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The Effect of Migration on the Regional Life Expectancy of Eastern and Western Germany after the Reunification

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Abstract

Background: Since the collapse of the Communist political system in 1989 the life expectancy of Eastern Germany increased rapidly, which is very surprising compared to the other Communist states. In other Former Soviet Union countries the mortality rates remain static, if not even got worse. Some scientists argue that migration can influence the mortality pattern of a region and the resulting regional life expectancy, and consequently the high migration flows from Eastern to Western Germany, which was caused by the collapse of the Communist political system in 1989, is one of the causes which may explain the rapidly increasing life expectancy in Eastern Germany.
Objective: The objective of this paper is to determine the regional life expectancy of Eastern and Western Germany, after migration is included, since the uni-regional life tables are excluding migration.
Data and Methods: The data are provided by the Federal Statistical Office. Additionally, some assumptions, based on the data provided by the Statistical Office in Baden-Württemberg, had to be made in order to use following methods besides uni-regional life tables: increment-decrement life tables and multi-regional life tables.
Main Findings: Especially for Eastern Germany for males as well as for females the regional life expectancy decreased around two years. Additionally, the peaks of the life expectancy could be explained by the economical background.
Conclusion: . Due to the lack of information, the situation just could be modelled, based on the assumption, that once somebody migrates he adopts the mortality pattern of the receiving population. Based on the example of Eastern and Western Germany, it is very important to include migration into life tables, since the life expectancy changes after applying the multi-regional life table method. Additionally, the results clarified the situation of Eastern Germans spending less than 2/3 of his/her life in Eastern Germany, which leads to a negative demographic and economical development. Policy makers in Eastern Germany should consider of attracting young workers in order to prevent worse demographic and economical development. Another aspect to consider is to remove the tempo-effects in the period life expectancy after including migration.

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1. Introduction

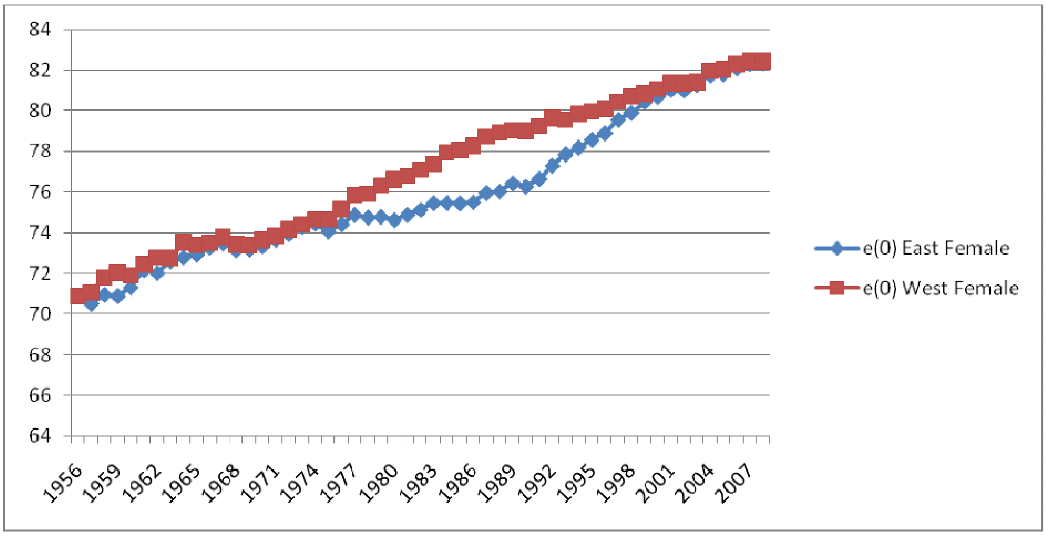
The life expectancy at birth (e0) or the remaining life expectancy at age x (e(x)) is usually an indicator for the health status and the quality of a health system of a population. As in almost all industrialized countries, the life expectancy at birth in Germany has been continuously increasing since for over 100 years. Still not every subpopulation benefits from the development in the same way. Especially since the discussion about increasing the pension age, the difference in mortality and the life expectancy of different subpopulations got more important. For example the life expectancy of subpopulations can differ between both sexes, between people with a different socio-economic status, between different regions or between other factors. One of the most interesting topics in mortality differences between regions in Germany are the mortality differences between Eastern and Western Germany. These differences are very interesting for the demographic development as well as further consequences, and which policies could be made, to prevent negative developments and consequences of the regions (Luy, 2006).

Luy assumes that the differences between Eastern- and Western Germany are mainly due to the division of Germany into two parts after the Second World War. Eastern Germany became part of the Soviet zone and thus its population experienced psychological consequences of the political oppression as well as of the economical situation. These led to different life styles, ultimately to different life qualities, and a lack in medical-technical treatments (Luy, 2009).

With respect to the political history, there is a clear relationship between the political history and the mortality patterns in Germany. Until 1945 (the end of the Second World War) both parts of Germany show similar demographic circumstances. After 1945, the differences of the demographic circumstances, including the mortality and the resulting life expectancy differences increased. From 1945 until the mid 1960s irregular variations were due to the flu epidemic, which increased the mortality in both parts of Germany at different points of time (Luy, 2006). Since the mid- 1960s a slightly higher mortality among the Eastern women as compared to the Western female can be observed

(Nolte, et. al., 2000). These observations are also represented in Figure 1.1, which deals with the life expectancy of Eastern and Western women from 1956 until 2008.

Figure 1.1: The Life Expectancy of Eastern and Western German Women from 1956 until 2008



x-axis: years

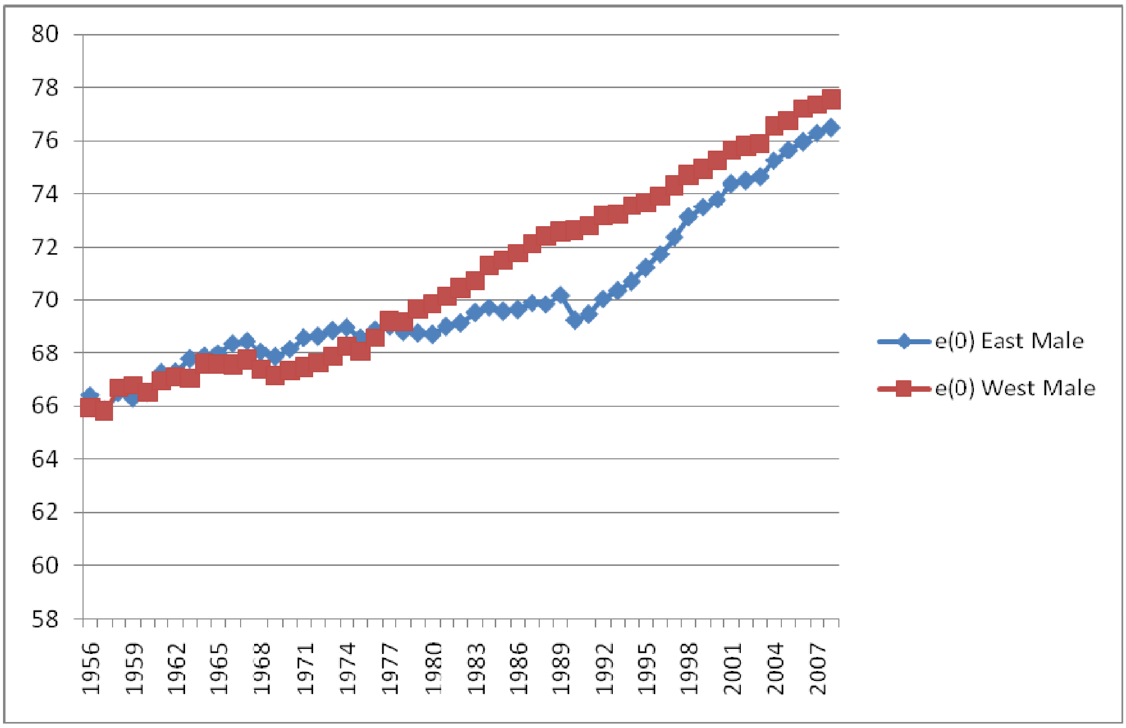
y-axis: age

Source: Human Mortality Database, 2010

Contrary to this the Eastern men had a higher life expectancy than the Western men at that time. Until 1971 the life expectancy of Eastern men was even 1 year higher than of Western men (Nolte et. Al., 2000), which can be observed in figure 1.2.

Afterwards a continuous development of the survival conditions in favour of the Western population emerged, which existed between Western and Eastern Europe as well. This increasing difference is due to the slow increase of the life expectancy of Eastern Germany and the rapid decrease of mortality of Western Germany (Luy, 2006; Höhn and Pollard, 1990; Scholz, 1996; Gjonca et. al., 2000). Especially within the Eastern male population the life expectancy remained stable for a while, which resulted in, that the life expectancy of the Western male population got higher than of the Eastern male population.

Figure 1.2: The Life Expectancy of Eastern and Western German men between 1956 until 2008



x-axis: years

y-axis: age

Source: Human Mortality Database, 2010

The maximum of the difference was for female in 1988; women from the West could expect to live around 2.95 years longer than women from the East and for male it was in 1990, where the life expectancy was 3.54 years more for Western men than for Eastern men (Luy, 2006).

Around this time the collapse of Communist political system occurred (1989) and the differences in mortality of Eastern and Western Germany have decreased since then. The decreasing mortality differences are due to the political chances and the resultant life style and life quality change in Eastern Germany. The observed difference in 1999 was just 0.52 years among the women and 1.59 years among the men. A reason for the decreasing mortality differences is the changing political situation which transformed the life style and life quality in Eastern Germany (Luy, 2006).

If the decreasing difference went linear since 1990, the Federal Statistic Office (2006a) expected that the difference in mortality would disappear for women in 2003 and men in 2006. Yet other scientists (e.g., Luy, 2005) believe that the mortality difference between Eastern- and Western Germany would not disappear.

But still, after numerously research with regard to the development of the difference in mortality among Eastern and Western Germany, the *main* cause could not be found (Luy,2009). Which factors were leading to the rapid reduction of mortality rates in Eastern Germany after a continuous increasing mortality difference between Eastern and Western Germany? This relatively rapidly increased life expectancy of Eastern Germany is quite surprising, if we compare it to the other Communist states.

In other Former Soviet Union countries the mortality rates remain static, if not even got worse (Luy, 2009). Luy (2009) argues, that, similar to all other mortality differences, the mortality difference between Eastern and Western Germany is due to a combination of several factors. Some scientists argue that migration can influence the mortality pattern of a region and the resulting regional life expectancy, and consequently the high migration flows from Eastern to Western Germany is one of the causes which explains the rapidly increasing life expectancy in Eastern Germany (Mai, 2003; Flöthmann, 1994).

To adopt this on the situation of Eastern Germany, each of those populations can be categorized by two subpopulations: One subpopulation that stays in Eastern Germany and one subpopulation that migrates from Western Germany to Eastern Germany. Likewise the same can be adapted to the population of Western Germany: One subpopulation that stays in Western Germany and one subpopulation which migrates to Eastern Germany. Each of these subpopulations shows a different mortality pattern. Since the migrants are moving to the other part of Germany, they will be categorized from the point of the movement to the other part of Germany: Migrants from Eastern Germany will be part of the population of Western Germany and migrants from Western Germany will be part of the population of Eastern Germany when the remaining life expectancy is estimated. In this way the regional life expectancy of the respective parts of Germany will change as well due to migration.

Since the high migration flows in 1989 after the Collapse of the Communist political party in Eastern Germany (which is somehow also the point of time, when the mortality differences of Eastern and Western Germany surprisingly decreased rapidly), one can assume that the high migration flows influenced the regional life expectancy. Additionally, it is also a well known fact, that population movements affects the spatial distribution of health. This leads to changes in the mortality rates in subgroups of any population (Saarela and Finnäs, 2008) since the health status is an important determinant for the mortality. If someone is in a very bad health condition, his chances to die are higher than of someone, who is in a very good health status. The mortality rates on return are determining the life expectancy.

This research will focus on the relationship between Eastern and Western migration and the regional life expectancy, which leads to the following research question:

‘How did the life expectancy in Eastern and Western Germany change after the reunification, when the migration flows are included?’

To answer this question, several aspects will be discussed in the following chapters:

In chapter 2 the migration patterns since 1980 between Eastern and Western Germany will be described. The focus will be put on the labour migration, selective migration, triggers to move and the impact of the high migration flows.

Chapter 3 proposes a theoretical framework for the relationship of migration and health, since the health status is an important determinant of mortality and due to the lack of extensive literature about the relationship of migration and mortality. Yet, there is no general theory about the relationship about migration and health either. However, the sparse existing research on the relationship of migration and health is reviewed in this chapter to adopt these to the relationship of migration and mortality as well as the resulting life expectancy. The secondary literature is just on the micro level and not on the macro level, like this Thesis is. It concentrates on the health status and mortality of migrants, but still the mortality of migrants influences the mortality rates of a whole regional population. The latter consists of the mortality of the subpopulation, which was born and stayed in that region and the subpopulation, which was born in another region and joined the new region. Finally the Conceptual Model, derived from the Background and Theoretical Framework, will be given.

Afterwards, the used data (which are mainly drawn from the Federal Statistical Office) as well as the used methods (Macro Life Table Methods, Increment-Decrement Life Table Methods and Multiregional Life Table Methods) will be described in detail in Chapter 4.

With respect to the used data a lot of assumptions, which will be described as well, had to be made since not all the required data were available. One aspect is also, that Berlin was not included, since the city cannot be divided into Eastern and Western Berlin and according to the Federal Statistical Office (2006b) the migration flows from Berlin are not representable for the migration flows between Western and Eastern Germany. The last part will show how the Conceptual Model will be operationalized.

Moreover, Chapter 5 describes the results derived from the research in three parts: The first part concentrates on the multi-regional life expectancies of the respective parts of Germany since 1991, after migration is included. The non-regional life expectancies are usually undisturbed by any migration flows. This seems to be quite unrealistic, since Germany had very high migration flows between Eastern and Western Germany after 1989. The second part focuses on the migration between Eastern and Western Germany: How many years does a German on average spend in each part of Germany?

The last part emphasizes the migration between both parts of Germany, which are categorized by birth region: How many years will a person, born in Eastern Germany, spend in each part of Germany? How many years will a person, born in Western Germany, spend in each part of Germany?

The sixth and last chapter comprises the conclusion, dealing with the question, whether migration actually is one of the main reasons for the rapid decrease in the mortality difference between Eastern and Western Germany. At the end of that chapter some political recommendations will be given since. Selective migration (e.g. age-selective migration; economical status- selective migration) can lead to problems for a demographic structure of a population, which could turn to many (e.g. economical) problems, as described in Chapter 2.

2. Migration in Germany

Migration in Germany plays an important role in the making of the state and the society. It started already with the early movement of German tribes across central Europe; followed later by migration of German farmers towards rich agricultural areas in the Dark Ages. Then the flight back of German refugees, who tried to escape the Red Army and German populated areas outside Germany. Before the fall of the Berlin Wall, three million political-economical refugees from Eastern Germany already left the Eastern part of the country (Berentsen and Cromley, 2005).

Before the fall of the Wall and the unification of the East and the West, the internal migration systems were different than afterwards. The East mostly comprised urbanization migration, whereas the West showed more intra- and interregional deconcentration migration. The housing situation, the economic development, and models for regional planning constitute the main contributors to the different migration patterns (Gans & Kemper, 2002). In the 1960s and 1970s primarily suburbanization characterized the migration pattern in the West, due to the former baby boom. In the late 1970s, interregional deconcentration, or counter-urbanization became the main migration pattern. In the 1970s and the 1980s also de-industrialization had a big impact. This meant migration losses for the old industrialized areas versus gains for Southern Germany since they had successful economic restructuring programs (Kemper, 2004).

Literature on internal migration in Germany has, since the unification, mostly been restricted to migration flows between the East and the West. This can be explained by the mass migration from the East to the West (Kemper, 2004).

When the Berlin Wall fell and the opportunity for migration emerged, the political future of the East was uncertain and the possibility that the border might be closed again contributed to this mass movement. In 1989 and 1990, 400,000 individuals moved annually from the East to the West, which constituted 2.5 percent of the Eastern population at that time (Hunt, 2000).

2.1. Migration Patterns between Eastern and Western Germany after 1989

With the collapse of Communist political systems in 1989 the East to West movement of European population increased greatly in volume. One of the respective populations was the German Democratic Republic (Eastern Germany) who migrated through Hungary to the old Federal Republic of Germany (Western Germany) (Knotuly, 1997).

Some even say (e.g., Kemper, 1993; Heilig et. al, 1990) that there is a close connection between the Eastern- Western Migration in 1989 and the political changes and events that resulted into the reunification. This is due to the fact that the reunification was triggered by the economic necessity and accelerated the process of the unification (Knotuly, 1997). But the former German Democratic Republic was always known as a country of emigration since its existence of 41 years 4.7 million people moved to the West (Kemper 1993). Kontuly et. al. (1997) still argues that it is too simple to say that the migration caused the reunification. However, he acknowledges migration as a significant factor in the reunification process.

