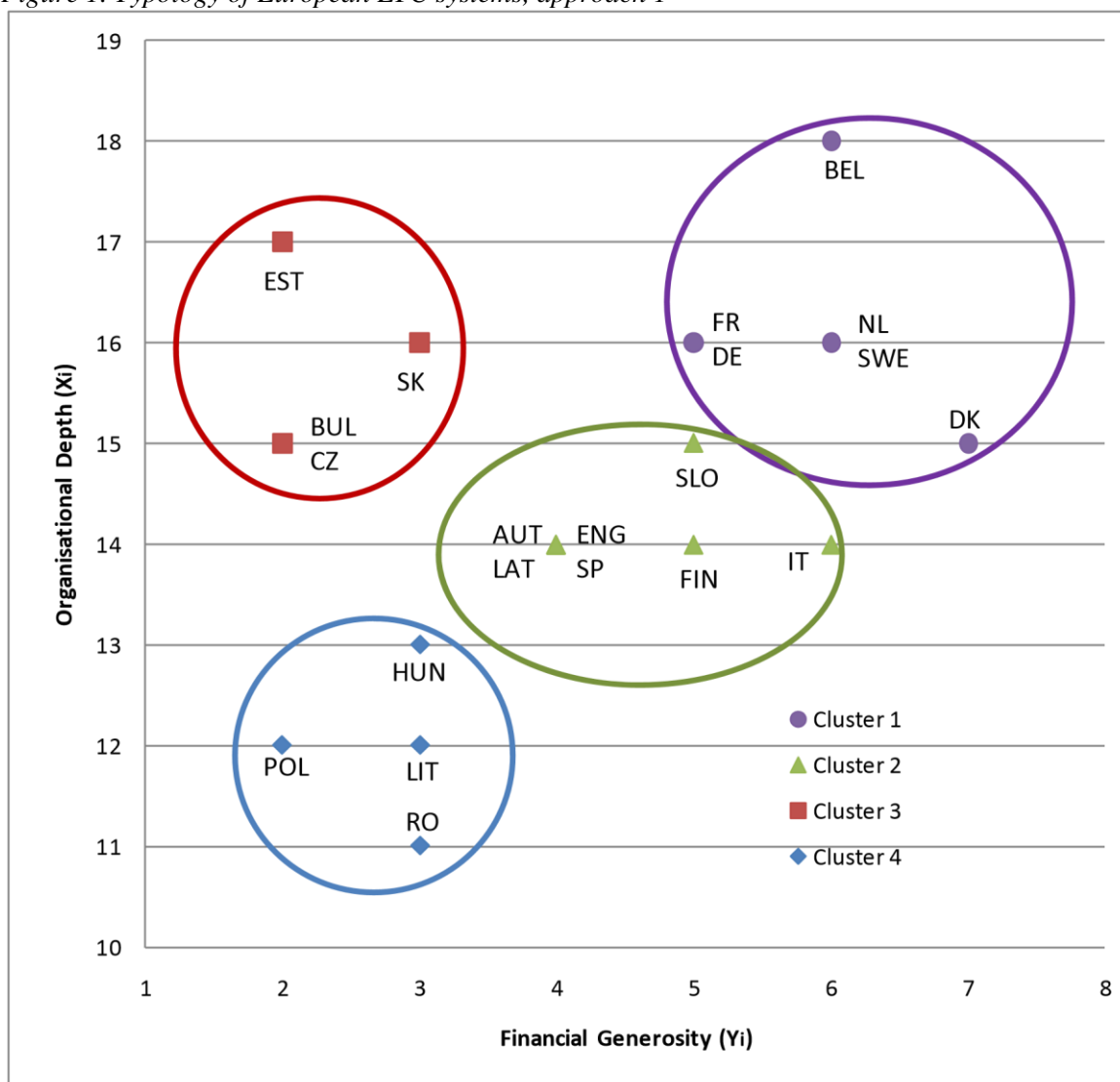| Countries	Organisational depth						X_i	
	Means-tested	Entitlement	Cash benefits	Choice	Quality assurance	Integration	Total	s
Austria	3	1	3	3	1	3	14	
Belgium	3	3	3	3	3	3	18	
Bulgaria	3	3	1	3	3	2	15	
Czech Republic	3	3	2	3	2	2	15	
Denmark	3	3	1	2	3	3	15	
England	1	2	3	3	3	2	14	
Estonia	3	3	3	3	3	2	17	
Finland	3	3	3	1	1	3	14	
France	3	3	2	3	3	2	16	
Germany	3	3	2	3	3	2	16	
Hungary	3	3	1	3	2	1	13	
Italy	1	3	3	2	3	2	14	
Latvia	1	3	2	3	2	3	14	
Lithuania	1	3	2	3	1	2	12	
The	3	3	2	3	3	2	16	
Poland	1	3	2	3	1	2	12	
Portugal	na	na	na	na	na	na	na	
Romania	2	1	1	3	3	1	11	
Slovakia	3	3	2	3	3	2	16	
Slovenia	3	3	3	3	1	2	15	
Spain	1	3	3	2	3	2	14	
Sweden	3	3	1	3	3	3	16	

Source: Authors' compilation.

4.3. Results

Figure 1 presents the results of the K-means clustering algorithm, using 21 countries and the two synthetic variables. Given the somewhat limited number of observations, we decided to set K = 4. Fewer clusters would result in rather heterogeneous groups, while more would result in clusters too small to be meaningful. We felt that the results are rather plausible and they give rise to a typology that can be interpreted in terms of organizational depth and financial generosity.

Cluster 1 consists of Scandinavian and Continental countries characterized by profound organizational depth and high levels of financial generosity. Within this cluster, the LTC system of Belgium has the greatest organizational depth. Care recipients enjoy the highest possible accessibility to publicly-financed LTC services, the most freedom of choice and most technical depth. When looking at financial generosity, Denmark has the most generous LTC system, as determined by public expenditures of 1.7% of GDP and cost sharing only for institutional care. Although public expenditures are higher in the Netherlands (2.5% of GDP) and Sweden (3.5% of GDP), their LTC systems are classified as less generous than the Danish one as cost sharing is more widespread in these two countries.

The second cluster is an intermediate case, between clusters 1 and 4. It comprises LTC systems characterized by medium organizational depth and medium financial generosity. Compared with cluster 1, the countries in this cluster are mainly lagging behind in organizational matters. In terms of financial generosity, clusters 1 and 2 do not differ very much from one another. There is no geographical pattern observable in this cluster, as it includes Scandinavian, Continental, Mediterranean and Eastern European countries as well as England. The distinguishing characteristics between cluster 1 and 2 are not very clearly defined: running the clustering algorithm repeatedly revealed some degree of flexibility with regard to the classification of Italy, Finland and Slovenia. Those countries were sometimes also classified as being part of cluster 1.

The LTC systems of the countries in clusters 3 and 4 share the characteristic of low levels of financial generosity. In all these countries private contributions for LTC services are widespread and public expenditure on LTC does not exceed 0.5% of GDP. LTC systems differ significantly regarding organizational depth. This heterogeneity in organizational matters is the reason the Eastern European countries do not form a cluster by themselves, which might have been expected in some way.

Figure 1. Typology of European LTC systems, approach 1

Source: Authors' compilation.

Summary and discussion

- Western countries tend to have LTC systems with a higher degree of patient-friendliness.

- In terms of organizational depth, there is no clear distinction between Western and Eastern European countries. Only Lithuania, Poland, Romania and to a lesser degree Hungary are lagging behind in this regard.

- Concerning financial generosity, a gap between the Western and Eastern European countries can be observed. Old member states tend to be more generous to care recipients than new member states. Western countries spend on average 1.6% of GDP on LTC, whereas Eastern European countries spend only 0.3% of GDP. A Scandinavian, Continental and Mediterranean country group cannot be exactly identified but there is some degree of compatibility with this classification.

- Scandinavian and Continental countries are situated in 'neighbouring' clusters (clusters 1 and 2). The only two Mediterranean countries in our sample are in the same cluster and are characterized by medium organizational depth and medium financial generosity.

- The Eastern European countries do not form a cluster by themselves. While sharing the feature of low spending on LTC, they differ widely with respect to organizational aspects.

- In contrast to our expectations, not even the Baltic States are together in one cluster. They are spread over three clusters (clusters 2, 3 and 4). They are homogenous regarding financial generosity, which is low in all three countries, but heterogeneous in terms of organizational depth. It seems that they have varied in the priority they have placed on developing the organization of care in the last two decades. For example, quality assurance is mandatory in both settings in Estonia, in one setting in Latvia and in no setting in Lithuania.

5. Approach 2: An LTC typology focused on use and financing of care

This section discusses the approach to cluster systems of LTC based on use and financing of care. This can be distinguished from the organizational approach by its emphasis on using quantitative factors to classify LTC systems, preferably those of a continuous nature. The aim of the use and financing approach is exactly the same as that of the organizational approach: to make a sensible classification of countries into groups according to their LTC systems. In a world without data problems, the two approaches would be similar, as all types of information could be combined in the analysis. In reality, system characteristics could be collected for practically all the participating countries, while reliable quantitative characteristics could be found only for a much smaller group. Instead of choosing between analysing all countries with a limited set of data and analysing a small group of countries with a more powerful dataset, we decided to follow both approaches so that they could complement one another.

5.1. Variables used in the formal cluster analysis

To carry out the formal cluster analysis, we tried to collect quantitative, continuous variables to the extent possible. Where this was not possible, pseudo-metric variables were used.[5]

Based on the literature (see section 2), the following characteristics of LTC systems may be important:

- How much is spent on LTC?

- Which portion of spending is private?

- What are the relative roles of formal and informal care?

- How much support is available for informal caregivers?

- For whom is the system meant: for everyone or for persons with low incomes or those most in need?

- What is the role of cash benefits (as a measure of consumer orientation)?

To represent these potentially important characteristics, we constructed eight variables out of the information that was collected by the national teams. Table 5 presents an overview of the variables and how they were defined.

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[5] As noted earlier, 'Pseudo-metric' refers to scores obtained from qualitative information in such a way as to obtain an ordinal measure, which is treated as a metric variable in the analysis (as is typically done with Likert-scale types of variables).

