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Faculty of Economic Sciences

Center for Regional Development and Planning

Graduate Programme in Demography

Andreea-Beatrice Rusu

The Contribution of Migration to Population Ageing in Romania (1977-2019)

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Andreea-Beatrice Rusu

The Contribution of Migration to Population Ageing in Romania (1977-2019)

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"Nothing in life is to be feared, it is only to
be understood. Now is the time to
understand more, so that we may fear less."

Marie Curie

Resumo

Rusu, Andreea-Beatrice. **The Contribution of Migration to Population Ageing in Romania (1977-2019)**. 2022. 140 f. Dissertation - Programa de pós-graduação em Demografia, Universidade Federal de Minas Gerais, 2022.

O envelhecimento populacional é um dos maiores desafios demográficos do século 21. Nas últimas décadas, a combinação de uma fecundidade abaixo do nível de reposição com o aumento da expectativa de vida trouxe mudanças significativas na estrutura etária da população de países desenvolvidos. Como resultado, as populações idosas aumentam enquanto as populações em idade ativa diminuem. Países emissores de migrantes com a fecundidade abaixo do nível de reposição e aumento na expectativa de vida tendem a ser ainda mais afetados pelo processo de envelhecimento. A Romênia é um bom exemplo desse contexto. Nas últimas três décadas, a população da Romênia diminuiu de 22 para 19 milhões. Ademais, a Romênia envelhecerá devido à baixa fecundidade, ao aumento da expectativa de vida, à emigração dos grupos em idade laboral e ao potencial de migração de retorno dos grupos mais velhos.

Esta tese tem como objetivo analisar a contribuição da migração para o envelhecimento da população na Romênia. Primeiramente, será analisada a dinâmica da mudança do perfil migratório da Romênia a partir de uma perspectiva histórica entre 1977 e 2019. Em segundo lugar, será analisada a contribuição relativa da mortalidade, do bônus demográfico e da migração líquida para a população em idade ativa da Romênia. Esta tese procura contribuir para a literatura sobre o envelhecimento populacional em países emissores de migrantes. A metodologia escolhida para esta análise é o modelo tradicional de decomposição. Como estratégia metodológica, a variação na população em idade ativa foi decomposta em três componentes demográficos: mortalidade, bônus demográfico e migração líquida. Além disso, aplicamos o conceito de idade prospectiva, como medida de envelhecimento populacional, ao modelo de decomposição para expandir os grupos de população em idade ativa.

Os resultados indicam que entre 1977 e 1991, a migração líquida afetou negativamente as mudanças nos grupos populacionais em idade ativa. Durante os períodos 1992-2006 e 2007-2019, o efeito da migração líquida intensificou-se e levou a mudanças negativas na população em idade ativa. Ao aplicar o conceito de idade prospectiva

na decomposição, descobrimos que os ganhos na expectativa de vida não conseguiram contrabalançar o efeito negativo da migração líquida e não conseguiram reduzir a perda nos grupos em idade ativa entre 1992 e 2019.

Palavras-Chave: Envelhecimento Populacional. Migração. Romênia. Decomposição Demográfica. População da Idade Laboral. Bônus Demográfico. Mortalidade.

Abstract

Rusu, Andreea-Beatrice. **The Contribution of Migration to Population Ageing in Romania (1977-2019)**. 2022. 140 p. Dissertation - Graduate Programme in Demography, Universidade Federal de Minas Gerais, 2022.

Population ageing is one of the greatest demographic challenges of the 21st century. In the last decades, fertility below replacement level, together with the increasing life expectancy, generated significant changes in the population age structure of the developed world. As a result, elderly populations increase while working-age populations decrease. Contexts such as migrant-sending countries with fertility below replacement level and increased longevity tend to be even more affected by the ageing process. Romania is an excellent example of such a context. Over the past three decades, Romania's population decreased from 22 to 19 million. Moreover, Romania will age because of low fertility, increased longevity, emigration of the working-age groups, and the potential return migration of older-age groups.

This dissertation aims to analyse the contribution of migration to population ageing in Romania. First, this dissertation will investigate the dynamics of Romania's changing migration profile from a historical perspective. Second, it will examine the relative contribution of mortality, cohort turnover and net migration to Romania's working-age population by gender. This dissertation seeks to contribute to the literature on population ageing in migrant-sending countries. The chosen methodology for this analysis is the traditional decomposition model. As a methodological strategy, the change in the working-age population was decomposed into three demographic components: mortality, cohort turnover and net migration. In addition, we apply the concept of prospective age, as a measure of population ageing, to the decomposition model to expand the working-age groups.

Our results indicate that between 1977 and 1991, net migration negatively affected the changes in the working-age population. During 1992-2006 and 2007-2019, the effect of net migration intensified and led to negative changes in the working-age population. By applying the concept of prospective age to our decomposition, we found that the gains in life expectancy could not counterbalance the negative net migration effect and could not reduce the loss in the working-age populations between 1992 and 2019.

Keywords: Population Ageing. Migration. Romania. Demographic Decomposition. Working- Age Population. Cohort Turnover. Mortality.

Rezumat

Rusu, Andreea-Beatrice. **The Contribution of Migration to Population Ageing in Romania (1977-2019)**. 2022. 140f. Dissertation - Programul de Doctorat în Demografie, Universidade Federal de Minas Gerais, 2022.

Îmbătrânirea populației este una dintre cele mai mari provocări demografice ale secolului XXI. În ultimele decenii, fertilitatea sub nivelul de înlocuire, împreună cu creșterea speranței de viață, au generat schimbări semnificative în structura de vârstă a populației din lumea dezvoltată. Ca urmare, populația în vârstă crește, în timp ce populația de vârstă activă scade. Contexte precum țările de origine a migranților cu fertilitatea sub nivelul de reproducere și longevitatea crescută tind să fie și mai afectate de procesul de îmbătrânire. România este un exemplu excelent al unui astfel de context. În ultimele trei decenii, populația României a scăzut de la 22 la 19 milioane. Mai mult, România va îmbătrâni din cauza fertilității scăzute, a longevității crescute, a emigrării grupelor de vârstă activă și a posibilei migrații de întoarcere a grupurilor de vârstă mai înaintată.

Această teză își propune să analizeze contribuția migrației la îmbătrânirea populației din România. În primul rând, această teză va analiza dinamica profilului migrației a României, care se afla într-o continuă schimbare dintr-o perspectivă istorică. În al doilea rând, va examina contribuția relativă a mortalității, a fluctuației cohortei și a migrației nete la populația de vârstă activă a României, în funcție de gen. Această teză urmărește să contribuie la literatura despre îmbătrânirea populației în țările de origine a migranților. Metodologia aleasă pentru această analiză este modelul tradițional de descompunere. Ca strategie metodologică, schimbarea populației în vârstă activă a fost descompusă în trei componente demografice: mortalitatea, fluctuația cohortei și migrația netă. În plus, aceasta teză aplică conceptul de vârstă prospectivă, ca măsură a îmbătrânirii populației, modelului de descompunere pentru a extinde grupele de vârstă activă.

Rezultatele noastre indică faptul că între 1977 și 1991, migrația netă a afectat negativ schimbările în populația de vârstă activă. În perioada 1992-2006 și 2007-2019, efectul migrației nete a fost intensificat și a dus la schimbări negative în populația de vârstă activă. Aplicând conceptul de vârstă prospectivă la descompunerea noastră, am constatat că, câștigurile în speranța de viață nu au putut contrabalansa efectul negativ al migrației nete și nu au putut reduce pierderea populației în vârstă de muncă între anii

1992 și 2019.

Cuvinte-cheie: Îmbătrânirea populației. Migrație. România. Descompunere demografică. Populația în vârstă de muncă. Fluctuația cohorței. Mortalitate.

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1 Introduction

1.1 Motivation

Population ageing represents one of the greatest demographic challenges of the 21st century. In the last decades, the world has been experiencing a sustained change in the population's age structure as a consequence of increasing life expectancy and decreasing fertility levels (WPA, 2020). Until the 1960s, the developing world populations has been getting younger due to improvements in infant mortality and increasing birth rates. This generation, born after World War II, is known as the baby boom. Since the early 1970s, the share of children in the population has been declining, while the share of the working-age population (WAP) has been experiencing a dramatic increase, known as the dividend phase. This phase has been dominating the demographic scene for decades and will continue to dominate the sub-Saharan Africa region over the following decades. In high-income countries, the demographic dividend phase is over, and in many emerging economies, it will end soon. Therefore, the share and size of the working-age population in developed countries is decreasing while the share of the old-age population is increasing faster. Nevertheless, the extent and speed of ageing vary across the globe. Japan and many European countries, such as Germany, Italy, and Spain, are in more advanced stages of population ageing. Eastern Europe, East and Southeast Asia will follow the same path of a rapid increase in the share of the old-age group (Kim, 2019).

According to the United Nations (UN), in 2020, there have been 727 million people aged 65 years or over worldwide. Furthermore, the share of this group is expected to increase from 9.3% in 2020 to 16.0% in 2050 (United Nations, 2019a). By 2050, one in six people in the world will be over 65 years, compared to the current share of one in eleven people. In Europe and North America, the proportion of people aged 65 years and over is expected to reach 28% and 22.6%, respectively. In Latin America and the Caribbean, the proportion of people within this group will reach 19%, followed by Asia with 18% and Oceania with 17.9%. Africa will have the lowest share of people aged 65 years and over, 5.7%, one in eleven (WPA, 2017, 2020; UN, 2019). In 2019 Romania has been having a share of the population aged 65 years and over of 18.5%. The share of people aged 80 and over was 4.7%. By 2050, the share of people aged 65 years and over is expected to reach 30.6% and the share of people aged 80 and over 10.1% Eurostat (2019).

Population Ageing and Longevity

Population ageing is an inevitable outcome of the unfolding demographic transition. In contrast to past Malthusian-inspired concerns of high fertility coupled with declining mortality, the world population is now ageing as a result of the decline in fertility and consistent gains in life expectancy across the globe. Because fertility and mortality declines have been experienced unevenly across space, time, and rhythm around the globe, ageing will affect countries differently (UN, 2019). The demographic transition began in Northwestern Europe around 1800 after a secular decline in mortality. The first stage of mortality decline occurred with the reduction in infectious diseases. The development of the smallpox vaccine in the late 18th century, investments in public preventive health measures, personal hygiene, and nutrition led to further declines in mortality. Mortality decline accelerated after the Second World War, especially in low-income countries. The transition to low mortality in low-income countries happened much faster. Even though mortality in these countries declined later than in Europe, this happened over a shorter period. Fertility followed the same faster transition pattern from high to low levels in these countries (Lee, 2003).