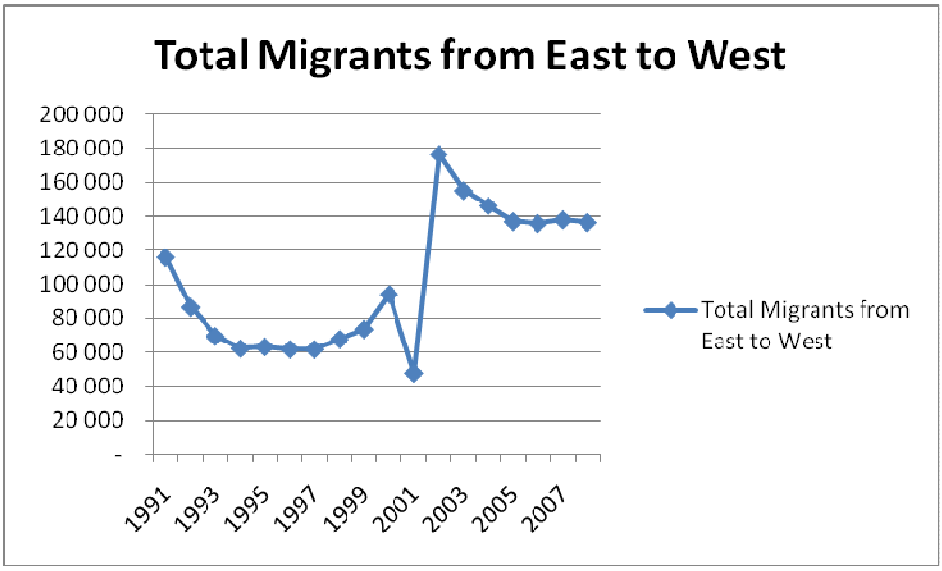
Between 1989 and 1998 the net migration was 1.2 million (Kemper, 2004).While German interregional migration rates are generally not particularly high, the migration mobility for Eastern Germans increased extensively since 1989 (Bucher & Gatzweiler, 1996). In 1991 to 1993 the emigration from the East to the West decreased again and remained steady thereafter. At the same time West to East migration rose which supplemented the net migration to be almost zero in the mid 1990s (Hunt, 2000; Flöthmann, 2002).

The migration flows since 1991 declined gradually, from 250.000 people in 1991 to 168.000 people in 1997, although the employment and wage gap between the East and the West still existed. The East to West migration decreased in absolute numbers after the mass movement. Since the reality and hope of a better life and future spread among Eastern Germans and as Eastern Germany became increasingly a United Germany. East to West movement flows weakened for a time and West to East movement grew (Berentsen and Cromley, 2005).

When the redevelopment of Eastern Germany's economy seemed to find some setbacks until 1997, a renewed increase in out migration from the East to the West could be observed, since 1998. In 1999 about 1,1 Million people migrated within Germany, 31% (347,000) of them from Eastern to Western Germany (Flöthmann, 2002).

Therefore negative net migration in the East grew again and in the first years of the new century the migration flows reached a second peak in 2001, which can be observed in figure 2.1.1. However the migration flows never rose to the levels of 1989 to 1991(Berentsen and Cromley, 2005). Only senior migrants (above 50) continued to have an increase in net migration for the East. The destinations for this group of retirement migrants and return migrants are mainly the rural regions in Eastern Germany (Kemper, 2004).

Figure 2.1.1: The Total Migration Numbers from Eastern to Western Germany between 1991 and 2007



x-axis: years

y-axis: persons

Source: Federal Statistical Office, 2010

2.2. Labor Migration between Eastern and Western Germany

When searching for the factors of the decrease in migration flows between East and West Germany, many researchers take economic factors into account. The decrease of migration flows ran parallel to rapid wage increases and a rise in unemployment in the East. After the unification many manufacturing firms in the East, which comprised rather low productivity lost their markets and collapsed. The rapid de-industrialization resulted in a loss of many jobs. As mentioned earlier, at the end of the 1990s, there was still high wages gap between the East and the West (Kemper, 2004; Burda, 1993; Granato and Niebuhr, 2009).

Also Hunt (2000) explains the downward trend by wages and unemployment information from 1991 to 1996 and applied state level data from 1991 to 1996 about migration, unemployment and wages. Hunt also clarifies that the major wage increase in the East led to a major fall in employment. The employment rates fell from 89 percent to 73 percent between 1989 and 1992 stabilization thereafter. Utilizing the Roy model, a prediction was made. Generally, the Roy model predicts that due to lower wages inequality in the East, emigrants to the West are likely to be better skilled. In total 312,000 full time workers migrated from 2000 until 2006, with 96,000 migrating from Eastern to Western Germany, 90% of them being qualified and high-qualified workers (Granato and Niebuhr, 2009).

The highly skilled workers generally want to leave low inequality places for higher ones, whereas low skilled workers prefer to find low inequality places. However, the expected wage is assumed to be a more important contributor, and depends on the hourly wage and the probability of being employed (Daveri & Faini, 1996). Workers accepting a job in the West between the years of 1990 and 1991 had median wage gains of 52 percent, while movers in later years just earned 8 to 9 percent (Hunt, 2000).

Between 2000 and 2006 approximately 4.1% high qualified as well as low qualified people migrated annually from Eastern to Western Germany. In these years 37% of the movements of workers in Eastern Germany are moving to Western Germany, but just 8% of the workers in Western Germany are moving to Eastern Germany. Latter lost in all quality-areas workers. (Granota and Niebuhr, 2009).

2.3. Other Factors than Economical for Migration between Eastern and Western Germany

According to Burda's (1993) the intention to migrate (from East to West Germany) were household income, rent, probability of becoming job loss and having family / friends in the West.

Furthermore additional factors which help to understand the migration between West and East Germany are given by multiple researchers. Hinrich (1997), states that maybe place ties are important factors for the downward migration flows from the East to the West. The scholar confirmed that residential movers in Eastern Germany have higher place ties and a more local orientation than movers from the West. He thus concludes that the migration is then maybe not a response to economic decline but rather an effect of long-term decay.

Also house ownership and housing conditions are factors that are considered in relation to the migration patterns of the East and the West of Germany. In East Germany home ownership and housing conditions seem to be more important because of deficits and unsatisfied demands. Despite the high unemployment, job related motives to move are less important in the East (Kemper, 1994). Thus, internal migration does not only depend on the labour market, but also on developments of housing markets.

Büchel and Schwarz (1994) showed in their research that people migrated because of unfair wages, family in Western Germany and unsatisfaction of the regional environment.

2.4. Selective Migration in Germany: Migration of young skilled workers, especially women

In the beginning of the 1990s the vast majority of people migrating from East to West was young and aged between 16 and 25 years old, mostly singles. West to East migrants were older, most of them married men who moved to the East without their partner (Büchel and Schwarz, 1994).

In the years 1989 until 1997, for the most mobile population, those aged 18 to 24, the mass movement was even larger. 17 percent of Eastern Germany 18 to 24 year olds was lost by migration between the East and the West, between the years 1989 and 1997 (Granato and Niebuhr, 2009).

Especially higher qualified civil servants migrated to the East (Flöthmann, 1994). Since the mid-1990s, demographic and socio-economic structures of both flows are converging. The proportion of females for West to East migrants rose from 36 percent in 1991 to 44 percent in 1996 (Kemper, 2004; Büchel and Schwarz ,1994). For East to West women migrating due to the labour market, especially young women are overrepresented. This results in substantial loss among young, working-age people in Eastern Germany (Flöthmann, 1994).

Kemper (2004) shows in his studies that the most mobile group is also here the 18 to 24 year olds and the 25 to 29 year olds. Between the ages 18 and 24 the probability is even 9.3 times higher to emigrate than someone aged 46-53 (Hunt, 2000). In 18 to 24 year olds prefer cities and agglomerations with an extensive supply of colleges, universities and jobs. The 25 to 29 year olds, referred to as the 'job-oriented migrants', are more sensitive to regional differences in job availability (also see Hunt, 2000). This suggests that emigration from the East to the West is influenced by the Eastern economy. Hunt (2000) showed that the probability of emigrating is twice as high for people who are laid off or experiencing non-employment. The unemployment rose from 5.7 percent in 1995 to 10.1 percent in 2001(Kemper, 2004). For the East, the data shows even a small gain of 25 to 29 year old halfway the 1990s. However at the end of the 1990s the net migration of the East decreased significantly again.

According to Hunt (2004) youth and brain drain could be a legitimate concern for policy makers, about economic viability of the Eastern Region.

2.5. The Impact of Migration between Eastern and Western Germany

Workers from Eastern Germany can avoid a career change by migrating to the West (Büchel and Schwarz, 1994). Workers from Eastern Germany still do not achieve the same high skilled level, when they work in Western Germany than people originally coming from Western Germany.

The migration of young skilled workers leads to a loss of “Human capital” (high skilled people) in Eastern Germany. In return this has an effect on the development and potential of Eastern Germany. The resulting population development affects the selective migration on several levels of the country and society with demonstrating great effects especially on the economy and regional developments. A negative economical development and pessimistic expectation with respect to employment, enforces the trigger to move to an economically and demographically advanced region- which leads to a vicious circle. Various Eastern regions within Germany are getting into increasing economical and demographic crises, which makes it even more difficult every year to composite this again. But the effects are different in every region, which leads to different developmental perspectives (Mai, 2004). Selective migration in Eastern Germany affects different areas: regional planning on the state as well as on the society level, political consequences, regional income, housing demand, but also mortality pattern and regional life expectancies (Mai, 2004; Flöthmann, 1994).

Flöthmann (1994) argues that when either many elderly into a region or many young people move out of a region (but the rest of the population structure remains constant), the population is ageing. In the first scenario it is an active ageing, whereas passive ageing occurs in the second scenario.

2.6. Conclusion

Since the collapse of the Communist political system in 1989, Eastern Germans have shown high migration flows. First, they migrated by first entering Hungary and before moving to Western Germany. Then, since the Berlin Wall had fallen, the migration from Eastern to Western Germany was direct. The first migration flow emerged as people were afraid that the border could be closed again. After the fall of the Berlin Wall the migration flows increased massively. Some scientists, e.g. Heilig et. al, (1990) even declare the high migration flows as a trigger of the reunification because the political change decreased the economical situation, which lead to high migration flows. Likewise Knotuly (1997) acknowledges that at least the migration flows constitute one aspect of the economical necessity of the reunification and they accelerated the process of the reunification.

Between 1991 and 1993 the migration flows decreased again until the net migration were almost zero, if not even positive in some parts until 1997. In 1998 the migration flow increased a second time (but never reached as high as in 1990 and 1991, except the senior migrants (above 50), who continued with increasing migration flows into the East and reached higher than the migration flows in 1990 and 1991).

Mainly young people between 18 and 30 years were migrating, with a great part being women. One main reason for that was the economical situation in Eastern Germany, which aggravated after the reunification process. The causes of the development are linked to demographical (such as population structure change), economical and political changes.

3. Theoretical framework

There has been no research or scientific literature yet, which concentrates on the effect of internal migration on mortality in Germany. Additionally the migration between Eastern and Western Germany and its effect on mortality and the resulting life expectancy has been discussed in the academic literature. Nevertheless it is a well known fact that population movements affects the spatial distribution of health, which in turn leads to changes in the mortality rates in subgroups of any regional population (Saarela and Finnäs., 2008). Moreover, the mortality rates of any subpopulation impacts the life expectancy of any subpopulation. This is why this chapter focuses on the relationship of migration and morality on the micro level and the mortality of migrants.

The relationship between migration and mortality is very important for health promotion and policy making, since the fact that migrants and non-migrants have a different mortality, which will be demonstrated in this chapter.

Due to the lack of extensive research on the relationship between migration and mortality, the relationship between migration and health is demonstrated as well, since the health as an important factor with regard to mortality.

3.1. The Effect of Migration on Mortality

Boyle (2004c) states that the literature on this topic is relatively rare. Results in this field vary by scale of analysis/ migration period/ morbidity and health outcome. Moreover, it is important focus at the migration background of groups of people, for example minority migrant groups, in order to understand mortality differences.

Additionally, for a good research on the effect of population change and thus migration, longitudinal data is needed to find out which factors influences mortality at different points in a person’s life-course. The location in which people grew up and stayed in their adult life influences the health status and mortality risk. Boyle provides examples of research directly focused on the relationship between migration and mortality. For instance, a research study on stroke mortality in the USA showed that the rates in some states were strongly influenced by migration. Another empirical study demonstrated that immigrants with fairly average rates of stomach cancer in New Mexico masked quite high rates among non-migrants in the state.

Similar to these findings, Luy and Caselli (2008) demonstrated in their study “The impact of a migration-caused selection effect on regional mortality differences in Italy and Germany” that migrants are living healthier than non-migrants and that the mortality is lower. Their study is based on others studies: Feinleib et al. 1981; Balarajan et al. 1984; Shai and Rosenwaike 1987; Tsugane et al. 1989; Nair et al. 1990; Valkonen et al. 1992; Kington et al. 1998; Razum et al. 1998a, 1998b; Singh and Siahpush 2001.

Other scientists (Hammer et. al., 2009) could not observe a close relationship between migration and mortality in their 20-years-follow-up studies about Finnish twin pairs with migrant co-twins in Sweden. They just indicate a relationship between the duration of stay and mortality: The longer the migrant has already been staying in Sweden, the lower was the mortality rate.

The study conducted by Kyobutungi, Ronellenfitsch, Razum, Becher in 2006, concludes that “Aussiedler” experiencing higher mortality from external causes than native Germans. In the 17th or 18th century settlers moved from Germany to Russia. Especially after the two world wars they experienced increased discrimination. That is why after the reunification of Germany, two million people resettled in Germany, which was part of the Diaspora migration. These re-migrating people are called “Aussiedler”. The data presented that among males, a slightly increased mortality with respect to Aussiedler could be observed, due to ‘suicide and self inflicted harm’, ‘all external causes’ and ‘accidents & adverse effects’. Contrary to the males, lower mortality rates among the female Aussiedler population compared to the whole population of Germany could be observed. The explanation for these findings was due to the migration background and characteristics.

Migration background could be explained by socio-economic deprivation, high unemployment, poor integration, psychological distress and hate. Aussiedler may have experienced these factors as well. The authors still emphasized that Aussiedler, males as well as females, had a lower risk of dying than the population of Russia, which was their origin-population.

3.1.1. Explanations for the mortality differences between migrants and non-migrants

The mortality status of migrants who moved between different deprived areas tend to fall somewhere between the status of those who are left behind and those who they join (Norman, 2004; Saarela and Finnäs; Kyobutungi et. al., 2006). Norman (2004) explains this due to the fact that those who move into the most deprived places have a worse health status than those who are leaving those places. Additionally people who move into the least deprived places have more favorable health behavior than those who leave the least deprivation places.

Saarela and Finnäs (2008) emphasize in their studies about the effect of internal migration on mortality in Finland aged 44 and 59 of the year 2000, that migration changed the health behavior and lifestyle of an individual after migration, which led to a mortality closer to the mortality of the destination population. Yet, the authors assumed that migration can also have a negative effect on mortality: Only if somebody migrates for the health status, the mortality risk will be lower, in any other case, that person will have difficulties to adapt to the new social environment and the mortality risk might increase.

3.2. The Effect of Migration and Health

To study the relationship between migration and health, the main question that is necessary to investigate, is, whether migration has a positive or negative effect on health, and which other factors influence the relationship between migration and health?

The United Nations Development Programme (2009) demonstrates in their Human Development Report the importance of a policy framework about migration. In this respect, the framework mainly focuses on how to deal with international migration, but there are also chapters about internal migration and migration in general. First of all, the Human Development Report 2009 requires policy-makers to facilitate the internal migration people.

Moreover it concentrates on five topics:

1. How mobility can foster human development,
2. Who moves where, when and why,
3. How movers fare,
4. Impacts at origin and destination and
5. Policies to enhance human development outcomes.

The third chapter comprises a part about health. It proposes that access to health services should be made available to everybody since it is often the case that health services are more difficult to access for migrants than for locals, although people often migrate because of better health care.

The fifth chapter concentrates on measures to enable benefits from internal migration. In respect, government policies should not hinder people to migrate within the country (but also not require people to move for basic services and livelihood). Policies should remove all the barriers to migrate within the country (economical, social and administrative barriers, but also discrimination against movers).

Considering this framework, it becomes obvious how important policies about migration are. The Human Development Report stresses that even if the access to health services were the same for mobile people and for locals, the mobile people would still not have access to the same quality of health services as locals. As the locals already have their general practitioner for years, who knows his/her patient very well, better health services can be provided. Yet, if they get new patients, they mostly do not know the "history" of the health status of that person and consequently they cannot treat that new patient as well as a long-term patient. Moreover, mobile people do not know the quality of the doctor. Since they are new in a city, there is a lack of information concerning the reputation of the new doctor.