Table 5. Overview of the variables used in the quantitative analysis

Variable	Label	Definition
Income and needs-corrected spending	Spending	Public expenditure on LTC as a share of GDP, corrected for the share aged 65+
Share of private expenditures	Priv%	Private expenditure as a share of LTC spending
Formal care use	FCuse	Formal care recipients aged 65+ as a share of the population aged 65+
Role of informal care	ICuse	Informal care recipients aged 65+ as a share of the population aged 65+
Support for informal caregivers	ICsupp	Ordinal variable with a minimum of 3 and a maximum of 8, representing the sum of benefits for informal care recipients, income support for informal caregivers and other benefits for informal caregivers
Accessibility	Access	Sum of means testing and entitlements (NB: a high value represents low accessibility!) **Means testing:** 1 = No means-tested access for either FIC or HBC 2 = No means-tested access in FIC; means-tested access in HBC 3 = Means-tested access in both FIC and HBC **Entitlement:** 1 = Entitlement applies to both FIC and HBC 2 = No entitlement applies to FIC; entitlement applies to HBC 3 = No entitlement applies to either FIC or HBC
Targeting	Target	Targeting with respect to level and severity of needs: 1 = No minimum requirements 2 = Minimum requirements for HBC 3 = Minimum requirements for FIC 4 = Minimum requirements for both HBC and FIC
Importance of cash benefits	Cash	Average sum available for HBC and FIC, corrected for relative income level within the EU-27

Source: Authors' compilation.

Income and needs-corrected spending

Income and needs can be expected to be major drivers of LTC spending: more affluent countries are likely to spend more on LTC services than poorer ones, just as they spend more on health care. The proportion of elderly persons gives a rough indication of the need for LTC for the elderly – a country with an older population will, *ceteris paribus*, need to spend more on LTC. Consequently, to define an indicator for the level of LTC spending that is internationally comparable, we constructed an LTC spending variable corrected for income and needs, as follows:

$$\frac{((public\ expenditure\ on\ LTC/GDP))}{Share\ of\ persons\ aged\ 65\ and\ older}$$

Public expenditure corrected for GDP and for the share of the elderly is mostly the result of political choice with regard to publicly financed services in general and LTC in particular. A country that considers it worthwhile to spend a lot on LTC apparently sees an important role for the state, in any case in the funding of LTC.

According to the corrected-spending characteristic, displayed in Figure 2, Sweden spends by far the most on LTC, more than three times the average of the 21 countries for which this information is available (see also Appendix 2). Following Sweden, notably the Netherlands, Denmark and Finland are also big spenders. Spending is very low in Portugal, Estonia, Bulgaria, the Czech Republic, Slovakia and Hungary. Spending in Latvia, Lithuania and Poland is still low but somewhat higher, comparable to the level in Spain.

Figure 2. Public corrected spending and share of private expenditure on LTC
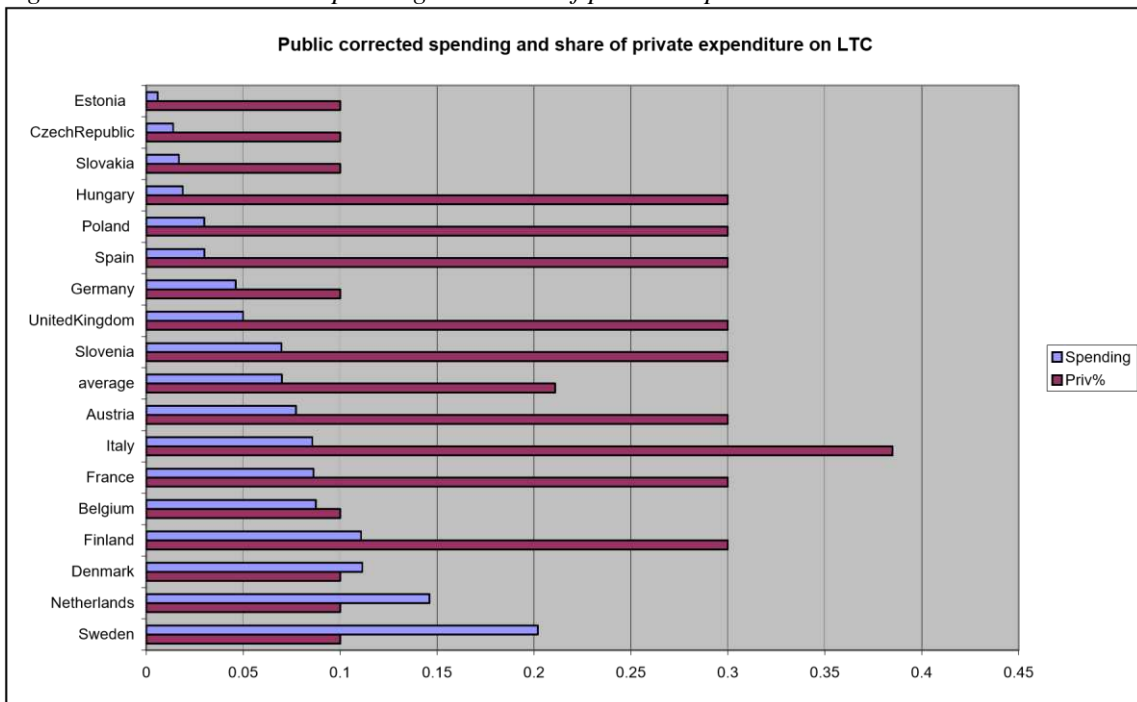
Note: Priv% was reported on a categorical scale by most partners. *Source*:
Authors' compilation.

Share of private expenditures

The privately funded share of LTC also gives information on political choices. The larger this share is, the more the responsibility of the citizens themselves for funding is emphasized. A hypothesis could be that countries with high levels of public spending have low levels of private spending and vice versa. This is true for several countries, such as Sweden, Denmark, the Netherlands, Hungary and Poland. Yet several countries show another pattern. Finland combines a high level of public spending with a high share of private spending. In Estonia, the Czech Republic and Slovakia, public as well as private spending is low. In *Figure 2* above, the countries are ordered by income and needs corrected public spending from low to high.

Formal care use

The factor 'formal care use' is intended to capture the importance of formalised LTC, by calculating the share of the elderly using formal care. Possible explanations for a low use of formal care are the robust health of the older population, a large role played by informal care (see below) or a large unmet need for LTC. The highest extent of formal care use is found in Belgium and the Netherlands: about 28% of the elderly uses formal care (either at home or in an institution) in these countries. The use of formal care is higher than average in the Czech Republic (17%). Germany and Estonia are the two countries where the use of formal care is lowest. *Figure 3* shows the use of formal and informal care in the countries analysed.

Figure 3. Use of formal and informal care
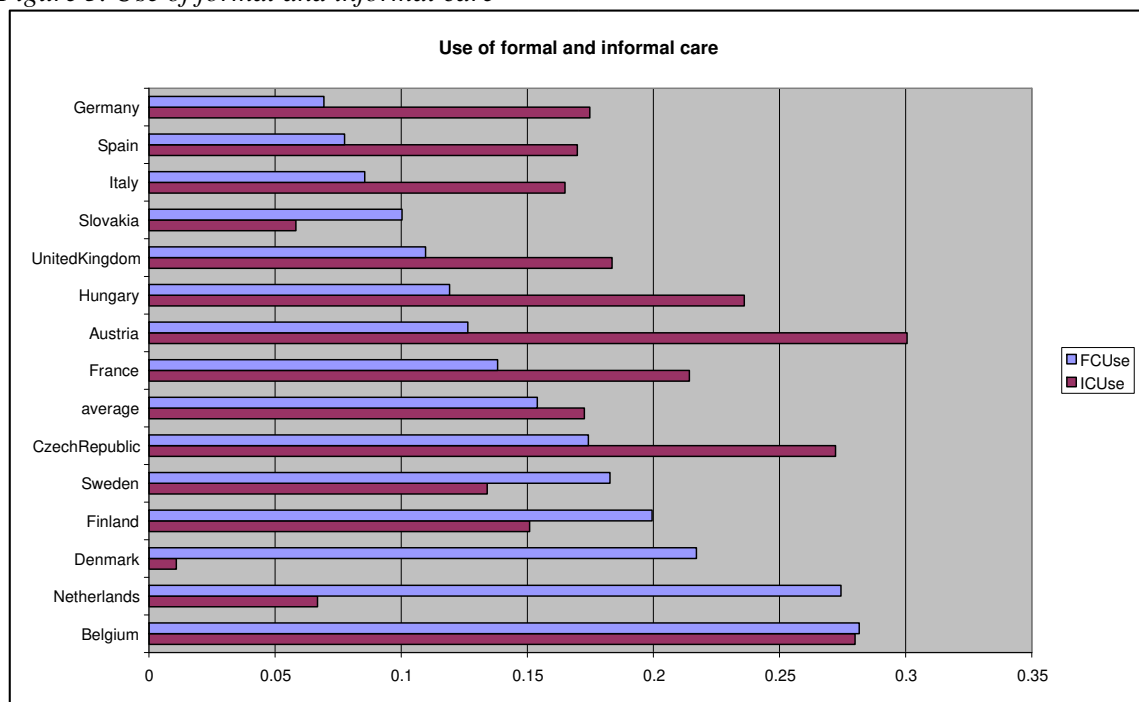
Source: Authors' compilation.

Role of informal care

The role of informal care is characterised in the same way as the use of formal care: by relating the number of informal care users to the number of persons aged 65 and older. An important role played by informal care may indicate either a preference for this type of care or insufficient availability of formal care. In the latter case, we would expect low use of formal care to be combined with high use of informal care. Unfortunately, for some countries either formal care use or informal care use is missing, so the relation between the two cannot be studied. No clear pattern emerges for the other countries.

In Germany and Spain, formal care use is relatively low and informal care use is about average. Denmark and the Netherlands show high use of formal care combined with a (very) small role of informal care. Belgium scores high on both formal and informal care use.

Support for informal caregivers

This factor summarizes information on several methods that support informal caregivers: benefits for informal care recipients, income support for informal caregivers and other benefits for informal caregivers. It is an indicator of how society feels about the importance of informal care. The variable is constructed as the sum of scores measured on an ordinal scale. The higher the value, the more informal caregivers receive support. The support is strongest in France, Slovenia, Belgium, Lithuania and Romania and weakest in Bulgaria, Hungary and Italy.