Because of significant declines in mortality at older ages, high-income countries are experiencing an almost steady increase in the average length of life at old ages. As a result, the variability of age at death declined. This reduction is strongly related to the compression of mortality hypothesis described by Fries (1983). Modern mortality regimes are characterised by a high average age of death. Even though the distribution of ages at death is still bimodal, the mode at younger ages has become less important. In developed countries, the distribution of death by age is concentrated between 65 and 90 years. With the reduction in infant mortality, the distribution of ages at death shifted upward and became compressed at older ages (Horiuchi and Wilmoth, 1998). According to Fries (1983), survival curves become rectangular as death rates decrease. Deaths are concentrated in a narrow age range, the slope of survival in that interval becomes steeper and the curve more rectangular. These imply that human life expectancy is approaching its maximum potential limit (Fries, 1983; Horiuchi and Wilmoth, 1998; Gonzaga et al., 2018).

Recent evidence suggested that the rectangularization of the survival curve in Eastern Europe differs from the one observed in Western countries (Aburto and van Raalte, 2018). Mortality rates increased in Central and Eastern Europe from the mid-1960s to the mid-1980s. The mortality rates were mainly concentrated between the ages of 20 and 80 years. Between 1985 and 1990, mortality decreased significantly in these countries, but after 1990 they experienced significant mortality increases among the working-age groups. After the mid-1990s, mortality trends diverged. Central European countries such as Estonia and Latvia experienced a decrease in mortality in nearly every age. In contrast, Russia, Ukraine, and Lithuania experienced another period of mortality increase in the

working-age group. Since the middle of the 2000s, mortality rates have decreased in these countries again (Aburto and van Raalte, 2018). As a result, less variability in age at death may occur. This variability can be altered according to lifestyle differentials and access to healthcare systems across regions. The HIV crisis in Africa, the effects of the fall of the Soviet Union in Central and Eastern Europe on adult mortality, and increased mortality from violent causes in LAC contributed to the increase in variability in age at death in these regions. The proportion of time living healthy at old ages becomes fundamental for accomplishing the benefits and challenges of population ageing (Gavrilov and Heuveline, 2003; Fries, 1980, 1983; Gonzaga et al., 2018; Nepomuceno et al., 2021; Canudas-Romo and Aburto, 2019; Alvarez et al., 2020; Aburto and van Raalte, 2018).

Traditionally, old age referred to the group of people aged 65 years or over. This old-age definition dated to the 1960s when people in Western countries, aged 65 years, had a remaining life expectancy of 15 years. Since the 1960s, life expectancy at age 65 has increased worldwide. Nowadays, life expectancy at 65 is above 15 years in many countries (Sanderson and Scherbov, 2013). These improvements challenged researchers in finding alternative measures for population ageing. Scherbov and Sanderson (2013) introduced the concept of prospective age as an alternative measure to ageing to redefine the old age group. Prospective ages can be understood as life-expectancy equivalent ages. Prospective age is the age at which the remaining life expectancy is 15 years (Scherbov and Sanderson, 2016; Sanderson and Scherbov, 2013, 2008).

Population Ageing and Migration

The importance of fertility and mortality as determinants of population ageing has dominated the discussion on ageing for decades. Although the role of international migration on population ageing has been studied, it has received less attention than fertility and mortality. However, most studies regarding the ageing populations and international migration have focused on the receiving countries (Fihel et al., 2018). During the middle of the 1980s and 1990s, researchers began to explore the impact of international migration on population size for many developed countries by providing various projections and simulations see (Espenshade, 1986; Lesthaeghe et al., 1988; Appleyard, 1991; Feichtinger and Steinmann, 1992). The UN introduced the concept in a report called “Replacement Migration - Is it a solution for Ageing/Declining populations?” The report referred to replacement migration as the international migration needed to achieve one of three goals: i) offset declines in the size of the population; ii) offset declines in the proportion of the working-age population, and iii) offset overall population ageing measured by the potential support ratio (PSR). The report presented simulations for achieving these goals in Germany, Italy, France, United States, Japan, Korea, Europe and EU-15¹ and

¹The EU15 comprised the following 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom.

concluded that replacement migration alone could not be a solution for declining and ageing populations (UN, 2000). During the middle of the 1980s and 1990s, researchers began to explore. Because the projected results seemed exaggerated compared to reality, the report drew many criticisms.

The demographic process of ageing was structurally different in Western and Eastern European countries. While Western Europe is affected by low fertility, increased longevity and a high inflow of migrants, Eastern Europe was not only affected by low fertility and increased longevity. However, it was also affected by high rates of emigration (Declaration, 2002; WPA, 2017; UN, 2019). On the one hand, immigration in Western European countries may temporarily slow the ageing process because recent immigrants tend to be younger and usually have more children. On the other hand, emigration of the young working-age populations can accelerate the ageing process in sending countries such as Eastern European and Caribbean countries. As a consequence, sending countries tended to be more affected by the ageing process, which could be further intensified when return migration of the (older) former emigrants occurred (Gavrilov and Heuveline, 2003; Fihel et al., 2018).

Romania represented an example of migrant-sending country undergoing a process of ageing as a consequence of declines in fertility and increasing longevity. Since 1990, Romania's total fertility rate has fallen below the replacement level, reaching its lowest value of 1.27 in 2002, while its net migration rate decreased to -7.39 in 2008. Ever since the total fertility and net migration rates reached their lowest values, both showed signs of recovery. By 2019, the total fertility rate increased to 1.63 and the net migration rate to -2.58. Therefore, a country such as Romania will age because of low fertility, increased longevity, emigration of the working-age groups, and the potential return migration of older-age groups (INSSE, 2022; World-Bank, 2021).

1.2 Objectives

Given the demographic transformations that have taken place in Romania over the last decades - varying levels of mortality gains, maintenance of fertility below-replacement levels and a historical trend of emigration - we asked to what extent did mortality, cohort turnover and migration flows impact Romania's working-age population by gender at the national and regional level between 1977-2019?

This dissertation analysed which of the main demographic components, namely, mortality, cohort turnover, and net migration, most contributed to Romania's decline in the working-age population between 1977 and 2019.

As such, it contributed to the ageing population literature from the perspective of a migrant-sending country, Romania. The dissertation had three main objectives. The first objective was to understand the dynamics of Romania's changing migration profile from a

historical perspective (1950–2019). The second objective was to decompose Romania’s working-age population into the three main demographic components – mortality, cohort turnover and net migration – to identify which of these components most contributed to Romania’s decline in the working-age population in the past. This decomposition was conducted by gender on a national level over three periods 1977-1991, 1992-2006 and 2007-2019. It was also conducted on a regional level NUTS-3 Nomenclature des Unités territoriales statistiques between 1992-2006 and 2007-2019, due to data availability. The minimum and maximum population thresholds for the size of NUTS-3 regions were 150 thousand to 800 thousand. In the case of Romania NUTS-3 regions are equivalent to the 42 counties EUROSTAT (2021a).

The third objective is to apply the concept of prospective age to the analysis at the regional level (NUTS-3) by gender between 1992-2006 and 2007-2019. We applied the prospective age concept to the decomposition to see if it could decelerate the working-age population’s decline. To do so, we redefined the conventional working-age group as the prospective working-age group between 15 years and the corresponding prospective age for each NUTS-3 region and gender.

To achieve the second and the third objectives, we applied the classical decomposition model proposed by Ghio et al.(2022).

Due to data availability, the starting point of the analysis was 1977. The division into three periods was marked by the main sociopolitical changes that occurred in Romania. The first period, 1977-1991, included the communist regime before up to the first democratic elections. The second period, 1992-2006, included the first democratic elections in Romania and the period of transition to a capitalist economy until 2006, before accessing the European Union. The third period, 2007-2019, covered the year Romania became part of the European Union and goes until before the COVID-19 pandemic and before the formal exit of the United Kingdom from the European Union (Brexit).

1.3 Relevance of the Chosen Case Study

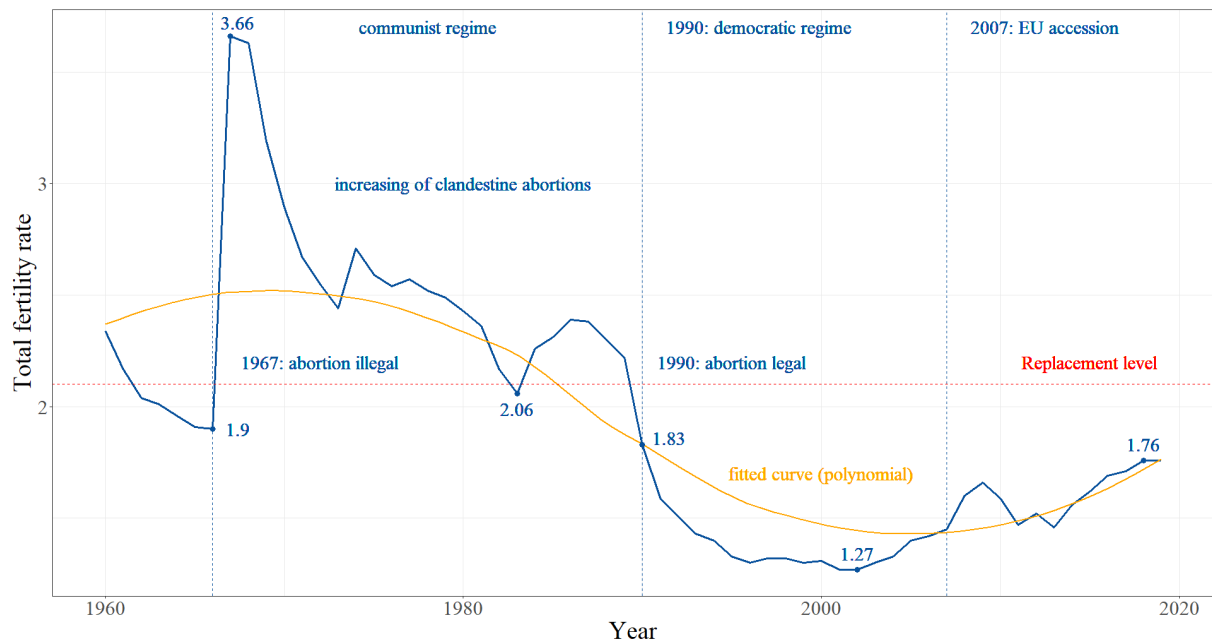
Since most studies focused on population ageing in migrant-receiving countries and how these countries could benefit from the inflow of labour in the short term, this dissertation analysed the ageing process from the perspective of a migrant-sending country. Romania is an excellent example of a country with low fertility, increasing life expectancy and high emigration rates. Over the past three decades, Romania’s population decreased from 22 to 19 million. Therefore, by decomposing the working-age population, we seek to identify which of the demographic components contributed the most to population ageing and at which scale. This method was applied by Ghio et al. (2022) Ghio et al. (2022) to NUTS-3 regions at the European level between 2015-2019. The study shows that the majority of the European territories experienced negative cohort turnover alongside

positive net migration, while only a few European territories experienced negative cohort turnover and negative net migration. Romania was one of these few countries. Our period of analysis covered more than 4 decades. Furthermore, the peculiarity of the Romanian case concerning its changing migration profile and differentials between female and male mortality over the past four decades, combined with several significant institutional changes, made the research of this study case relevant. In addition to Ghio et al.'s (2022) decomposition model, we apply the prospective age concept proposed by Sanderson and Scherbov (2013); Scherbov and Sanderson (2016) to the model, and disaggregated the working age population by gender. Through this concept, we analyse to what extent the prospective age mitigates the decline in the working-age population in Romania as it reflects the direct gains in longevity. The gender disaggregation allows us to compare the female with the male working-age population. Even though the analysis decomposes the working-age population into three components, the dissertation focuses on the net migration effect. We discuss the other two components as marginal effects.

