

**Charles University in Prague**

Faculty of Social Sciences  
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BACHELOR THESIS

**Long-Term Care in the Czech Republic:  
The Way Forward**

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Academic Year: **2012/2013**

## Declaration of Authorship

The author hereby declares that she compiled this thesis independently, using only the listed resources and literature.

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Prague, May 17, 2013

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Signature

## Acknowledgments

I would hereby like to express my gratitude to my supervisor PhDr. Kateřina Pavloková for her useful comments, remarks and for introducing me to the topic. My thanks belong to her also for allowing me to use data related to one of her own projects. Secondly, I would like to thank Mgr. Tomáš Roubal who provided me with a great dataset which was essential for the whole projection in this thesis. Furthermore, I am grateful to Mr. Etienne Sail for letting me access European Commission's data on future labour productivity growth rates.

## Abstract

This thesis focuses on the future development of expenditures on long-term care in the Czech Republic. It consists of an introduction to the problems of population ageing and long-term care and then uses a mathematical model to predict the future expenditures on long-term care until the year 2060. The impact of population ageing on these costs is crucial. The prediction is based on an external population projection and uses data on long-term care capturing about 65% of Czech population which makes the prediction very unique. The thesis contains the results of this projection as well as their comparison with another model using the same population projection.

<b>JEL Classification</b>	H51, I15, I18
<b>Keywords</b>	long-term care, Czech Republic, expenditures, projection, population ageing
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## Abstrakt

Zaměřením této bakalářské práce jsou budoucí výdaje na dlouhodobou péči v České republice. Práce obsahuje úvod do problematiky dlouhodobé péče a demografického stárnutí, na který navazuje matematický model odhadující budoucí výdaje na dlouhodobou péči do roku 2060. Vliv demografického stárnutí na tyto výdaje je velice výrazný. Predikce je založena na externí populační projekci a pro vyčíslení nákladů na dlouhodobou péči používá data zachycující 65% české populace, což predikci činí jedinečnou. Tato práce obsahuje výsledky projekce a také jejich srovnání s již existujícím modelem, který používá stejnou populační projekci.

<b>Klasifikace</b>	H51, I15, I18
<b>Klíčová slova</b>	dlouhodobá péče, Česká republika, výdaje, projekce, demografické stárnutí
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# Acronyms

<b>ADL</b>	Activities of Daily Living
<b>CA</b>	Care Allowance
<b>CR</b>	Czech Republic
<b>CZK</b>	Czech Crown
<b>EU</b>	European Union
<b>GDP</b>	Gross Domestic Product
<b>LTC</b>	Long-Term Care
<b>NAWRU</b>	Non-Accelerating-Wage Rate of Unemployment
<b>VZP</b>	Czech health insurance company named ‘Všeobecná zdravotní pojišťovna’

# Bachelor Thesis Proposal

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<b>Author</b>	Lucie Blechová
<b>Supervisor</b>	PhDr. Kateřina Pavloková
<b>Proposed Topic</b>	Long-Term Care in the Czech Republic: The Way Forward

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**Topic Characteristics** In my BA thesis, I intend to focus on the future development of public expenditures on long-term care in the Czech Republic. Long-term care includes both medical and social services to people with limited ability to perform activities of daily living due to physical or mental disorders. Care is considered to be long-term if it is provided over a period of six months or more. The expenditures on long-term care in the Czech Republic are generally expected to rise due to demographic ageing of the population. I am going to model the volume of long-term care consumed in the future with respect to expected demographic development. Based on the volume of care consumed, I will estimate the level of overall future public expenditures on long-term care. I will use data provided by the Ministry of Health of the Czech Republic for modelling.

Expected structure:

1. Introduction
2. Demographic Development Expectations
3. Modelling Long-Term Care
4. Conclusion

**Charakteristika práce v češtině** Ve své práci se zaměřím na budoucí vývoj výše veřejných výdajů na dlouhodobou péči v České republice. Dlouhodobá péče zahrnuje zdravotní a sociální služby jedincům, kteří jsou nesoběstační ve vykonávání aktivit každodenního života. Tato nesoběstačnost může být způsobena špatným zdravotním či mentálním stavem. Péče je považována za dlouhodobou, pokud je nutné ji poskytovat alespoň šest měsíců. Obecně se očekává, že výdaje na dlouhodobou péči v České republice porostou kvůli demografickému stárnutí obyvatelstva. V práci budu

modelovat budoucí úroveň spotřeby dlouhodobé péče s ohledem na demografický vývoj v České republice. Na základě úrovně spotřeby dlouhodobé péče poté odhadnu celkové budoucí veřejné výdaje na dlouhodobou péči. K modelování využiji data poskytnutá Ministerstvem zdravotnictví České republiky.

Očekávaná struktura práce:

1. Úvod
2. Očekávaný demografický vývoj
3. Modelování vývoje dlouhodobé péče
4. Závěr

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# 1 Introduction

Long-term care is a set of medical and social services to people who suffer from a long-term disability due to a physical or mental disorder. The disability keeps such persons from performing common activities that are necessary for everyday life. Therefore, disabled people need help provided by either volunteers (usually relatives) or professionals. Long-term disability can appear at any age but most long-term care is demanded by the elderly. In most developed countries including the Czech Republic, a share of elderly people in the population is rising over time. This phenomenon is called population ageing and it is caused mainly by higher past fertility rates than are those present and future ones connected with an increasing life expectancy.

This thesis focuses on the future costs of both the medical and the social component of long-term care in the Czech Republic. The expenditures on long-term care are predicted using an external population projection and data on long-term care related to the year 2009. The projection methodology is based on *The 2012 Ageing Report* (European Commission (DG ECFIN) and Economic Policy Committee (AWG), 2012) but it is expected to bring more exact results thanks to better data available. The costs are predicted for each five years ending in the year 2060. The hypothesis is that the costs of long-term care will be rising due to the ageing of Czech population.

The thesis is structured as follows. Firstly, the general problem of long-term care and population ageing is introduced. In the second chapter, the dataset used for the projection of long-term care expenditures is described. Next, the theoretical framework of the model is covered in Chapter 3 and it is followed by the results of the projection that are presented in the fourth chapter. Afterwards, a comparison of results with *The 2012 Ageing Report* is performed. The last chapter of the thesis focuses on the aspects of long-term care that are not captured by data and therefore may have an incalculable influence on the future costs of long-term care.

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## 2 Long-Term Care in an Ageing Population Environment

Long-term care is defined as care provided to people who are unable to perform activities of daily living independently of help provided by other persons due to physical or mental disorders. The activities of daily living (ADL) are common everyday activities such as eating, drinking, hygiene, changing clothes or locomotion. However, the range of dependence is much broader. Dependent people need help with so called instrumental activities of daily living as well. These are for example shopping, preparing meal, housework or moving out of home. Nevertheless, the necessary condition for long-term care provision is the inability to perform the ADL. (Vachek, 2011)

Long-term care (LTC) includes also a medical component. Dependent people often need nursing care during the period of their dependency. The necessity of this type of care can exist due to the physical or mental disorder which causes long-term dependence or due to a reason independent of this disorder. The medical component is considered to be a part of long-term care in both cases even if the nursing care is provided on a short-term basis. The important factor is the long-term dependence, not the character of the medical service. (Vachek, 2011)

There are several ways in which LTC can be provided (Vachek, 2011):

**Informal Care at Home** This type of care is provided to people in their natural environment usually by close relatives or by other people apart of their occupation. Informal care includes help with the ADL as well as with other activities a person has to perform to preserve social dignity.

**Formal Care at Home** The difference from informal care at home is in the person by who the care is provided. In this case, there is a professional care provider who does not share the same home with the dependent person. Services concerning housing support are included in this type of care as well.

**Formal Care in Institutions** Several institutions (homes for elderly or disabled people) provide formal care in artificial homes for the dependent. Apart from help with the ADL and other common daily activities, this care substitutes home environment to the dependent. However, the last part of the service is not considered to be long-term care.

**Nursing Care at Home or in Institutions** Nursing care is usually necessary either due to the physical disorder itself or for other reasons as mentioned above. This type of care can be provided at home as well as in formal institutions.

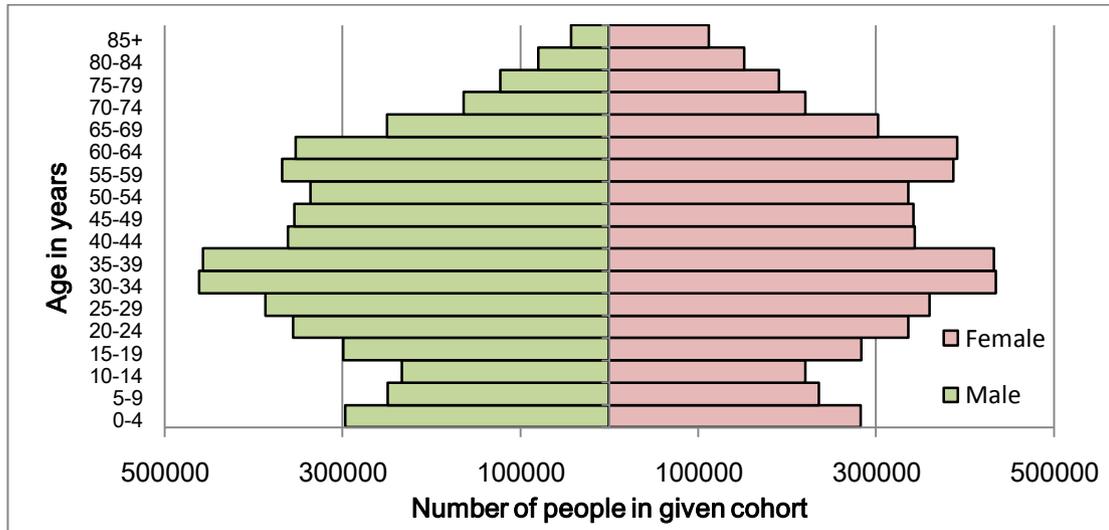
The disability that leads to the necessity of LTC provision can have many different causes. These are numerous types of chronic diseases and either physical or mental handicaps. The most common causes of disability are: Alzheimer disease and other diseases causing dementia, cerebrovascular diseases and traumatic brain injuries. Because these are nothing but types of medical diagnoses, it is usually very difficult to distinguish health care from long-term care in data. However, the purpose of care is very different in each case. The purpose of health care is to improve the patient's health status. On the contrary, the purpose of LTC is only to compensate one's disability which is not reduced by the care provision. (Válková et al., 2010)

There is a spread misinformation in the Czech society about the true meaning of LTC. People usually consider LTC to be the care of aged people. This is not entirely true. However, it is true that the need for LTC grows rapidly after the 75<sup>th</sup> year of age. (Válková et al., 2010)

Generally, the ratio of dependent people in a given cohort (specific age and sex group) grows with age (Daňková et al., 2011). This means that in the situation where demographic ageing is present in the population, one must expect a rise of LTC costs in the future.