This shows that even if the access to health services were equal, the quality of the health services would not be the same. Consequently, if research about migration emphasizes that the mortality of internal migrants is lower than the mortality of local people then the policy maker should consider changes in the policy for health. This would lead to equal access and quality in the health service.

Apart from that, even if the policy does not hinder the people to migrate within the country; the Human Development Report proposes a framework that could be applied to stimulate a respective policy.

The relationship between migration and health has received more attention in scientific literature the last few years. Depending on the demographic characteristics (e.g. age) and the distance of the move, the research results have shown that mobility has a positive effect as well as a negative effect on health. However, the impact has been greater on morbidity than on mortality (Boyle et al., 2004). Moreover, most studies focus on migration and health.

Connolly and O'Reilly (2007) assessed the influence of migration on the distribution of health over time in Northern Ireland between the years 2000 and 2005. The authors stress that the potential contribution of migration increases inequalities in health between areas with different levels of deprivation. The results demonstrated that 70% of the migrants were from the most deprived area while 11% came from the most affluent area. Surprisingly, 45% moved to a more deprived area and 55% to a more affluent area. However, the result of the movement on the distribution of health was not immediately apparent.

In order to determine the impact of the population change, the out-migrants are compared with the non-migrants of the origin in terms of health status as well as numbers. The first result worth noting is that between 2000 and 2005 barely any difference in the results have been observed, which shows that migration plays a decreased role in changing the distribution of health over time. This might be that out-migrants are replaced by in-migrants in that area with the similar health status.

Yet, another important result is that those who move to a more affluent area are healthier than non-migrants of the origin region, but less healthy than those of the destination region.

Furthermore, additional facts are mentioned which might be worth discussing: A period of five years is very short to say if migration plays a great or a small part in changing the distribution of health over time. Still, the conclusion can be upheld: Migration is a possible explanation of population dynamics in all studies that examine changes in spatial distribution of health inequalities.

Larson et. al. (2004) demonstrated a negative effect of internal migration on mortality in their studies. The authors studied the relationship between health and residential mobility among women aged 40-55 in 1996 in Australia and came to the conclusion that those migrants had more health problems than non-migrants.

Boyle (2004c) states that migration is not a random process. Migrants are generally healthier than non-migrants (although elderly are more likely to move if they are ill and short distance migrants tend to have higher mortality rates than long distance migrants). This is why different health selective mobility is discussed within the rest of the chapter.

3.2.1. Health Selective Social Mobility

Boyle (2004c) defines health inequalities as consistent variations in mortality and morbidity by social class and considers ´health selection social mobility´ as a reason for this divergence. This means, that those in lower socio economic groups, who are healthy and have individual characteristics favorable to good health, may be expected to rise up the social scale, and are displacing those, in the higher social class, who have less favorable health characteristics. If so, the widening gap between rich and poor might be extensively related to health selective mobility.

3.2.1. Health Selective Geographical Mobility

In the recent years, the debate about "context vs. composition" has been growing (Macintyre et. al., 1993) and research has been conducted based on different data, health outcomes, and statistical techniques. The most common technique is to control individual characteristics and to test in a next step if the contextual factor has a significant effect on health and mortality. The existing research has shown different results. However, the main outcomes are that the contextual effect is not as important as the compositional effect (Picket and Pearl, 2001) and that the contextual effect has a greater impact on health than on mortality (Boyle et al., 2004).

Furthermore, the context within which individuals reside may also affect their health, and many research studies deal with geographical variations in mortality. One reason for geographical variations could be ´health selected geographical mobility´ (Boyle, 2004c). Boyle (2004c) focuses on the body of ecological research in which the geographical variations in mortality are studied. These are often relating to mortality patterns and to the area based measures.

Some examples of existing research that Boyle mentions: Higher levels of deprivation increase admission rates for all respiratory infections for all age groups. Or meningococcal disease rates are higher in more deprived areas. Thus evidence is growing that for most diseases and causes of death, a gradient with those who are living in the most deprived areas having the worst health, shorter life expectancies and greater mortality risks emerges.

Deprivation may be related to mortality and morbidity, but health selective migration is often ignored in ecological studies. The widening health inequality may also be influenced by migration, and not including migration in research could be misleading, according to Boyle. Boyle explains this aspect further: If you compare areas in two different points in time, you are comparing two different populations since migration makes the population change. This is often ignored. Plus many studies relate deprivation to health at the time a particular illness or death is identified. Yet, for many people it is possible that current environment, may not have been the same environment in which deprivation was identified. Did they live long enough at that place to be affected by the environment?

It is possible that selective movement is the underlying reason why ecological studies have identified widening inequalities in health and mortality. Is the gap widening because of people´s relative health changes or because people with similar health characteristics cluster together?

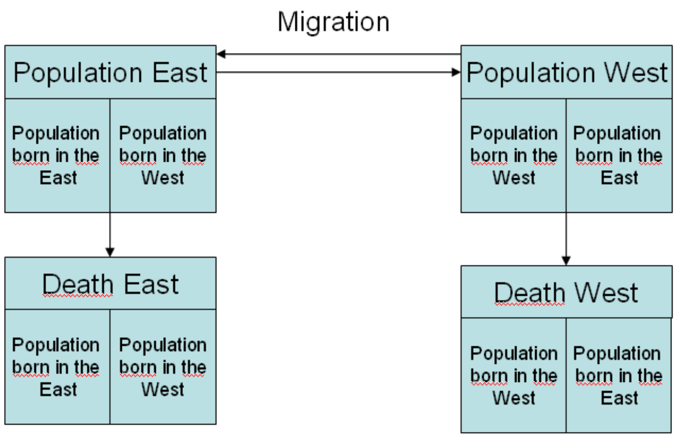
O´Reilly (1994) says that within the most deprived areas, the mortality rates improved least. However, mortality reduction is closely correlated to net population change: Districts experiencing largest net decline also experience the smallest improvement in mortality. The idea behind this is that people who are more likely to be in good health, leave such deprived areas and leave behind a residualized group.
Boyle himself examined flows between districts. Those in poor health were actually more likely to move up towards less deprived places, rather than down. This suggests that the relationships between deprivation and health have been under-rather than over-estimated, as migration appears to weaken, rather than strengthen the respective relationship.

Additionally people who moved into the least deprived places had more favorable health behavior than those who left the least deprivation places (Norman, 2004).

3.4. Conceptual Model

This studies concentrates on the effect of migration flows between Eastern and Western Germany and on the respective regional life expectancy differences on the macro level, which emphazised by figure 3.4.1

3.4.1. The Conceptual Model of the Relationship between Migration Flows and Mortality



Each population can be divided into two subpopulations: A population that stays in that region and a population that migrates to another region. In this case there is only one other region: Either Western Germany, if the origin population is Eastern Germany, or Eastern Germany, if the origin population is Western Germany.

However, the migrants, after the movement, belong to the population of the destination and will adopt immediately the mortality regime of the population of the destination: An Eastern person will adopt immediately the Western mortality regime and vice versa. But also the population, which is left behind, will experience a change in life expectancy, since part of the other subpopulation, is joining them. In Figure 3.4.1. the subpopulations and migration flows ("abgebildet" as arrows) can be seen. Both populations are each divided into a subpopulation born in Eastern Germany and a subpopulation born in Western Germany. Likewise, death occurring in both populations, are each divided into a subpopulation born in Eastern and Western Germany.

Since in the secondary literature it has been clarified that the respective subpopulations differ in their health status due to different health behaviour and life style, which lead to different mortality statuses- mostly to mortality rates in between the sending and receiving region, the regional life expectancy changes, after both populations are mixed up due to migration. Consequently, the respective regional life expectancies in the two subpopulations will differ less between each other: The life expectancy in Western Germany will decline and in Eastern Germany increase.

Still, due to the lack of information about the mortality of the four subpopulation, the outcomes of these studies, cannot be adopted to the reality and is modelling the hypothetical situtation, based on the assumption, that once a person migrates to the other region, he is adopting the mortality pattern of the receiving region.

3.5. Research Questions

Based on the Background, Secondary Literature and Conceptual Model, this Thesis concentrates on following research questions:

Main Research Question:

- How does the life expectancy at birth in Eastern and Western Germany change after the reunification, when the migration flows included?

Sub questions:

- How long is a newborn expected to spend in Eastern and Western Germany catagorized by place of birth between 1991 and 2008?
- How long is a German newborn expected to spent in Eastern and Western Germany between 1991 and 2008?

4. Data and Methods

4.1. Data

The following methods are used in this research: Macro Life Table, Increment Life Table and Multiregional Life Table. For the respective methods the following data are required:

- The mid-year population in five-years age-groups by sex and divided into Eastern and Western Germany between 1991- 2008
- The numbers of deaths in five-years age-groups by sex and divided into Eastern and Western Germany between 1991- 2008
- The numbers of in- and out-migrants in five-years age-groups by sex and divided into Eastern and Western Germany between 1991- 2008.

The age group between 0 and 4 has to be categorized into two groups: the first group contains the ages under 1 and the second group ages between 1-4 because the mortality behavior under 5 differs from the other age groups (Preston et. al., 2001).This will be explained more in detail in the next chapter.

The respective data are provided by the Federal Statistical Office. For Western Germany, the data are updated vital registrations data, based on the census on the 30th of June 1987. The data on Eastern Germany are based on former civil registration of Berlin-Biesdorf and refreshed on October 3rd, 1990.

Apart from that, any data of the Federal Republic of Germany after October 3rd, 1990, were updated by the vital registration provided by the Statistical Offices of each Federal State in Germany, which used the same methods.

However, not every required data were available. First, the population and death numbers in Berlin since 2001 were not categorized into East- and West Berlin, and the migration data has never been available separated into East- and West Berlin. The Federal Statistical Office did not consider Berlin for estimating the migration between Eastern and Western Germany for two reasons (Federal Statistical Office, 2006b):

1. The data is not categorized into East- and West-Berlin and
2. The migration between Berlin and the other cities are not representative for the migration between Eastern and Western Germany.

Since the respective data are provided by the Federal Statistical Office, Berlin was not considered in this research as well. The second challenge emerged when no mid-year population categorized in five-years age groups and separated by sex and region, were available. To solve this challenge, the average population of two respective years was calculated.

Moreover, the data were categorized into the Federal States; consequently the sum of the five New Federal States had to be estimated and the sum of the ten Old Federal States.

The third and greatest challenge conducted the lack of existing migration data between 1991 and 1999 categorized into five-year age groups. Instead, the following categorizations were provided:

- Under 18 years
- 18-24 years
- 25-29 years
- 30-49 years
- 50- 65 years
- Over 65 years

The exclusive article about age-specific Migration in Germany was provided by an article by the Statistical Office of Baden- Württemberg (Cornerlius, 2003). In this article age-specific out-migration data is in single age groups of Baden-Württemberg and Mecklenburg- Western Pomerania of the following years were estimated:

- 1991
- 1995

- 2001

These data helped to estimate the age-specific migration data by five years aged group. To demonstrate that the outmigration proportion of Baden-Württemberg are represented for Western Germany, the proportion of each age group between the years 2000 and 2008 were estimated as follows:

$$\frac{\text{Required age group}}{\text{Respective existing age group}}$$

An example provided as following:

$$\frac{\text{Male Migrants aged under 1 of the year 2000}}{\text{Male Migrants aged under 18 of the year 2000}}$$

Followed by the proportion of the group aged 1-4:

$$\frac{\text{Male Migrants aged 1-4 of the year 2000}}{\text{Male Migrants aged under 18 of the year 2000}}$$

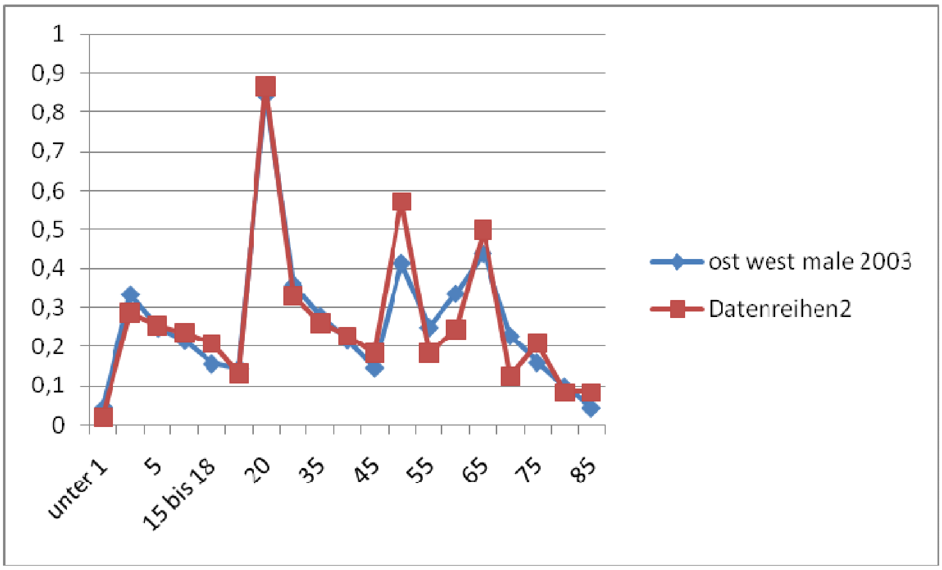
Consequently following age proportions were estimated:

- Under 1
- 1-4
- 5-9
- 10-14
- 15-18
- 18-20
- 20-24
- 25-29
- 30-34
- 35-49
- 50-54

- 55-59
- 60-64
- 65-69
- 70-74
- 75-79
- 80-84
- 85+

The estimated out-migration proportions of Baden-Württemberg were compared annually with the estimated out-migration proportions of Western Germany from 2000-2008. Likewise the estimated out-migration proportions of Mecklenburg-Western Pomerania were compared annually with the calculated out-migration proportions of Eastern Germany from 2000-2008. Figure 4.1.1 provides an example of the out-migration proportion of Eastern Germany compared to Mecklenburg-Western Pomerania of male in 2003.

Figure 4.1.1. The Proportion of the out-migration data of Eastern Germany compared to Mecklenburg-Western Pomerania opf male in 2003



Datenreihe 2- Mecklenburg-Western Pomerania

x-axis: age

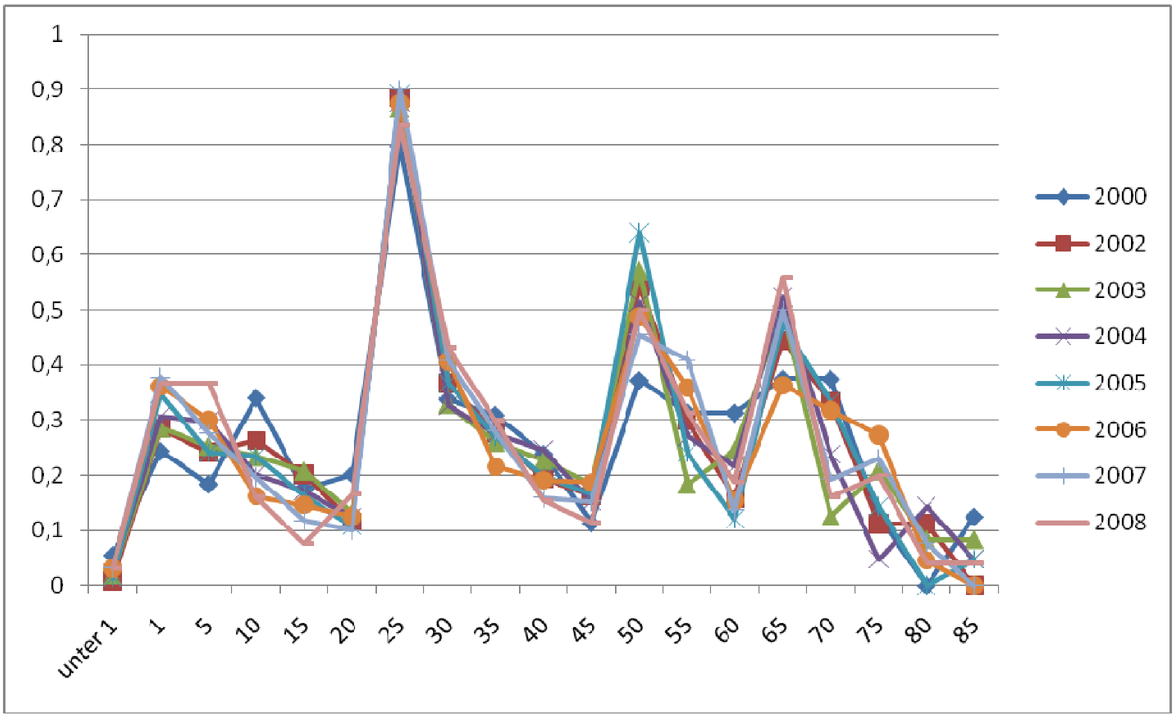
y-axis: proportion

Source: data from the Statistical Office of Baden-Württemberg; own calculations

Figure 4.1.1 demonstrates that the proportions of the out-migration nearly did not differ from each other. With respect to figure 4.1.1, the other years proved similar findings.