Fertility

Romania, an Eastern European country, was characterised by fertility below replacement level and historically high emigration rates.

Figure 1.1: Total fertility rate Romania (1960-2019)



Source: (World-Bank, 2021)

In 1966, Romania's total fertility rate (TFR) reached a low level of 1.90 live births per woman (see Figure 1.1). In 1967, the government restricted abortions and contraception through *Decree 770*. As a result, fertility increased above replacement level to 3.6 births

per woman.² At the beginning of 1969, fertility started to decline again because of the increasing clandestine abortions. This trend continued until the end of the communist regime in 1989. In 1990, Romania's TFR fell below the replacement level. Ever since 1990, it did not recover to a replacement level.

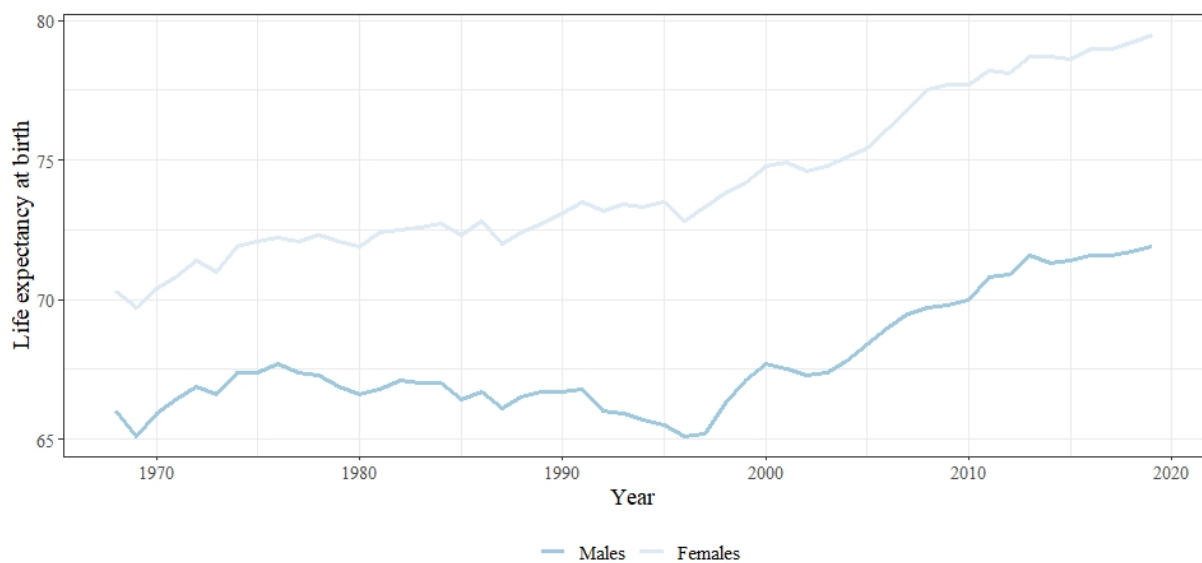
According to the Romanian National Institute of Statistics, total fertility rates fluctuated during the past three decades, reaching their lowest level of 1.27 in 2002. By 2019, the total fertility rate had increased to 1.76 live births per woman (INSSE, 2022).

As a result of the abortion-prohibiting decree, Romania's working-age population benefited from the demographic bonus for an extended period. Currently, the cohort born right after abortion was prohibited is the largest in Romania, reaching 55 years in 2022. By 2032, this cohort will reach the retirement age of 65. This will significantly increase expenditures on health insurance and the retirement system.

Mortality

Unlike fertility, Romania followed an entirely different path in mortality than other Eastern European countries.

Figure 1.2: Life expectancy at birth Romania (1968-2019)



Source: (Eurostat, 2021b)

The country's life expectancy at birth improved by about two years in the early 1970s. Afterwards, it went through a period of stagnation until the middle of the 1980s. From the late 1980s until 1991, life expectancy increased to 66.9 years for men and 73.4 years for women. A steady decrease followed this until 1996. The recovery afterwards was

²The cohort born right after the implementation of *Decree 770* is called *decrețeii*. The term comes from the Romanian language *decret* and is used as a diminutive. The word means "decree".

slow, by 1998, life expectancy in Romania had not reached the level of 1991. Its decline was mainly attributed to an excess of mortality in men.

The female life expectancy at birth remained relatively stable during this period, leading to a male-female gap increase of 7.7 years between 1990 and 1996. By 1998, the male-female gap had decreased to 7.5 year (Dolea et al., 2002). Significant advances in mortality were made after the 2000s, especially after Romania entered the European Union. In 2019, the gap between female and male life expectancy was 7.6 years (see Figure 1.2).

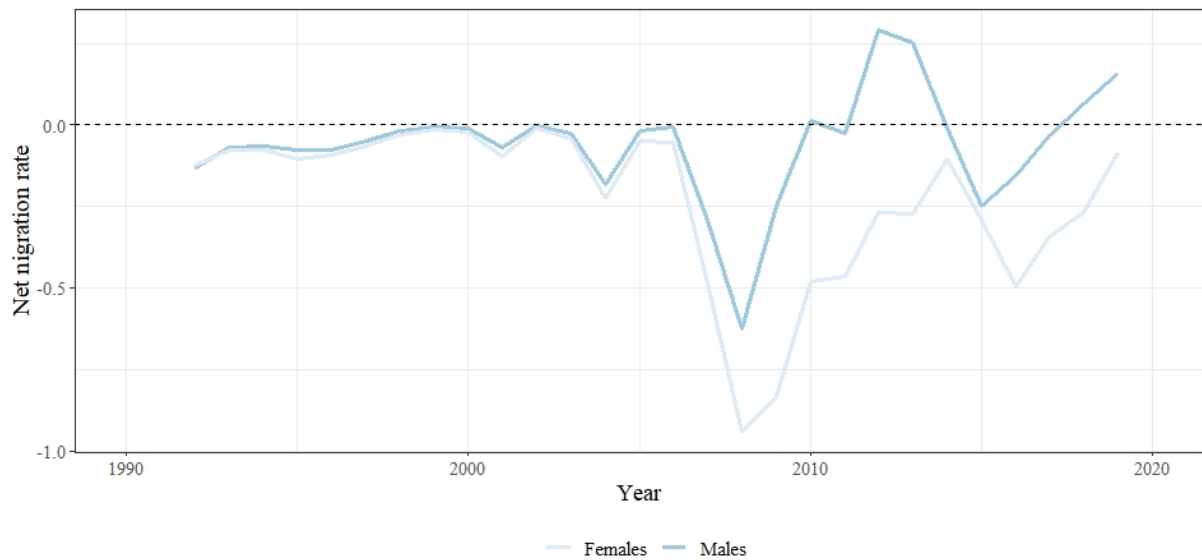
Migration

Historically, Romania was a migrant-sending country. At the end of the 20th century, the country sent many migrants to North America (Horváth and Gabriel Anghel, 2009). After World War II, and particularly during the communist regime, emigration was mostly ethnic, dominated by the outflows of Jews, Hungarians, and Germans. Under the communist regime until 1989, the emigration of ethnic Germans to Germany occurred via agreements between Romania and the Federal Republic of Germany. The net migration rate was only marginally negative because of the control exerted by the authorities. Throughout the 1990s, the nature of Romania's emigration radically changed; the state lost control of the outflow, while economic motivations became the main reason to emigrate. The characteristics of emigration shifted from ethnic to circular, temporary and permanent emigration (Horváth and Gabriel Anghel, 2009). This period was marked by an accelerated population loss. Between 1990 and 2008, the net migration rate decreased from -2.82 to -7.9 (see Figure 1.3). It took another decade for Romania's net migration rate to return to its 1990 level, reaching -3.1 by 2019 (INSSE, 2022).

The fall of communism triggered a change in the composition of emigration flows. Between 1990 and 2000, around 320 thousand Romanians emigrated permanently (INSSE, 2022). The main countries of destination were: Germany, Hungary, and Israel. In the late 1990s, emigration to Italy and Spain increased significantly. Between 2000 and 2007, before Romania entered the European Union, Italy and Spain continued to be the main destinations of Romanians. After the accession to the European Union in 2007, emigration from Romania to Italy, Spain, Germany, France, the UK, and other European countries increased even further. Data on migrant stocks (Eurostat, 2021a) indicate that between 2007 and 2018, 2.5 million Romanian left the country (Horváth and Gabriel Anghel, 2009; INSSE, 2022; Eurostat, 2021a).

Between 1989 and 2007, Romania suffered two major political shocks, the fall of the communist regime in 1989 and the accession to the European Union in 2007. By joining the European Union, Romanians gained the right of free movement within the European Union. Until 2014, access to the labour market for Romanian and Bulgarian migrants varied across countries. Some countries applied full work-permit schemes, and others created simplified procedures for employment in specific sectors or exempted specific jobs from

Figure 1.3: Observed net migration rate Romania (1992-2019)



Source:(INSSE, 2022)

labour-market tests (Commission, 2011). Starting in 2014, Romanian emigration to the UK, Scandinavian countries and other western European countries increased significantly due to the end of working restrictions.

During the communist regime, immigration to Romania was strict. Most immigrants came from other communist states for studying purposes. After the transition to democracy, immigration was insignificant compared to emigration. After 2007, Romania started attracting more immigrants from neighbouring countries and, lately, from Asian countries. During the last decade, return migration became relevant as well (Eurostat, 2021a; Horváth and Gabriel Anghel, 2009; INSSE, 2022).

1.4 Organization of the Dissertation

This dissertation was organized into six chapters. Chapter two reviewed the literature on population ageing and international migration, as well as the literature on mortality and morbidity compression and changes in life expectancy. This analysis was relevant to better understand the mortality effect of the changes in Romania's working-age population. The chapter then presented Romania's social-economic profile to understand better the factors that triggered emigration from the country during the period under analysis. Chapter three presented the methodological approach, and the data sources used to compute the decomposition. Chapter four characterised Romania's migration profile from a historical perspective (1950-2019). Chapter five presented the decomposition results of Romania's working-age population, the analysis, and results validation. Finally, chapter six concluded our analysis by discussing the research limitations and recommendations for future research and for policymakers.