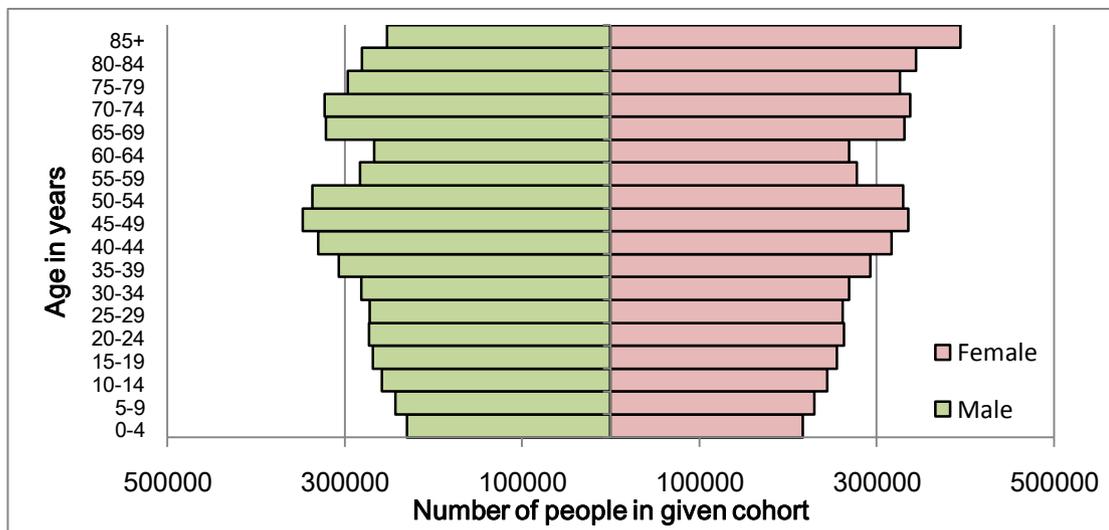
The population of the Czech Republic is ageing. This phenomenon is expected to have a large impact on the overall public spending including expenditures on LTC. Ageing of the Czech population is caused by a combination of factors. The main ones of these are: low fertility rate, increasing life expectancy and retirement of baby-boomers (Economic Policy Committee, 2006). Naturally, the Czech Republic is not

the only country facing this problem. The majority of developed countries in the world have to handle with complications connected with population ageing.



**Figure 1.1: Age structure of the Czech Republic in the year 2010**

Source: Czech Statistical Office (2013)



**Figure 1.2: Expected age structure of the Czech Republic in the year 2060**

Source: Eurostat (2012)

Figures 1.1 and 1.2 show how different the population is expected to be in the year 2060 from what it was like in the year 2010. There will be fewer children in the population and fewer working-age people as well in 2060 compared to 2010. The biggest change; however, will take place in the elderly cohorts. The number of people aged 85 years or over will probably more than triple during the next 50 years. What is

usually called a population pyramid will not resemble a pyramid anymore in 2060. As the population structure is changing, the costs of LTC are changing as well which will be shown in following chapters of this thesis. The rise in costs of LTC is not the only problem population ageing is presumed to bring. What is expected is that there will be much fewer working-age people in the population compared to much more people dependent due to old age. In the year 2010, the old-age dependency ratio<sup>1</sup> was 22.17% and the percentage of economically active people (aged 15 – 64) in the population was 70.06%. These numbers are likely to be very different in the year 2060. There are expected to be only 55.75% of working-age people and the old-age dependency ratio is predicted to be 55.00%. This indicates that there will probably be only approximately two people of working age for each dependent due to old age. The overall dependency ratio<sup>2</sup> is expected to be 79.38% in 2060 (it was 42.74% in the year 2010). (Eurostat, 2012 and Czech Statistical Office, 2013)

The problem of rising long-term care expenditures due to population ageing is discussed in a number of publications. There are three rather recent publications by the European Commission and the Economic Policy Committee that aim to predict future expenditures on LTC in several European Countries including the Czech Republic. The first one of these called *The impact of ageing on public expenditure: projections for the EU25 Member States on pensions, health care, long-term care, education and unemployment transfers (2004-2050)* (Economic Policy Committee and European Commission (DG ECFIN), 2006) considers many aspects of population ageing including the need for long-term care. This report uses a unified methodology for the EU25<sup>3</sup> countries and five different scenarios to predict age-related expenditures on LTC.

*The 2009 and 2012 Ageing Report* (European Commission (DG ECFIN) and Economic Policy Committee (AWG), 2009 and 2012) provide a complex set of predictions based on the Eurostat population projection named EUROPOP

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<sup>1</sup> The ratio of people aged 65 or over to those of working age (15 – 64 years).

<sup>2</sup> The ratio of dependent (people aged 0 – 14 and 65 or over) to those of working age.

<sup>3</sup> Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, The Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.

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(EUROPOP2008 in the 2009 case and EUROPOP2010 in the 2012 case). These predictions cover the area of future expenditures on pensions, healthcare, long-term care, education, and unemployment benefits up until the year 2060. Both of these reports were published together with a detailed description of their projection methodology. The assumptions and methodology associated to *The 2012 Ageing Report* (European Commission (DG ECFIN) and Economic Policy Committee (AWG), 2011) were used as a base for the model of future expenditures on the medical part of LTC in this thesis. A comparison of results of the projection in this thesis and in *The 2012 Ageing Report* comes later in Chapter 6.

Nevertheless, population ageing is not only a problem of the European Union. In order to support this idea, let one more publication be mentioned – an Australian one. Madge (2000) brings a projection of costs of long-term aged care until the year 2031. Madge works with a slightly different definition of LTC than this thesis. He focuses on long-term aged care only which is basically a set of services and benefits to people who suffer from disability and are aged 65 years or over (some of the programs mentioned consider even only people aged 70 or over). The projected costs of long-term aged care in Australia in 2031 are equal to 1.38% of Australia's GDP in that year according to Madge's base case scenario.

In a situation where even a relatively young population such as the Australian one is concerned with the impact of population ageing, the Czech Republic should definitely be concerned as well. In the year 2000 when the paper by Madge was published, the median age of Australian population was 35.2 years (Australian Bureau of Statistics, 2001) which is much lower than the 37.4 years in the Czech population (United Nations Statistics Division, 2010). Even the prospect of the 2060 population structure of the Czech Republic in Figure 1.2 is quite pessimistic in terms of the share of elderly people in the population that is expected to bring higher costs of LTC.

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## 3 Data Description

There are many data sources used for the projection of long-term care expenditures. This chapter is meant to describe all the data used in terms of their sources and form in order to make the model more understandable for the reader.

The projection itself is made for each five years from 2010 to 2060. These years are referred to as *years of the projection* and they are denoted by  $t$  which takes values 2010, 2015, ..., 2055, 2060. The year 2010 is called the *base year* as it is based on present data and the projection is built on it.

### 3.1 Population Projection

The model uses the EUROPOP2010 population projection (Eurostat, 2012). This dataset contains information on population of age and sex-specific cohorts for each five years from 2010 to 2060. These cohorts are age and sex-specific five-year groups, e.g. females from 20 to 24 years. There are 17 of these five-year age groups and one extra group for people aged 85 or over for each sex. In the model, the age groups are denoted by  $a$  which takes values 0, 5, ..., 85 representing always the lowest age in given age group (i.e.  $a = 55$  denotes the group of people aged 55 to 59 years). The two sexes are denoted by  $s$  in the model. It takes value 1 for males and value 2 for females.

### 3.2 Labour Market

The unemployment rate for the cohorts mentioned above was obtained from the Czech Statistical Office (2012b). The quarterly values were averaged for each sex and age group to create the yearly value.

The prediction of age and sex-specific rates of participation on labour force is necessary for modelling future GDP of the Czech Republic. The European Commission's prediction used in Prušvic and Pavloková (2010) was obtained from

the authors (European Commission, Participation Rate Projections). The dataset contains values for each year of age for both sexes and for years 2007 – 2110. Weighted average is used to transform the values for each year of age into desirable values for five-year age groups used in the projection. Only the values for years of the projection are used.

Labour productivity for each year of the projection is computed using labour productivity in year 2010 and labour productivity growth prediction by European Commission (2012a). The 2010 labour productivity is computed as the ratio of 2010 real GDP (Ministry of Finance of the Czech Republic, 2012) to the total number of people employed in the year 2010 (Czech Statistical Office, 2012a).