Accessibility

This factor signifies how easy it is to obtain access to the system of publicly financed LTC for persons with higher incomes or when public funding is problematic. It combines information on means testing and entitlements in institutional and home-based care. A low value represents a high degree of accessibility: access is at its maximum when there is no means testing in either institutional or home-based care and there are entitlements to both types of care.

On average, the LTC systems in Europe are very accessible: the highest possible level of accessibility is found in 13 of the 22 countries. Access is most difficult in Romania and England.

Targeting

This factor reveals the extent to which the systems target only the users with more severe needs. At the one extreme, minimum requirements do not exist. At the other extreme, they exist for both home-based care and institutional care.

Hungary is the only country without any minimum requirements. Most other countries employ minimum requirements for both home-based and institutional care.

Importance of cash benefits

This factor reflects whether cash benefits exist in a country, and if so, what the amount is (averaged for home-based care and institutional care, and corrected for the relative income level within the EU-27). The existence of cash benefits is an indicator of freedom of choice for the care user. The use of cash benefits is widespread. A majority of the countries have some form of cash benefit, although cash benefits do not exist in Bulgaria, Denmark, Hungary, Romania and Sweden. Thus, cash benefits are absent in both countries that spend a lot on LTC and some that spend little. The amount of cash benefits is relatively high in Spain, Italy, Estonia, the Netherlands and Austria.

Table 6 presents summary information on the values of the factors described and the number of countries with missing values. Appendix 2 presents detailed information on the metric variables (the ordinal variables are described in section 4).

Table 6. Summary information on quantitative variables

Variable	Average	Minimum	Maximum	Missing
Spending	0.06	0.006	0.20	1
Priv%	21.0%	10%	38.5%	3
FCuse	14.4%	6.9%	28.2%	6
ICuse	17.3%	1.1%	30.1%	8
ICsupp	5.65	3	8	2
Access	2.86	2	5	1
Target	3.74	1	4	3
Cash	€183	€0	€672	2

Source: Authors' compilation.

## 5.2. Clustering methods

Introduction

Two broad classes of cluster analysis have been described in the literature: 'classic', i.e. distance-based clustering and 'probabilistic' clustering. These approaches are described below. Both approaches have strengths and weaknesses. Classic cluster analysis cannot handle missing data, which in our case greatly reduces the number of countries or variables that can be used. Both methods turn out to be sensitive to the choice of starting points, in the sense that the final solution obtained depends on the initial solution chosen at random. This suggests that a number of alternative solutions exist that are similar and equally likely, or put differently, that there is no clear and stable solution that dominates all other solutions. The problem of missing values, which persists despite our efforts to collect all the data for the 'core' variables, can be handled either by using probabilistic clustering techniques or by dropping variables or countries (or both) from the analysis. Initially, we thought that the former approach would be best, since it allowed us to keep a maximum number of countries in the analysis. It is explained in the following section. Yet including missing observations in the analysis has drawbacks of its own, so we decided to use a classic K-means clustering as an alternative, as explained below.

Probabilistic clustering

Probabilistic clustering is an alternative to distance-based clustering based on the concept of mixtures of distributions. The core assumption is that sample observations are realizations from an unknown number of probability distributions, and that the clusters themselves are outcomes of a multinomial distribution. This idea is illustrated graphically in Figure 4 for the simple case of a mixture of three univariate normal distributions. One application of this idea is called expectation-maximization (EM) – clustering (see Witten & Frank, 2005). Basically, this algorithm searches the parameter vector that optimizes the probability of observing the sample, given assumptions about the shape of the density functions associated with the characteristics (variables) and about the number of clusters. Likelihood-based algorithms like these have the disadvantage that they favour solutions with many clusters, since the likelihood of the sample approaches unity when each observation constitutes its own cluster. To counter that problem,

some penalty has to be applied. A rather sophisticated version of this idea uses a Bayesian approach, whereby the penalty takes the form of decreasing the overall likelihood of the final result because the probabilities associated with the prior distribution diminish as more clusters are added. Intuitively, the additional likelihood of a solution with one more cluster has to outweigh the penalty of introducing it.

Figure 4. Example of a mixture of three normal distributions
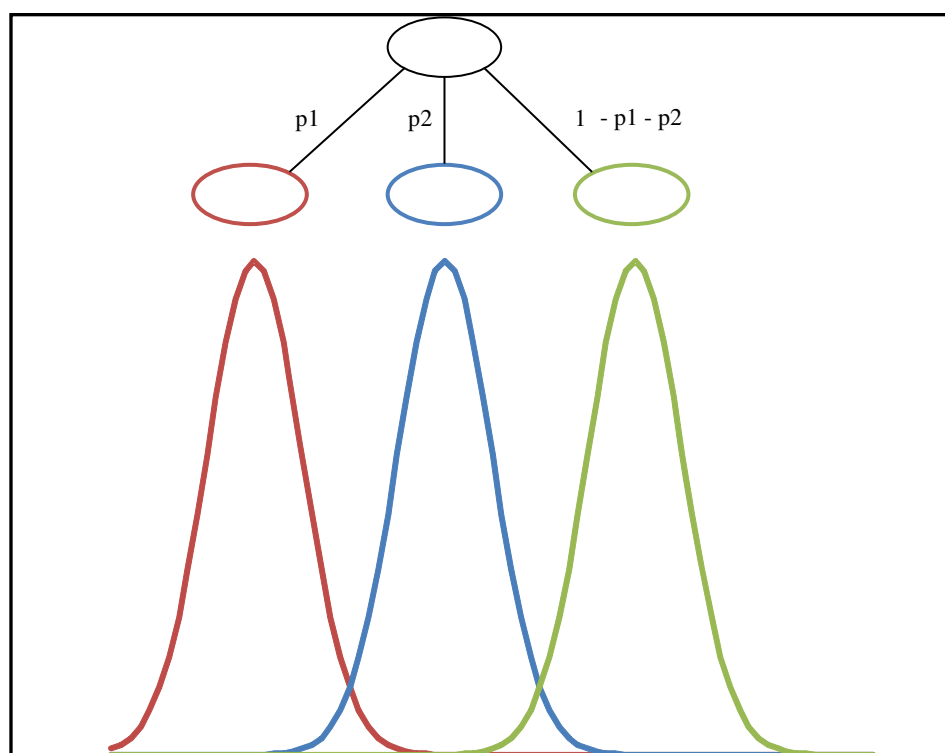
In section 5.3 we report results obtained with AutoClass, a programme developed by the Bayesian Learning Group at the NASA Ames Research Center (Cheeseman & Stutz, 1996) that applies this Bayesian probability clustering technique. In addition to finding the 'optimal' number of clusters as part of the maximization algorithm, AutoClass has another rather attractive feature: it allows for missing values, which are treated as 'observations' in the sense that they are combined with the observed data using an additional mixture distribution. The additional 'layer' combines the probabilities of observing actual data from, say, a normal distribution, with the probability of observing a 'missing' value. The probabilities of the mixing distribution (binomial) are again estimated as part of the maximization algorithm.

Distance-based cluster analysis

The 'classic', distance-based, cluster analysis performed on the available (pseudo-)metric variables has turned out to be tedious, for reasons related to the number of variables and missing values. Not all of these variables are necessarily important determinants of the cluster solution, so we initially performed a 'general-to-specific' analysis by testing the differences between cluster means and eliminating the insignificant variables in a stepwise manner. A drawback of this procedure is that the results are very unstable as a consequence of the changing set of countries included: when a variable is eliminated from the analysis, one or more countries with missing values for this variable become eligible for inclusion, thereby changing the composition

of the dataset and (usually) the outcome. Another drawback of classic cluster analysis based on simple distance measures is that the clustering is not based on statistical criteria. Of course, the computed distances can be interpreted as a kind of inverse likelihood, with greater distance implying smaller probability of belonging to the same group. The number of groups itself is in principle not determined by the analysis.

5.3. Cluster results: A typology of European LTC systems

Probabilistic clustering

Table 7 shows the results of one run with AutoClass, using 17 countries and 7 variables.[6] Despite the fact that missing values are allowed, as explained in the preceding section, we felt that the final results were unduly influenced by the countries with many missing values. As an extreme example, it would have been possible to include Portugal in the cluster analysis, even without any observations. It seems clear, however, that it would be hard to justify that the distribution of the missing values was a main driver behind the solution found. For this reason we decided to drop the countries with four or more missing values from the analysis (Bulgaria, Latvia, Lithuania, Portugal and Romania).

Several points should be kept in mind when interpreting these results. First, AutoClass starts its optimization algorithm from an initial point chosen at random, with the result that different runs with the same setup may produce different solutions. This actually occurs frequently, and we interpret it as a sign that several statistical models are compatible with the observed data, meaning that they are 'equally likely' to have generated them. Second, while many cluster solutions can be obtained by running the programme repeatedly with different sets of variables, many of these solutions are comparable in the sense that they usually consist of three clusters containing the same core set of countries, while they differ because a number of countries appear to have 'unspecific' characteristics. These unspecific countries probably combine features that resemble different clusters. They are Finland, Hungary, Austria, Slovenia and to a lesser extent Germany and Belgium.

The results in Table **7** below seem rather plausible. Cluster 1 consists mainly of Central European and Scandinavian countries characterized by relatively high levels of spending on average, high use of formal care and in general a public LTC system with a high degree of accessibility. Looking at the spending of individual countries in cluster 1, we see large differences. Spending is very high in Sweden, the Netherlands and Denmark, while it is very low in Estonia, the Czech Republic and Slovakia. Apparently other factors, such as the modest role of private funding, bring these countries together in one cluster. Cluster 2 consists of countries with a system in which the public sector plays a much smaller role, with lower total spending and more individual responsibility, a greater role for cash benefits and more informal care use. The third cluster is somewhat intermediate, containing countries in which relatively high overall spending is combined with individual responsibility. High levels of informal care provision are underpinned by measures to support informal caregivers.

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[6] We have dropped the 'Targeting' variable because of its apparent low information content: it has missing values for Denmark and Finland, and exhibits very little variation otherwise. With the exception of Hungary (whose value equals 1) and Austria and the Netherlands (whose value equals 3), all countries report a score of 4.