2 Literature Review

2.1 Ageing Populations and International Migration

The idea of international migration as a solution for population ageing predates the UN report about replacement migration (UN, 2000). Lesthaeghe et al. (1988) analysed the impact of the constant inflow of migrants on the growth of a population with fertility levels below replacement. They projected the populations of 12 European countries showing that in a scenario with fertility below replacement level and with no further immigration, the total populations of these European countries would fall by approximately 20% to 25% by 2050. Furthermore, if approximately 1 million immigrants moved into these European countries annually, the overall population decline could be avoided (Lesthaeghe et al., 1988). Espenshade (1986) projected the population of the United States and fixed the annual inflow of immigrants to the level of 1983. He concluded that since fertility rates are less likely to recover, immigrants are needed to contribute to the demographic stability of the U.S (Espenshade, 1986). In another study on the impact of immigration on population decline, Appleyard (1991) pointed out the importance of international immigration for population growth. He argued that the current level of immigration might not be sufficient to prevent population decline in the future (Appleyard, 1991). In 1992, Feichtinger and Steinmann (1992) supported the idea that fertility below replacement level coupled with international immigration would eventually lead to a significant increase in the foreign population. They projected the population of Germany by fixing the total fertility rate (TFR). First, they fixed the TFR to the level of Western Germany, 1.74, and concluded that under this scenario, Germany would need 300 thousand immigrants annually to maintain its actual population size. Second, they fixed the TFR at the level of Eastern Germany, 2.58, and concluded that under this scenario, only 150 thousand immigrants per year would be necessary to keep the population constant (Feichtinger and Steinmann, 1992). Münz and Ulrich (1998) projected Germany's population under different fertility assumptions for natives and foreigners. The projections showed that, even with a high level of immigration, Germany's population would start declining in the near future. He concluded that immigration could, at best, slow down the population decline (Münz and Ulrich, 1998). Within this context, the UN report on replacement migration focused on Western European countries, the USA, Japan, and Korea. The report estimated how

many migrants these countries would need to keep their population sizes, working-age population and PSR constant. Their results were far from reality and concluded that replacement migration alone is not a viable solution for population decline and ageing. The report drew much criticism. One of the most remarkable critiques came from Coleman (2002) in an article entitled “Replacement Migration: why is everyone going to have to live in Korea by 2050?” In the paper, Coleman argued that keeping the Korean Potential Support Ratio (PSR) at the 1995 level would require the world’s entire population to live in Korea by 2050. Furthermore, Coleman considered that the UN Report ignored some of the negative implications of high immigrant inflows, such as social conflict, social cohesion, and national identity (Coleman, 2002).

Despite its criticism, the report generated a wave of simulations for countries that were initially not included in the original report, such as Latvia, the Czech Republic, and Canada (Burcin et al., 2005; Bouvier, 2001). These studies did not bring any new contributions in terms of methodology but have explored the concept of replacement migration and addressed its implications within the context of ageing populations. Saczuk (2003) criticised that the UN Report might have been misunderstood since it is mostly interpreted as a policy suggestion rather than purely an academic exercise based on specific conditions of the observed demographic trends. Whether the labour market will need an additional inflow of labour force or not can only be subject to speculations (Saczuk, 2013).

Ceobanu and Koropecj-Cox (2013) made a cross-country analysis of public attitudes in European countries regarding whether international migration should be encouraged to offset population ageing. Having no children, living in urban centres, being educated at the university level, and being active in the labour force were significantly and positively related to greater endorsement of immigration as a solution to population ageing. The authors concluded that “to account for the unexplained cross-country differences in attitudes about immigration as a solution to population ageing, future models should broaden their reach at both the micro and macro levels of analysis. Considering the linkage of immigration with the political arena, factors such as electoral outcomes or citizenship regimes may influence public attitudes in a given national context” (Ceobanu and Koropecj-Cox, 2013 pp.281).

Other studies brought some contributions to the concept of replacement migration by enlarging the concept and enriching the simulations (Bijak et al., 2008, 2013; Craveiro et al., 2019). Bijak et al. (2013) use the UN methodology to make an international comparison for 27 European countries. They concluded that the replacement migration needed to prevent population decline and to maintain the classical potential support ratio, economic elderly support ratio¹, and the labour market support ratio² between 2002 - 2052 constant is remarkably high. The hypothetical number of immigrants needed is

¹active population relative to those aged 65 or over

²the ratio of active to inactive population

high when looking at the replacement migration as a measure of demographic deficit combined with increased life expectancy and low fertility levels. Furthermore, changes in the labour markets and increasing labour force participation rates may help curb the economic consequences of demographic imbalances (Bijak et al., 2013).

Craveiro et al. (2019) published a revision of the UN Report by assessing replacement migration estimates according to both conventional and prospective age limits. In this study, they considered the Western European Countries analysed in the UN Report, and they added Spain because of its size and high inflow of immigrants. The authors used three methodological steps. First, they made demographic projections for five countries in a zero-migration scenario based on recent Eurostat fertility and mortality assumptions. Second, the authors computed the prospective working-age thresholds according to Eurostat mortality assumptions. Third, they calculated replacement migration estimates according to classic and prospective limits. For example, by applying the prospective age concept, Germany would require, between 2015 and 2060, 345 thousand international immigrants annually to keep the PSR constant at 4.4. Compared to the UN's estimates (UN, 2000), the use of this new prospective age measure made Germany need ten times fewer international immigrants to keep its PSR constant (Craveiro et al., 2019).

Craveiro and colleagues were the first to incorporate new measures of ageing into replacement migration simulations, showing that if the entry into the old age group remained fixed at 65, the proportion of the elderly would be overestimated due to continuous gains in longevity. Therefore, the projected replacement migration results will appear exaggerated.

From the perspective of migrant-sending countries, few studies explored the impact of migration on population ageing. Fihel et al. (2018) studied the direct impact of emigration on the age structure in Poland. The study concluded that despite the large scale of emigration from Poland, the direct impact was smaller than that of fertility or mortality. The study also showed that if no emigration occurred between 1980 and 2015, the proportion of the old-age population would have been 1.1% lower than it actually was. In addition, the indirect effect of emigration resulted in a loss of approximately 10% of births. This result has long-term and far-reaching consequences on Poland's age structure (Fihel et al., 2018).

Hoff (2008) studied the accelerated demographic change in Central and Eastern European countries during the 1990s. The study showed that population ageing in Central and Eastern Europe was mainly due to the unprecedented drop in fertility combined with the emigration of many young people and improvements in life expectancy (Hoff, 2008).

The literature on replacement migration focuses on the idea that international immigration should be a solution for population ageing. The literature did not capture the perspective of migrant-sending countries with fertility below replacement levels, such as those in Eastern Europe, Central America, and other regions. Compared to the migrant-

receiving countries, these countries lose significant amounts of their working-age population. This dissertation aims to contribute to the migration and population ageing literature from the perspective of a migrant-sending country. In order to accomplish this, it is essential to consider the advances in longevity research and the alternative measures for conventional life expectancy.

2.1.1 Alternative Measures to Population Ageing

Prospective Age

The literature on prospective age goes back to Ryder (1975) and Siegel and Davidson (1984), who computed transition trajectories into the old age group based on the remaining life expectancy. Similar thoughts were found in the works of (Fuchs, 1976; Shoven, 2007; Scherbov and Sanderson, 2016; Sanderson and Scherbov, 2013, 2005). The economist Fuchs (1984) suggested that a person can have two different ages. This idea was borrowed from the distinction in economics between values measured in current prices, called nominal values, and those prices adjusted to inflation, called real values. Fuchs suggested that people have “nominal” and “real” ages from this idea. Nominal ages would be the chronological ages, and real ages would be the ages adjusted for life expectancy or changes in mortality rates (Fuchs, 1984).

Sanderson and Scherbov reinvented Fuchs’ proposal of “real age”. They provided examples of how to measure it across time and countries (Sanderson and Scherbov, 2013). The idea of prospective age comes also from the thanatological age of Brouard (1986) in (Riffe and Brouard, 2018) and more recently there has been increased interest in the concept because of its relationship to health care costs (Miller, 2001). The thanatological age is defined as the exact number of years a person has left to live (Riffe and Brouard, 2018; Scherbov and Sanderson, 2016).

For a better understanding, Scherbov and Sanderson (2016) propose a theoretical exercise: two people, one alive in 1950 and the other alive in 2000. If both were 40 years old, naturally, they would have lived 40 years by the given dates of 1950 and 2000, respectively. However, people who share a prospective age share a remaining life expectancy. If a 40-year-old person in 1950 had a remaining life expectancy of 30 years, then a 50-year-old person in 2000 would also have a remaining life expectancy of 30 years. Then the 50-year-old person in 2000 would have a prospective age of 40, using the year 1950 as a reference year. Therefore, anyone who had a remaining life expectancy of 30 years would have a prospective age of 40 when using 1950 as the reference year (Scherbov and Sanderson, 2016; Sanderson and Scherbov, 2005, 2008, 2013).

The characteristic approach to measuring population ageing includes the conventional measure of chronological age but is far more general. Sanderson and Scherbov focus on four characteristics: chronological age, remaining life expectancy, the mortality rate,

and the proportion of adult person years lived after a particular age. Each of them provides a particular interpretation for population ageing studies. The chronological age shows how conventionally measures can be naturally embedded in the generalised framework. They provide a quantitative benchmark against which to assess the importance of including other characteristics. The remaining life expectancy produces a forward-looking definition of age. The mortality rate is a relevant indicator for measuring the health of a group of older people. Finally, the proportion of adult person-years-lived after a particular age is relevant for constructing a simple hypothetical demographically indexed public pension system (Sanderson and Scherbov, 2013).

The alternative measurement for population ageing proposed by (Sanderson and Scherbov, 2013), more precisely the prospective age, is relevant for the decomposition of Romania's working-age population because of its potential impact on the pace of the ageing process. With this measurement, we can alter the size of the working-age population according to their remaining life expectancy at older ages (Craveiro et al., 2019). By doing so, change in age-specific mortality conditions can be incorporated in changes in the working age population.