### 3.3 Expenditures on LTC

The data on LTC expenditures are obtained from a dataset created jointly by the Ministry of Labour and Social Affairs of the Czech Republic and VZP<sup>4</sup> (MPSV and VZP, 2009). This dataset is not available to the public but its detailed description can be found in Vachek (2011). The author obtained the data by e-mail indirectly from Tomáš Roubal, an employee of the Ministry of Health of the Czech Republic. This dataset describes the cost structure of VZP in the year 2009. As the base year of the projection is 2010, the values are transformed into 2010 prices using GDP per capita growth (Ministry of Finance of the Czech Republic, 2012 and Český statistický úřad, 2013). There are five-year age groups in this dataset as well as in the population projection; however, there are extra groups for people aged 85 – 89, 90 – 94, and only then there is the group of people aged 95 years or over. Therefore, weighted average is used for costs related to people aged 85 years or over so that this data are compatible with the population projection.

The data are disaggregated into 5 dependency levels denoted by  $d$  which takes the following values (Česko, 2006):

- 0 for people that are independent of other persons' help in long term; however, the services are provided to them on a short-term basis.

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<sup>4</sup> a Czech health insurance company named 'Všeobecná zdravotní pojišťovna'

- 1 for people with slight dependence on other persons' help in long term.
- 2 for people with medium-heavy dependence on other persons' help in long term.
- 3 for people with heavy dependence on other persons' help in long term.
- 4 for people with total dependence on other persons' help in long term.

Understanding the meaning of dependency levels is crucial for the analysis following in the next chapters. These dependency levels do not precisely describe the need for LTC of the individual. They describe whether and at what amount the individual was receiving monetary help from the state which is called *care allowance*. Care allowances are social benefits dedicated to people that are unable to perform certain ADL on their own. These activities are (MPSV, 2012 and Česko, 2006):

- (i) Mobility (standing up, sitting down, walking).
- (ii) Orientation (orientation by sight, hearing, using psychical functions).
- (iii) Communication (making oneself understood and understanding by means of speaking and writing).
- (iv) Consuming (portioning food, eating, drinking and being on a special diet).
- (v) Dressing and putting on shoes (choosing clothing and shoes, dressing, putting on shoes, undressing and taking off shoes).
- (vi) Bodily hygiene (washing one's face, hands and the whole body, combing one's hair, oral hygiene).
- (vii) Physiological needs satisfaction (using the toilet and means of hygiene).
- (viii) Care of one's health (complying with medical regime).
- (ix) Personal activities (time planning, keeping the time plan).
- (x) Household care (shopping for groceries, moving articles of everyday use, dispose of money).

The right to receive certain amount of care allowance is based on the number of these activities the individual is unable to perform in long term and on the individual's age. This is described in greater detail in Table 3.1. However, not every person that is supposed have right to receive care allowance according to this table is in fact allowed to receive it. The reason is that many heavily dependent people are placed in special medical institutions and the care of them is financed by their health insurer. Therefore, these people lose their right to receive the care allowance and they are considered to have dependency level 0 for the time they are placed in such institution. That is the reason, why people with dependency level 0 are included in the medical component of LTC expenditures. (Pavloková et al., 2011)

**Table 3.1: Dependency levels**

Age	Under 18 years				18 years or over			
Number of ADL one is unable to perform	3	4-5	6-7	8-9	3-4	5-6	7-8	9-10
Dependency level	1	2	3	4	1	2	3	4

Source: Česko (2006)

There are many categories of costs incurred by VZP that are included in the data set. For the purposes of this thesis, it is not necessary to describe all of them as these are costs related to the whole health care and LTC is only a small part of it. The cost categories related to LTC are chosen mainly according Vachek (2011) and these are:

- Costs of nursing beds, institutes for long-term patients and hospices because these institutions are designed to provide especially LTC.
- Costs of homecare including birth attendants and psychiatric nurses of which all costs are included because the share of costs on birth attendants and psychiatric nurses is negligible.
- Costs of social beds in healthcare facilities which are considered to be a substitute of homecare.
- Costs of nursing and rehabilitative care provided in social services institutions which are assumed to be a substitute of homecare as well.

- Costs of hospitals of which only 3% are assumed to be related to LTC.
- Costs of specialized therapeutic institutes which are included according to Pavloková et al. (2011) as a substitute of receiving care allowance.

Please note that the original Czech names of these categories are included in Appendix A.

The dataset contains average annual costs per capita (disaggregated into categories of different sexes, age groups and dependency levels) for each of these types of care which means that the total per capita average annual costs of LTC can be computed as a sum of all these 6 types of costs having on mind that only 3% of costs of hospitals are to be included. The average annual costs of LTC per capita are computed for all age, sex and dependence level combinations that are used in the model and then transformed into 2010 prices using GDP per capita growth rate (Ministry of Finance of the Czech Republic, 2012 and Český statistický úřad, 2013).

Social costs of LTC are computed using the data sources above and the past and present values of monthly care allowances which can be found in Table 3.2.

**Table 3.2: Care allowance (CA)**

Age	Under 18 years				18 years or over			
Dependency level	1	2	3	4	1	2	3	4
Monthly CA from 2011 (in CZK)	3000	6000	9000	12000	800	4000	8000	12000
Monthly CA in 2010 (in CZK)	3000	5000	9000	12000	2000	4000	8000	12000

Source: Česko (2006) and Filipová (2010)

There was a change in legislation in 2011 (Ministerstvo práce a sociálních věcí, 2011) during which monthly amounts distributed to two of the cohorts used changed. The model uses the year 2011 as the base year for care allowances so that it is possible to predict the future values of care allowances based on their present values and not on the past ones. The value of these 2011 care allowances is transformed into 2010 prices using GDP per capita growth (Ministry of Finance of the Czech

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Republic, 2012 and Český statistický úřad, 2013) so that they are compatible with the rest of the model. The model then uses their twelvefold as the yearly care allowance which is denoted by  $CA_{b,y}$ . to avoid reader's confusion from the legislation change.

## 4 Model

Future expenditures on long-term care are modelled in two steps. Firstly, the prediction of the gross domestic product (GDP) must be computed and only then one is able to model the future level of costs of long-term care.

### 4.1 Modelling Future GDP

Future gross domestic product is necessary for predicting the levels of long-term care expenditure. GDP is modelled for all years of the projection using the assumptions and methodology described in Prušvic and Pavloková (2010). First, the age and sex-specific labour force for a given year is computed as

$$LF_t^{s,a} = PR_t^{s,a} \cdot Pop_t^{s,a}$$

where  $LF_t^{s,a}$  is the labour force specific to age  $a$  and sex  $s$  in year  $t$ ,  $PR_t^{s,a}$  is the age and sex-specific participation rate in year  $t$  and  $Pop_t^{s,a}$  is a given part of population of age  $a$  and sex  $s$  in year  $t$ .

The second step in modelling GDP is computing the age and sex-specific unemployment rates. In order to be able to do this, several assumptions (Prušvic and Pavloková, 2010) had to be made:

- (i) The ratio of employees to self-employed people is constant over time.
- (ii) No difference between part-time and full-time employment is considered.
- (iii) The ratio of hours worked in full time and in part-time does not change.
- (iv) Non-accelerating-wage rate of unemployment (NAWRU) is used as a proxy for structural unemployment rates.

Using the NAWRU values from Prušvic and Pavloková (2010), the age and sex-specific unemployment rates are calculated as

$$UR_t^{s,a} = \frac{NAWRU_t \cdot UR_{2010}^{s,a} \cdot \sum_{s=1}^2 \sum_{a=15}^{75} LF_t^{s,a}}{\sum_{s=1}^2 \sum_{a=15}^{75} UR_{2010}^{s,a} \cdot LF_t^{s,a}}$$

where  $UR_{2010}^{s,a}$  is the unemployment rate for people of age  $a$  and sex  $s$  in year 2010,  $UR_t^{s,a}$  is the unemployment rate for people of age  $a$  and sex  $s$  in year  $t$ . The age and sex-specific employment is then computed as

$$ASE_t^{s,a} = PR_t^{s,a} \cdot Pop_t^{s,a} \cdot (1 - UR_t^{s,a})$$

where  $PR_t^{s,a}$  is the participation rate for people of age  $a$  and sex  $s$  in year  $t$  and  $ASE_t^{s,a}$  is the employment of people of age  $a$  and sex  $s$  in year  $t$ . We compute the total employment for each year of the projection as a sum of these age and sex-specific employments.

$$Empl_t = \sum_{s=1}^2 \sum_{a=15}^{75} ASE_t^{s,a}$$

Finally, the real GDP in each year is computed as the product of total employment and labour productivity ( $LP_t$ ) for that year and the nominal GDP is then calculated from the real GDP using 2% inflation assumption (i.e.  $\pi = 0.02$  as in European Commission (DG ECFIN) and Economic Policy Committee (AWG), 2011).

$$RGDP_t = Empl_t \cdot LP_t$$

$$GDP_t = RGDP_t \cdot (1 + \pi)^{t - 2010}$$

## 4.2 Modelling Future LTC Expenditures

Modelling future LTC expenditures consists of two parts. One part predicts the expenditures on the medical component of LTC and the later predicts the expenditures on the social component of LTC.

The model of future expenditures on the medical part of LTC in this thesis uses the same approach as European Commission (DG ECFIN) and Economic Policy Committee (AWG) (2011). The methodology of this model is based on their *base case scenario* but it uses a slightly different data disaggregation. However, the core

assumptions are very similar. The structure of dependency levels and unit costs of LTC is assumed to be the same in all insurance companies. As most (about 65% according to Vachek, 2011) people in the Czech Republic are insured by VZP, data by VZP are used to compute the ratio of dependent people in each cohort and the sample obtained from VZP is assumed to be representative for the whole Czech population.