Table 7. Cluster profiles, probabilistic clustering (17 countries, 7 variables, independent normal densities)

Clusters	FCuse	Priv%	Spending	ICuse	Access	Cash	ICsupp
Belgium Czech Republic Denmark Estonia Germany The Netherlands Slovakia Sweden	High	Low	High	Low	Low	Low	Med
Hungary Italy Poland Spain England	Low	High	Low	Med	High	High	Low
Austria Finland France Slovenia	Med	Med	High	High	Med	Low	High

Note: The coding of the accessibility variable is reversed. *Source:* Authors' compilation.

Distance-based cluster analysis

Since the number of clusters is not determined by distance-based algorithms, we have experimented with three- and four-cluster solutions using k-means clustering with Euclidian distances. As explained earlier, because of missing values for some of the countries/variables, too few countries were available to carry out a meaningful cluster analysis. One way to increase the number of available observations is to reduce the number of variables. To do so without too much loss of information, we performed a factor analysis using the principal components of the eight 'core' variables. It turned out that there are only four dominant orthogonal factors (defined as principal components with eigenvalues exceeding unity), which together capture 87% of the total variance of the original variables. Given the high factor loadings obtained, we have selected one variable from each factor as representing that factor's dimension. The four variables retained were: Spending, IC use, Priv% and ICsupp. With these variables, 14 countries were available for analysis. Unfortunately, just like with the probabilistic clustering, the final clusters obtained depended on the random choice of the initial clusters, with the rather unappealing consequence that the final result has a substantial degree of arbitrariness. To avoid this, we have proceeded as follows: we have generated a large number of solutions, the results of which were used in a subsequent 'meta-clustering'. In other words, we have performed a cluster analysis on the replicated cluster solutions. This may seem rather unorthodox, but it can be viewed as an averaging procedure, in which every individual cluster solution is interpreted as an observation from an underlying (but unknown) distribution of clusters. The results are encouraging because

the cluster solution obtained seems plausible and is stable.[7] It also coincides with the result obtained from a hierarchical clustering cut off at 4 clusters. The results are summarised in Table 8.

Table 8. Cluster profiles, meta-analysis of distance-based clustering (14 countries, 4 variables, marked in bold and italics)

Clusters	*Spending*	*ICuse*	*Priv%*	*ICsupp*	FCuse	Cash	Access
Belgium Czech Republic Germany Slovakia	*Low*	*High*	*Low*	*High*	Med	Low	Low
Average Cl 1	*0.041*	*0.196*	*0.1*	*6*	0.156	131.5	2
Denmark The Netherlands Sweden	*High*	*Low*	*Low*	*High*	High	Low	Low
Average Cl 2	*0.153*	*0.071*	*0.1*	*5.667*	0.224	140.1	2
Austria Finland France Spain England	*Med*	*High*	*High*	*High*	Med	High	High
Average Cl 3	*0.071*	*0.204*	*0.3*	*6.2*	0.130	302.2	3.4
Hungary Italy	*Low*	*High*	*High*	*Low*	Low	Med	Med
Average Cl 4	*0.052*	*0.200*	*0.343*	*3*	0.102	240.8	3
Overall mean	*0.070*	*0.173*	*0.211*	*5.647*	0.144	206.3	2.647

Source: Authors' calculations.

Missing values precluded the clustering of Estonia, Poland and Slovenia. Nevertheless, based on the results of the probabilistic clustering, it seems reasonable to allocate Estonia to cluster 1, Slovenia to cluster 3 and Poland to cluster 4. This also follows from computing the distances of these countries to the cluster centres (using the available observations), except that Slovenia is slightly closer to cluster 4. The results thus obtained are presented in Figure 5, which shows the cluster membership on a European map. The countries that could not be classified because of severely lacking data are marked in light grey shading, while the countries not included in the analysis are marked in plain grey.

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[7] Repeating the 'meta-clustering' with different starting points does not change the final solution.

Figure 5. A spatial map of the final cluster solution of European LTC systems
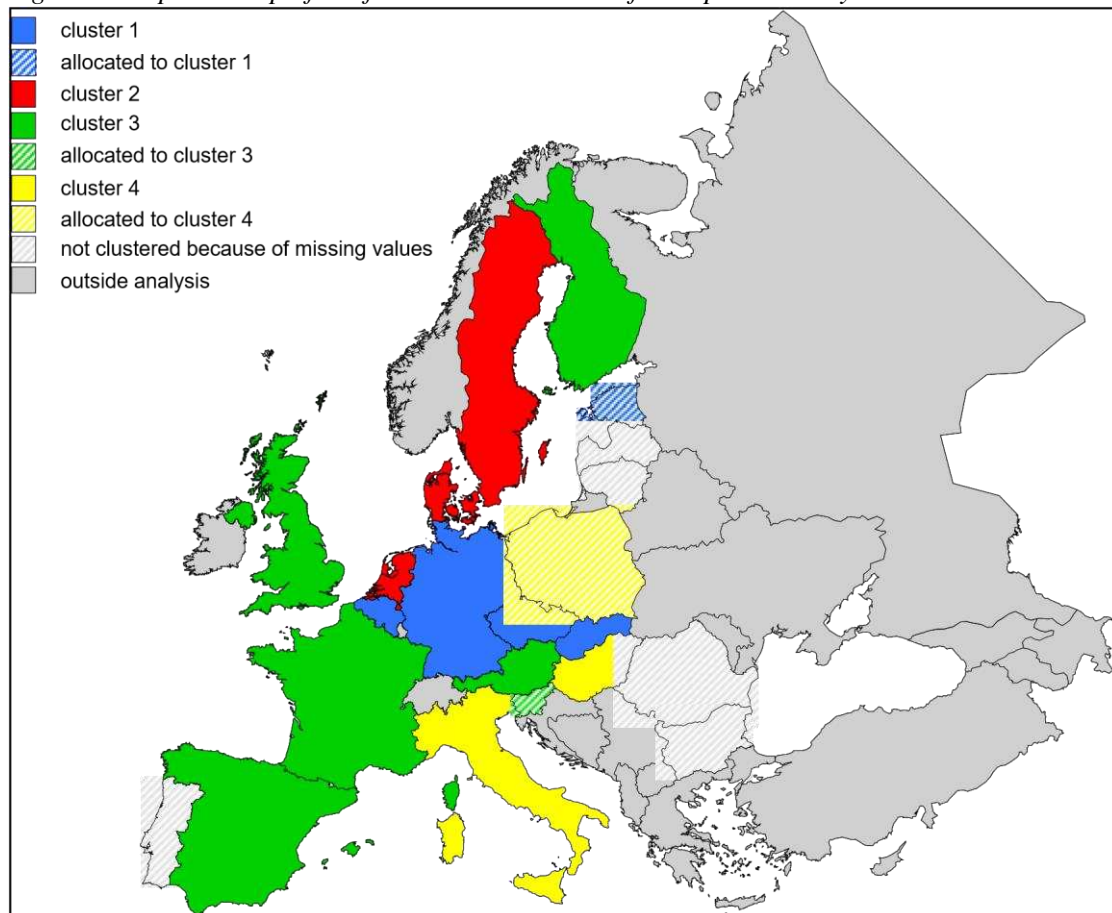
Source: Authors' compilation.

It should be kept in mind when interpreting these cluster outcomes that the analysis is based on four variables simultaneously and that it is possible that a country does not fit its cluster very well on any single variable. Belgium, for instance, is a 'medium' rather than a 'low' spender. It has the highest spending of the four countries in its cluster, the average of which is pulled down by the presence of the Czech Republic and Slovakia. This point is further elaborated in the following discussion.

Discussion

As explained earlier, while the probabilistic and distance-based clustering methods both have pros and cons, a common problem is the sensitivity of the cluster solution to the random starting point. This problem can be solved by replicating the procedure and averaging the outcomes, but this solution was only practically feasible for the distance-based method, using Stata's K-means clustering algorithm (the output produced by AutoClass is stored in text files, in a way that does not lend itself to easy automation and processing of the results).

Consequently, we consider the K-means meta-clustering results to be the final outcome of the clustering of LTC systems based on use and financing of care.

The results presented in the previous paragraph give rise to a typology of LTC systems that can be interpreted in terms of 'spending-related' (spending and Priv%) and 'informal care-related'

variables (ICuse and ICsupp). In terms of the former group, cluster 2 is characterized by countries with a highly developed and 'generous' public LTC system. This group represents the so-called 'Scandinavian' model. On the opposite side we find clusters 3 and 4, characterized by low- or medium-spending countries with considerable private financing. There is no clear geographical pattern discernable, as this group includes Mediterranean, Central European and Scandinavian countries, as well as England. Cluster 1 is an intermediate case, comprising less generous systems with a low share of private financing. The results are illustrated in Figure 6.