2.2 Mortality

Life Expectancy and Life Span Dynamics

The literature on mortality and gains in life expectancy indicates that these gains are universal. This idea has been widely discussed in UN publications such as (MIPAA, 2002; UN, 2019; WPA, 2020). Life expectancy represents an average indicator for survivorship and conceals considerable heterogeneity in individual mortality trajectories. Variations in age at death, defined as lifespan variation, are an essential dimension of inequality. Lifespan variation summarizes this heterogeneity at the population level and uncertainty at the time of death at the individual level (Bohacek et al., 2018). Since mortality decline over young ages outpaced mortality decline at older ages, deaths were compressed in a narrower age window. (Aburto and van Raalte, 2018) conducted a study regarding lifespan variations in Central and Eastern Europe (CEE). They argued that in CEE mortality change at different ages was not equal and changes in lifespan variation did not correspond with changes in life expectancy. According to Aburto and van Raalte (2018), from a public health perspective, these results disclose inequalities underlying population health that cannot be identified when looking at life expectancy alone. For example, if we take a closer look at the evolution of longevity, we can observe significant differences between Eastern and Western Europe. While life expectancy at birth in western European and other developed countries remained constant, in Eastern Europe, it stagnated between the 1960s and 1980s. In Eastern Europe, male life expectancy at birth stagnated between

65 and 70 years from the 1960s until the 1980s (Aburto and van Raalte, 2018; Aburto, 2019; Aburto et al., 2020). In the United States (Case and Deaton, 2021) the educational gap in life expectancy has widened, and the racial gap has narrowed in the USA. The life expectancy between 25 and 75 years for black Americans with a bachelor's degree got closer to the life expectancy of white Americans without a bachelor's degree. At the same time, the life expectancy of white Americans has worsened (Case and Deaton, 2021). Lifespan variation can be a good measure of aggregate health inequality because it reveals fundamental differences in levels and trends. Aburto and van Raalte (2018) showed that countries from Central and Eastern Europe experience high variations in lifespan and a more significant fluctuation in the predictability of lifespan. Furthermore, their study shows that life expectancy and life disparity behaved independently, particularly in periods of stagnation in life expectancy. These findings do not correspond to those experienced in Western Europe. Thus, analysing lifespan dispersion together with life expectancy offers a deeper understanding of the impact of changing mortality trends on population health.

Compression of Mortality and Morbidity

The compression of morbidity is defined as a reduction over time in total lifetime days with chronic disability. It reflects the balance between morbidity and case continuance rates generated by case-fatality and case-recovery rates. Improvements in morbidity can lead to a compression of morbidity if the reduction in age-specific prevalence rates can overcome the increases in a lifetime disability. With the improvements in mortality, disability prevalence rates increase with age (Stallard, 2016). The compression of mortality represents the reduction over time in the variance of age at death and increasing mean age at death, leading to progressively more “rectangular” survival function (Olshansky et al., 2001; Stallard, 2016).

According to Campolina et al. (2014) three hypotheses need to be considered to discuss the effect of changing morbidity and mortality patterns on the population's health status. The first hypothesis argues for the compression of morbidity and suggests that life expectancy has reached its biological limits. If the incidence of disabling diseases can be extended, morbidity can be compressed to a shorter period of time. The second hypothesis follows the argument that mortality decline derives from a reduction in the case-fatality rates of diseases and not from their decreasing incidence. Consequently, mortality decline is accompanied by an increase in the number of people with chronic illnesses and disabilities. The third hypothesis argues that mortality decline is partly due to declines in disease lethality. At the same time, the incidence and progression of chronic diseases should fall and result in a dynamic equilibrium. Based on this idea, the years lived with chronic diseases and disabilities should remain relatively constant since medical interventions and lifestyle changes can reduce the progression of chronic diseases (Campolina et al., 2014); (Stallard, 2016).

Regarding the compression of morbidity and mortality, Crimmins and Beltrán-Sánchez (2011) showed that mortality declines have slowed in the USA in recent years, especially for women. However, the prevalence of the disease has increased. The study concluded that the age-specific prevalence of many risk factors representing physiological status has remained relatively constant. Between 1998 and 2008, the length of life with disease and mobility function loss among Americans increased. Crimmins and Beltrán-Sánchez (2011) argued that the empirical findings did not support the recent compression of morbidity since morbidity was defined as a major disease and mobility function loss. Evidence showed that the incidence of a first heart attack remained relatively stable between the 1960s and 1990s and the incidence of some cancers has been increasing (Crimmins and Beltrán-Sánchez, 2011).

2.3 Social and Economic Characteristics of Romania

2.3.1 Life Expectancy Fluctuations in Romania

Romania followed a quite different mortality path than other Eastern European countries. In Romania, life expectancy at birth improved by about two years in the early 1970s. Afterwards, it went through a period of stagnation until the middle of the 1980s. From the late 1980s until 1991, it increased, reaching its highest point of 66.9 years for men and 73.4 years for women. A steady decrease followed this until 1996. The recovery afterwards was slow and by 1998, life expectancy in Romania did not reach the level of 1991. The decline was mainly attributed to an excess of mortality in men. The female life expectancy at birth remained relatively stable during this period. Consequently, the male-female gap increased to 7.7 years between 1990 and 1996. By 1998, the male-female gap decreased to 7.5 years (Dolea et al., 2002).

Between 1990 and 1996, the death rate for the age group 5 to 9 years increased by 40% and remained at this level until 1998. A substantial fall in mortality in the age group between 1 and 4 years was observed during the same period. The greatest increase in mortality was observed in the age group from 40 to 44 years for both men and women. Mortality for this age group increased by 41% for men and 17% for females between 1990 and 1996. By 1998, death rates for females aged 40 to 44 years fell again to the levels of 1990. The excess in adult mortality was caused mainly by circulatory diseases and diseases of the digestive system. The increase in children's death rate between 5 and 9 years was attributed entirely to an epidemic of pediatric AIDS caused by a particular set of health care policies pursued in the 1980s³ (Dolea et al., 2002).

³"In the late 1980s, over 100 thousand children were living in so-called "orphanages" in Romania. "Micro-transfusions" of blood were commonly administered as a treatment for anaemia or malnutrition, in many cases leading to HIV infection. Further infections arose from inadequate sterilisation of needles and syringes" (Dolea et al., 2002), pp.448.

Increasing morbidity is challenging for population ageing. Living longer does not necessarily mean living a healthy life without chronic diseases and disabilities. The compression of morbidity differs among countries, as we have seen between Eastern and Western Europe. Besides, the increased costs to pension systems living longer with chronic diseases and disabilities will increase public expenditure even further. From this perspective, would be relevant to consider indices that measure healthy years of life. Among these indices are: the length of healthy life; health expectancy;(Sauerberg et al., 2020) the average length of healthy life; disability-free life expectancy and years lived with disability. These indices combined with life expectancy at birth can offer a wide-ranging view of a population's health. However, this dissertation focuses on population ageing and not on the population's health during the ageing process. Therefore, the prospective age is a reasonable solution as a substitute for the more refined measure of healthy life expectancy in the case of Romania.

The prospective age offers us the possibility of extending the working-age group by a few years. When choosing alternative measures for population ageing, such as the prospective age, over the conventional chronological age, the following aspect needs to be considered. Increasing longevity can come with a possible increase in the years lived with chronic diseases and disabilities. Under this circumstance, even if the working years increase, it is important to investigate whether the potential additional workforce is healthy enough to work.

2.3.2 Social-Economic and Political Aspects

Communist Regime

Regional development was influenced by growth pole theory based on metropolitan development. In spite of the intention of the rulers of the Romanian state to determine the size and the form of the cities, the urbanization process showed some patterns common to other East European countries. To a smaller extent, these patterns were similar to the first stage of urbanization as experienced by Western countries at an early period. This means that the general trend of urbanization has a relative autonomy reflecting, at least from a quantitative perspective, a general law of urbanization concerning urban concentration in the first stage, the high rate of growth of big cities compared to small ones, and the important role of rural-to-urban migration for urban growth. During this period, infrastructure was not one of the main priorities of the government since communist ideology considered infrastructure an unproductive sector (Abraham, 1992).

Romania experienced some of the most challenging economic conditions under an autocratic system that aimed for independence from both the West and the Soviet Union. During the 1980s, Romania faced food and fuel shortages as it struggled with diminishing oil reserves and an aggressive debt repayment agenda. In 1989, Romania had one of the

bloodiest revolutions in Eastern Europe. Afterwards, Romania experienced a series of new economic crises, inconsistent reform and increasing economic inequality (Cunningham, 2009).

After 1989

1990 marked significant economic, social, and political changes in Central and Eastern European countries. These countries were transitioning from socialist to market economies. This transition imposed the adoption of new economic reforms and measures to ensure the shift from a centralised economy-based system to a system where competition and market economy should be functional. Romania was also among those countries. The breadth of institutional and structural changes that Romania needed to implement after 1989 exceeded that of the other Eastern European countries. The fall of the communist regime generated major political confrontations. The adaption of the market economy was delayed because of budgetary restrictions. During the first years after the change in the political system, the government had to fight against inflation while the economic policy was restrictive. Furthermore, the government had to cope with the increasing unemployment rate after the privatisation of many state companies (Arpinte et al., 2010).

After the change in the political system in 1990, the regional disparities in Romania increased significantly. They took new forms after the deindustrialisation process of the late 1990s. Unemployment increased, and the phenomenon of return migration from urban to rural regions also occurred. The introduction of redistributive social benefits for low-income groups was delayed. Furthermore, social services, education and healthcare systems had poor financing. Romania did not have effective job-creation programmes or sizable social housing programmes. These aspects led to the aggravation of poverty and new forms of marginalisation that affected mainly the Roma ethnic minority (Fina et al., 2021). Furthermore, these events were the main trigger for labour migration after 1989.

Since it acceded to the European Union, Romania has experienced massive economic growth, out-migration, and political and economic crises. Between 2007 and 2019, Romania has been the fastest growing economy in the European Union. The average annual GDP growth rate was around 4.4%. In 2019, the World Bank classified Romania as a high-income country for the first time. Within the European Union, Romania is one of the least developed countries. The average life expectancy was 75.9 years in 2019, five years below the European average Eurostat (2021b). As a consequence of limited income opportunities and below-average living conditions compared to the other European countries, Romania has been a country of emigration over the last three decades. According to OECD, 17% of the people born in Romania no longer live there (Fina et al., 2021).

In synthesis, this chapter synthesised the literature review on population ageing and international migration. First, it discussed the literature on international migration

as a possible solution for population ageing and the lack of studies from the perspective of migrant-sending countries. Second, the chapter summarised the alternative measures for population ageing, such as the prospective age measure. In addition, it illustrated the importance of other alternative measures for ageing, such as healthy life expectancy, disability-free life expectancy and years lived with disability. Third, the chapter briefly discussed the compression of mortality and morbidity worldwide. Fourth, the chapter briefly synthesised Romania's social-economic profile and mortality transition during and after the communist regime. The aspects discussed in this chapter are relevant for understanding the dynamics of Romania's migration profile in chapter four.

3 Concepts, Data and Methodology

This dissertation uses data from the Romanian National Institute of Statistics, TEMPO-Online, and the Eurostat database. The sources of information and their relevant concepts are described in the following sections.

The Romanian National Institute of Statistics provides annual time series aggregated by age, age groups, sex, and region. Below we explain each term regarding data aggregation.