The first step in modelling LTC costs is computing the ratio of dependent people in Czech population. This is computed for each dependency level from above mentioned data by VZP as the share of people with given dependence level in the sample.

$$RD^{s,a,d} = \frac{N^{s,a,d}}{N^{s,a}}$$

where  $RD^{s,a,d}$  is the ratio of dependent people of sex  $s$ , age  $a$  with dependency level  $d$  in part of the same age and sex group who are insured by VZP.  $N^{s,a}$  denotes the number of VZP clients of age  $a$  and sex  $s$  and  $N^{s,a,d}$  stands for the number of people of age  $a$ , sex  $s$  with dependency level  $d$  insured by VZP.

Based on the data by VZP, the assumption of homogeneity of population in terms of dependency structure is used to compute the number of dependent people in each cohort. The author assumes that the dependency structure will stay constant over time.

$$DPop_t^{s,a,d} = RD^{s,a,d} \cdot Pop_t^{s,a}$$

where  $DPop_t^{s,a,d}$  is the number of people of age  $a$  and sex  $s$  with dependency level  $d$  in year  $t$ .

The unit medical costs of LTC for each year of the projection are computed using nominal GDP per capita growth rates obtained from the GDP prediction.

$$UMC_{t+5}^{s,a,d} = UMC_t^{s,a,d} \cdot \frac{GDP_{t+5}}{GDP_t} \cdot \frac{Pop_t}{Pop_{t+5}} \quad t = 2010, 2015, \dots, 2055$$

$UMC_t^{s,a,d}$  stands for the unit medical costs of LTC for a person of age  $a$ , sex  $s$  with dependency level  $d$  in year  $t$ . Finally, the total costs of the medical component LTC are computed simply as

$$TMC_t^{s,a} = \sum_{d=0}^4 DPop_t^{s,a,d} \cdot UMC_t^{s,a,d}$$

$$TMC_t = \sum_{s=1}^2 \sum_{a=0}^{85} TMC_t^{s,a}$$

where  $TMC_t^{s,a}$  are the total medical costs related to a cohort of sex  $s$  and age  $a$  in year  $t$  and  $TMC_t$  are the total medical costs of LTC in year  $t$ .

There are three different scenarios used when computing the future social costs of LTC. The reason for this is that these costs are directly dependent on the future level of care allowances which is given arbitrarily by the government's decisions. The three scenarios used follow.

### Scenario 1: GDP per capita growth

The first scenario assumes that the care allowances will grow with GDP per capita. It is obvious that the assumption of smooth growth is rather unrealistic because social benefits that are arbitrarily fixed by law change as they grow in jumps in line with the law changes. However, this scenario is useful to describe the approximate growth under the assumption that the government is trying to keep the standard of living of dependent people proportional to the one of the independent.

The future value of care allowances for each cohort is computed as

$$CA_{t+5}^{s,a,d} = CA_t^{s,a,d} \cdot \frac{GDP_{t+5}}{GDP_t} \cdot \frac{Pop_t}{Pop_{t+5}} \quad t = b.y., 2015, 2020, \dots, 2055$$

where  $CA_t^{s,a,d}$  is the yearly care allowance received by a person of age  $a$  and sex  $s$  with dependency level  $d$  in year  $t$ .<sup>5</sup>

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<sup>5</sup> In case that  $t = b.y.$ , then  $t + 5 = 2015$ .

### Scenario 2: Growth with inflation

Growth of the care allowances that is proportional to inflation is assumed in the second scenario. Growth in line with inflation is chosen because it is the type of growth in which the value of care allowances in real terms is preserved over time and the government may want their decisions to be in accord with such preservation. As well as in the medical part of LTC projection, the assumption of 2% inflation is used here. The future value of care allowances in this scenario is computed as

$$CA_{t+5}^{s,a,d} = CA_t^{s,a,d} \cdot (1 + \pi)^5 \quad t = b.y., 2015, 2020, \dots, 2055$$

### Scenario 3: No growth

The third scenario is very pessimistic from the point of view of LTC recipients. It assumes that the nominal value of care allowances will stay constant for the next almost 50 years which makes it the most unrealistic of all scenarios. Nevertheless, it is used to counterbalance the quite optimistic Scenario 1. Moreover, this scenario describes the situation of no future policy change.

$$CA_t^{s,a,d} = CA_{b.y.}^{s,a,d} \quad t = 2015, 2020, \dots, 2060$$

where  $CA_{b.y.}^{s,a,d}$  is the yearly care allowance received by a person of age  $a$  and sex  $s$  with dependency level  $d$  in the base year.

The total costs of social component of LTC are computed for each of the three scenarios as

$$TSC_t^{s,a} = \sum_{d=0}^4 DPop_t^{s,a,d} \cdot CA_t^{s,a,d}$$

$$TSC_t = \sum_{s=1}^2 \sum_{a=0}^{85} TSC_t^{s,a}$$

where  $TSC_t^{s,a}$  denotes the total costs of the social part of LTC that are related to people of sex  $s$  and age  $a$  in year  $t$  and  $TSC_t$  denotes the total costs of the social component of LTC in year  $t$ .

Having already computed both components of LTC, one is then able to compute the total costs of LTC simply by summing up the social and the medical component.

$$TC_t^{s,a} = TMC_t^{s,a} + TSC_t^{s,a}$$

$$TC_t = TMC_t + TSC_t$$

$TC_t^{s,a}$  stands for the total costs of LTC spent on the cohort of sex  $s$  and age  $a$  in year  $t$  and  $TC_t$  are the total costs of LTC in year  $t$ .

## 5 Projection Results

### 5.1 GDP Projection

According to the methodology described in the previous chapter, the GDP is expected to be increasing over the whole projection period both in total and per capita terms. The GDP in 2010 was 3 775 billion CZK according to Ministry of Finance of the Czech Republic (2012) and it is predicted to be 22 263 billion CZK in year 2060 using the 2% inflation assumption. The GDP per capita is expected to rise from 359 thousand CZK (Ministry of Finance of the Czech Republic, 2012 and Český statistický úřad, 2013) to 2 127 thousand CZK over the same period.

**Table 4.1: Nominal GDP (2010 – 2060)**

Year	GDP in current prices (billions of CZK)	Nominal GDP per capita (thousands of CZK)
2010 <sup>6</sup>	3 775	359
2015	4 867	455
2020	5 928	548
2025	7 037	648
2030	8 410	776
2035	10 098	937
2040	11 902	1 108
2045	14 001	1 307
2050	16 303	1 528
2055	18 968	1 791
2060	22 263	2 127

Source: Author's computations.

<sup>6</sup> This is the actual 2010 GDP according to Ministry of Finance of the Czech Republic, 2012 and Český statistický úřad, 2013.

The average growth rate of GDP is predicted to be 19.5% for a five-year period both for the case of nominal GDP and of nominal GDP per capita. The yearly growth rates could not be computed due to data unavailability; however, defining them as a fifth of the five-year growth rate these are 3.9%. The projected values of future GDP can be found in Table 4.1.

## 5.2 Medical Component of LTC

According to the projection, the expenditures on the medical component of LTC are expected to be rising over the whole period until the year 2060. In the year 2060 the spending on the medical component is projected to be more than nine times larger in nominal terms and to represent a 1.64 times larger share of GDP than in 2010. The approximate average growth rate of the nominal value is 25% and this rate has no clear trend over the projection period. The average growth rate of the expenditures expressed as a percentage of GDP is 4.9%. It is important to keep in mind that these growth rates are related to periods of five years which means that they are not yearly growth rates. It was not possible to compute the exact yearly growth rates due to data unavailability but the average yearly growth rates expressed as a fifth of the rates mentioned above would be 5% and 1% respectively. The projected values of spending on the medical component of LTC can be found in Table 5.1.

**Table 5.1: Total medical costs of LTC**

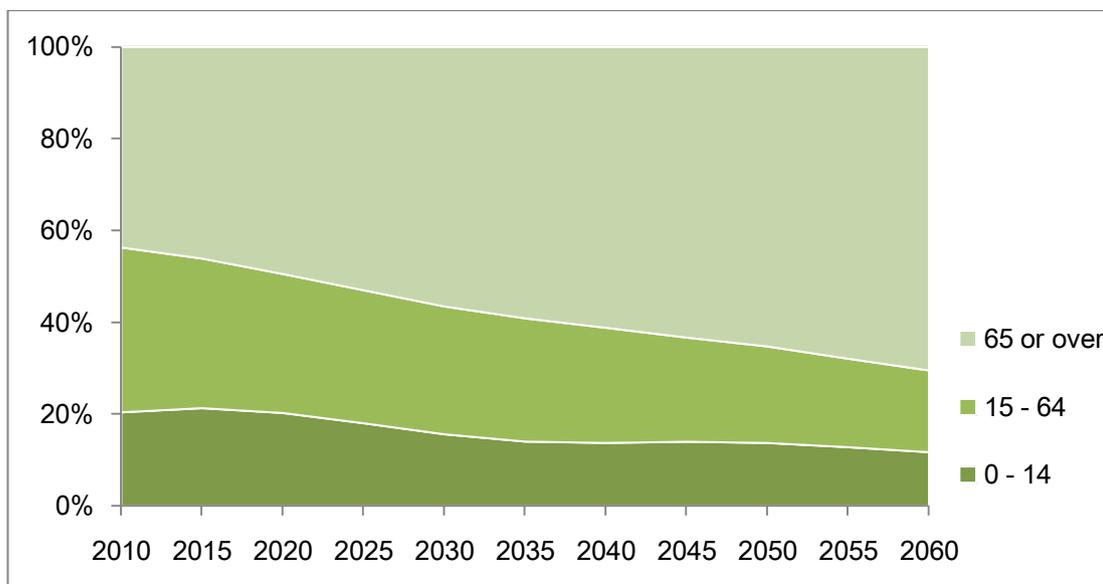
Year	Spending on medical component of LTC (millions of CZK)	Spending on medical component of LTC as percentage of GDP
2010 <sup>7</sup>	15 255	0.39%
2015	20 327	0.42 %
2020	25 733	0.43 %
2025	31 982	0.45 %
2030	40 786	0.48 %

<sup>7</sup> The level of expenditures computed from 2009 data is used here. The reason for preferring time-adjusted 2009 data for the year 2010 to real 2010 data is that each author and institution works with a slightly different definition of LTC in costs and therefore such data would not be compatible with the rest of the projection.