The results of the estimated proportion led to the assumption that the proportion of out-migration of Baden-Württemberg are similar to the ones of Western Germany and likewise that of Mecklenburg- Western Pomerania are similar to the ones of Eastern Germany. Figure 4.1.2 provides a represented example of the proportion of out migration of Mecklenburg-Western Pomerania between the years 2000 and 2008.

Figure 4.1.2.- Proportion of Mecklenburg-Western Pomerania between the years 2000 and 2008



x-axis:age

y-acis:proportion

Yet, another challenge which had to be dealt with was the included international migration out-flows.

Since the annually calculated proportions for Baden-Württemberg, Mecklenburg-Western Pomerania, Eastern Germany and Western Germany did not differ majorly from each other, the assumption was made that the estimated proportions are regardless of international migration and region.

Nonetheless, annually estimated proportion of Baden-Württemberg were the representative data for Western Germany for the years 1990-1999 and likewise the annually proportion of Eastern Germany for the years 1990-1999 were estimated with respect to the annually estimated proportion of Mecklenburg-Western Pomerania.

Furthermore, since the background literature explained that the migration flows between the years and 1991-1997 are different from the migration flows between the years 1998-2001, the proportion of 1995 was provided for the years 1991-1997 and likewise the proportion of 2001 was provided for the years 1998-2001.

Another challenge to solve was that the article just provided data until the age of 50. But since the proportion for elderly people was quite the same from 2000-2008 and since the literature presented any particular migration flows for elderly people, with respect to the average of the proportions of the respective age group of Eastern/Western Germany between the years 2000 and 2008, the proportions for the elder age groups could be estimated.

4.2. Methods

There is no scientific discipline that deals with human longevity other than biology, epidemiology and demography. Many people did research on estimating the life expectancy and on the complexity of this topic, to derive a formula that estimates the life expectancy. The most widely used measure of longevity is the period life expectancy at birth which is calculated from age specific death rates, by life table methods that originated with Gaunt (1661) have been standard in the field for well over a century (Barbi, p.1, 2006).

Naturally, it is impossible to estimate precisely the life expectancy of one person, since every person follows a different lifestyle and some unforeseen events occur in life, which makes it impossible to predict a definite life expectancy. Such unforeseen events include serious terminal illness, accidents, etc. Additionally, the estimation of the life expectancy does not equal the exact age each person in this cohort dies. The estimated life expectancy rather provides the average of individual lengths of life in a cohort. Yet, it is unachievable to estimate the exact life expectancy of a cohort since cohort analysis requires longitudinal analysis and due to the lack of unregistered death.

Due to this, the life expectancy of a period is mostly estimated by life table methods of a period. These are cross section analysis for a period of time (like a certain calendar year or perennial years). Due to the consideration of every living person and death during this period a hypothetical cohort can be build. Basically a period life table conduces to emphasize the consequences of the observed death rates on an ideal population (Luy, 2009).

But the problem in this method of period life table (Rogers (1995) terms them as single-regional or uni-regional life tables), is that these populations are assumed to be "undisturbed by, or 'closed' to migration" (Rogers, 1995, p.1). This seems to be rather unrealistic (except for closed countries like North Korea). Rogers (1995) proposes a method to calculate life tables, which is "open" (Rogers, 1995, p.1) to migration, called a "multiregional life table". His example is based on three regional populations and each of it gets migration flows from the other two regional populations. He focuses on outflows and inflows "one at a time" (Rogers, 1995, p.2) Besides that, he also proposes how to calculate population projections, which is also open to migration. These multiregional life tables can also be adapted to a multistate life table, which is also termed as increment-decrement life table, for example employed/ unemployed states; married/single/widowed states, etc.

This Thesis focuses on the multiregional life tables and will be later adapted to an increment-decrement life table, on two regional populations: Eastern and Western Germany. Consequently, Roger's formulas will be adapted to a two regional population. The purpose is to calculate the probability that an individual of a state at exact age x will survive to exact age $x+5$. For the Estimation the survival probability, the transition probabilities will be calculated first. Rogers (1975) suggests two different methods to estimate the age-specific transition rates, which are required. This Thesis will focus on one of them, which is also applied in Preston et. al. (2001) for calculating an Increment-Decrement Life Table.

Finally, the life expectancies of a multiregional life table can be compared to the life expectancies of a uni-regional life table and how the life expectancy changes after taking migration into account, but also secondly to show many the years an individual at age x is expected to live in Eastern and Western Germany. These results can be gathered from an increment decrement life table, but from the multiregional life table, as, how many years an individual at age x born in Eastern Germany can expect to live in Eastern and Western Germany can be answered.

Due to this aspect, first the method of a uni-regional life table will be explained, followed by the method of increment decrement life table and in the end the method of multiregional life tables.

4.2.1. Uni-regional Life Table

To summarize a cohort's mortality experience, it can be described in a graphical form, a mathematical function or in a life table. A life table is one of the most important devices for demography different information about the dying out of a birth cohort are provided Yet, the collection of the required data for a cohort's life table analysis exacerbates the estimation of a cohort's life table. Due to this aspect, the period's life table is mostly applied to build a hypothetical cohort. It provides information on a "hypothetical cohort if a certain set of mortality conditions pertained throughout its life" (Preston et al., 2001, p.42).

A life table begins always with the age *x* which is one of the invariable columns. "The remaining columns tabulate age-related functions pertaining to mortality, such as the number of survivors to various ages, deaths in particular age intervals, age-specific death rates, probabilities of death in various age intervals, and so on" (Preston et al. 2001, p. 38).

Further required columns, which should be provided, are the Numbers of Persons alive in the population between x and $x+n$ ($_nN_x$) and the Numbers of Deaths in the population between x and $x+n$ ($_nD_x$). Based on these columns, the age-specific death rates, $_nM_x$, can be estimated as following.

$$_nM_x = \frac{nDx = Number\ of\ deaths\ in\ that\ population\ between\ ages\ x\ and\ x+n}{nNx = \ Number\ of\ persons\ alive\ in\ that\ population\ between\ ages\ x\ and\ x+n}$$

Usually, alternatively to $_nN_x$, the number of person-years lived in the population between agex x and x+n is used, L_x ,merely it can be replaced by nNx.

The conversion of the age-specific death rates can be converted to an age specific probability of dying between ages x and $x+n$, $_nq_x$.

$$_nq_x = \frac{n * nmx}{1 + (n - nax) * nmx}$$

This formula is based on the assumption, that "${}_nM_x$ is to be reproduced in the hypothetical cohort passing through life in the period life table (${}_nm_x$)". Furthermore ${}_na_x$ stands for the average person-years lived by those dying in the interval. In average ${}_na_x$ is estimated as following:

$${}_na_x = \frac{n}{2}$$

There are different ways to calculate ${}_na_x$ for the first two age-groups. One suggestion by Coale and Demeny (1983: also see Preston, 2001) is following:

If ${}_1m_0 >= 0.107$, the ${}_1a_0$ is 0.330 for males and 0.35 for females.
If ${}_1m_0 < 0.107$, ${}_1a_0$ is $0.45+2.684*{}_1m_0$ for males and $0.53+2.800*{}_1m_0$ for females.
If ${}_1m_0 >= 0.107$, the ${}_4a_1$ is 1.352 for males and 1.361 for females.
If ${}_1m_0 < 0.107$, ${}_4a_1$ is $1.651\text{-}2.816*{}_1m_0$ for males and $1.522\text{-}1.518*{}_1m_0$ for females.

With respect to the age-specific probability of dying between ages x and $x+n$, the age-specific probability of surviving between ages x and $x+n$, ${}_np_x$, simply estimated as following:

$${}_np_x = 1 - {}_nq_x$$

Thereafter a hypothetical cohort, beginning with 100,000 people can be build, consequently the numbers left alive at age 0, l_0, is 100,000. Thereupon the numbers left alive at age x, l_x, can be estimated as following:

$$l_{x+n} = l_x * {}_nq_x$$

The next convention to be estimated is the number of death of the hypothetical cohort between ages x and $x+n$, ${}_nd_x$, calculated as following:

$_nd_x = l_x - l_{x+n}$

Subsequently, the person years lived between ages *x* and *x+n, L_x*, can be estimated as following:

$$L_x = n * l_{x+n} + {}_na_x * {}_nd_x$$

With respect the person- years above age *x, T_x* , finally the average remaining years alive at age x, e_x, also known as the remaining life expectancy at age *x*. T_x is defined as following:

$$T_x = \sum_{a=x}^{\infty} nLx$$

e_x is finally defined as following:

$$e_x = \frac{Tx}{lx}$$

The most used column of the life table is the expectancy of life at age *birth* or life expectancy at age *birth*: *e(0).*

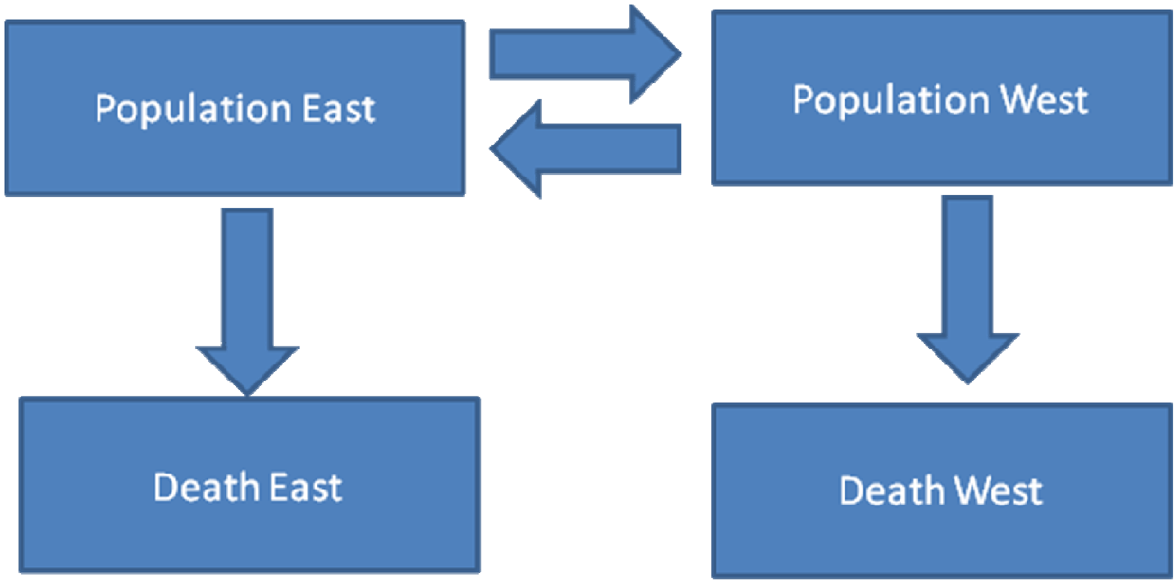
4.2.2. Increment Decrement Life Table

The increment-decrement life table is known as a multi-state life table, as an extension of the standard single-decrement life table and of the multiple decrement life table. More than one living state and more than one force of decrement can be included. Furthermore, compared to the single-decrement life table the destination states are not "absorbing", i.e. people can move into and out of states, which is closer to reality. Additionally a re-entry is possible feasible, which is different to the multiple decrement life table. Yet, death is included as a single absorbing state since nobody can get alive again. An increment-decrement life table generally studies different subjects, such employment status or marital status, migration or health. Consequently, it does not exclusively estimate the length of life, but describing the structure of life as well. It provides following information:

- Life expectancy in different states
- Proportion of remaining lifetime spent in a state
- Probability of a certain transition to occur
- Probability that a newborn will be in state i at a particular age
- Average number of transitions to state i (e.g. marriage, move to region A) that a person will experience.

In Figure 4.2.2.1 the multi-states are represented of Migration between Eastern and Western Germany, which represent two non absorbing states and death of the respective population as a single absorbing state, which leads to two life tables for two non absorbing states. Each arrow indicates a transition between two different states.

Figure 4.2.2.1 The Multi-states of Migration between Eastern and Western Germany



There are different types of a multistate life table:

- Cohort vs. Period Life Table
- Nonhierarchical vs. Hierarchical Life Table
- Population-based vs. Status-based Life Table
- Uni-radix vs. Multi-radix Life Table

The difference between cohort and period data was demonstrated in the previous sections. This research is based on period data and is providing the period life expectancy.

A Hierarchical Life Table deals with a specific order in which a transition occurs. Since the migration transitions are not occurring after a specific order, this research concentrates on a nonhierarchical life table.

In a population based life table, measures relate to the entire population with unconditional outcomes. In a state based life table the outcomes are conditional. In the increment decrement life table calculation, the measures outcome relate to the entire population.

In a multi-radix life table, the population at the beginning is catagorized by more states; in a uni-radix life table all people start in the same state. Since the research deals with two populations, the life table is multiradix.

One assumption of a multistate life table method is based on includes the aspect that the transition from state i to state j depends only on state i. Furthermore, the assumptions are non dynamic, which means, that the transition probability does not depend on the duration of the states, in return, the assumption in this case is based on the fact that directly after migrating to the East or West an individual adopt the health pattern of the destination population. The last assumption, this method is based on, is, that every person is arranged in one of the states in any moment, consequently international migration is not considered in this research. Although the notations might be similar to the ones in a uni-regional life table, the interpretations of the notations differ as following

- x as the referring age
- ${}_np_x$ *(i* to *j)* as the probability of moving from state i to state j between the ages x and $x+n$
- ${}_np_x$ (*i* to death) as the probability someone living in state i and dies between the ages x and $x+n$
- *lx (i)* as number of individuals in state i at exact age x
- ${}_nd_x$ *(i* to *j)* as the number of people moving from i to j between the ages x and $x+n$
- ${}_nd_x$ *(i to death)* as the number of people living in i and dying between the ages x and $x+n$
- L_x as the person-years lived in state i between the ages x and $x+n$
- T_x as the person years in state i above age x
- e_x as the expected numbers of years to be lived in state i at age x

e_x *(i)* is not defined as the remaining life expectancy at age x anymore- it provides the expected number of years to be lived in state i at age x ,thus the average duration of time lived in state i, regardless of origin is demonstrated. Additionally it deals with the proportion of remaining lifetime spent in state *i* by dividing the life expectancy in state *i* by the total life expectancy as following:

$$\frac{ex\,(i)}{ex\,(all)}$$

Furthermore, the probability that a newborn will be in state *i* at exact age *x* can be achieved by dividing the number of individuals in state i at exact age 0 by the number of individuals in every state at exact age 0 as following:

$$\frac{l(0)(i)}{l\,(all)}$$

Moreover, different life tables for all non absorbing states will be provided and the observed transition rates will be transformed into probabilities and finally with respect to the probabilities rates a the matrix calculation can be measured. In the last step, the remaining columns of the life tables can be calculated.
The steps of a multistate life table were as follows:

1. The states and transitions (represented by arrows in the state), a person can be in, were defined as in figure 1.
2. The transition rates were calculated by dividing the occurrence by the exposure (e.g. migration from East to West between ages *x* and *x+n* divided by the population of Eastern Germany between ages *x* and *x+n*).
3. A matrix of transition rates for the separate age groups was designed.
4. The transition rate matrices (*M*) were converted into the probabilities (*P*) for all age groups (Matrix calculation can be referred to Preston (2001), figure 12.5
5. With respect to the matrix probabilities, the probabilities can be adopted for the separate life tables for the different states were used.
6. The remaining columns of the life tables are calculated (l_x, ${}_nd_x$, L_x, T_x *and* e_x), as following:

- l_x starts with the whole population of i
- $l_{x+n} = l_x - {}_nd_x\ (i\ to\ j) - {}_nd_x\ (i\ to\ death) + {}_nd_x\ (j\ to\ i)$
- ${}_nd_x\ (i\ to\ j) = {}_np_x\ (i\ to\ j) * l_x$
- ${}_nd_x\ (i\ to\ death) = {}_np_x\ (i\ to\ death) * l_x$
- $L_x = (n/2) *(l_x + l_{x+n})$
- $T_x = \sum_{a=x}^{\infty} nLx$
- $e_x = \frac{Tx}{lx}$

7. Finally a summary life table of both life tables could be constructed by summing both life tables up (e.g. *l(x) (East) + l(x) (West),…).*

Yet, one assumption has to be considered: Somebody, who died in an age interval, lived half of the age interval (also children dying in the first two age groups).

4.2.3. Multiregional Life Table

In addition to the focus on the proportion of remaining lifetime spent in state *i* and the probability that a newborn will be in state *i* at exact age *x*, the last section focused on measuring the average duration of time lived in state *i*, regardless of origin. Moreover, the increment decrement life table deals with the proportion of remaining lifetime spent in state *i* and the probability that a newborn will be in state *i* at exact age *x*. This section demonstrates the average duration of time lived in state *i*, categorized by origin (by place of birth). Finally one can calculate the life expectancy of each region, if migration included.