3.1 Concepts

3.1.1 Territorial Classification

The Member States of the European Union use the nomenclature of territorial units for statistics, abbreviated NUTS, from the French version "*Nomenclature des Unités territoriales statistiques*". The NUTS classification was the common statistical classification of territorial units in order to enable the collection, compilation and dissemination of harmonized regional statistics of the European Union (EUROSTAT, 2021a).

The classification was divided into three different levels, NUTS-1, NUTS-2 and NUTS-3. Above NUTS-1 there was the national level for each Member State:

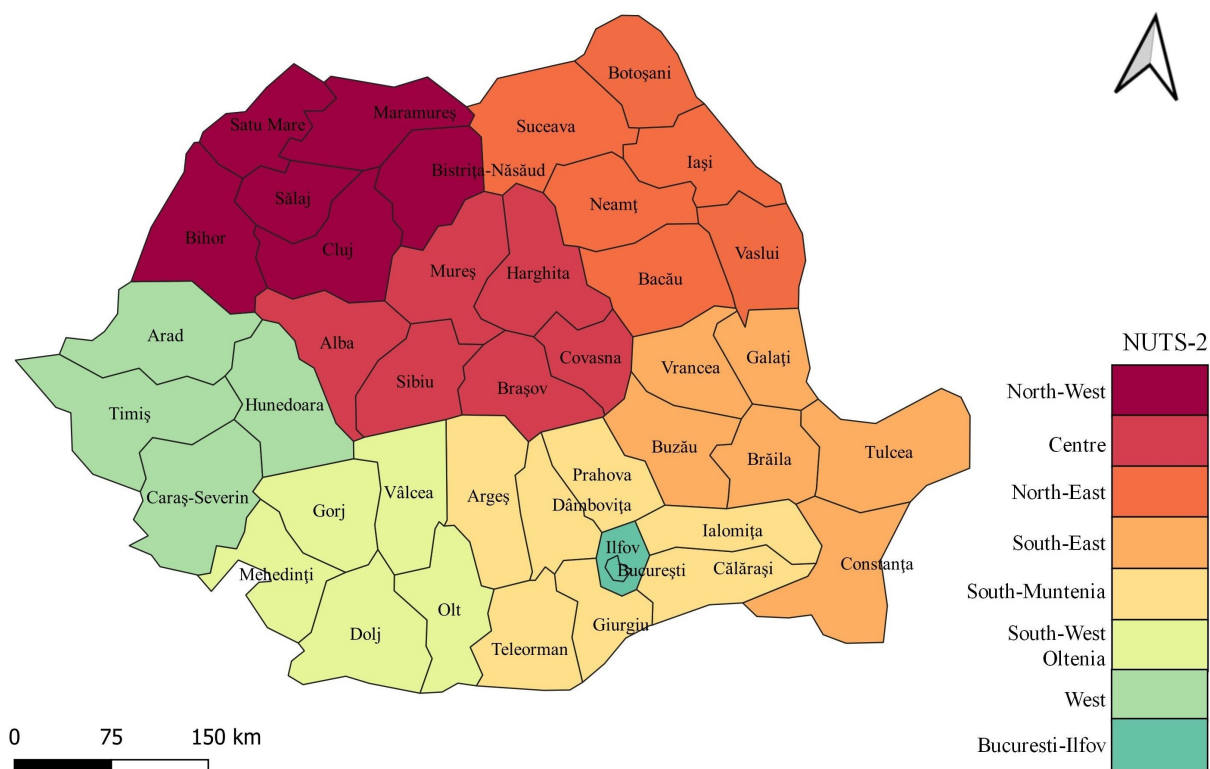
- NUTS-1: major social economic regions;
- NUTS-2: basic regions for the application of regional policies;
- NUTS-3: small regions for specific diagnoses (counties).

The NUTS was based on Regulation (EC) No 1059/2003 of the European Parliament and of the Council of 26 May 2003 on establishing a common classification of territorial units for statistics (NUTS), which was regularly updated. The last update was valid from 1.st of January 2021 (EUROSTAT, 2021b).

Romania was divided into four NUTS-1, eight NUTS-2 and forty-two NUTS-3 regions.

Due to data availability, this dissertation will use data on the national level for 1977-1991. For 1992-2019, the analysis will be conducted at the NUTS-3 level.

Figure 3.1: Romania NUTS-2 and NUTS-3 territorial division



Source: Own elaboration using geodata from (Eurostat, 2019)

Note: The 42 NUTS-3 regions are classified within the NUTS-2 region.

3.1.2 Population

This dissertation uses data on Romania's population on January 1st. Data on population was divided into two categories: *population by domicile* (de jure) and *resident population* (de facto).

Population by Domicile

Population by domicile refers to the legally resident population representing the number of persons with Romanian citizenship and legal residence on the territory of Romania. The person's legal residence was the address where the person declares to have the main dwelling printed on his/her identity card and registered by the administrative authorities. To set up the value of this indicator, the usual residence was not considered, nor was the period or reason of absence from the domicile. Therefore, this data includes persons living temporarily abroad. The temporary term can be understood as long-term temporary if the person keeps the legal residence in Romania but resides elsewhere, including abroad. In this case, this data set accounts for temporary emigrants (persons living abroad for a period longer than 12 months but with legal residence in Romania) (INSSE, 2022).

Usual Resident Population

Unlike the population by domicile, the usually resident population represents all persons of Romanian nationality, foreign or stateless, who have their usual residence, longer than 12 months, in Romania. The usual residence was where a person usually resides, regardless of temporary absence for recreation, holidays, visits to friends and relatives, business, medical treatment, or religious pilgrimage. The usual residence may be the same as the domicile or may differ from it for the person who chooses to establish their usual residence in a locality other than the locality of domicile inside Romania or abroad. This data set includes the persons who immigrated to Romania but excludes those who emigrated from Romania (INSSE, 2022).

3.1.3 Migration

Tempo-Online is the official database of the Romania National Institute of Statistics. This database provides time-series data regarding Romania's resident population, mortality, fertility, and migration. According to the Tempo database, migrants are categorised as temporary and permanent. Both types of migrants refer to long-term migration lasting longer than 12 months.

Temporary emigrants are persons absent for at least 12 months but whose legal residence or domicile was still established in Romania and written on the Romanian identity card. Establishing a domicile in Romania means registering the legal address with the authorities. In Romania, a person can legally have only one domicile. Temporary immigrants are persons who immigrated to Romania for at least 12 months and did not establish their legal residence or domicile in Romania. Their domicile was still established in their home country.

Permanent emigrants are persons absent for at least 12 months but whose legal residence or domicile was not established in Romania but in the host country. Permanent immigrants are persons who immigrated to Romania for at least 12 months and established their legal residence or domicile in Romania.

This dissertation uses both definitions of migrants, temporary and permanent. The category of temporary migrants became especially important after Romania acceded to the European Union. With the freedom of movement, Romanian emigrants were not obliged to change their domicile to their host country. The same was valid for temporary immigrants. Temporary migrants can register their current addresses without changing their domicile. Maintaining the temporary status makes it easier to return to the home country without losing any social benefits. A permanent Romanian emigrant would have more difficulties accessing the social protection system when returning to Romania. According to the 2011 Romanian Census, there are two categories of migrants: long-term and short-term migrants. Long-term migrants are those who migrate for a period longer

than 12 months, and short-term migrants are those who migrate for a period shorter than 12 months. According to the Quality Report of the 2011 Romanian Census, one segment of the population living abroad was severely underestimated. The 2011 Census captured only 727.5 thousand Romanians living abroad. This underestimation was caused because most of these people had gone abroad with their families at the critical moment of the census. Consequently, there were no other people or relatives in the country to declare the requested information about them. Even though data on Romanian emigrants was still under-recorded, the 2011 Romanian Census provides relevant information on their demographic profile and their main countries of destination and areas of origin (INSSE, 2011a, 2022).

3.2 Data

3.2.1 Tempo-Online

Population by Domicile

The time series of this data set was divided into two parts. First, historical data was available from 1969 until 1992 and refers to the Romania population data on the 1st of January. This data set was aggregated by age, age groups, and sex at the national level. Second, between 1992 and 2021, the data set on population by domicile on the 1st of January was aggregated by age, age groups, sex, NUTS-1, NUTS-2, and NUTS-3 levels.

According to the National Institute of Statistics Romania, the dataset on the legally resident population comes from administrative data sources, such as the Directorate for Personal Records and Database administration, the National Registry for Persons Evidence, and the Passport General Directorate.

This data set imposes limitations in the research for the period 1992 to 2011 because it overestimates the usually resident population. Furthermore, on the county level, the change of legal residence considers both internal and international migration. Therefore, if a county gains or loses population during the period of analysis due to migration, it will not be possible to identify which type of migration, internal or international, contributes more. According to the National Institute of Statistics of Romania, this data set was used only for regional comparison within Romania and cannot be used for international comparison. The data set on the usually resident population will be used for international comparison.

Usually Resident Population

This data set was available starting with 2003 on the national level, disaggregated by age, age groups, and sex and refers to the population on the 1st of January. Starting

with the 1st of January 2012, this data set was aggregated by age, age groups, and sex for NUTS-1, NUTS-2, and NUTS-3 regions and was available until 2021.

According to the National Institute of Statistics Romania, the source of this data set was the statistical survey of Romania's usually resident population. The indicators of the usually resident population were obtained using data from the administrative source, data from national statistical institutes of Spain and Italy and the Eurostat database. In addition, econometric models based on small-area estimation techniques to assess the size of the international migration were used. Starting with the 2011 Romanian Population Census, the number of the usually resident population was estimated according to the criteria of usual residence using the component method. For 2003-2011, the usually resident population was re-estimated under comparability with the final results of the Population and Housing Census of 2011.

This data set was limited since it was only available between 2012 and 2021. The same data set was available on the Eurostat website on the NUTS-3 level.

Mortality

Starting in 1990, the Romanian National Institute of Statistics provided annual data on deaths by age group and sex on NUTS-1, NUTS-2, and NUTS-3 regions. This time-series data set was available from 1990 until 2021.

Migration

Tempo-Online provides time-series data on temporary and permanent emigrants and immigrants. The time-series data regarding permanent emigrants and immigrants covers the period from 1992 to 2020 and was aggregated separately by sex, age group, country of origin, and destination. The time series about temporary emigrants and immigrants was available from 2008 until 2020. This dataset was more comprehensive since it combines more categories, such as age groups and sex or single age and sex. To better understand the migration flows in and out of Romania, it was necessary to combine both databases. The two datasets complete each other, especially between 2008 and 2020. Since the Tempo-Online data do not provide information on temporary migration before 2008, migration measures may be severely underestimated. Data on permanent migration underestimate the number of emigrants since it does not include information on temporary emigrants until 2007.

3.2.2 Eurostat Database

Each member state of the European Union submits its statistics to Eurostat every year. With the Eurostat database, it was possible to reconstruct the annual flows of Romanian temporary emigrants by inputting data on flows of Romanian immigrants

from Italy, Spain, France, Germany, the United Kingdom, Belgium, Netherlands, Austria, Hungary, and the Scandinavian countries.