2035	52 023	0.52 %
2040	63 889	0.54 %
2045	77 396	0.55 %
2050	93 448	0.57 %
2055	114 032	0.60 %
2060	141 542	0.64 %

Source: Author’s computations.

It is desirable to explore the drivers of the rise in spending on the medical component of LTC. As depicted in Figure 5.1, the spending related to the age group 65 years or over as a part of total spending on medical long-term care is predicted to rise substantially. The share of spending related to this cohort is expected to rise from 43.7% in 2010 to 70.5% in 2060.



**Figure 5.1: Shares of spending on medical component of LTC by age groups**

Source: Author’s computations.

The Figure 5.1 itself may be misleading in the way that the share of spending related to the age groups below 64 years is declining. Nevertheless, it is crucial to realise that the nominal value of spending on these cohorts is expected to be rising over the whole projection period. Therefore, the nominal values of spending on the medical component of LTC are shown in Table 5.2.

**Table 5.2: Medical costs of LTC by age groups**

Age/Year	2015	2030	2045	2060
Less than 5 years	1 562 340 940	2 111 673 543	3 900 013 537	5 661 198 769
From 5 to 9 years	2 485 713 402	3 700 728 308	6 129 119 671	9 537 028 517
From 10 to 14 years	286 200 821	564 582 617	814 125 871	1 410 153 061
From 15 to 19 years	174 233 869	379 547 603	513 256 641	908 839 907
From 20 to 24 years	295 476 327	477 303 358	717 533 941	1 132 830 833
From 25 to 29 years	404 678 384	512 500 462	985 104 431	1 368 690 226
From 30 to 34 years	460 063 321	550 743 784	1 144 151 428	1 510 936 055
From 35 to 39 years	608 265 100	782 542 450	1 252 026 120	1 817 384 510
From 40 to 44 years	690 773 704	1 055 016 574	1 340 344 160	2 458 687 678
From 45 to 49 years	632 106 597	1 210 341 304	1 449 425 344	2 888 022 008
From 50 to 54 years	843 221 678	1 971 388 487	2 525 228 908	3 916 751 073
From 55 to 59 years	1 077 875 822	2 207 888 953	3 370 172 458	4 175 097 058
From 60 to 64 years	1 438 491 387	2 206 924 546	4 261 232 888	5 015 832 887
From 65 to 69 years	1 576 429 238	2 406 015 570	5 739 508 392	7 296 757 888
From 70 to 74 years	1 553 289 816	3 108 910 243	6 606 132 833	10 087 133 600
From 75 to 79 years	1 565 356 335	4 663 491 920	7 521 741 546	14 750 373 210
From 80 to 84 years	1 986 128 599	5 861 416 221	9 736 498 385	24 191 926 988
85 years or over	2 686 112 174	7 015 120 075	19 390 044 820	43 414 072 564

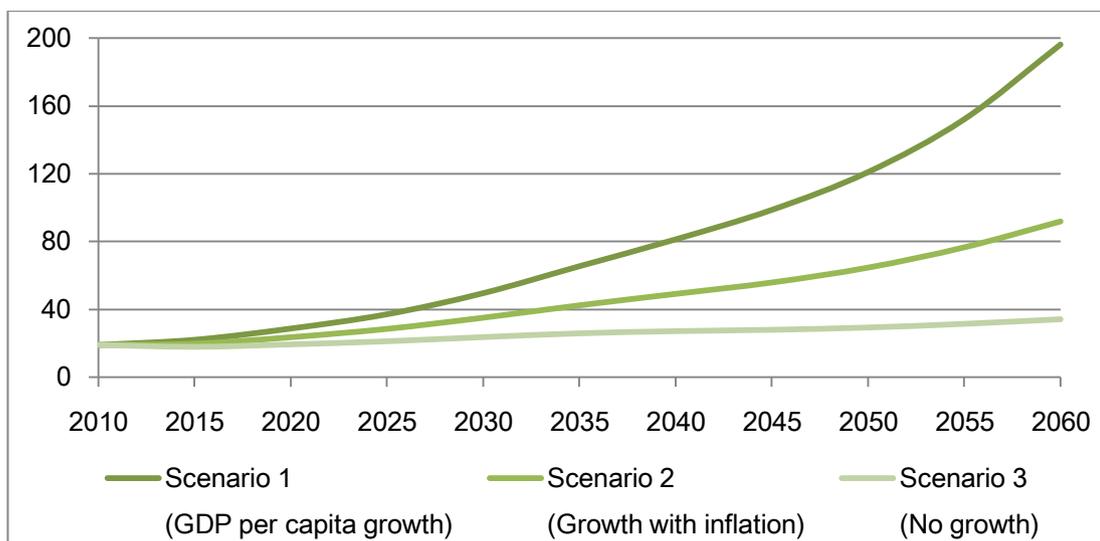
*Source:* Author's computations.

### 5.3 Social Component of LTC

The trend of the expenditures on the social component of LTC is different according to each scenario. The predicted future values are compared to the one in the base year 2010. Please mind the legislation change in 2011 that often causes a fall or a slower growth of expenditures in years close to present.

The nominal values of spending are shown in Figure 5.2. All scenarios start with 19.6 billion CZK in the year 2010 (the real expenditures according to MPSV, 2011) and then the spending grows in the fastest manner in Scenario 1 and in the slowest manner in Scenario 3. The final value of spending on the social component of LTC is 196 474 million CZK, 91 779 million CZK and 34 098 million CZK in Scenarios 1,

2, 3 respectively. This means that the costs are expected to rise approximately ten times in Scenario 1 compared to almost 4.7 times in Scenario 2 and to only 1.7 times in Scenario 3. This divergence of scenarios is expected having in mind the assumptions under which the scenarios are formed.



**Figure 5.2: Spending on social care (billions of CZK)**

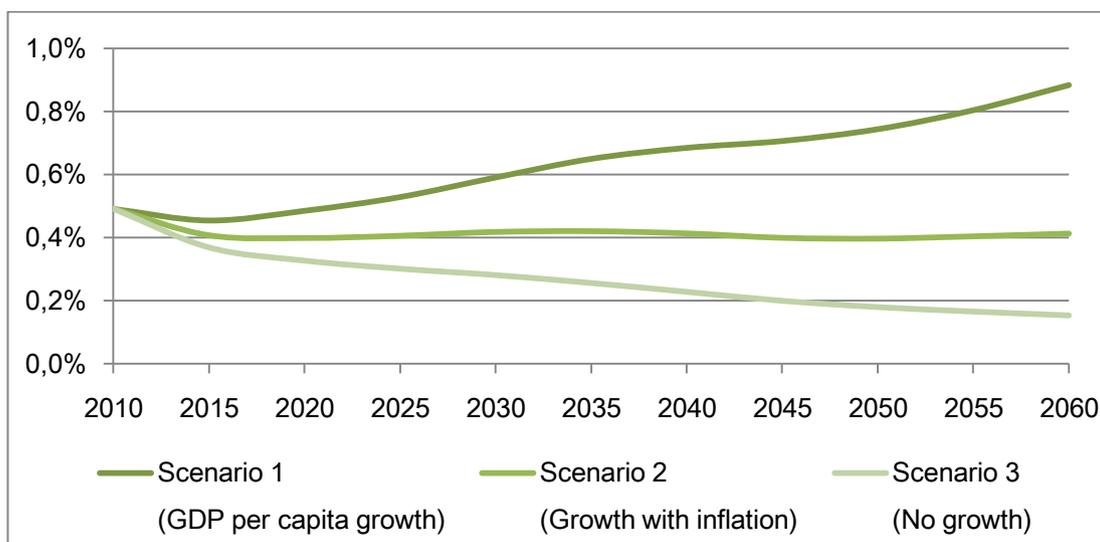
*Source:* Author's computations.

The share of GDP spent on social care differs to a great extent across the scenarios used. It starts on 0.52% in 2010 and then a decline in 2015 follows in all scenarios. After that, the trend is different for each scenario:

- In Scenario 1, the share increases over the whole period 2015 – 2060 and its final value is 0.88%.
- In Scenario 2, the share declines to 0.41% in 2015 and stays at approximately the same level ( $\pm 0.01$  p.p.) all the time until the year 2060.
- In Scenario 3, the share is declining over the whole projection period and the final value of spending as a percentage of GDP is 0.15%.

The overall development in all three scenarios is depicted in Figure 5.3. As well as in the nominal-value case, the differences among the scenarios are caused by differences in the government's priorities. Social benefits to the dependent are most important for the government in Scenario 1 and least in Scenario 3. The decline in the

year 2015 compared to the year 2010 is caused by the change in legislation of care allowances in the year 2011 which was described in greater detail in Chapter 3.



**Figure 5.3: Spending on social care as a percentage of GDP**

Source: Author's computations.