The computation of multiregional transition probabilities are calculated equally to the multistate transition probabilities (by using the matrix calculations). Specifically, following probabilities are needed for calculating a multiregional life table:

- the probability that an individual in region *i* at age *x* will survive and be in region *j* at age *x+n* (e.g. ${}_np_x$ (East to West))
- the probability that an individual in region *i* at age *x* will die before reaching *x+n* (e.g. ${}_np_x$ (East to Death)).

With the following probabilities a regional life table can be measured:

- p_{ij} (x) as the probability that an individual in region i at age x will survive and be in region j at age x+n
- ${}_np_i$ (x) as the probability that an individual in region i at age x will die before reaching age x+n

Following columns can be estimated:

- $l_i(x)$ as the number of individuals born in region *i* and living in region *i* at age *x*
- $L_i(x)$ as the person years lived in region *i* at age *x* of someone, who was born in region *i*
- $T_i(x)$ as the person years lived in region *i* above age *x* of someone, who was born in region *i*
- $e_i(x)$ as the average number of years expected to live in region *i* at age *x* of someone, who was born in region *i*
- l_{ij} (x) as the number of individuals born in region *i* and living in region *j* at age *x*
- $L_{ij}(x)$ as the person years lived in region *j* at age *x* of someone, who was born in region *i*
- $T_{ij}(x)$ as the person years lived in region *j* above age *x* of someone, who was born in region *i*
- $e_i(x)$ as the average number of years expected to live in region *i* at age x of someone, who was born in region *i*

The notations will be defined as following:

- $l_i(0)$ starts with a hypothetical cohort of *100,000*
- $l_i(x+n) = l_i(x)*(1- {}_np_{ij}(x) - {}_np_i(x)) + l_{ij}(x) * {}_np_{ji}(x)$
- $L_i(x) = (n/2)*(l_i(x) + l_i(x+n))$
- $T_{ix}= \sum_{a=x}^{\infty} nLix$
- $e_i(x) = \frac{Ti(x)}{li(x) + lij(x)}$
- $l_{ij}(x+n)= l_{ij}(x)* (1 - {}_np_{ji}(x) - {}_np_j(x)) + l_i (x) * {}_np_{ij}(x)$
- $L_i(x) = (n/2)*(l_{ij}(x) + l_{ij}(x+n))$
- $T_{ijx}= \sum_{a=x}^{\infty} nLijx$
- $e_i(x) = \frac{Tij(x)}{li(x) + lij(x)}$

4.4. Conceptualization

Migration: The movement of people across a specified boundary for the purpose of establishing a new or semi-permanent residence. This is divided into international migration (migration between countries) and internal migration (migration within a country. (Population Reference Bureau, 2004)

Life Expectancy: The average number of additional years that a survivor at age x will live beyond that age (Preston, 2001, pp.38-39).

4.5. Operationalization

Migration: Everybody, who changed the municipality of the main residence (Federal Statistical Office). In this research the migrants, just those migrants included, who changed their municipality from Eastern to Western Germany or the other way around.

Life Expectancy: The average number of additional years that a survivor at age x will live beyond that age. (Preston, 2001, pp.38-39). In this research the life expectancy is categorized by regions.

5. Results

This Chapter will present the results of this research by first answering the main research question:

- How did the life expectancy in Eastern and Western Germany change after the reunification, when the migration flows are included?

Moreover this research tried to answer with the following sub questions:

- How long is a newborn expected to spent in Eastern and Western Germany catagorized by place of birth between 1991 and 2008?
- How long is a German newborn expected to spent in Eastern and Western Germany between 1991 and 2008?

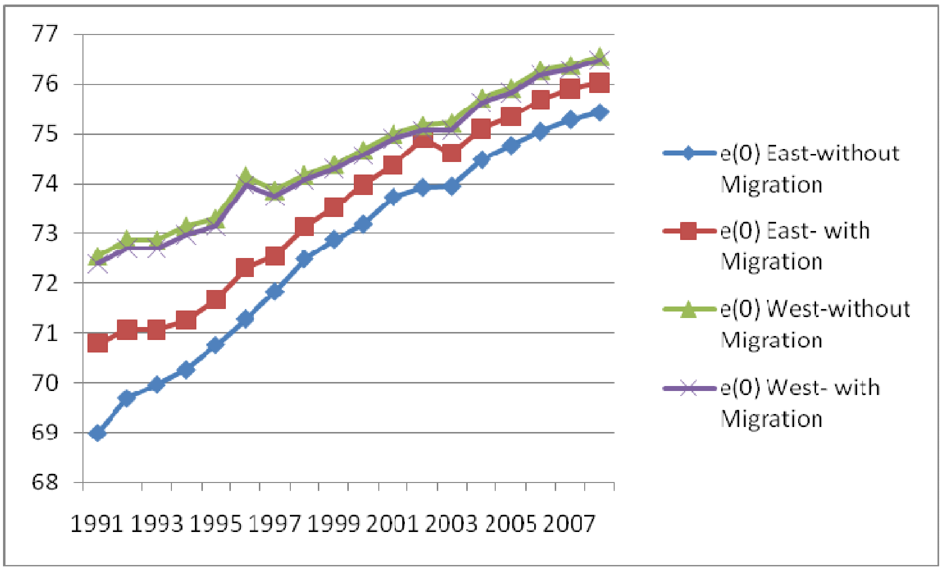
The first sub question will be answered in the second section, while the third section studies the second sub question.

5.1. The Life Expectancy of Each Regional Subpopulation, when Migration is included

The following part deals with the life expectancy change, after including migration. The section starts with the difference in life expectancy of males and continues with the one of females.

Figure 5.1.1 represents the life expectancy of males, separated by Eastern and Western Germany and separated by the in-/exclusion of migration. In Western Germany the difference of both life expectancies can nearly be observed, since the difference is quite small. The life expectancy change indicates equal results. One explanatory factor is the low migration flows from Western to Eastern Germany in comparison to the other way around, which was explained in chapter 2.

Figure 5.1.1 The Life Expectancy of Males separated by Eastern and Western Germany and separated by the in-/exclusion of migration



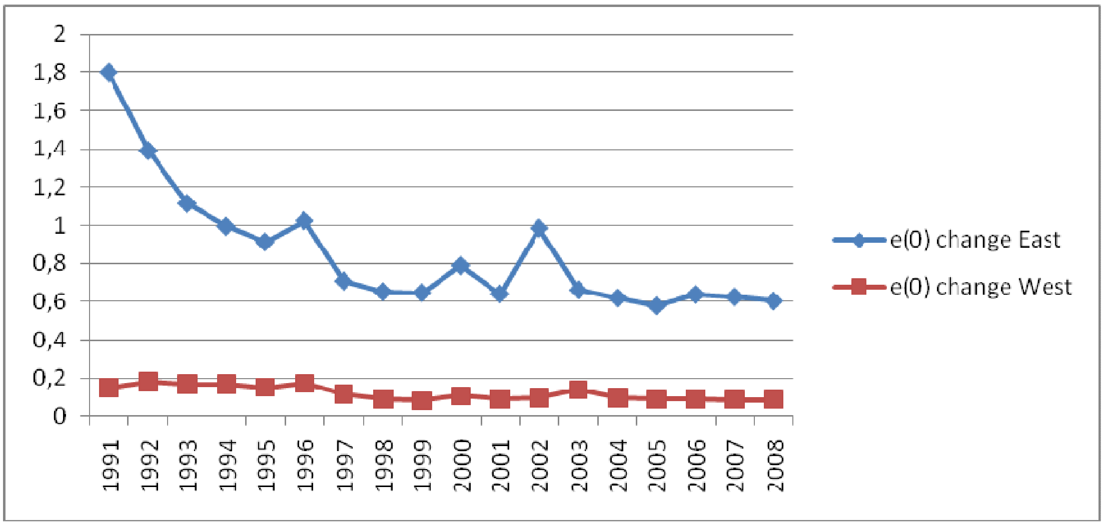
x-axis: years

y-axis:age

Source: Data from the Federal Statistical Office (2010), own calculations

Contrary to these results Eastern Germany represents different results: In 1991 the difference in the life expectancy in Eastern Germany categorized by the embedding of migration, is almost 2 years. Nevertheless the difference is almost continuously decreasing until 2008.

Figure 5.1.2: The Difference in the Life Expectancy by In-/Excluding Migration in Eastern and Western Germany between 1991 and 2008



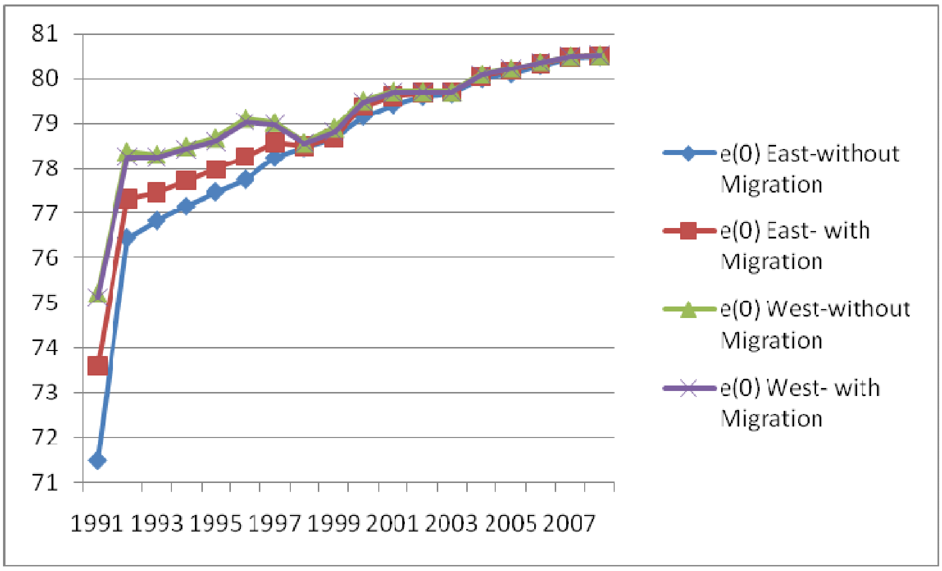
x-axis:calendar years

y-axis: years

Source: Data from the Federal Statistical Office (2010), own calculations

The difference of life expectancy in embedding and excluding migration are emphasized in Figure 5.1.2. It becomes more obvious that except for the years 1996 and 2002 the difference is continuously decreasing. The migrations flows in Eastern Germany the life expectancy difference in Eastern Germany proceed almost convergent: In the mid- 1990s the economical situation in Germany decreased, which lead to higher migration flows, divergent to the economical situation and convergent to the migration flows the difference in the life expectancy increased. In 2001 the migration flows demonstrated a second peak, convergent to these results, the difference in life expectancy increased in the year of 2001.

Figure 5.1.3: The Life Expectancy of Females categorized by including and excluding Migration in Eastern and Western Germany between 1991-2008



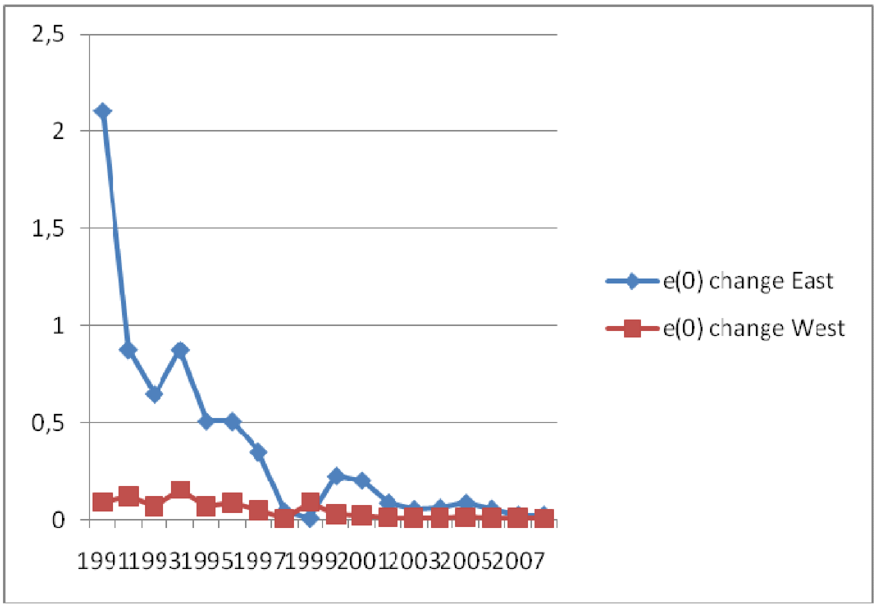
x-axis:years

y-axis:age

Source: Data from the Federal Statistical Office (2010), own calculations

Figure 5.1.3 represents the life expectancy of females categorized by including and excluding migration. The life expectancy of females represents similar results: The life expectancy of females with the exclusion of migration seems to precede equal to the life expectancy of females with the inclusion of migration. Merely, Eastern Germany emphasize great differences until the year of 1999. Similar to the life expectancy of males, in 1991 the difference in the life expectancy of including and excluding migration presents almost 2 years but surprisingly the difference is decreasing rapidly until 1999. Thereafter the life expectancy of Eastern and Western German females with the inclusion and exclusion of migration do nearly not differ from each other.

Figure 5.1.4: The Difference of the Life Expectancy of Eastern and Western Germany in including and excluding migration



x-axis:calendar years

y-axis: person years

Source: Data from the Federal Statistical Office (2010), own calculations

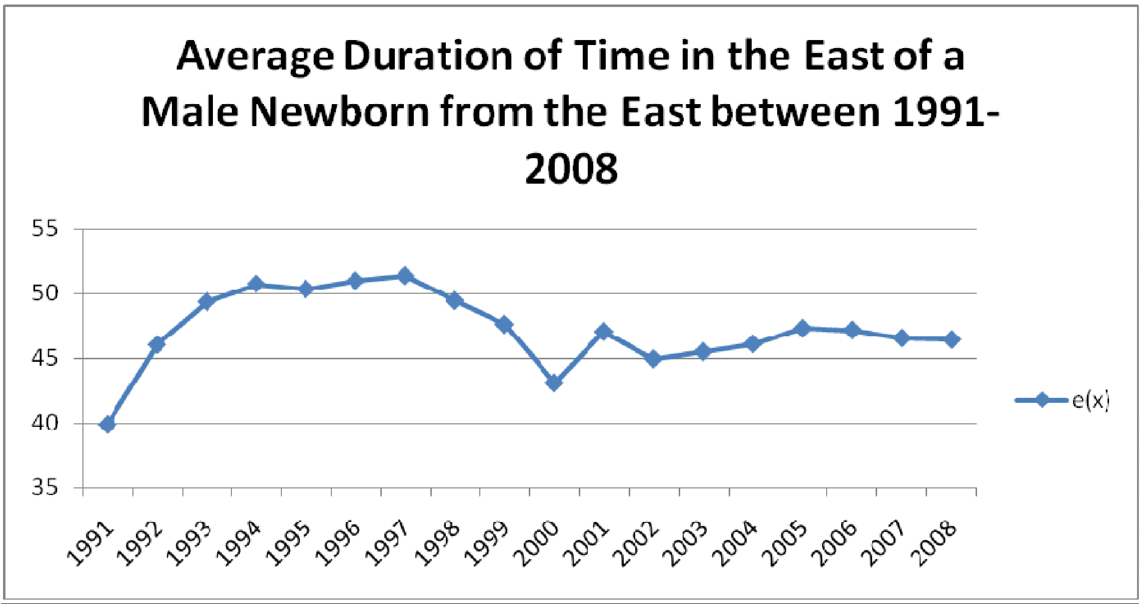
Figure 5.1.4 represent the difference of life expectancy of Eastern and Western Germany in including and excluding migration. This figure show nearly static difference of zero in Western Germany and the rapidly decrease of the difference in Eastern Germany. Similar to the males the difference in life expectancy for females increases slightly in the years of 2000 and 2001, which is convergent to increasing migration flows in 2001.

5.2. Average Duration of Time in Eastern and Western Germany divided by Place of Birth

Due to the calculations of the multiregional life table, the average duration of time in Eastern and Western Germany divided by Place of Birth could be calculated. In the following part this component of a newborn of time period of the years 1991-2008 will be presented. Moreover the focus is on the change of the average duration of time.