Even though it was impossible to reconstruct migration flows for the entire period, much of it was recovered.

Furthermore, Eurostat provides annual data on population stock. From this database, it was possible to extract part of the Romanian stock of migrants abroad by age group and sex.

Eurostat database on migration flows refers to changes of residence for at least 12 months.

Data Overview

Table 3.1: Required data according to the objectives

Objectives	Databases	Required Data	Analysis Unit and Interval
1. Understanding the dynamics of Romania's migration profile from a historical perspective	• Census Hub 2 • Eurostat • INSSE (Tempo-Online) • IPUMS • Romanian Censuses (1992, 2002, 2011)	• Migrants by gender and age groups and country of birth • Activity status of migrants • Main countries of destinations	National: • 1950-2019
2. Decomposing Romania's working-age population into three demographic components	• Eurostat • INSSE (Tempo-Online)	• Resident population age groups and sex • Deaths age-groups and sex	National: • 1977-1991 • 1992-2006 • 2007-2019 Regional NUTS-3: • 1992-2006 • 2007-2019
3. Applying the prospective age to the decomposition model	• Eurostat • INSSE (Tempo-Online)	• Resident population single-age and sex • Deaths single age and sex	Regional NUTS-3: • 1992-2006 • 2007-2019

3.3 Methodology

In order to achieve the objectives of this dissertation, a three-step method of decomposition was used. For the first specific objective, to examine the relative contribution of mortality, cohort turnover and net migration to Romania's working-age population by sex, we applied the classical decomposition model.

For this, first, we decomposed Romania's working-age population by gender on national level into the three main demographic components – mortality, cohort turnover and net migration – to identify which of these components most contributed to Romania's decline in the working-age population in the past. The first part of the analysis was between 1977-1991, 1992-2006 and 2007-2019.

Second, we decomposed Romania's working-age population by gender on regional level (NUTS-3 *Nomenclature des Unités territoriales statistiques*) between 1992-2006 and 2007-2019.

Third, we applied the concept of prospective age to the analysis at the regional level (NUTS-3) by gender between 1992-2006 and 2007-2019. We applied the prospective age concept to the decomposition to see if it can decelerate the working-age population's decline. To do so, we redefined the conventional working-age group as the prospective working-age group between 15 years and the corresponding prospective age for each NUTS-3 region and gender.

3.3.1 Classical Decomposition Model for Measurement of the Ageing Process

The classical decomposition model decomposed Romania's working-age population (WAP) into mortality, cohort-turnover, and net migration effects in the past (Ghio et al., 2022). Because of data availability, the analysis was first conducted on the national level between 1977 and 2019, and then on the NUTS-3 level between 1992 and 2019.

The decomposition of Romania's working-age population was divided into three intervals: two intervals consisting of 15 years and one of 13 years. The reference periods were 1977-1991, 1992-2006, and 2007-2019. We chose to analyse 2019 before the conclusion of Brexit and the COVID-19 pandemic. The impact of Brexit and the COVID-19 pandemic on Romania's working-age population can be investigated in future research. The first period (1977 to 1991) captured Romania during the communist regime and the first two years of the transition period. The second part of the analysis between 1992 and 2006 captured Romania after the first democratic elections in 1992 and the transition period to the European Union. The third period (2007-2019) captures Romania as a member of the European Union.

As mentioned in the previous section, the Romanian National Institute of Statistics provided two types of data on population by domicile and resident population. Data on the resident population has been available since 2003 by gender at the national level. Starting with 2012, data on regional NUTS-2 and NUTS-3 levels became available by single age, age group, and gender. The database on population by domicile also included those who have their domicile established in Romania but reside abroad. Therefore, this database overestimates the actual resident population. Since data on the resident population was available only from 2012, we estimated the resident population for the previous years by applying the ratio of resident to domicile population for each age. We observed that between 2012 and 2021, the ratio by age and age groups was constant over time. Therefore, we used these ratios to estimate the resident population between 1992 and 2011.

For the first part of the analysis, we defined the working-age population as those

between 15 and 64 years (de coopération et de développement économiques , Paris). The components of change in the working-age population were identified by applying the following equation of balance:

$$net_mig_{j,t-(x+t)}^{15-64} = (pop_{t+x}^{15-64} - pop_t^{15-64}) + deaths_{j,t-(x+t)}^{15-64} - (entry_{j,t-(t+x)}^{ABFE} - exit_{j,t-(t+x)}^{CDHG}) \quad (3.1)$$

where,

j - represents the territorial unit NUTS-3;

t and $t + x$ - identified the starting and the ending of the reference period;

x - denoted the interval;

$net_mig_{j,t-(x+t)}^{15-64}$ - estimated net migration for the for the WAP for each Romanian county (NUTS-3) j ; $(pop_{t+x}^{15-64} - pop_t^{15-64})$ - denoted the change in the size of WAP; the difference between WAP at the end and at the beginning of the interval;

$deaths_{j,t-(x+t)}^{15-64}$ - represented the number of deaths occurring in WAP;

$(entry_{j,t-(t+x)}^{ABFE} - exit_{j,t-(t+x)}^{CDHG})$ - compared the size of the entry and exit cohorts to identify the cohort turnover effect, see Figure 3.2;

The cohort turnover represented the difference between the entry (ABFE) and exit (CDHG) effects De Beer et al. (2011). The cohort turnover effect was estimated at the national and NUTS-3 levels. This effect compares the population's age structure at two points in time (see Figure 3.2). In the case of Romania, for the entry effect, we assume that half of deaths and migration occur between the ages 15-30 during the reference period (1992-2006) and the other half outside these ages, implying that half of the growth is already covered by the age group 15-30. (Goujon et al., 2021; De Beer et al., 2011; Ghio et al., 2022).

The entry effect was calculated by using the following equation:

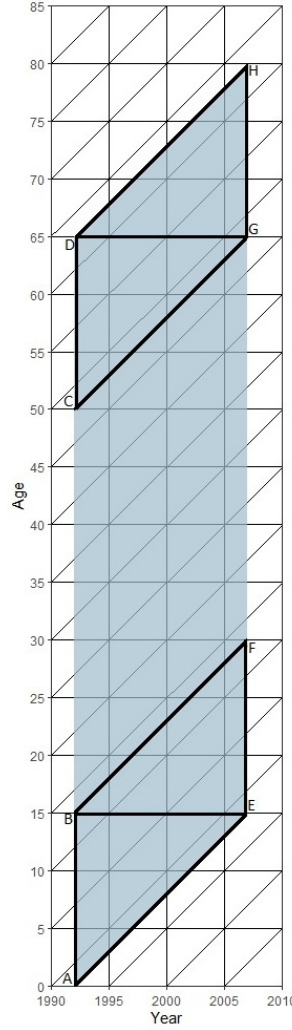
$$entry_{j(1992-2006)}^{(ABFE)} = age_group_{(1992)}^{(0-15)} + \frac{age_group_{(2006)}^{(15-30)} - age_group_{(1992)}^{(0-15)}}{2} \quad (3.2)$$

The exit effect was estimated as similar to the entry effect. The effect was determined by the outflow of the cohorts of 50 to 64 years in 1992 and the cohorts of 65 to 79 years in 2006. For the computation of the exit effect during the reference period 1992 and 2006, we assumed that half of migration and deaths occurred between the ages of 50 and 79 years (De Beer et al., 2011).

The exit effect was calculated by using the following equation:

$$exit_{j(1992-2006)}^{(CDHG)} = age_group_{(1992)}^{(50-64)} + \frac{age_group_{(2006)}^{(65-79)} - age_group_{(1992)}^{(50-64)}}{2} \quad (3.3)$$

Figure 3.2: Change of 15-64 working-age group Romania (1992-2006)



Source: Own elaborations based on (De Beer et al., 2011)

For the 13-year interval, the cohort turnover effect was defined as the difference between the inflow of people in the age groups 2-14 for 13 years (i.e. people aged 15-27 years at the start of the interval) and the outflow of people in the age groups 52-64 during the 13 years interval (i.e. people aged 65-77 at the end of the interval). Therefore, the cohort turnover effect represents the difference between the entry and exit effect.

The analysis on the regional level (NUTS-3) came with some limitations because net migration included internal and international migration. It was not possible to distinguish internal from international net migration on this level. The net migration effect of the decomposition on the national level included only international migration. In

addition, when the net migration effect is obtained by residual method, net migration may suffer statistical biases¹(Goujon et al., 2021).

It is important to point out that the residue carries not only migration but also census coverage error and death sub-registration error. These two effects are also reduced by the subtraction of the two working-age populations, but are not annulled.

3.3.2 Prospective Age

To extend the analysis, we applied the prospective age concept. Prospective ages can be understood as life-expectancy equivalent ages. People with the same prospective age had the same remaining life expectancy. Sanderson and Scherbov defined this methodology as a 'characteristics approach'. The remaining life expectancy at a particular chronological age α was allowed to vary over time (Scherbov and Sanderson, 2016; Sanderson and Scherbov, 2013, 2008). As a result, we fixed the remaining life expectancy at 15 years and selected each α age for the two intervals, 1992-2006 and 2007-2019.

Due to data availability, the prospective-age concept was only applied to the NUTS-3 level analysis.

We applied this concept to the working-age population to expand the working-age group. Therefore, we worked with two definitions for the working-age population.

First, we decomposed the conventional working-age population between 15 and 64 years. Second, decomposed the prospective-working-age group between 15 and the prospective age.

Therefore, the decomposition equation for the prospective working-age population was computed as the following

$$net_mig_{j,t-(x+t)}^{15-p-\alpha} = (pop_{t+x}^{15-p-\alpha} - pop_t^{15-p-\alpha}) + deaths_{j,t-(x+t)}^{15-p-\alpha} - (entry_{j,t-(t+x)}^{15-p-\alpha} - exit_{j,t-(t+x)}^{p-\alpha-gr}) \quad (3.4)$$

where,

$p-\alpha$ - denoted the prospective age;

$p-\alpha-gr$ - denoted the prospective exit age group;

The prospective age was obtained from the life table, namely life expectancy at exact ages. In this dissertation, we used the remaining life expectancy between 14.5 and 15.4 years, rounded to 15 years.

¹According to Goujon et al. (2021), since many countries either do not have accurate figures on immigration and emigration or have no figures at all, net migration is often estimated as the difference between total population change and natural increase between two dates. Eurostat database refers to this as corrected net migration). The statistics on net migration are therefore affected by any statistical inaccuracies in any of the components used for their derivation (Goujon et al., 2021), page 32.