## 5.4 Total Expenditures on LTC

The total expenditures on LTC are simply the sum of their medical and social component as defined in Chapter 4. Therefore, the total expenditures differ across the three scenarios used for the projection of spending on the social component of LTC.

As can be seen in Table 5.3, the nominal value of expenditures on LTC is expected to be increasing over the next almost 50 years according to all the scenarios used. The expenditures are predicted to rise from 35 billion CZK in 2010 to almost ten times more in Scenario 1. Scenarios 2 and 3 also bring a dramatic rise in the nominal value of expenditures – to 233 and 176 billion CZK respectively. The costs of LTC expressed as a percentage of GDP again have different trends according to the social costs scenarios all starting with the 0.91% in 2010. Scenario 1 predicts a fall to 0.87% in 2015 and then a steep rise up to 1.52% in 2060. In Scenario 2, the share is also expected to fall first in 2015 by nine percentage points and then increase all the way up to 1.05%. According the Scenario 3, the percentage is estimated firstly to fall, then rise and then fall and rise again reaching its bottom 0.752% in 2045. The 2060 value for Scenario 3 is 0.79%. It is notable that according to Scenario 3, the spending on

LTC is not expected to reach its original 2010 value over the whole projection period. Moreover, it is not even expected to exceed 0.8%.

**Table 5.3: Spending on LTC in billions of CZK and as a percentage of GDP**

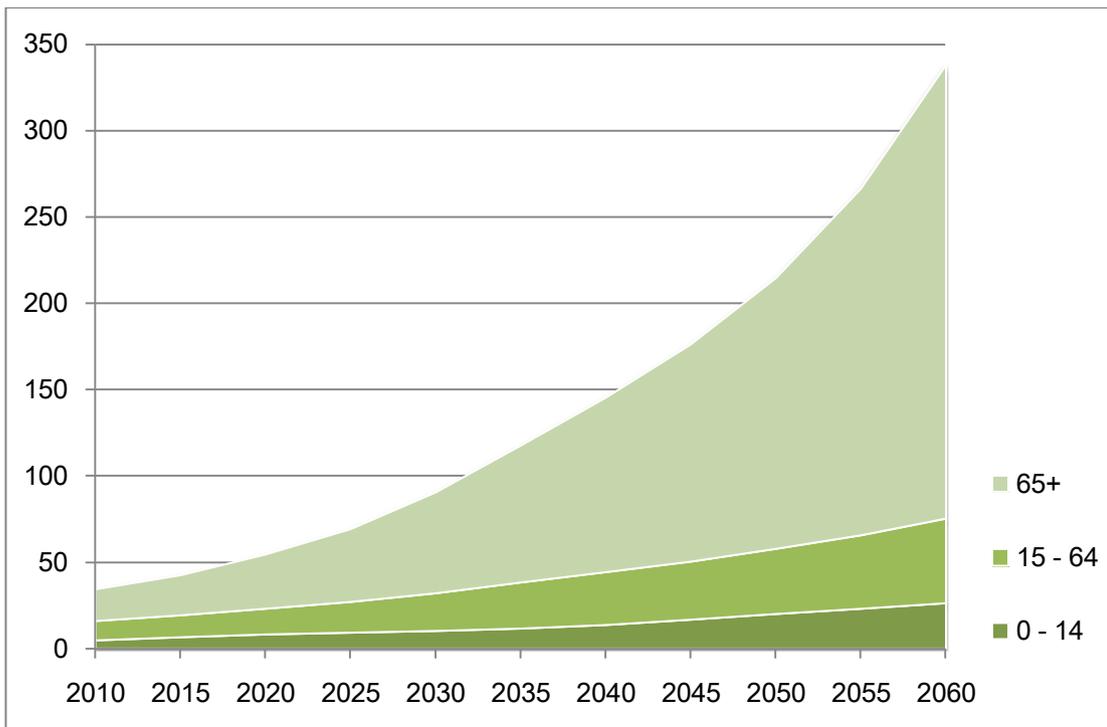
Year	Scenario 1:		Scenario 2:		Scenario 3:	
	GDP per capita growth		Growth with inflation		No growth	
2010	35	0.91%	35	0.91%	35	0.91%
2015	42	0.87%	40	0.82%	38	0.79%
2020	54	0.92%	49	0.83%	45	0.76%
2025	69	0.98%	61	0.86%	53	0.76%
2030	90	1.08%	76	0.90%	64	0.77%
2035	118	1.16%	94	0.93%	78	0.77%
2040	145	1.22%	113	0.95%	91	0.76%
2045	176	1.26%	133	0.95%	105	0.75%
2050	215	1.32%	158	0.97%	123	0.75%
2055	266	1.40%	191	1.00%	145	0.77%
2060	338	1.52%	233	1.05%	176	0.79%

Source: Author's computations.

The results confirm the hypothesis that population ageing will have a great impact on the spending on LTC. The detailed development of costs by age groups is shown in Figures 5.4, 5.5 and 5.6.

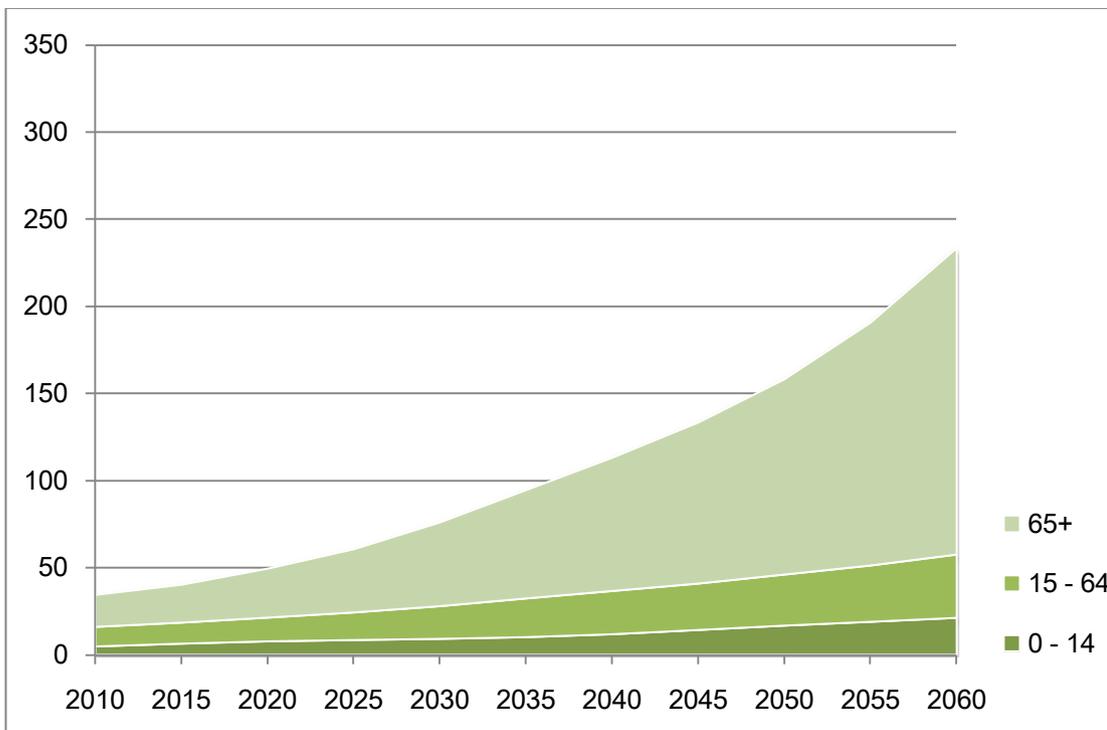
In all the three scenarios, the beginning share of costs spent on the elderly cohorts (people aged 65 years or over) was 53.5% in the year 2010. According to Scenario 1, this share is expected to be increasing over the whole projection period with an average five-year growth rate 3.81% which makes the average yearly growth rate<sup>8</sup> 0.76%. The growth rate has no clear trend. The final value of the percentage of costs related to the elderly cohorts is 77.7% according to Scenario 1. What is noteworthy is that the fraction of costs related to the elderly is projected to increase from more than a half to more than three quarters of the total costs of LTC.

<sup>8</sup> As for all following scenarios, this is the fifth of the five-year growth rate. Actual yearly growth rates could not be computed due to data unavailability.



**Figure 5.4: Spending on LTC by age groups (billions of CZK) - Scenario 1**

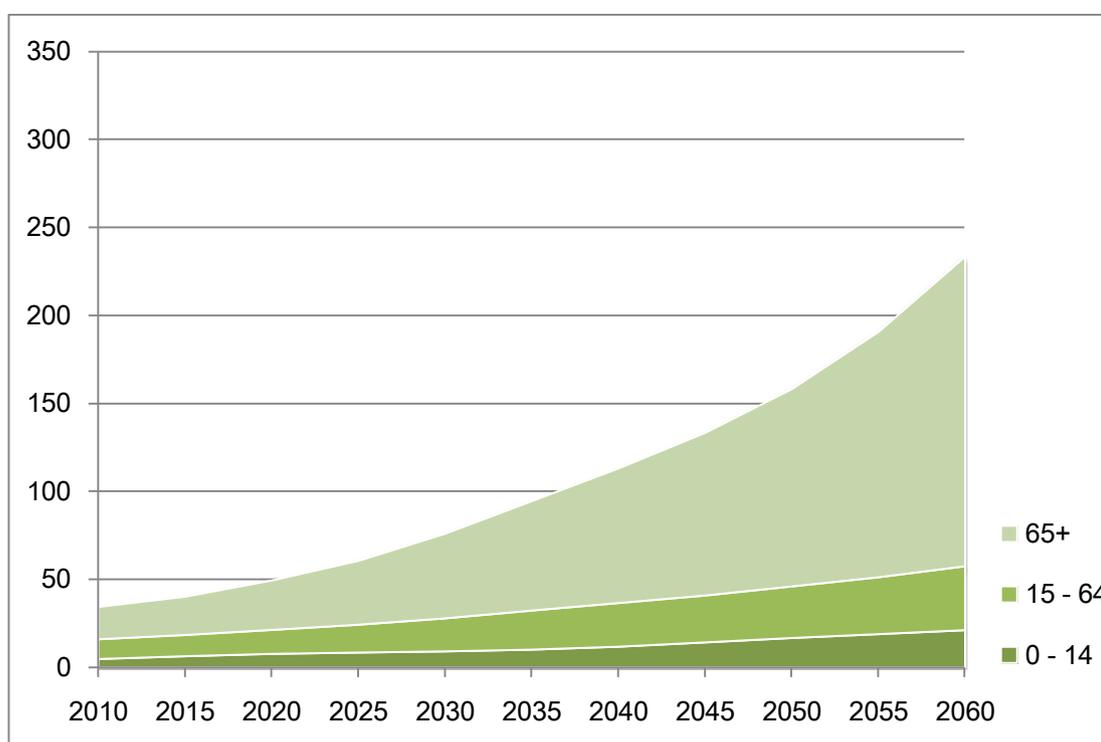
Source: Author's computations.