Figure 6. Countries plotted by spending – Share of private expenditures (Priv%)
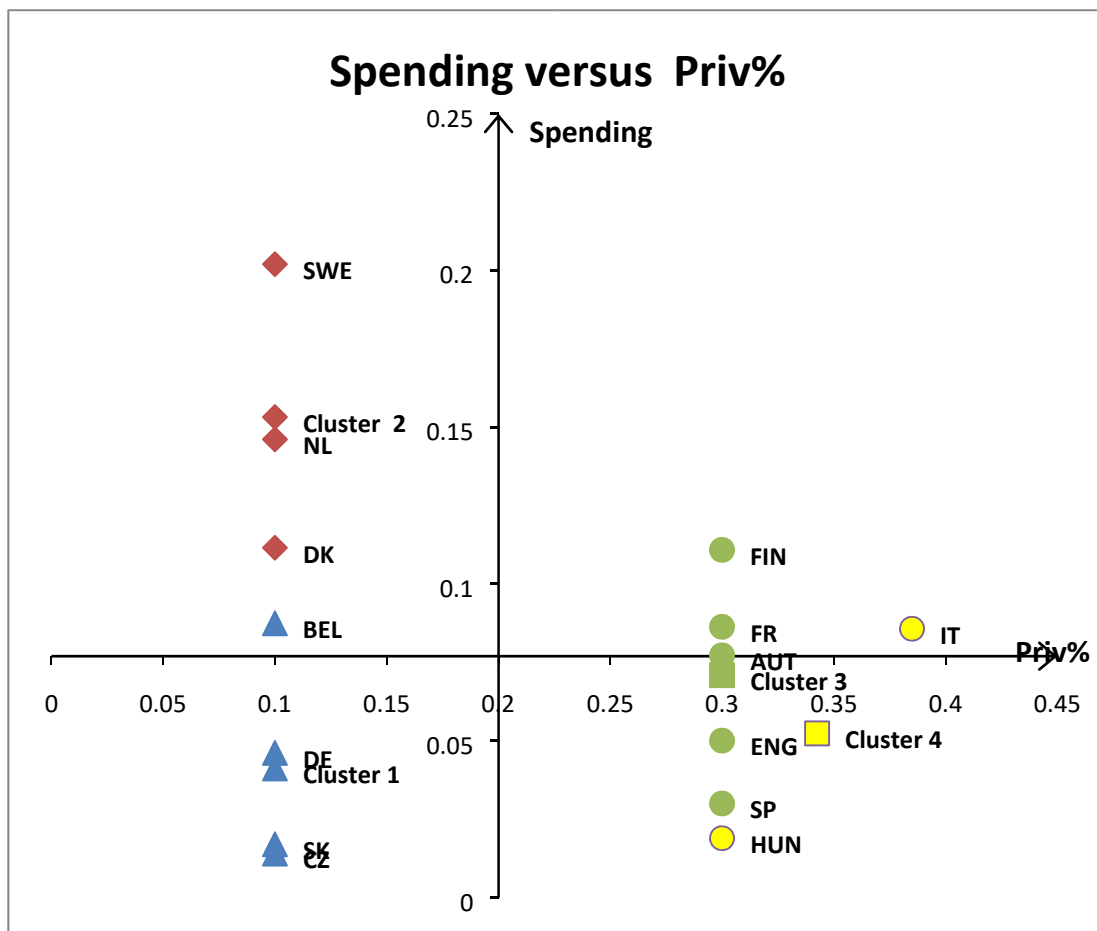
Source: Authors' calculations.

In terms of the role of informal care, there are two opposite and two intermediate systems. The opposites are clusters 2 and 4. The former is characterized by low use of informal care but relatively substantial support for informal caregivers, while the latter has high use of informal care despite the lack of support. This outcome can be interpreted in terms of the degree of development of the LTC systems: the Scandinavian cluster has a highly developed system with generous funding, where the relatively low use of informal care (despite the financial support) can be explained by the availability of and probably the preference for formal services. Conversely, cluster 4 has a relatively poorly-developed formal LTC system, with relatively heavy reliance on informal care despite the relatively poor support (out of necessity, one might say). Clusters 1 and 3 combine high levels of informal care use with substantial support, which can be

viewed as the 'expected' outcome of countries that favour informal care and support it accordingly. The results are illustrated in Figure 7.

Figure 7. Countries plotted by support for informal caregivers (ICsupp) vs. institutional care use (ICuse)
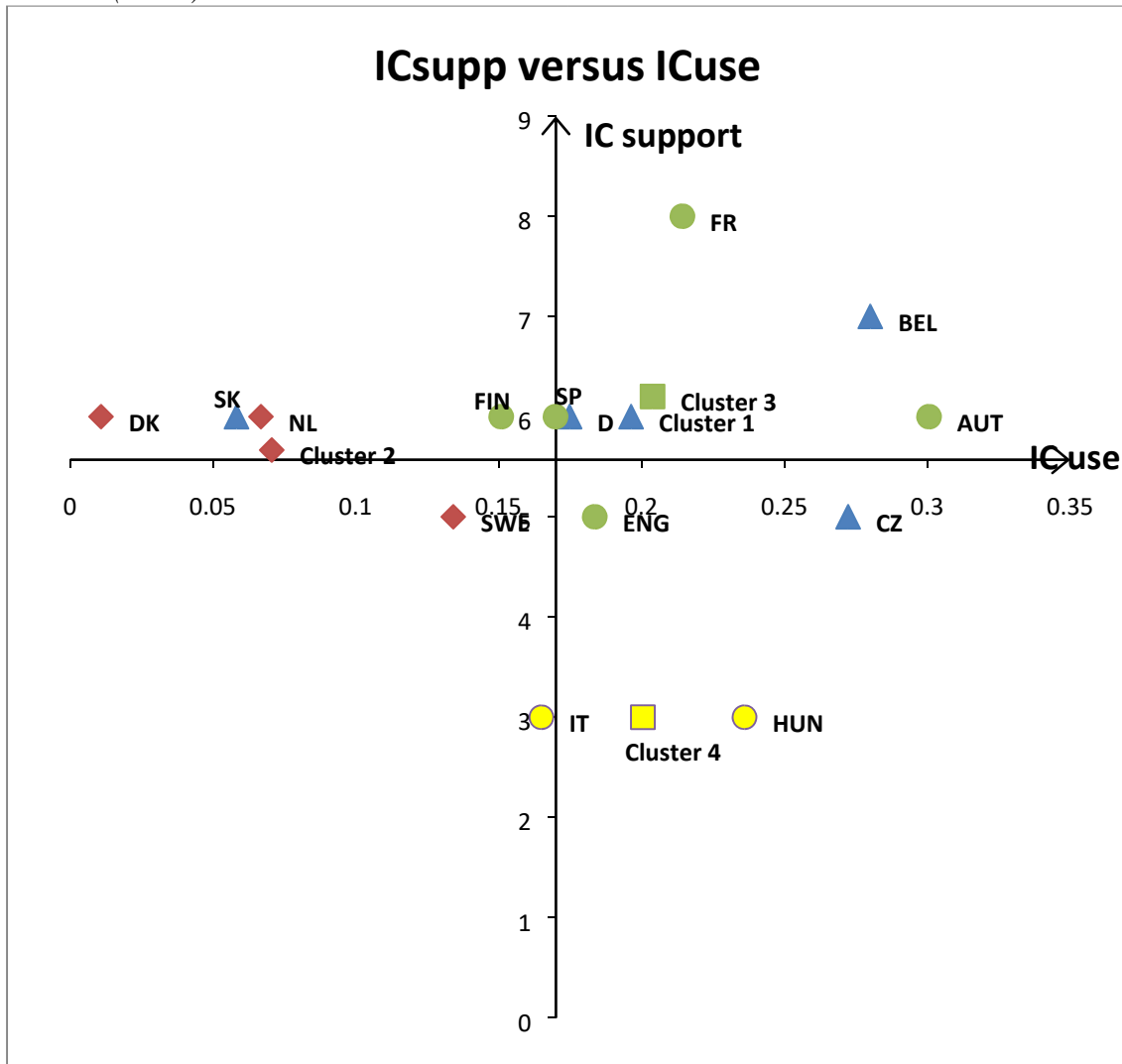
Source: Authors' calculations.

It is interesting to note that the outcomes in terms of informal care use are the mirror image of the outcome on spending, at least in a qualitative sense: the three low-spending clusters all score high on informal care use. A graphical presentation of the LTC typology, combining all four variables, is given in Figure 8. The figure displays the values of the cluster centres in a star diagramme.

Figure 8. A star plot of LTC systems (cluster centres)
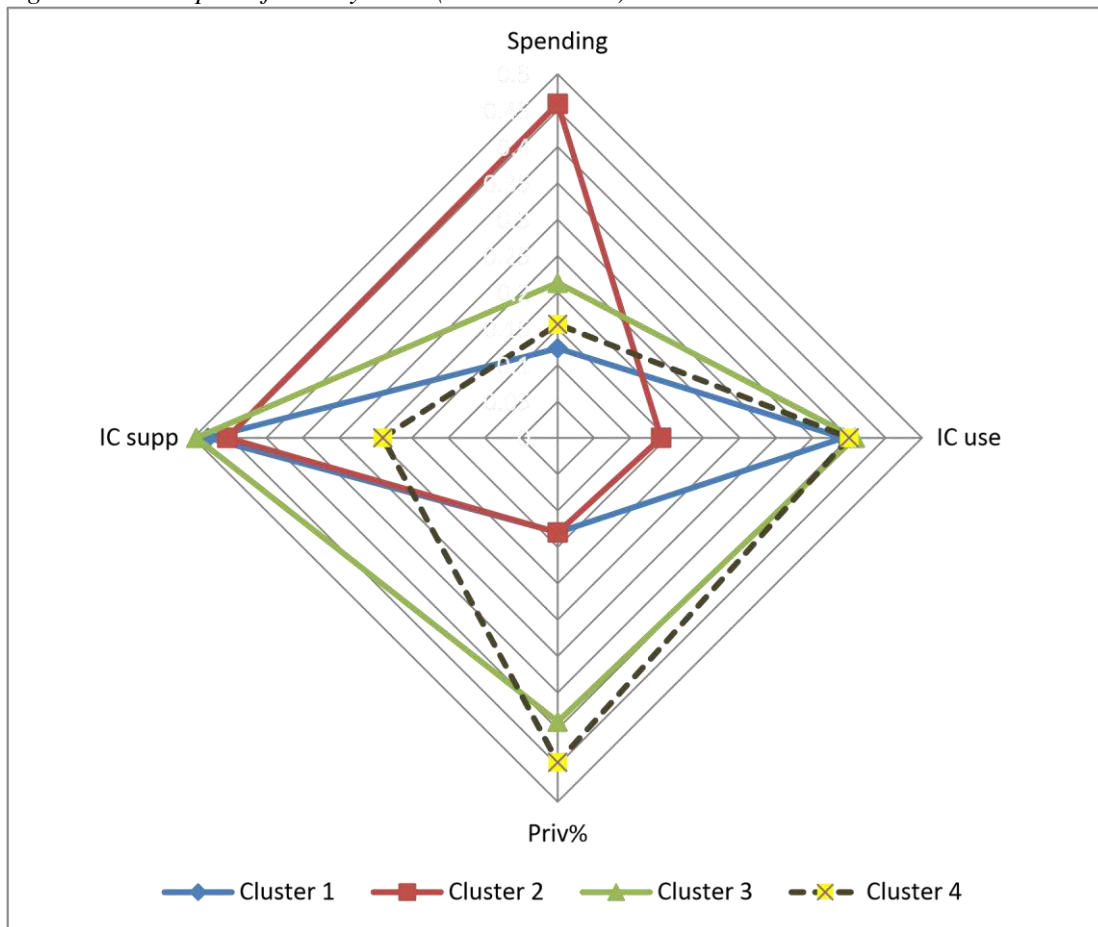
Source: Authors' calculations.