5.2.1. Average Duration of Time in Eastern and Western Germany of a newborn in Eastern Germany

Figure 5.2.1.1



x-axis: calendar years

y-axis: age years

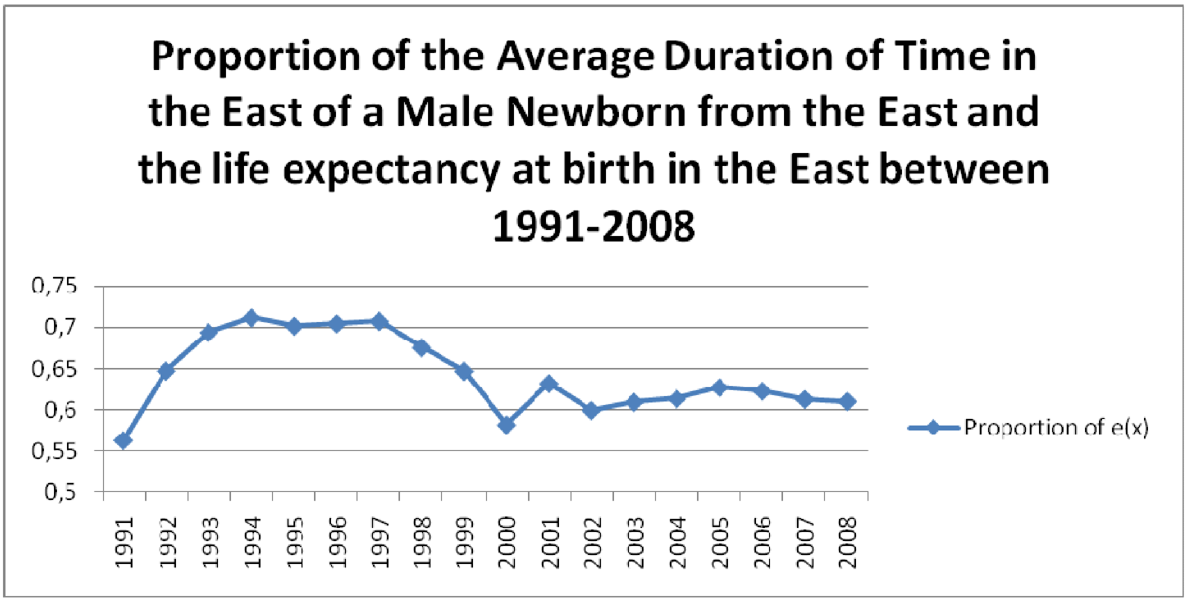
Source: Data from the Federal Statistical Office (2010), own calculations

In Figure 5.2.1 the average duration of time in Eastern Germany of a male newborn from Eastern Germany between 1991 and 2008 is represented. A male newborn from Eastern Germany in average increases the years of his duration in Eastern Germany from the years 1991 to 1997 from 40 years to 50 years. Convergent to the decreasing economical situation a male new born in average decreases his duration in Eastern Germany from the years 1997 to 2000 from 50 years to 43 years.

Convergent to the results of the background literature, which demonstrated the second peak of migration in 2001, the second peak of the average duration of a male newborn from Eastern Germany proceed in the same year. Thereafter the average duration of a male newborn in Eastern Germany is continuously increasing until the year of 2006 and slightly decreasing afterwards.

The average duration of time spent in Eastern Germany by someone born in Eastern Germany vary between 40 and 50 years.

Figure 5.2.1.2. The Proportion of the Average Duration of Time spent in the East of a Male Newborn from the East



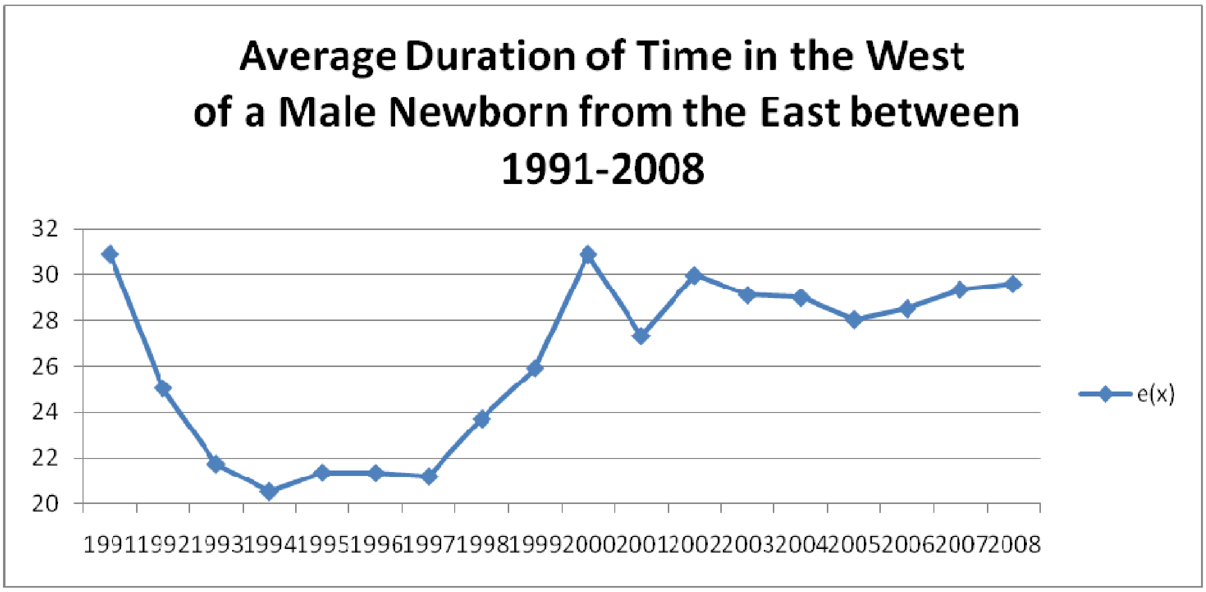
x-axis: calendar years

y-axis: proportion

Source: Data from the Federal Statistical Office (2010), own calculations

In Figure 5.2.2 the proportion of the average duration of time spent in Eastern Germany Between the years of 1991 and 2008 is presented. The shape of the graph proceeds similar to the graph in figure 1. But it becomes clearer that in 1991 a male newborn from the East just lived slightly more than half of his life (56.35%) in Eastern Germany, consequently, he was expected to live almost half of his life in Western Germany. Similar results are emphasized for the year of 2000: a male newborn from the East was eventually expected to live less than 60% in Eastern Germany. In average between the years 1991 and 2008 he was expected to live less than 2/3 of his life in Eastern Germany (64.39%). Moreover, in 1994 the hypothetical cohort achieved the highest proportion of living in Eastern Germany; almost 30% consequently 1/3 of his life, a newborn was expected to live in Western Germany.

Figure 5.2.1.3



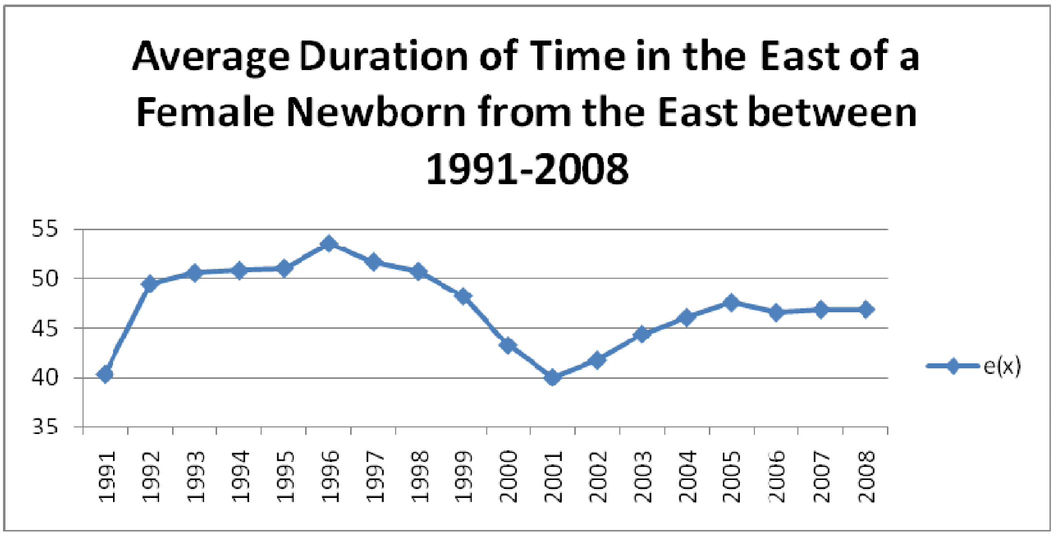
x-axis:calendar years

y-axis:person years

Source: Data from the Federal Statistical Office (2010), own calculations

In Figure 5.2.3 the average duration of time in Western Germany of a male newborn born in Eastern Germany is presented. In this figure it is even more obvious, which years were the highest peak of migration. In the years 1991 and 2000 a male newborn from Eastern Germany was expected to live around 31 years in Western Germany, which was convergent to the process of the migration flows.

Figure 5.2.1.4

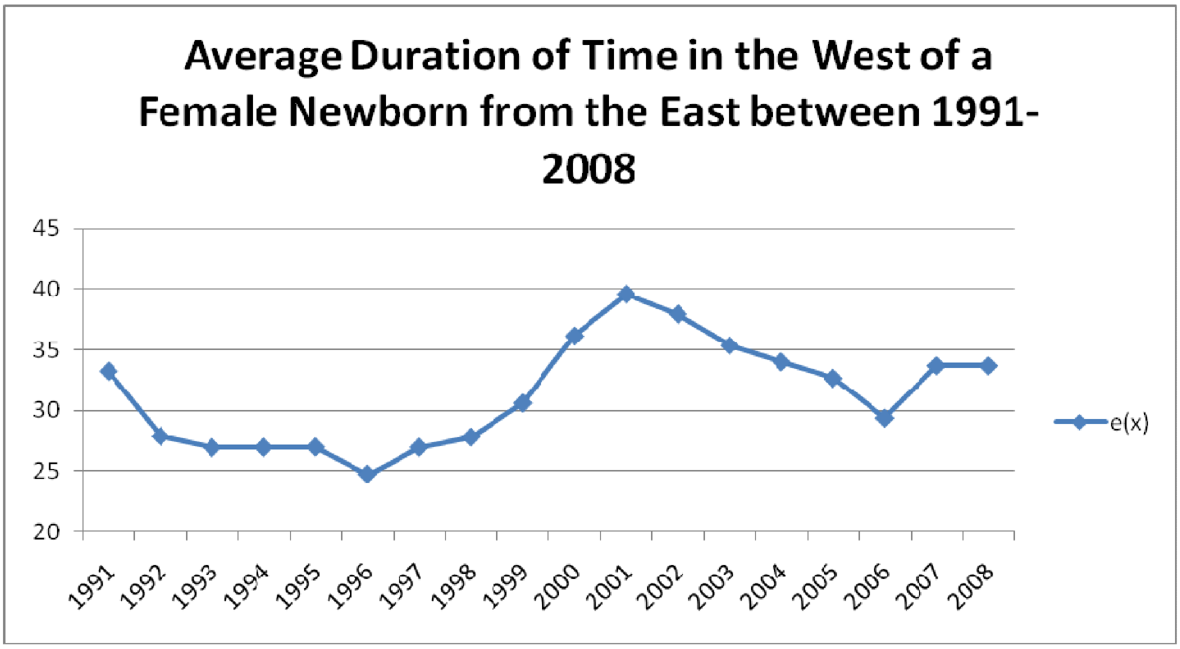


x-axis: calendar years

y-axis: person years

In Figure 5.2.4 the average duration of time in Eastern Germany of a Female newborn from Eastern Germany between 1991 and 2008 is presented. Similar to the males, the average duration of time in the East of a female newborn from the East is increasing until the year of 1996 from 31 to 20 years. Thereafter the average of duration of time of a female newborn from Eastern Germany increases almost continuously until the year of 2000 to almost 31 years. After a decrease in 2001 the figures increases continuously until the year of 2008. This graph proceeds divergent to the economical situation: A decrease in the economical situation in the East results the increase in migration from the East and consequently it results a decrease in the average duration of time spent in the East.
The average duration varies between 40 and 53 years.

Figure 5.2.1.5

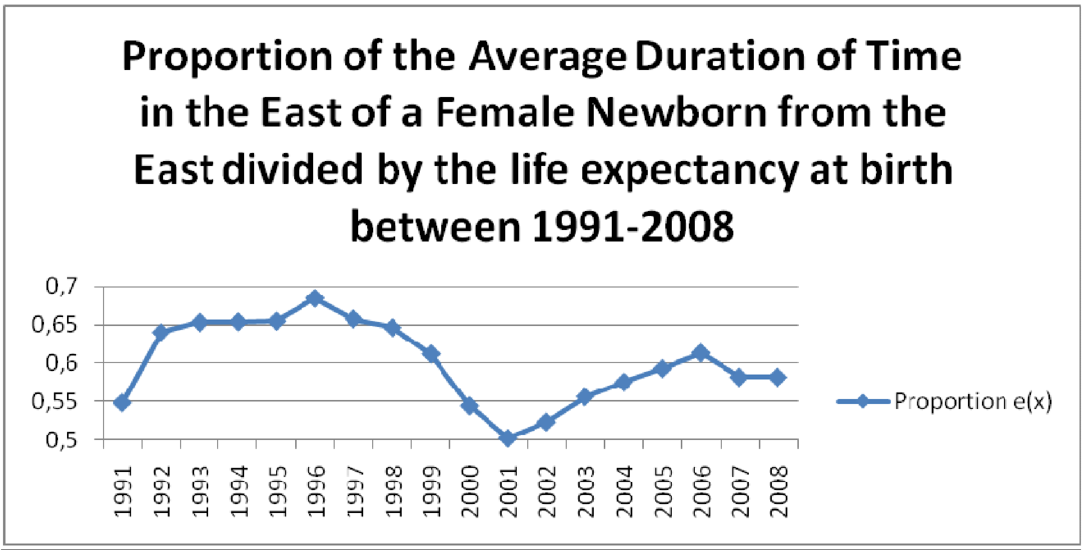


x-axis:calendar years

y-axis:person years

Figure 5.2.5 represents the average duration of time spent in Western Germany of a female newborn from Eastern Germany between the years 1991 and 2008. The results proceed divergent to the progress of figure 4. Whereas in 20001 a newborn from Eastern Germany spent 40 years in average in Eastern Germany, he spent the other half of his life in Western Germany.

Figure 5.2.1.6 The Proportion of the Average Duration of Time spent in the East of a Female Newborn from the East between 1991-2008



x-axis:calendar years

y-axis:proportion

Source: Data from the Federal Statistical Office (2010), own calculations

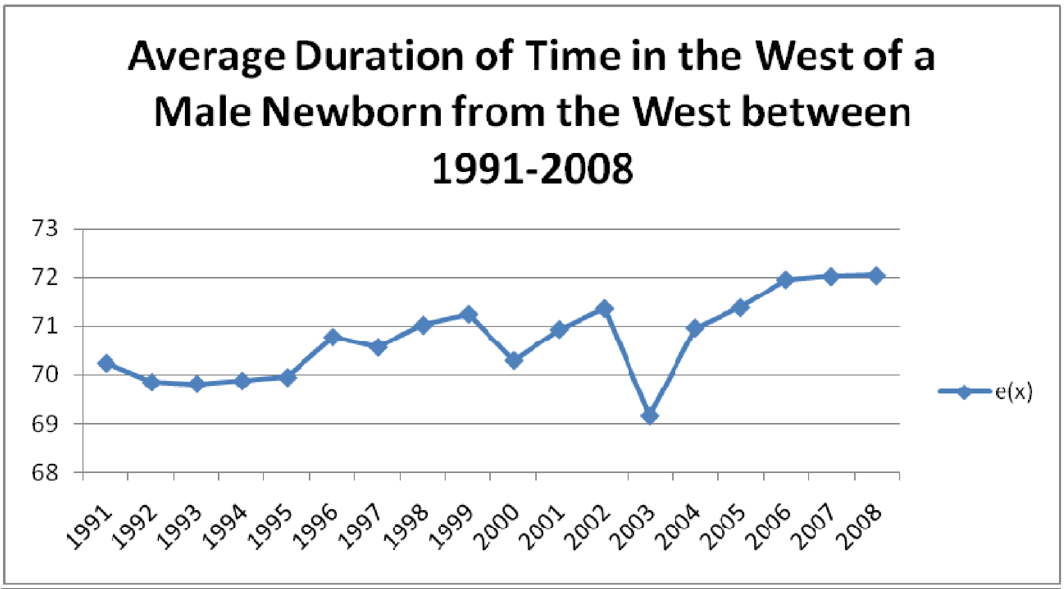
Due to figure 5.2.6, the proportion of the average duration of time of a newborn from Eastern Germany can be followed. In average she will even live 40% of her life in Western Germany, which is longer compared to the males. These findings resemble the background literature that females tempt to migrate more than males.

5.2.2. The Average Duration of Time in Eastern/Western Germany of a Male Newborn from Western Germany between 1991 and 2008

In Figure 5.2.2.1 the average duration of time in Western Germany of a male newborn from Western Germany between 1991 and 2008 is represented. It emphasizes the smaller variation of the duration of time compared to Eastern Germany. Between

1991 and 2008 the duration of time in Western Germany vary around 3 years instead of 11 years, as in Eastern Germany. The graph is decreasing so slowly that one could conclude, the graph is nearly staying static the year of 1996. In 1996 an increase of the average duration of time in Western Germany of a male newborn from Western Germany proceeds. Excluding the years 1997 and 2000, the average duration is increasing slowly until 2002. In 2003 the average duration of time in Western Germany of a male newborn from Western Germany obtains the lowest point, thereafter the duration is increasing nearly continuously until 2008 again.