**Figure 5.5: Spending on LTC by age groups (billions of CZK) - Scenario 2**

Source: Author's computations.

In Scenario 2, the trend is very similar to Scenario 1. Despite the fact that the total value of expenditures on LTC differs substantially, the shares spent on different cohorts are similar. According to Scenario 2, the share of expenditures related to the elderly cohorts is projected to be rising during all the period until the year 2060 with an average five-year growth rate of 3.49% and the yearly one of 0.70%. The final 2060 percentage of LTC costs related to elderly persons is expected to be 75.4% according to this scenario. Similarly to Scenario 1, this fraction rises dramatically – from more than a half to more than three quarters.



**Figure 5.6: Spending on LTC by age groups (billions of CZK) - Scenario 3**

*Source:* Author's computations.

The trend in the share of costs related to the elderly cohorts is no different in Scenario 3. This percentage is again expected to be rising over the whole projection period with an average five-year growth rate of 3.15% and the yearly one of 0.63% reaching the value of 72.9% in the year 2060.

When exploring the percentage of total spending on LTC that is related to each dependency level, one comes to an interesting finding. Even though one of the assumptions of the model is that the dependency structure will not change over time, the shares of spending on groups of people of given dependency level change. The

development of these shares shown in Table 5.4 varies according to the particular scenarios:

- According to Scenario 1, the largest part of costs on LTC is expected to move from the dependency level 0 in 2010 to the dependency level 2 in 2060. On average, most funds spent on LTC are predicted to be related to dependency level 2.
- According to Scenario 2, most spending is on average expected be related to dependency level 0. The same holds for the 2010 and the 2060 value.
- According to Scenario 3, the largest share of expenditures is on average and in both years 2010 and 2060 projected to be associated with dependency level 0.

**Table 5.4: Shares of spending on LTC by dependency levels**

Dep. level	Scenario 1			Scenario 2			Scenario 3		
	average	2010	2060	average	2010	2060	average	2010	2060
0	22.21%	25.57%	17.25%	26.94%	25.57%	24.99%	32.04%	25.57%	33.20%
1	13.41%	17.26%	14.02%	14.12%	17.26%	15.64%	14.90%	17.26%	17.37%
2	25.61%	22.02%	27.90%	23.75%	22.02%	24.71%	21.75%	22.02%	21.33%
3	22.01%	20.07%	22.92%	19.90%	20.07%	19.32%	17.63%	20.07%	15.50%
4	16.76%	15.08%	17.91%	15.28%	15.08%	15.33%	13.69%	15.08%	12.60%

*Source:* Author's computations.

When comparing the shares on expenditures by different dependency levels, please keep in mind that many heavily dependent people officially have the dependency level 0 because they are placed in a special LTC institution as already described in Chapter 3. It is interesting that even though there are no social costs related to the dependency level 0, there is a significant share of the overall expenditures related to it. Even in Scenario 1 where the social contributions to the disabled are quite generous in the future, the zero-dependency-level patients cause quite large costs to the system. This demonstrates the importance of the medical part of LTC when it comes to costs of LTC.

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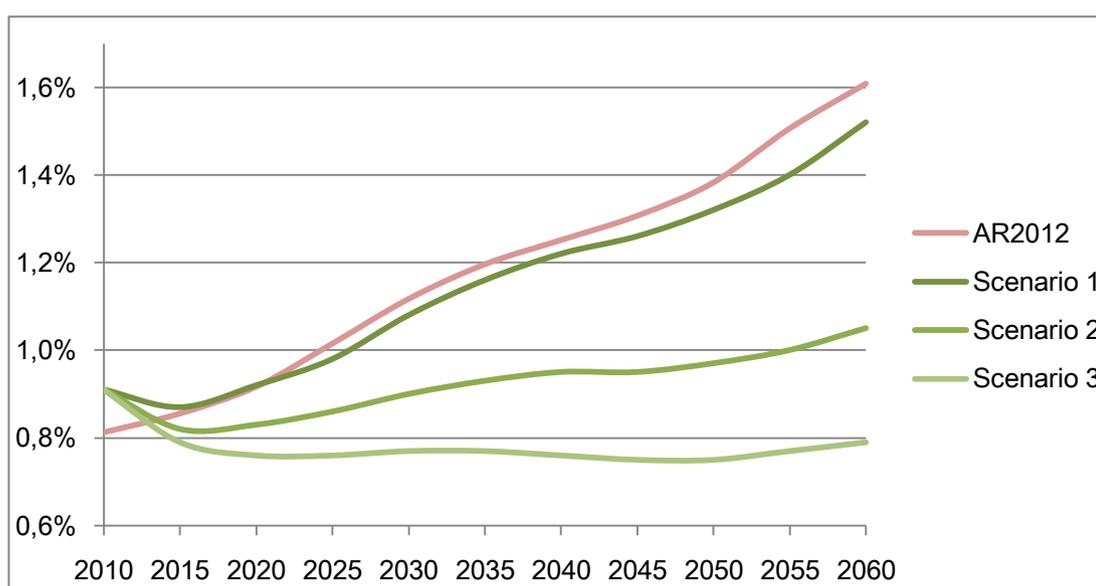
## 6 Comparison of Projection Results with *The 2012 Ageing Report*

*The 2012 Ageing Report* (European Commission (DG ECFIN) and Economic Policy Committee (AWG), 2012) was chosen for the comparison for several reasons. Firstly, because *The 2012 Ageing Report* (AR2012) uses the same population projection as the model in this thesis and secondly, because it is one of the most recent papers that discuss the possible future development of LTC expenditures in the Czech Republic. It is also most helpful that the AR2012 model uses a methodology that is clear and available to the public and therefore it is possible to make these two models comparable by sticking to the AR2012 projection methodology.

The aim of this model is to make an even more accurate projection of LTC expenditures than the AR2012 model. The reasons are hidden in the data. The AR2012 model uses a unified methodology and dataset for all countries of the European Union (EU). Without doubts, this is very useful for international comparisons. Nevertheless, it is slightly problematic as well. There is a lot of inconsistency among the data by different countries of the EU and there is even a lot of data necessary for a precise prediction missing. Fortunately, this is not a problem of the projection model of this thesis. As there was no limitation on types of data that could be used for the model, there was also no reason not to choose the best available data. These are definitely those by the Ministry of Labour and Social Affairs of the Czech Republic and VZP described in Chapter 3. With such dataset that actually covers about two thirds of Czech population and a wide range of publications describing the LTC in data, it is possible to make an even more precise projection of LTC expenditures than the one in AR2012.

As depicted in Figure 6.1, the costs projected in Scenario 1 are very close to those projected by the AR2012 model. The AR2012 model starts with a 0.81% of GDP spent on LTC in the year 2010. This is a value that is 10 percentage points lower than the starting point of all the three scenarios used in this thesis which is 0.91%.

However, the costs of LTC expressed as a percentage of GDP projected by the AR2012 model are expected to rise faster than those projected in this model. In the year 2015, the AR2012 model predicts already a higher share of GDP expended on LTC (0.86% according to European Commission, 2012b) than both Scenario 2 (0.82%) and Scenario 3 (0.79%). The AR2012 expenditures equilibrate those predicted by Scenario 1 in the year 2020 when both of these models predict the expenditures at 0.92% of GDP. After 2020, the AR2012 projection is the one that estimates the future costs of LTC to be the highest. The final 2060 value by the AR2012 model is 1.61% of GDP which is higher than the already mentioned 1.52% (1.05%, 0.79%) by Scenarios 1 (2, 3).



**Figure 6.1: Spending on LTC as a percentage of GDP (2010 – 2060)**

*Source:* Author's computations and European Commission (2012b).

The summary of different projections is shown in Table 6.1. The largest growth of costs as a percentage of GDP is predicted by the AR2012 model – 0.80 percentage points. Scenarios 1 and 2 project a smaller but positive growth of 0.61 p.p. and 0.14 p.p. respectively. Scenario 3 predicts a fall of LTC costs as a percentage of GDP by 0.12 percentage points. It is good to remind that Scenario 3 is from its definition the most unrealistic of all and its purpose is only illustrative.

There was a difference found in the costs projected by the different scenarios and by *The 2012 Ageing Report*. The AR2012 scenario resembles Scenario 1 most of all but projects higher costs in terms of percentage of GDP for most of the years.