The results are quite interesting. They reveal a clear distinction between systems with a low share (clusters 1 and 2) and a high share (clusters 3 and 4) of private LTC spending. The 'small share of private LTC' group is further split into high- (cluster 2) and low-spending (cluster 1) clusters. The 'private LTC' group is split in terms of informal care support, with cluster 4 characterized by very little informal care support. In fact, as Figure 7 has shown, cluster 4 differs mainly from the other clusters in terms of informal care support.

6. Comparison of typologies and conclusions

6.1. LTC systems from the care recipient's perspective

In this section we look at the results of the two approaches from the viewpoint of the elderly in need of care. Naturally, patient-friendliness is only one aspect in the assessment of LTC systems, albeit an important one. For persons in need of care, especially those with a low income, a system that is substantially publicly funded may have a number of advantages over one that is privately funded. First, a public system entails solidarity with persons who are at higher risk of needing care and usually also with persons with lower incomes. Second, in an insurance system (public or private), risks can be pooled, reducing the uncertainty. Private LTC insurance, however, suffers from a

number of market failures that make it an inadequate solution.[8] An important problem is that the long-term inflation risk cannot be insured: that risk stays with the person who is looking for insurance. The problems with private LTC insurance make public LTC insurance more attractive, as it can reduce some of the uncertainty that risk-averse persons would wish to avoid. According to the results of the special Eurobarometer survey on health and long-term care (European Commission, 2007), there is a great deal of support for obligatory insurance schemes in Europe.[9]

Under the assumption that people value solidarity and that they are risk-averse we expect that elderly persons in need of care will prefer a larger share of public LTC funding and a lower share of private funding. We also assume that more choice will be preferable (e.g. the possibility to opt for cash benefits) and that more support for informal caregivers is preferable. With regard to the role of informal care, we make no a priori assumptions. It might be that some elderly persons prefer informal care, while others appreciate formal care more. The European Commission (2007) shows that there are large differences across countries in preferences for informal care. In Poland, 76% prefer a form of informal care, compared with only 23% in Denmark.[10] We expect that preferences also differ for aspects other than informal care, not just between inhabitants of different countries but also among various groups in the same country.

In Table 9 and Table 10 we try to order the two typologies that were described in the preceding sections, from the perspective of the elderly in need of care and given the assumptions about preferences. Table 11 shows how this preference ordering correlates with the replies by respondents to questions of the Eurobarometer on LTC in their country. These correlations provide some checks on the validity of the preference ordering.

Within the clustering based on system characteristics, the cluster with profound organizational depth and a high level of financial generosity would be preferred by the elderly. We assume that the combination of moderate organizational depth and moderate financial generosity would be preferable to the combination of profound organizational depth and a low level of financial generosity. The reason is that a lack of (public) funding would in the end lead to less choice for patients with lower incomes, no matter how well organized the system is. Least attractive to the elderly would be the combination of shallow organizational depth and little financial generosity.

Table 9. Preference ordering of the organizational clustering from the viewpoint of the elderly in need of care

Patient-friendliness ordering	Organizational clustering (21 countries)	Countries
1	Profound organizational depth, high level of financial generosity	Belgium, Denmark, France, Germany, the Netherlands, Sweden
2	Moderate organizational depth, moderate financial generosity	Austria, England, Finland, Italy, Latvia, Slovenia, Spain
3	Profound organizational depth, low level of financial generosity	Bulgaria, Estonia, the Czech Republic, Slovakia
4	Shallow organizational depth, low level of financial generosity	Hungary, Lithuania, Poland, Romania

Source: Authors' compilation.

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[8] Brown and Finkelstein (2007), Cutler (1996).

[9] 70% of Europeans agreed with the statement "Every individual should be obliged to contribute to an insurance scheme that will finance care if and when it is needed." This ranged from 85% in Belgium to 41% in Finland among the countries in our dataset.

[10] These preferences may be affected by the perceived quality and availability of formal care and by cultural factors.

The typology based on financing and use of care is somewhat more difficult to order from the point of view of the elderly. First, it is based on several characteristics that do not lead to a straightforward preference ordering, such as the use of formal and informal care. The European Commission (2007) gives information on the preference for informal care in the different countries, which shows marked differences. Furthermore, the comparison of clusters is based on a combination of characteristics, some of which are more attractive and some of which less so. For example, what would be more important to an elderly person: higher public spending as in the Nordic countries or a larger role for cash benefits as in some Continental countries? In the end, the cluster with high public spending is ranked most preferable, as it has a large number of attractive characteristics for the elderly in need of care. The only clear drawback is the relatively small role of cash benefits, which can make it more difficult for the elderly to be autonomous in organizing their care. At the other end of the spectrum, we find a cluster with many unattractive characteristics that is placed fourth in the ranking. For the two remaining clusters, no clear ranking is possible without further information, as the assessment depends on a number of trade-offs. These two clusters share second and third place in the ordering.

Table 10. Preference ordering of the use and financing clustering from the viewpoint of the elderly in need of care

Patient-friendliness ordering	Use and financing clustering (14 countries)	Countries
1	High public spending, low private funding, high FC use, low IC use, high IC support, small role of cash benefits	Cluster 2: Denmark, the Netherlands, Sweden
2 and 3	Low public spending, low private funding, moderate FC use, high IC use, high IC support, small role of cash benefits	Cluster 1: Belgium, the Czech Republic, Germany, Slovakia
	Moderate public spending, high private funding, moderate FC use, high IC use, high IC support, large role of cash benefits	Cluster 3: Austria, England, Finland, France, Spain
4	Low public spending, high private funding, low FC use, high IC use, low IC support, moderate role of cash benefits	Cluster 4: Hungary, Italy

Note: FC refers to formal care; IC refers to informal care. *Source:* Authors' compilation.

In Table 11 the correlation between the preference orderings and the answers to questions from the Eurobarometer is given. We used two questions:

> Q19: In the future do you think that you would be provided with the appropriate help and LTC if you were to need it?

> Q20b: And in which way would you prefer to be looked after?

The first question is an indication of the confidence that citizens have in their national LTC system. For the second question, we added the answers to the categories "in your own home by a relative" and "in the home of one of your close family members", as these are the two possible answers that refer to informal care.

Both preference orderings are somewhat correlated with confidence in the system. [11] The correlation is higher for approach 2 (use and financing typology). The preference orderings for both approaches are more strongly correlated with the preference for informal care. This correlation is even higher for approach 1, even though the use of formal and informal care does not affect the classification in that approach. The lower the financial generosity and the less the organizational depth of the system, the larger is the preference for informal care. It is not clear what the relevant interactions and dependencies are in this respect: Is financial generosity limited because citizens prefer informal care anyway or do they prefer informal care because funding is inadequate for effective formal care?

Table 11. Correlation between the preference orderings and opinions on LTC by country

| | Eurobarometer | | Preference ordering | |
| | Confidence in the system | IC preferences | Approach 1 | Approach 2 |
	Q19	Q20b		
Denmark	72	23	1	1
The Netherlands	72	35	1	1
Sweden	84	37	1	1
Belgium	88	44	1	2.5
Czech Republic	80	60	3	2.5
Germany	74	54	1	2.5
Slovakia	79	57	3	2.5
Austria	70	45	2	2.5
England	61	51	2	2.5
Finland	78	42	2	2.5
France	76	26	1	2.5
Spain	69	53	2	2.5
Hungary	76	72	4	4
Italy	61	48	2	4
Slovenia	82	52	2	–
Latvia	75	59	2	–
Bulgaria	71	70	3	–
Estonia	77	54	3	–
Poland	69	76	4	–
Lithuania	75	68	4	–
Romania	73	58	4	–
Correlation with Q19			-0.13	-0.27
with Q20b			0.84	0.67

Note: FC refers to formal care; IC refers to informal care. *Source:* Authors' compilation.

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[11] The correlation is negative because of the coding of the preference ordering.

Table 12 shows for each country how the LTC system is rated on patient-friendliness according to the two typologies. For the 14 countries that are included in both typologies, a comparison can be made. Despite the fact that the criteria for the typologies are partly different, it turns out that 10 countries have the same ordering. Four countries are clearly ranked differently.

Denmark, the Netherlands and Sweden have a very clear profile of paying a lot of attention to the interests of LTC users. It is not surprising that they end up in the most preferred category in both typologies. Other countries, like Hungary, are clearly less attractive to LTC users. Many of these countries are new member states where the available data are not very good, so only a very limited comparison of the two typologies is possible in this respect. Some other Eastern European countries do not spend a lot of money on LTC, but their organizational depth is quite extensive, which leads to a higher ranking in both typologies. Examples are the Czech Republic and Slovakia.

Table 12. Ordering from the viewpoint of the elderly in the two typologies

Country	Organizational typology	Use of care typology	Comparison of ordering
Austria	2	2/3	Same
Belgium	1	2/3	Different
Bulgaria	3	na	–
Czech Republic	3	2/3	Same
Denmark	1	1	Same
England	2	2/3	Same
Estonia	3	na	–
Finland	2	2/3	Same
France	1	2/3	Different
Germany	1	2/3	Different
Hungary	4	4	Same
Italy	2	4	Different
Latvia	2	na	–
Lithuania	4	na	–
The Netherlands	1	1	Same
Poland	4	na	–
Portugal	?	?	–
Romania	4	na	–
Slovakia	3	2/3	Same
Slovenia	2	na	–
Spain	2	2/3	Same
Sweden	1	1	Same

Source: Authors' compilation.