Figure 5.2.2.1



x-axis:calendar years

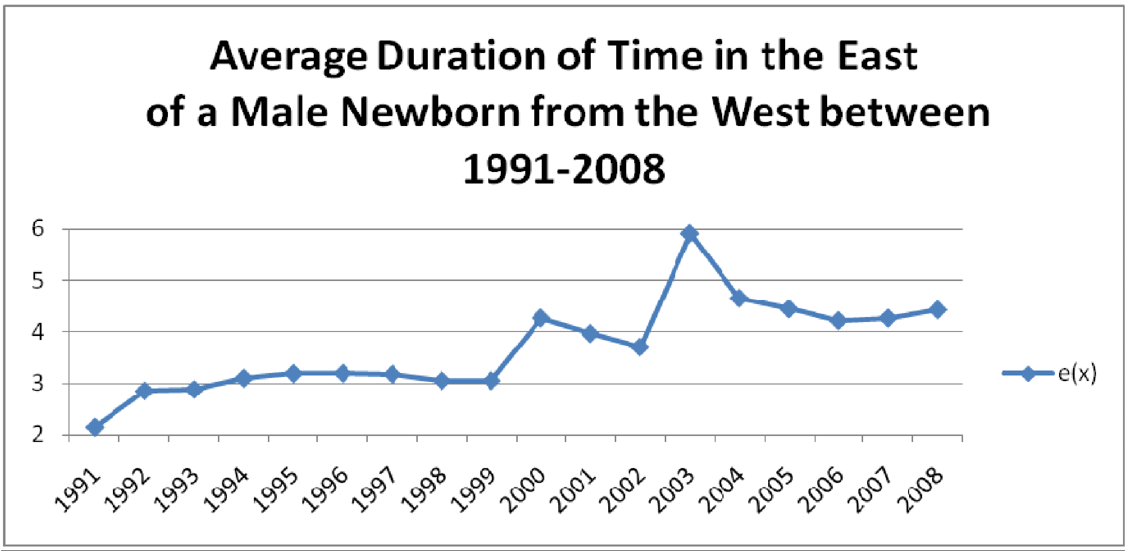
y-axis:person years

Source: Data from the Federal Statistical Office (2010), own calculations

In Table 5.2.2.2 the average duration of time in the East of a male newborn from Western Germany between the years 1991-2008 is presented. From 1991 to 1992 the average duration of time is increasing, afterwards it is staying nearly static until 1999. Yet, compared to the average duration of time of newborns from Eastern Germany between 1999 and 2008 the duration for time is varying slightly. The variations determine 4 years instead of 12 years as the average duration of the East.

However, from 1999 to 2008 the graph represents two peaks: One in the year of 2000 and the other one 3 years later.

Figure 5.2.2.2



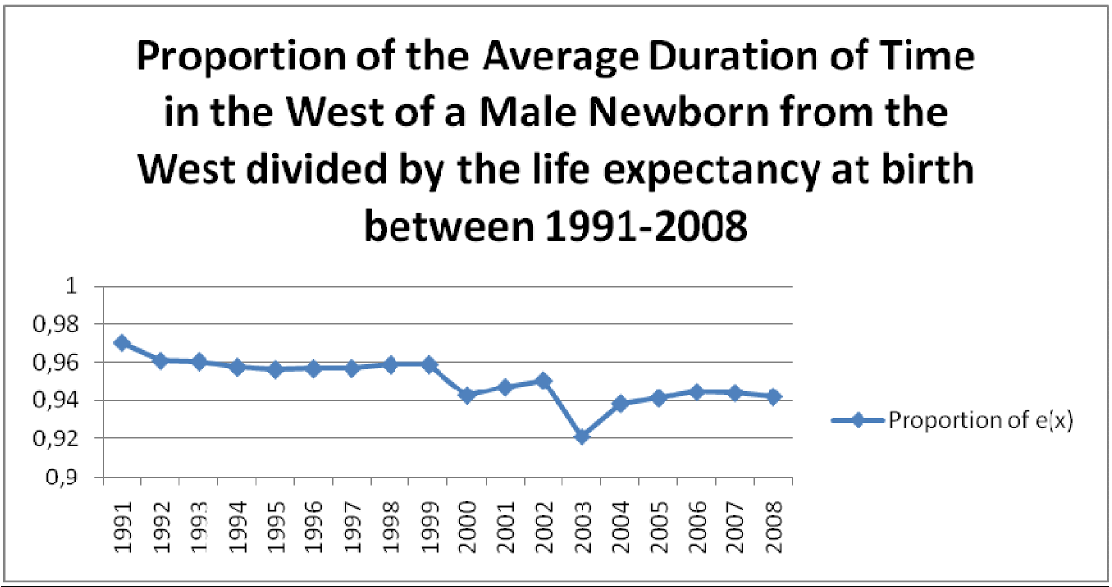
x-axis:calendar years

y-axis:person years

Source: Data from the Federal Statistical Office (2010), own calculations

In Table 5.2.2.3 the Proportion of the average duration of time in Western Germany of a male newborn from Western Germany between 1991 and 2008 is presented. It mostly provides the findings as in figure 8. But there is no background explanation for these results.

Figure 5.2.2.3 The Proportion of the Average Duration of Time spent in the West of a Male Newborn from the West between 1991-2008



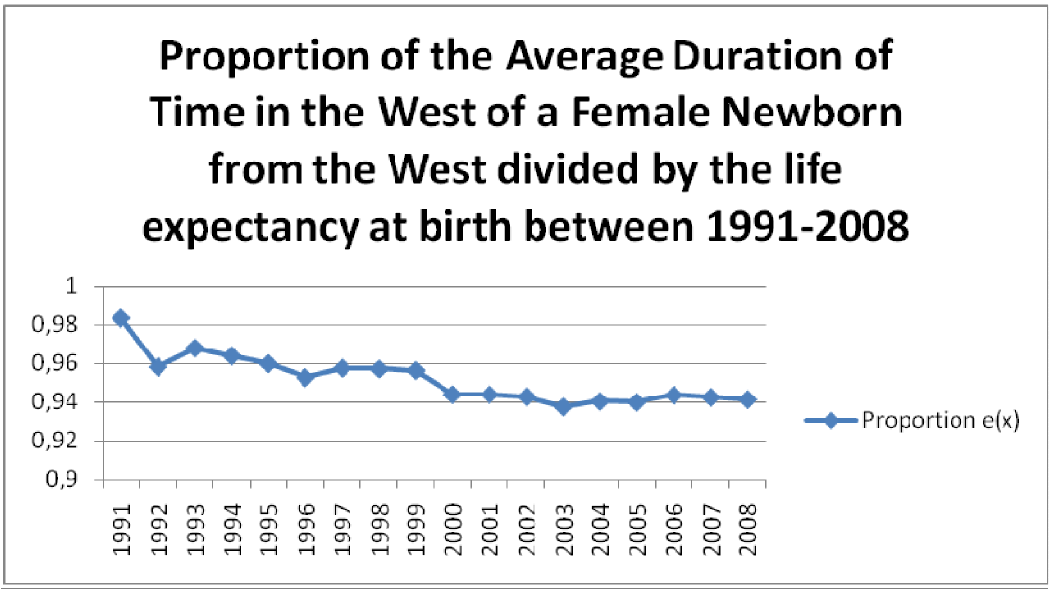
x-axis:calendar years

y-axis:proportion

Source: Data from the Federal Statistical Office (2010), own calculations

Figure 5.2.2.4 represents similar finding for males as Figure 5.2.2.3 for males. A female newborn from Western Germany from 1991-2008 is eventually exposed to live less than 10% of her life in Eastern Germany. Moreover, the proportion is almost steadily, but slowly, decreasing. Consequently, female newborns from Western Germany spend decreasingly time in Eastern Germany over the years from 1991 to 2008.

5.2.2.4 The Proportion of the Average Duration of Time spent in the West of a Female Newborn from the West between 1991-2008



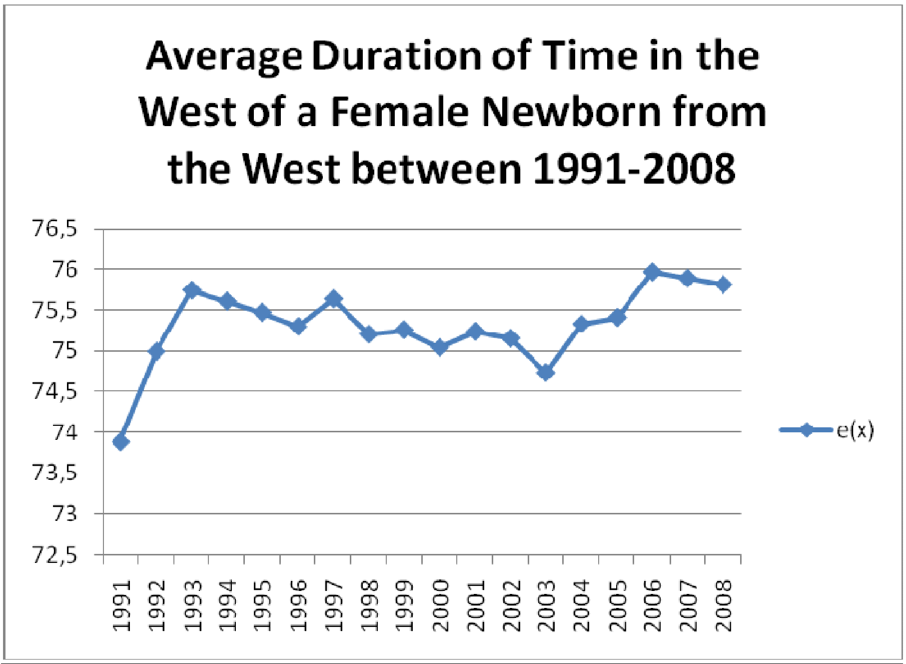
x-axis:calendar years

y-axis:proportion

Source: Data from the Federal Statistical Office (2010), own calculations

Figure 5.2.2.5 demonstrates that the average duration of time in Western Germany of a female newborn from Western Germany between 1991 and 2008 is varying around 2 years. This value is quite small compared to the previous variations of other cohorts. Between 1993 and 2008 the average duration of time spent in Western Germany of a female newborn from Western Germany remains almost static.

Figure 5.2.2.5



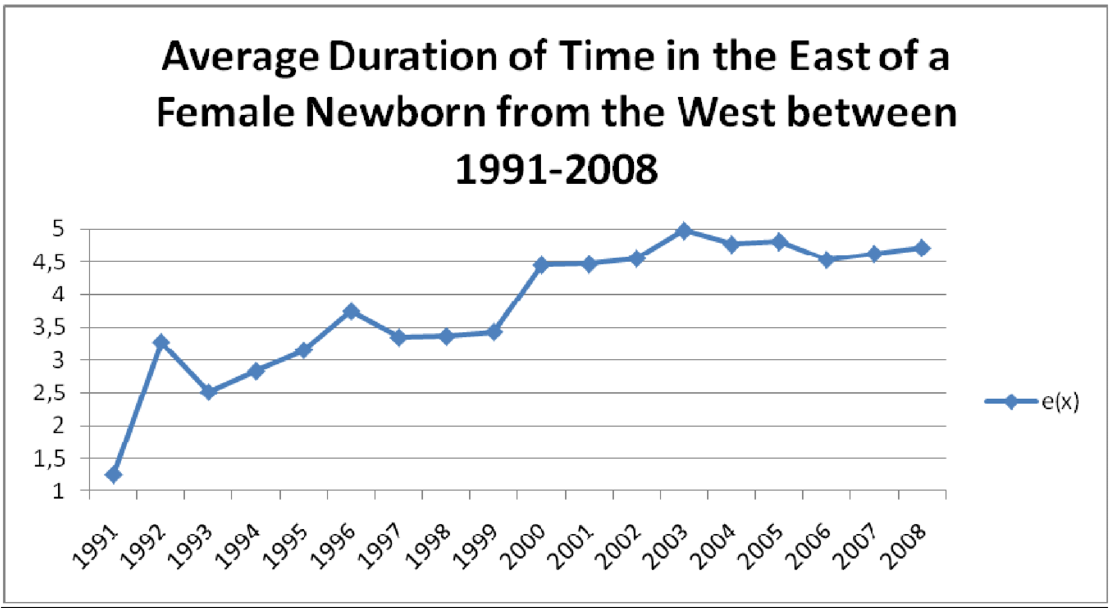
x-axis:calendar years

y-axis:person years

Source: Data from the Federal Statistical Office (2010), own calculations

Figure 5.2.2.6 explains the steadily slowly increase of the proportion of female newborns born in Western Germany. Except for the years 1993 and 1997, the average duration in time in Eastern Germany of a female newborn from Western Germany a steadily increase between 1991 and 2008. The variation of duration of time is around 5 years. The decrease in 1997 can be explained by the decrease of the economical situation in Eastern Germany.

Figure 5.2.2.6



x-axis:calendar years

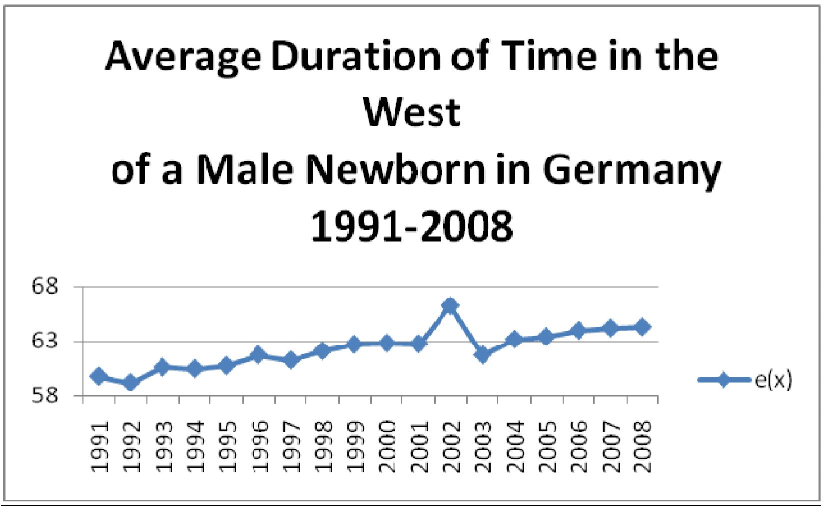
y-axis:person years

Source: Data from the Federal Statistical Office (2010), own calculations

5.3. The Average Duration of Time in Eastern And Western Germany of a Newborn in Germany

With the Increment Life Table Methods it was possible to calculate the average duration of time in Western Germany of a newborn in Germany between 1991-2008. The distribution of the whole population clarify the average duration of time spent in the respective region more than the average duration of time spent in a respective region of a subpopulation.

Figure 5.3.1



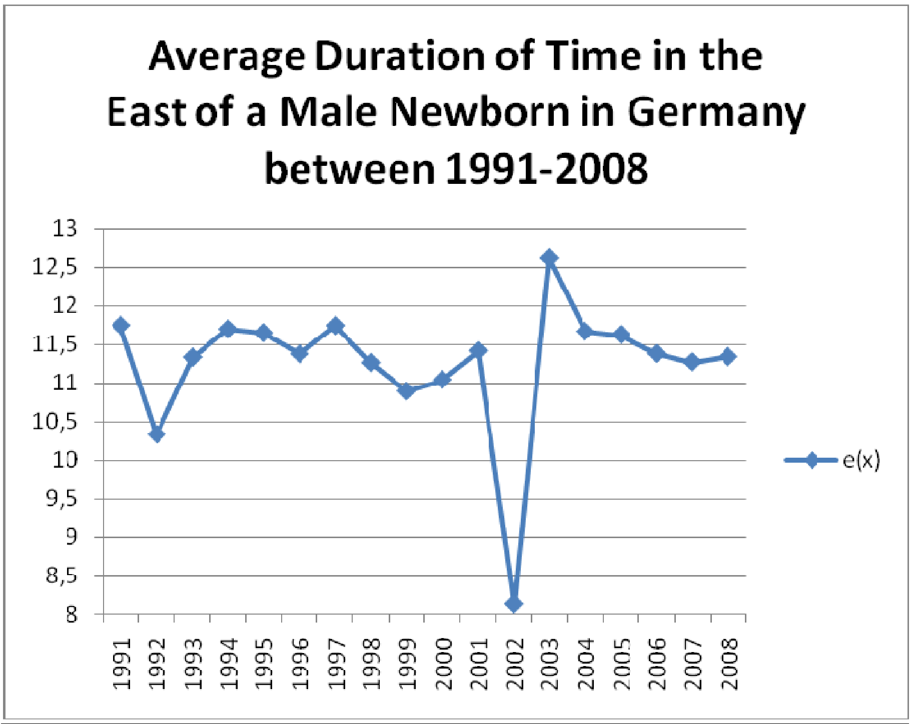
x-axis:calendar years

y-axis: person years

Source: Data from the Federal Statistical Office (2010), own calculations

Figure 5.3.1 the average duration of time in Western Germany of a male newborn in Germany between 1991 and 2008 is presented. Except for the year 2002, the graph is almost constantly increasing at a slow pace. The peak in 2002 can be explained due to the economical decrease in Eastern Germany in 2001. 2002 represent the effects of this economical decrease. Still the average duration of time in Western Germany of a male newborn are varying between age 59 and 67. Consequently, the variation in the average duration of time spent in Western Germany of a German male newborn varies between 8 years between the years 1991 and 2008.