**Table 6.1: Spending on LTC as a percentage of GDP (Summary)**

	<b>AR2012</b>	<b>Scenario 1</b>	<b>Scenario 2</b>	<b>Scenario 3</b>
<b>2010</b>	0.81%	0.91%	0.91%	0.91%
<b>2060</b>	1.61%	1.52%	1.05%	0.79%
<b>change</b>	0.80 p.p.	0.61 p.p.	0.14 p.p.	- 0.12 p.p.

*Source:* Author's computations and European Commission (2012b).

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## 7 Beyond the Data

As in any kind of mathematical model, not all costs of LTC can be ever captured by pure data. There are many factors of long-term care that are not measured or even measurable. An example of such factor is the provision of informal care. Informal care is the most natural type of care that can actually exist – the dependent lives at home with his or her relatives who take care of him or her. Despite the fact that it is definitely good from the psychological point of view of the dependent, it is accompanied by many problems.

The informal voluntary care takers usually experience a large fall in living standard when keeping the dependent at home. These care takers spend many hours a day by taking care of their dependent relative for which they get no wage. On the contrary, they usually give up the opportunity to work and to earn money for the family because they may be needed by the dependent for the most of the day. The informal care taking usually has a very negative impact also on the socialisation of the care taker and can even influence their health negatively. All these inconveniences including the difficulty of finding a job in the future are very long-term. (Válková et al., 2010)

Another negative aspect of being taken care of informally is the fact that the voluntary care takers are usually not very educated when it comes to the provision of the medical part of LTC. A person with no education in medicine can simply not provide the care of equal quality to a professional.

There is no small share of people that are being taken care of informally. Alzheimer disease which is the disease that causes the need for LTC most often, is a good example of a high volume of informal care that is being used. According to Válková et al. (2010), 56% of costs of LTC related to this disease are paid by informal care takers. This means that 56% of costs are actually hidden and cannot be included in any type of model. As there is an evident transition from informal to formal care in developed economies, one can expect that the same will take place in the Czech

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Republic. If this trend becomes reality in the Czech Republic, a much higher future growth of costs of LTC than the one predicted by any of the scenarios used must be expected. There is an alternative to the transition from informal to formal care. As informal care at home is very favourable for the dependent, the state could introduce some kind of financial contributions to the informal care takers that would compensate them for the wage loss and other difficulties connected to providing LTC. Nevertheless, costs of such social benefit would be huge as well. (Válková et al., 2010)

In case that the transition to formal care takes place in the future, there will most probably be further expenditures than just those directly related to units of LTC. Expecting such development, numerous new institutions of LTC will have to be built which would be very costly as well. Otherwise the transition would not even be possible due to lack of beds in such institutions. Unfortunately, these are not all additional costs that may occur in the future. As the living standard is increasing over the course of years, it might be necessary to improve the quality of institutions and of the care itself in order to satisfy the requirements of the future dependent.

The quality of care itself needs to be improved even if the clients' requirements stay on their present level and do not increase. As higher quality of care is usually more costly, there is often a financial downward pressure on the care quality in terms of costs minimization. There are no official standards of quality of care that would be compulsory to be implemented in the Czech Republic which causes huge differences in quality among institutions. The key problem related to insufficient care quality is low respect of human dignity which appears very often in LTC institutions. (Válková et al., 2010)

The main drivers of low quality of care were chosen according to Válková et al. (2010). The first one is that LTC is not a priority when it comes to health care budget. Several institutions of LTC are insufficiently equipped or do not have enough personnel or have personnel whose education is unsatisfactory. Fortunately, a new specialization named *medicine of long-term care* was introduced in recent years. This may lead to a future quality improvement; however, life-long education of the LTC personnel is necessary. The insufficient respect for the dignity of dependent comes through for example in the form of missing privacy when carrying out hygiene.

Communication of the personnel with patients should be a natural part of LTC but it has unfortunately been replaced by bare administrative. As the requirements of quality of care have increased significantly over past years, it is expectable that they will keep increasing in the future.

The aim of this chapter is to show the reader that there are future costs of LTC that cannot be found in present data. This makes the costs predicted by any model underestimated; however, it is very hard or maybe not even possible to asses by how much.

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## 8 Conclusion

The aim of this thesis was to predict the future expenditures on long-term care in the Czech Republic. These expenditures are closely related to the population age structure and they will be influenced by population ageing; a phenomenon which is and will be a budgetary problem in the Czech Republic.

The theoretical model uses an external population projection and data on the structure of dependency in the Czech Republic in the year 2009 to perform the projection of expenditures. The later dataset is of a very high quality and contains data on approximately 65% of the Czech population and therefore it should make the projection a very precise one. There are several assumptions made that are related to the future structure of dependency and unit costs of care. The costs of medical long-term care are expected to grow with GDP per capita. The growth of social costs of long-term care that are represented by social benefits named care allowances is very difficult to predict because it is directly dependent on the decisions of future governments. Therefore, there are 3 different scenarios of growth used: growth with GDP per capita, growth with inflation and no nominal growth. Please note that from its definition, the first scenario is expected to predict the highest costs whereas the third one the lowest. The third scenario is considered to be to a great extent unrealistic but it describes the no-change-in-legislation development.

According to the projection results, the medical costs of long-term care are expected to be rising both in nominal terms and in terms of percentage of GDP. The 2010 expenditures on the medical part of care are 15.3 billion CZK which is 0.39% of the 2010 GDP. These expenditures are projected to rise over the whole period 2010 – 2060 to their ending 2060 value of 141.5 billion CZK representing 0.64% of that year's GDP.

Furthermore, the 2010 expenditures on the social component of long-term care were 19.6 billion CZK (0.52% of the 2010 GDP). Their further development depends on the scenario used. It is important to bear in mind that there was a change in law that

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decreased the total amount spent on long-term care in 2011. According to the GDP-per-capita-growth scenario, the nominal value of social expenditures is expected to rise to 22.1 billion CZK in the year 2015 and it is projected to keep increasing over the whole projection period with the final value of 196.5 billion CZK in 2060. The percentage of GDP spent on the social part of long-term care according to this scenario is expected to be 0.45% in 2015. A continuous increase is predicted to follow from 2015 reaching the final value of 0.88% of GDP in 2060.

Naturally, the inflation-growth scenario predicts lower costs than the previous one. The nominal value of expenditures is expected to rise to the 2015 value of 19.8 billion CZK and then keep increasing up to 91.8 billion CZK in 2060. A fall of value relative to GDP after the legislation change is predicted by the second scenario as well. The bottom value after this fall is 0.40% GDP in 2020 after which the expenditures stay in the interval from 0.40% to 0.42% of GDP with the 2060 value of 0.41% of GDP.

The scenario with no nominal growth of care allowances predicts even a fall in the nominal value of expenditures. The lowest value of expenditures on the social component of LTC is the 2015 one – 17.9 billion CZK. Then the expenditures are predicted to be increasing until the year 2060 when they reach 34.1 billion CZK. The costs of social care in terms of percentage of GDP are expected to be decreasing according to this scenario. Their 2060 value is 0.15% of GDP.

The future development of the overall spending on long-term care is dependent on the scenario used. The 2010 expenditures are equal to 0.91% of GDP (35 billion CZK). The expenditures in the year 2060 are predicted to be 338 billion CZK (1.52% of GDP), 233 billion CZK (1.05% of GDP) and 176 billion CZK (0.79% of GDP) according to the above mentioned scenarios respectively.

The bottom line is that the expenditures on long-term care are, according to the two realistic scenarios where the care allowances increase over time, expected to be increasing all over the projection period until the year 2060 in nominal value and also expressed as a percentage of GDP after the fall in 2015 that is caused by the 2011 change in legislation. This is in favour of the hypothesis that population ageing will have a large impact on future costs of long-term care. It is notable that the share of

costs spent on the elderly cohorts is projected to be rising over the whole projection period. This is expected to be caused directly by population ageing.

The thesis compares the results of the projection with *The 2012 Ageing Report* base case scenario and it is found that this report estimates the 2010 expenditures to be lower than the real ones and that the costs predicted by this report are higher than those in this thesis. This difference is caused by different data that are used for the projection of future unit costs of care.

Yet it is important to realize that the costs of long-term care will probably be higher than predicted by any kind of model because of costs that are hidden in the present. These are costs of voluntary informal care and costs that will be needed to improve the quality of long-term care institutions and to built new ones. Unfortunately, it cannot be predicted by how much these hidden factors will increase the future costs of long-term care.

Long-term care, no matter how important, is only a small part of the overall expenditures that are related to population ageing. All in all, it would be interesting to make an extension to this work that would also predict other costs related to population ageing.

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## Appendix A: Data Description (Extras)

**Table A.1: Types of medical costs (Translation)**

Original Czech name	Author's translation
Náklady na odborné léčebné ústavy	Costs of specialized therapeutic institutes
Náklady na ošetrovatelská lůžka, léčebny dlouhodobě nemocných a hospice	Costs of nursing beds, institutes for long-term patients and hospices
Náklady na home care (domácí péči) vč. porodních asistentek a psychiatrických sester	Costs of home care including birth attendants and psychiatric nurses
Náklady na zdravotní péči v (lůžkových) zdravotnických zařízeních poskytnutou osobám umístěným v nich z jiných než zdravotních důvodů	Costs of social beds in healthcare facilities
Náklady na ošetrovatelskou a rehabilitační péči poskytnutou v zařízeních sociálních služeb	Costs of nursing and rehabilitative care provided in social services institutions
Náklady na nemocnice	Costs of hospitals

*Source:* Vachek (2011) and author's translation based on Institute of Health Information and Statistics of the Czech Republic (2012).