Belgium, France, Germany and Italy are ordered quite differently in the two typologies. In the use and financing typology, Belgium was included in a low-spending cluster on the basis of other characteristics of its system, even though Belgium spends much more than the other countries in the cluster. So the Belgian system is in reality probably more attractive to the elderly than is shown

by the ranking on the basis of use and financing. For Germany, more or less the opposite holds. Within the cluster with a high level of financial generosity, income and needs-corrected spending is by far the lowest in Germany. In Figure 1 (typology, approach 1), it can be seen that France and Germany are located close to the somewhat less attractive cluster. France in any case does not belong to the Nordic cluster, as informal care use and private funding are high there. For Italy the difference between the two typologies is especially large. In the use and financing typology it has ended up in the least attractive cluster because of characteristics such as a high degree of private funding, moderate public spending, low use of formal care, low support for informal care and moderate use of informal care. In the organizational typology, the financial generosity in Italy is judged relatively favourably, as there is no cost sharing in home nursing care. Italy is nonetheless the country with the highest level of private funding in our set of countries. This example illustrates the difference between the use of qualitative and quantitative information: if the only information used is that on the *existence* of cost sharing in several areas, this does not tell us anything about the *importance* of out-ofpocket spending.

6.2. Comparison with existing typologies

Organizational typology

The application of the well-known distinction between Beveridge- and Bismarck-oriented systems, as also discussed in Pacolet et al. (1998), does not fit very well with our typology of the organization and funding of LTC. Cluster 1 consists of Nordic tax-funded systems (Denmark and Sweden) as well as traditional social-insurance systems (Belgium, France, Germany and the Netherlands). Cluster 2 is a mixture of southern (Italy and Spain) and northern (Finland and England) tax-funded systems, two new member states (Latvia and Slovenia) and Austria, a country with a tradition as a social insurance country but rather mixed financing in health care. Due to differences in organizational aspects, the remaining new member states are spread over two more clusters.

Figure 9. Funding for LTC by public sources
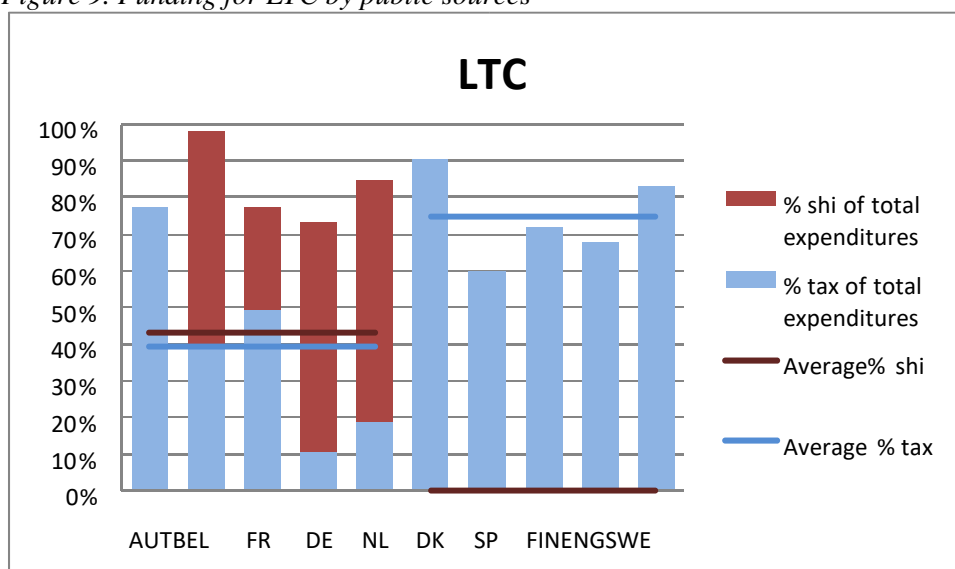
Source: Authors' compilation.

In health care funding, a leading role of either government or insurance can be identified for each country in Figure 10, even though most countries use public funds from both payers to finance their services. In LTC, however, six of ten countries use only tax money to fund services, and insurance-dominated LTC systems use a higher share of tax funds than health care systems. There are some countries where social insurance contributes more funding for LTC than the government (Germany, the Netherlands, Belgium and some new member states not included in Figure 9), but the relative contribution is in general smaller than in health care. In contrast, social insurance has no financial role in Austrian LTC and only a limited one in France, even though both countries are usually seen as traditional social-insurance countries. A comparison of funding shares between health care and LTC shows that the financial role of social insurance is in general far less distinctive in LTC (see Figure 9 and Figure 10).

Figure 10. Funding for health care by public sources
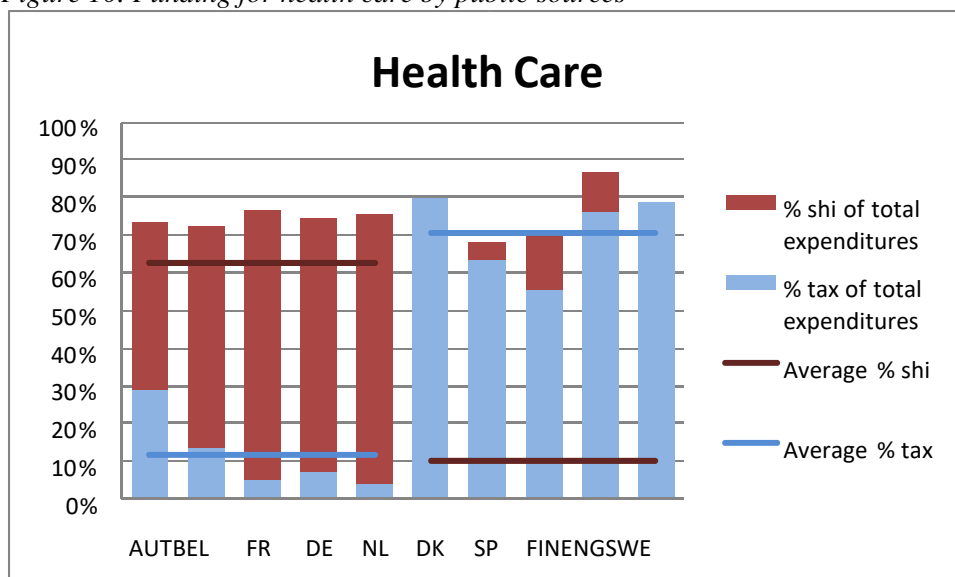
Source: Authors' compilation.

With regard to the classification into Scandinavian, Continental and Mediterranean systems, we see only some degree of compatibility in so far as Denmark, the Netherlands and Sweden are grouped in the same cluster. Also, the only two Mediterranean countries in our sample (Italy and Spain) are grouped together. Both clusters, however, also contain other members, such as those that are usually associated with a Continental welfare model.

Use and financing typology

A Scandinavian cluster with a high level of public spending, high use of formal care, low use of informal care and a high degree of accessibility can be distinguished. The same grouping of Denmark, Sweden and the Netherlands was found as in the analysis of Pommer et al. (2007). They characterize the group of Belgium, France and Austria as the nuclear family-oriented, Continental model with both formal and informal care use at a high level. In our analysis of 14 countries, this group is spread over two clusters. Both of these clusters show high use of informal care and support, and medium use of formal care. The main differences between clusters 1 (including Belgium) and 3 (including Austria and France) concern the importance of private financing and cash benefits. These factors are not included in the analysis of Pommer et al. (2007). They position

Spain, Italy and Germany in an intermediate group between the individualistic Scandinavian model and the extended family-based Mediterranean model of Greece. Our quantitative approach puts Spain, Italy and Germany in three different clusters, while Greece is not included. These clusters differ on private funding, informal care support, the importance of cash benefits and accessibility.

We can conclude that the use of a larger set of explanatory variables and of a partly varying set of countries leads to alternative clustering. Only the Scandinavian group of Sweden, Denmark and the Netherlands seems to be robustly clustered under different approaches.

6.3. Discussion and conclusions

Data and methods

It turned out to be very difficult to collect precise quantitative information on LTC according to predefined definitions for a large selection of European countries. As could be expected, data collection was more problematic for the new member states. Yet we also encountered serious problems for Western European countries. Data are available for financing and use of formal care, but they do not necessarily match the definitions considered most useful for the analysis. National systems may be organized in a way that conflicts with the definitions. Information on subjects such as the use of informal care can only be obtained from surveys. Not only do the results of surveys have a degree of statistical uncertainty, the amount of informal care used and provided is also very sensitive to the exact definition that is used. It was much easier to collect qualitative data on system characteristics, for example on the existence of mandatory quality assurance or cash benefits.

The differences in the ease of data collection are reflected in the analyses, where two different approaches complement one another.[12] The approach that is mostly based on qualitative system characteristics exploits the fact that this information could be collected for 21 countries, enabling us to derive a broad typology of organizational aspects, supplemented with some information on funding. The strength of the approach based on continuous quantitative data is that it can use detailed data on funding and use of care, thereby including more information on the functioning and outcomes of LTC systems. Still, this analysis could not be carried out for all selected countries, but for just 14 countries with relatively good data. A drawback of the systems approach is that limited information on funding could be used. But an advantage of the ordering of factors in two dimensions is that the final clustering is easier to understand.

Analysis of the typology on care use and financing shows that a limited number of crucial characteristics is sufficient for clustering. It turned out that a set of eight explanatory variables could be condensed to four variables. In the end, the four clusters can to a large degree be characterized by four factors: income and needs-corrected public spending on LTC, the share of private funding, the support for informal caregivers and use of informal care. The use of formal care, the role of cash benefits and the accessibility of the system are all very interesting factors, but are not absolutely crucial for deriving typologies. This result does suggest, however, that very general distinctions, such as that between a tax- and an insurance-financed system, are not sufficient for meaningful clustering.

Typology results

In the analysis of 21 countries, the system characteristics were summarized under the headings 'organizational depth' and 'financial generosity'. Organizational depth represents the way the

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[12] The probabilistic clustering is not discussed in this chapter, as the results of the distance based clustering are considered the final outcome for the second approach.

system is organized in aspects such as the accessibility of care and the freedom that patients have to choose and organize their care. Most of the new member states share the characteristic of a low level of financial generosity. Latvia and Slovenia are exceptions, with moderate financial generosity comparable to countries like Austria, Spain, England and Finland. An interesting result is that the LTC systems in the new member states differ greatly in organizational depth. This is much more extensive in Estonia, Slovakia, the Czech Republic and Bulgaria than in the other Eastern European countries. The Western European countries display a moderate to high level of financial generosity and greater organizational depth. They can be classified into two groups. Belgium, France, Germany, the Netherlands, Sweden and Denmark are in the group with profound organizational depth as well as a high level of financial generosity. Austria, England, Spain, Finland, Italy, Latvia and Slovenia combine moderate organizational depth with moderate financial generosity.