Figure 5.3.2



x-axis:calendar years

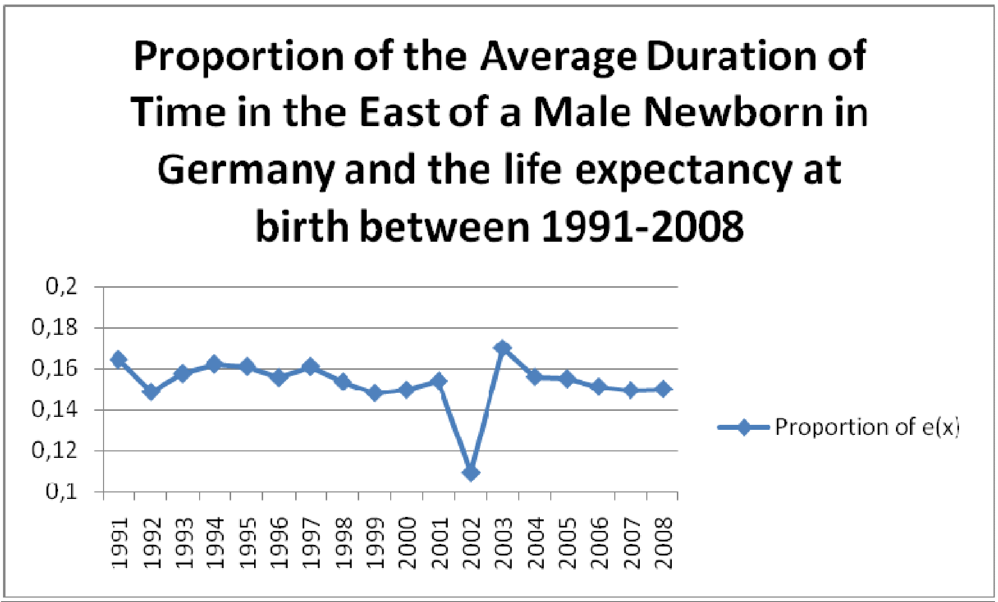
y-axis:person years

Source: Data from the Federal Statistical Office (2010), own calculations

In Figure 5.3.2 the average duration of time in Eastern Germany of a German male newborn between 1991 and 2008 is demonstrated. This graph does not increase continuously as the graph in the previous figure. However, the shape represents the background literature. After 1991 the migration flows decreased, which can be seen in 1992 as well. In 2001 the economical situation changed negatively, consequently in 2002 the average duration of time in Eastern Germany decreased with about 3 ½ years. Surprisingly in 2003 the duration of time in Eastern Germany of a male newborn raised until more than 12.5 years. Nevertheless, the variation of the average duration of time vary between 8 and 13 years, consequently the average duration of time spent in Eastern Germany of a German male newborn vary between 5years.

In Figure 5.3.3 the proportion of the average duration of time spent in Eastern Germany is shown. The graph mainly provides the same results as figure 13. Less than 20% of the life of a newborn in Germany will be spend in Eastern Germany; in 2002 this percentage even decreased to nearly 10%.

Figure 5.3.3 The Proportion of the Average Duration of Time spent in the East of a Male Newborn in Germany between 1991-2008



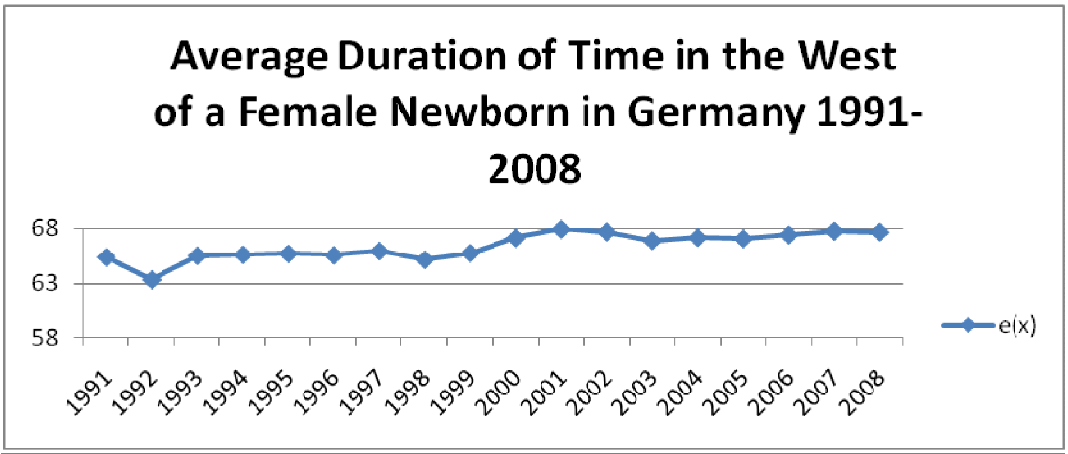
x-axis:calendar years

y-axis:proportion

Source: Data from the Federal Statistical Office (2010), own calculations

The average duration of time in Western Germany of a female newborn in Germany between 1991 and 2008 is varying between aged 63 and 68 years, which means the variation, determine 5years. In Figure 16 the almost static flow of the average duration of time between 1991 and 2008 can be observed.

Figure 5.3.4



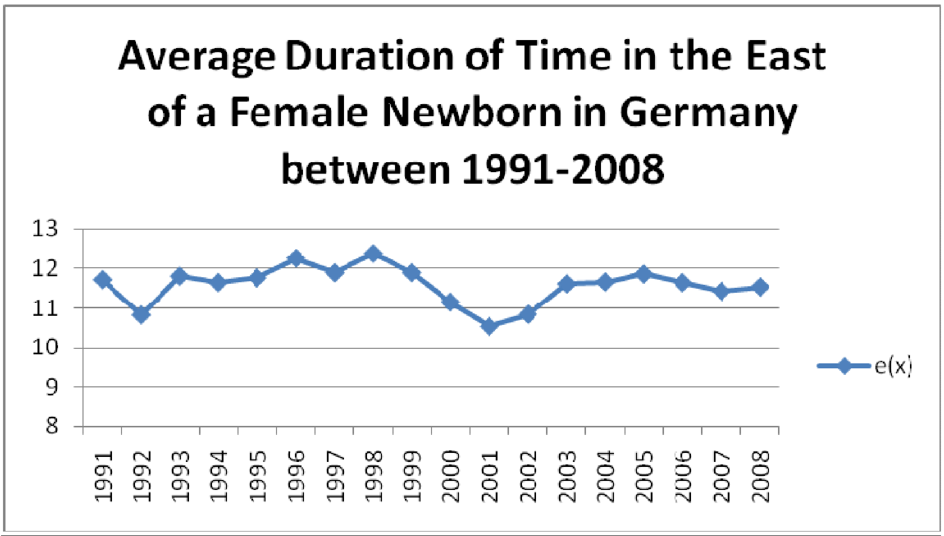
x-axis:calendar years

y-axis:person years

Source: Data from the Federal Statistical Office (2010), own calculations

Figure 5.3.5 demonstrate the duration of time in Eastern Germany of the same cohorts. The economical decrease in Eastern Germany is clarified better than in the previous figure. Contrary to the male newborns, the decrease of duration of time in Eastern Germany already occurs in 2001 instead of 2002. The spending years are varying between 10.5 and 12.5 years, consequently the variation determines 4 years within the 17 years period.

Figure 5.3.5



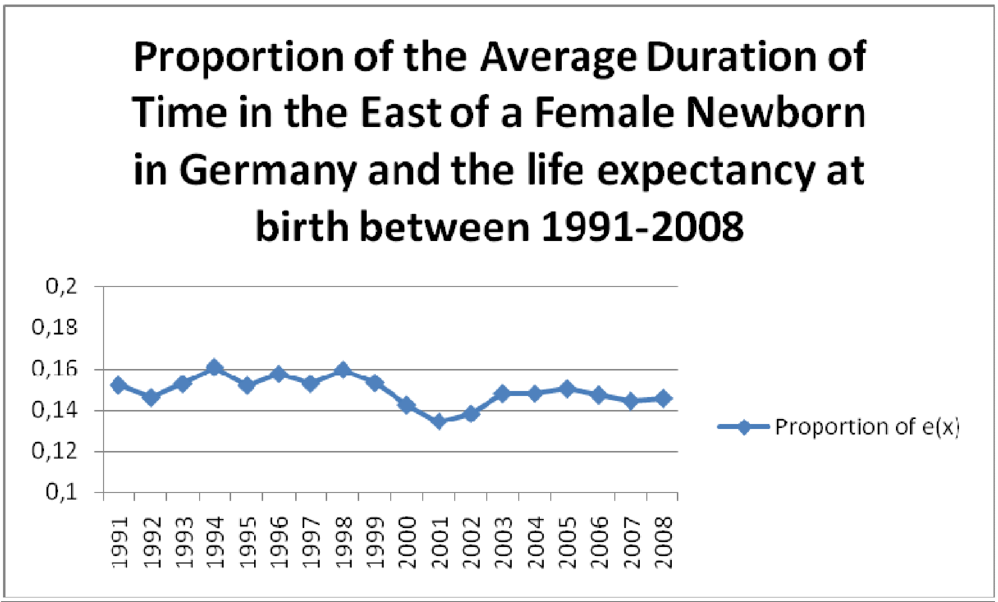
x-axis:calendar years

y-axis:person years

Source: Data from the Federal Statistical Office (2010), own calculations

Finally the proportion of the average duration of time spent in Eastern Germany of a between the years 1991 and 2008 are demonstrated in Figure 5.3.6. The proportion is more or less static and varies between 14% and 16%. Consequently, all newborns in this cohort are expected to spend around 15% of their life in Eastern Germany. In 2001 the proportion is increasing minimal.

Figure 5.3.6 The Proportion of the Average Duration of Time spent in the East of a Female Newborn in Germany between 1991-2008



x-axis:calendar years

y-axis:person years

Source: Data from the Federal Statistical Office (2010), own calculations

6. Conclusion

This research dealt with the change of the life expectancy at birth of Eastern and Western Germany between 1991 and 2008, when migration is included. If any of the four subpopulation changes the mortality pattern due to improvement in the health outcome or if migration selection occurs (e.g. healthy people move and unhealthy people stay) cannot be taken from any information of macro data. Due to the lack of information, the situation just could be modelled, based on the assumption, that once somebody migrates he adopts the mortality pattern of the receiving population.

To summarize the results and the answers of the research question, the results clarified that the regional life expectancy of Eastern Germany differed from the conventional life expectancy, when migration was included. Specifically the life expectancy of males in 1991 differed about nearly 2 years. Excluding the peaks in 1996 and 2000, the life expectancy difference nearly constantly decreased to nearly ½ year.

The life expectancy of females presented different results: The year 1991 is similar to the difference of the life expectancy of males, where the difference was about 2 years. Merely, the difference decreased to nearly zero until 1999. Three peaks in the difference of the life expectancy of females over times occurred in the years 1994, 2000 and 2001. The peaks of the differences in the life expectancy, for males as well as for females are due to the economical situation: A decrease of the economical situation led to an increase of the migrations flows from Eastern Germany to Western Germany, which consequently led to an increase of the life expectancy difference.

The life expectancy of Western Germany, of males as well as of females, was nearly biased by migration flows, since the background literature emphasized that the migration flows from Western Germany were not as high as the other way around.

Changing the focus on the sub questions, section 2 provides following results: A male person, born in Eastern Germany is expected to live less than 2/3 of his life in Eastern Germany, a male person, born in Western Germany is even less than 9% expected to live in Eastern Germany.

A female newborn from Eastern Germany is expected to live in average 60% of her life in Eastern Germany; a female newborn from Western Germany even less than 7% of her life.

To observe the distribution of a whole population, section 3 dealt with the question how long a German newborn was exposed to live in Eastern and Western Germany. A German female newborn is expected to live less than 15% of her life in Eastern Germany and a German male newborn is exposed to live less than 20% of his life in Eastern Germany.

The gender difference is similar to the findings in the literature: More females from Eastern Germany are expected to migrate to Western Germany. Consequently their duration of time is longer than the ones of males.

The changes of the differences over time are convergent to the economical situation: A decrease of the economical situation leads to a decrease of time spent in Eastern Germany.

6.1. Discussion

The Data and Methods part clarified, that all these results are disturbed by several assumptions, which are noted as following:

- The Out-Migration data of Baden-Württemberg (inluding International Migration) has the same proportion in age-specific data, as the Out-Migration data of every other Western German country.
- The Out-Migration data of Mecklenburg- Western Pomerania (inluding International Migration) has the same proportion in age-specific data, as the Out-Migration data of every other Eastern German country.
- The Out-Migration of 1995 has the same proportion as the Outmigration data of 1992-1997 and the Out-Migration of 2001 has the same proportion as the Out-Migration data of 1998-2000.
- Berlin is excluded of the research.

- International Migration is excluded.

Another fact has to be kept in mind: the population data have the origin of two different sources because Germany was divided into Eastern and Western Germany- combining two sources is less reliable than using just one source.
Besides that a Census has not been made for more than 20 years (and a Census should be refreshed between every 5-10 years). Vital registrations are always more data missing than a Census, because a lot of people tend to not register.

Concluded from these results, there are also some political advices:
Based on the background literature and results, it is very important to keep Eastern Germans in Germany, especially young workers, since they are playing a big role for the economical situation. If the economical situation decreases, more people are emigrating. The cities have to find some policies and projects to keep the young population and labor population in Eastern Germany. This is why also more research about migration between Eastern and Western Germany has to be made to make efficient policies for reducing the migration flows.

One example given by Flöthman (2002) is to change the housing situation for specific groups, such as families, but also living situation, like building schools and kindergartens.

For young people educational institutions are very important. Additionally, commuting region has been constructed. There are a lot of potentials, if the policies will be changed.

Moreover, some further research has to be done, in order to understand the effect of migration on the regional life expectancy. First, it has to be proved that the economical situation is a significant variable for the decrease and increase of the time spent in Eastern Germany. Another aspect to be considered is to include international migration.

One interesting aspect to research is, to remove the tempo effects.
Luy (2009) argues that the rapidly decreasing difference in life expectancy between Eastern and Western Germany might be due to Tempo- Effects in Period Life Tables. In this respect, “a tempo effect is defined as an inflation or deflation of the period incidence of a demography event (e.g., births, marriages, deaths) resulting from a rise or fall in the

mean age at which the event occurs" (Barbi, p.1, year). The result of a rise in the life expectancy at birth is that the mean age at death of the actual demographic measure is too high, and the result of a fall in the life expectancy at birth is that the mean age at death of the actual demographic measures is too low. The effect of a rise or fall in the predicted mean age at death can be damped by tempo-adjusting the life expectancy. Since period rates strive to quantify the incidences during the observed period, tempo effects have to be considered, e.g. like effects on age distribution, as objectionable distortions (Luy, 2009b).

Luy refers to the theory of Boongarts and Feeney (2008; Boongarts, 2006). The scholars argue that a period life table "describes the experience of a hypothetical cohort subject to the conditions observed in a given time period"(Bongaarts and Feeney, 2008:29). Here, period rates can be tempo distortions, which are called tempo effects. They give an example of tempo effects in mortality: Imagine that a fixed population has a life expectancy of 70 years at birth. This population gets a pill, which raises the life expectancy for each person of this population for 3 months. Everyone in this population takes this pill on January 1 of year T. As a result of this pill, no one will die during the first 3 months of year T and thus "the number of deaths in year T will fall by 25 %, and the mean age of deaths will rise from 70 to 70.25 years". (Bongaarts and Feeney, 2003p.20). This is due to the pill having the same effect at all ages. Since the mortality function is falling by 25%, the adoption of this produces a life expectancy at birth of 73 years for year T. "In the next year, the number of deaths and the force of mortality function rise to the level observed before year T, but with values shifted forward to older ages by 0.25 years." (Bongaarts et al. 2003, p. 21) and that the life expectancy is again 70.25 years. Therefore, the prior year was a temporary rise in life expectancy at birth. With the background of this known trend, Bongaarts and Feeney want to remove this tempo effect.

This theoretical aspect of Boongarts and Feeney could be adopted for further research. The tempo effect of the period data of Eastern and Western Germany can be removed, after including migration.

In Conclusion, there are several aspects in this research, which can be examined more in detail. Additionally, policy-makers should consider of changing some policy in order to reduce the migration flows of young skilled workers.

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