In the analysis of 14 countries, the clusters are characterized by the amount of public spending on LTC (corrected for income and needs), the share of private funding, the support for informal caregivers and – somewhat less important – the use of formal and informal care (see Table 13). The countries can be divided into two broad groups, each consisting of two clusters: a group with a low share of private financing and a group with a much higher share of private financing. The two clusters with a very modest role for private financing can be distinguished by the amount of public funding. In Denmark, the Netherlands and Sweden, public spending on LTC is high, private financing is low, the use of formal care is high and the use of informal care is low. These countries have generous, accessible and formalized systems of LTC with still a great deal of support for informal caregivers. The role of cash benefits is modest. Belgium, Germany, the Czech Republic and Slovakia combine a low level of private funding with rather low public spending. Belgium is an exception in the latter respect, as the spending is moderate rather than low. In the countries in this group, the use of informal care and the support for informal caregivers are both high. Their systems can be seen as more oriented towards informal care, with a low level of private financing. In Austria, England, Finland, France and Spain, a high level of private funding is combined with moderate public spending. The accessibility of the formal system is rather low, but as in the case of the cluster with Belgium, the use of and support for informal care are high. These systems might be described as informal care-oriented systems that also use a rather high amount of private funding. In other words, individual responsibility is large. The remaining cluster with a high level of private funding consists of Hungary and Italy. Public spending is low and the use of informal care is high. Yet support for informal care is low. It seems that the high use of informal care is not so much a policy choice but more a necessity.

Comparison of typologies

The resulting typologies following the two approaches can be ordered according to the attractiveness of their systems for the elderly in need of care under certain assumptions concerning the preferences of elderly persons. A more complete assessment of the systems will be made in Work Package 7. Despite the differences in explanatory factors, the two typologies yield the same result for 10 out of 14 countries for the attractiveness ordering. Denmark, the Netherlands and Sweden have a very attractive system for LTC users according to many characteristics. Only for Belgium, France, Germany and Italy is the ordering really dependent on the approach.

Compared with existing typologies, our results are based on richer datasets. This leads to a different clustering of countries, and the resulting typologies are more informative than the rather crude divisions usually reported in the literature. Only the Nordic group of Denmark, the Netherlands and Sweden seems to be robustly clustered under different approaches.

Table 13. Typology based on use and financing of care

Nature of the system	Countries	Characteristics
Oriented towards informal care, low private financing	Belgium,* Czech Republic, Germany, Slovakia	Low spending, low private funding, high IC use, high IC support, cash benefits modest
Generous, accessible and formalized	Denmark, the Netherlands, Sweden	High spending, low private funding, low IC use, high IC support, cash benefits modest
Oriented towards informal care, high private financing	Austria, England, Finland, France, Spain	Medium spending, high private funding, high IC use, high IC support, cash benefits high
High private financing, informal care seems a necessity	Hungary, Italy	Low spending, high private funding, high IC use, low IC support, cash benefits medium

* Medium spender

Source: Authors' compilation.

Selection of countries to be modelled in later work packages

According to the description of work, a representative country is to be selected from each of the clusters for detailed modelling in later work packages. Data availability is an important consideration in this selection. The selection of countries has been based on the results of the typology on care use and financing, as this contains the richest information on LTC systems. Even though this typology contains only 14 countries, the absent countries are missing in most cases precisely because it has been very difficult to find good data. This implies that the same problem would occur for many of the missing countries if they were selected for further modelling.

We chose Germany to represent cluster 1, as it is a large country with good data availability. The Netherlands represent cluster 2, mostly because of the availability of longitudinal data.[13] Spain was chosen as the representative country for cluster 3. As we wanted to include an Eastern European country in the selection, we would have liked to have chosen Hungary to represent cluster 4, but data problems made us choose Poland instead.

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[13] Our original plan was to choose Sweden in order to use the Swedish administrative data for some of the analyses in WP2. Because of problems surrounding these data, we switched to the Netherlands.

List of Abbreviations

ADL   Activities of daily living

EPC   Economic Policy Committee

FIC   Formal institutional care

GDP   Gross domestic product

HC   Home care

HNC   Home nursing care

HBC   Home-based care (home care + home nursing care)

IC   Institutional care

LTC   Long-term care

SHA   System of Health Accounts

SHARE   Survey of Health, Ageing and Retirement in Europe

SHI   Social health insurance

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Appendix 1. Partner institutes that provided country-specific data

Unless otherwise stated, country-specific data were provided by members of the partner institutes for the countries shown below.

Table A1.1 Institutes and countries covered

Institute		Countries
CASE	Centre for Social and Economic Research	Czech Republic, Lithuania, Poland, Romania
CEPS	Centre for European Policy Studies	Bulgaria
CPB	Netherlands Bureau for Economic Policy Analysis	The Netherlands
DIW	German Institute for Economic Research	Denmark, Germany
ETLA	The Research Institute of the Finnish Economy	Finland
FEDEA	Fundacion de estudios de economia aplicada	Spain
FPB	Federal Planning Bureau	Belgium
IER	Institute for Economic Research	Slovenia
IHS	Institute for Advanced Studies	Austria
ISAE	Istituto di Studi e Analisi Economica	Italy
KI	Karolinska Institute – Department of Medicine, Clinical Epidemiology Unit	Sweden
LEGOS	Université de Paris-Dauphine-Laboratoire d'Economie et de Gestion des organisations de Santé	France, Portugal
LSE–PSSRU	London School of Economics and Political Sciences – Personal Social Services Research Unit	UK
PRAXIS	Center for Policy Studies	Estonia, Latvia
SAS BIER	Institute of Economic Research, Slovak Academy of Sciences	Slovakia
SU	University of Stockholm – Department of Economics	Sweden
TARKI	Social Research Institute	Hungary

Appendix 2. Observed values for metric variables on the care use and financing approach

Table A2.1. Observed values for metric variables related to funding

Countries	Spending corrected	Priv% (middle of class)	Cash (euros)
Austria	0.077	30	404
Belgium	0.087	10	253
Bulgaria	0.012	na	0
Czech Republic	0.014	10	64
Denmark	0.112	10	0
England	0.05	30	na
Estonia	0.006	10	455
Finland	0.111	30	87
France	0.086	30	46
Germany	0.046	10	129
Hungary	0.019	30	0
Italy	0.086	38.5	482
Latvia	0.024	10	95
Lithuania	0.032	na	270
Netherlands	0.146	10	420
Poland	0.03	30	96
Portugal	0.006	na	na
Romania	na	30	0
Slovakia	0.017	10	79
Slovenia	0.07	30	114
Spain	0.03	30	672
Sweden	0.202	10	0
Average	0.06	21.0	183

Sources: European Commission (2009) and ANCIEN questionnaires.

Table A2.2. Observed values for metric variables related to use of care

Countries	FCuse (%)	ICuse (%)	ICsupp
Austria	12.6	30.1	6
Belgium	28.2	28.0	7
Bulgaria	na	na	3
Czech Republic	17.4	27.2	5
Denmark	21.7	1.1	6
England	11.0	18.4	5
Estonia	7.5	na	6
Finland	19.9	15.1	6
France	13.8	21.4	8
Germany	6.9	17.5	6
Hungary	11.9	23.6	3
Italy	8.6	16.5	3
Latvia	na	na	na
Lithuania	na	na	7
Netherlands	27.4	6.7	6
Poland	na	na	4
Portugal	na	na	na
Romania	na	na	7
Slovakia	10.0	5.8	6
Slovenia	7.3	na	8
Spain	7.8	17.0	6
Sweden	18.3	13.4	5
Average	14.4	17.3	5.7

Sources: European Commission (2009) and ANCIEN questionnaires.

ANCIEN

Assessing Needs of Care in European Nations

FP7 HEALTH-2007-3.2-2

L aunched in January 2009, ANCIEN is a research project financed under the 7th EU Research Framework Programme. It runs for a 44-month period and involves 20 partners from EU member states. The project principally concerns the future of long-term care (LTC) for the elderly in Europe and addresses two questions in particular:

1) How will need, demand, supply and use of LTC develop?

2) How do different systems of LTC perform?

The project proceeds in consecutive steps of collecting and analysing information and projecting future scenarios on long term care needs, use, quality assurance and system performance. State-of-theart demographic, epidemiologic and econometric modelling is used to interpret and project needs, supply and use of long-term care over future time periods for different LTC systems.

The project started with collecting information and data to portray long-term care in Europe (WP 1). After establishing a framework for individual country reports, including data templates, information was collected and typologies of LTC systems were created. The collected data will form the basis of estimates of actual and future long term care needs in selected countries (WP 2). WP 3 builds on the estimates of needs to characterise the response: the provision and determinants of formal and informal care across European long-term care systems. Special emphasis is put on identifying the impact of regulation on the choice of care and the supply of caregivers. WP 6 integrates the results of WPs 1, 2 and 3 using econometric micro and macro-modelling, translating the projected needs derived from WP2 into projected use by using the behavioral models developed in WP3, taking into account the availability and regulation of formal and informal care and the potential use of technological developments.

On the backbone of projected needs, provisions and use in European LTC systems, WP 4 addresses developing technology as a factor in the process of change occurring in long-term care. This project will work out general principles for coping with the role of evolving technology, considering the cultural, economic, regulatory and organisational conditions. WP 5 addresses quality assurance. Together with WP 1, WP 5 reviews the policies on LTC quality assurance and the quality indicators in the EU member states, and assesses strengths, weaknesses, opportunities and threats of the various quality assurance policies. Finally WP 7 analyses systems performance, identifying best practices and studying trade-offs between quality, accessibility and affordability.

The final result of all work packages is a comprehensive overview of the long term care systems of EU nations, a description and projection of needs, provision and use for selected countries combined with a description of systems, and of quality assurance and an analysis of systems performance. CEPS is responsible for administrative coordination and dissemination of the general results (WP 8 and 9). The Belgian Federal Planning Bureau (FPB) and the Netherlands Bureau for Economic Policy Analysis (CPB) are responsible for scientific coordination.

For more information, please visit the ANCIEN website (http://www.ancien-longtermcare.eu).