Indirect Estimations for inter-census Net Migration and Net Migration Rates

To estimate the inter-census net migration, we need at least two census years. We used the Romanian Censuses from 1992, 2002 and 2011. The change in the size of the age cohort of the Romanian population between the initial time and a time, $(0 + T)$ was the result of the number of births minus deaths and the net migration of Romanians in the cohort during the 10 years. Hereby, we assume no coverage error differential between the censuses. Furthermore, we need the survival ratio S from the inter-census life tables. The survival ratio represents the average probability of persons aged $x + n$, $x + m - n$ surviving n more years (Rigotti, 1999; Carvalho and GARCIA, 2003). Therefore, the survival function S can be expressed as:

$${}_mS_x = \frac{{}_mL_{j,x}}{{}_mL_{j,x-n}} \quad (3.5)$$

${}_mS_x$ = survival ratio of Romania, corresponding to the age groups from x to $x+m$ years in the second census, 2002

${}_mL_{j,x-n}$ and ${}_mL_{j,x}$ = person-years lived from the life tables, in this case from the United Nations Abridged Life Tables Romania, for the age groups $x - n$ to $x - n + m$ and x to $x + m$.

By having the cohort born in the first census, 1992, we can estimate the expected population in Romania, at the date of the second census, 2002. The same we do for the period 2002 and 2012.

$$\overline{{}_mP_{j,x}^n} = {}_mP_{j,x-n}^0 * {}_mS_x \quad (3.6)$$

$\overline{{}_mP_{j,x}^n}$ = was the expected population of Romania in year $n = 2002$, aged x to $x + m$

${}_mP_{j,x-n}^0$ = observed population of Romania, aged $x - n$ to $x - n + m$, in year 0, 1992 (first Census)

The net migration of the Romanian population aged x to $x + m$, in year n was calculated as follows:

$${}_mNM_x = {}_mP_{j,x}^n - \overline{{}_mP_{j,x}^n} \quad (3.7)$$

The equation (4.4) corresponds to the inter-census net migration estimation of the population already born in the first census, starting from the age group of 10 to 14 years. For the younger age groups 0 to 4 and 5 to 9 years Everett Lee's algorithm was used (Kuznets and Thomas, 1957). The relations are extracted from the Census data as follows:

$${}_5NM_0 = \frac{1}{4} * RCW_0 * {}_{30}NM_{15}^f \quad (3.8)$$

$${}_5NM_5 = \frac{3}{4} * RCW_5 * {}_{30}NM_{20}^f \quad (3.9)$$

${}_5NM_0$ = net migration for children from 0 to 4 years

${}_5NM_5$ = net migration for children from 0 to 4 years

RCW_0 = ratio of children 0 to 4 years to women from 15 to 44 years

RCW_5 = ratio of children 5 to 9 years to women from 20 to 49 years

${}_{30}NM_{15}^f$ = net migration of women from 15 to 44 years

${}_{30}NM_{20}^f$ = net migration of women from 20 to 49 years

Lee's algorithm was a simple procedure suggested by the United Nations (VI, 1970) to overcome the difficulties in estimating the born and surviving population based on fertility and child mortality functions. Despite these limitations, the estimates generated by Lee's algorithms maintain consistency between the women's migration during the reproductive period and the migration of children born in the inter-census period. Another advantage was that the results contemplate the direct effect of children's migrations and the indirect effect, that was, the children of migrant women born at the destination.

In the case of Romania, the inter-census net migration was unknown. The survival rate from the United Nations Life Tables for both males and females was used to estimate the net migration.

The net migration rate NMR represents the difference between the number of immigrants and the number of emigrants throughout the year divided by the population at the end of the period reported per 1000 residents. If positive, the NMR must be interpreted as the proportion of the population in the second census resulting from the net migration between the two periods. Conversely, when negative, the NMR represents the proportion of the population in the second census lost by the net migration. In the case of Romania it was calculated as follows:

$${}_mNMR_x = \frac{{}_mNM_x}{{}_mP_j^n} \quad (3.10)$$

${}_mNM_x$ = estimated net migration

${}_mP_j^n$ = population at the end of the interval (2002; 2012)

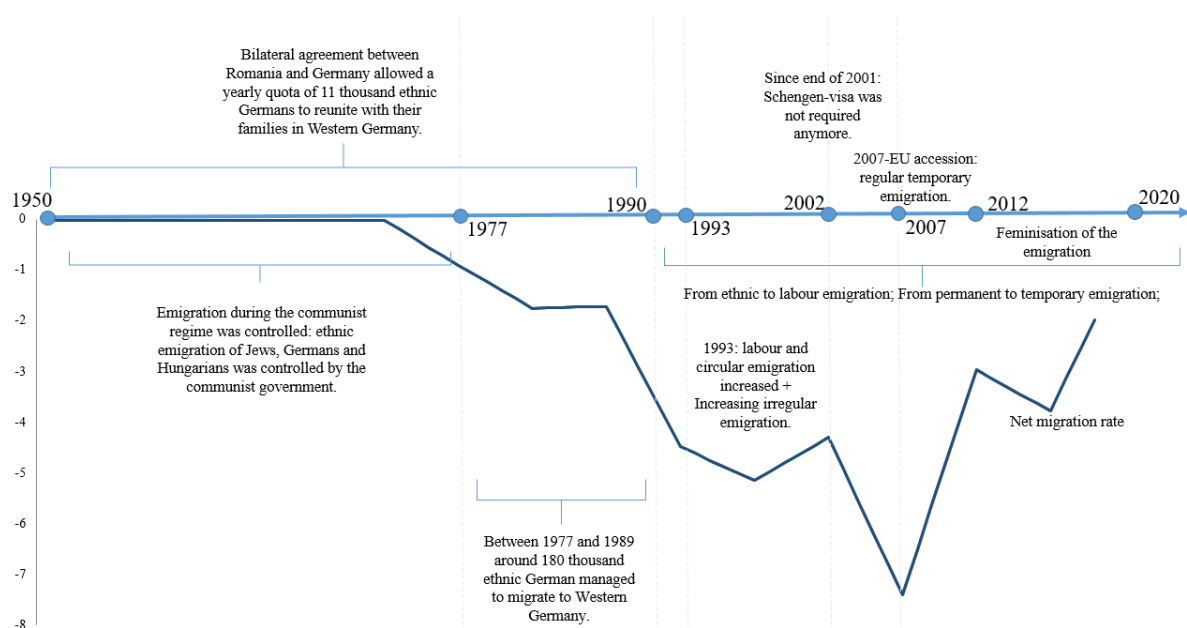
This chapter first presented the territorial classification of Romania, and the concepts used in the analysis, such as population by domicile and resident population, permanent and temporary migrants. Second, it presented the databases that were used for the decomposition analysis. Third, the chapter introduced the methodology and techniques of the decomposition model applied in this dissertation. This chapter was essential in order to understand the analysis step by step. The following chapter presents Romania's migration profile from the historical perspective.

4 Migration in Romania in the 20th and 21st Century

This chapter analyses Romania's migration profile from a historical perspective. First, the chapter looks at the emigration phenomenon at the beginning of the 21st century and during the communist regime. Second, the chapter presents Romania's emigration profile after the changes in the political system, with emigration shifting from ethnic to mainly labour and from permanent to temporary emigration. Furthermore, the feminisation of migration in recent years is also analysed. Then, the chapter presents how international immigration evolved after 1989 and discusses the importance and implications of return migration in population ageing. Figure 4.1 offers a quick overview of emigration from Romania between 1950 and 2019.

4.1 Romania's Emigration Profile

Figure 4.1: Time-line of Romania's emigration profile



Source: (World-Bank, 2021)

Note: Net migration rate between 1950-2019.

4.1.1 Emigration at the Beginning of the 20th Century

Romania has a long history of emigration. Ethnic Romanian communities were identified outside Romania at the end of the 19th century and the beginning of the 20th century (OECD, 2019). The first wave of large-scale emigration occurred within the context of Eastern European migration to North America. The majority of emigrants were from Transylvania, a region that became part of Romania after the end of World War I. During the first decade of the 20th century, around 250 thousand inhabitants from Transylvania emigrated to North America. During the interwar period, more than 200 thousand ethnic Hungarians emigrated from Transylvania to other countries. In 1940, Transylvania was re-annexed to Hungary. Therefore, 220 thousand ethnic Romanians left Northern Transylvania and moved to the territories of Romania. In the course of World War II, the Jewish population living in Romania was deported by Romanian and Hungarian authorities to concentration camps. Because of the Holocaust, the Jewish population in Romania, which was approximately 780 thousand, was reduced by half. After World War II, around 70 thousand ethnic Germans were deported to the Soviet Union (Horváth, 2007).

4.1.2 Emigration During the Communist Regime

At the end of World War II, the entire Eastern European region came under the influence of the Soviet Union. This was the scenario also for Romania starting in 1945, when the former King of Romania, Michael I, was forced to abdicate and was sent into exile. Romania remained under Soviet military influence until the late 1950s when Soviet troops withdrew from the country and gained more independence after 1958 (Petrescu, 2009). During the communist regime, international migration was strictly controlled by the authorities (see Figure 4.1). For example, passports were stored by the authorities and exit visas made it difficult for Romanians to leave the country. Also, contact with foreigners was often criminalised by the regime for ideological reasons (Gabanyi, 2000; Horváth, 2007; Horváth and Gabriel Anghel, 2009). Since the end of World War II and the instauration of the communist regime, emigration from Romania was mostly ethnic. This type of migration was strongly supported by international organisations and NGOs due to raising nationalism in Romania. The receiving countries were playing an important role in granting ethnic migrants access to rights. The purpose of the restrictive communist regime was not to prevent emigration but to control the flows by restricting the exit from Romania, while allowing certain groups, such as ethnic Germans, Hungarians, and Jews to leave. The purpose of the authorities was to reduce the number of asylum applications made by Romanians abroad because an increasing number would discredit the regime's legitimacy both internationally and nationally (Anghel et al., 2016; Horváth, 2007).

Bilateral Agreement with Germany

Ethnic Germans from Eastern Europe were blamed for the actions of Germany's fascist regime during World War II. Consequently, about 14 million Germans from Eastern and Central Europe, including Romania, were deported by the Soviet Union. Germany designed a legislative package for receiving ethnic Germans during the Cold War. The package offered citizenship, housing facilities, travel expenses, full access to the social security system, language courses, recognition of their educational degrees and tax facilities to start new businesses. Between 1950 and 1977, the emigration of ethnic Germans from Romania became more complex, and family reunification became the primary strategy for emigrating to Germany. The bilateral agreement between Romania and Germany allowed a yearly quota of 11 thousand of ethnic Germans to reunite with their families in Western Germany. Romania benefited from this bilateral agreement by receiving financial benefits for every visa issued by the Romanian authorities for each ethnic German. Between 1977 and 1989, around 180 thousand ethnic Germans migrated to Western Germany. Western Germany also offered asylum for Romanians, but their number was significantly lower than ethnic Germans. Most Romanians who managed to arrive in Germany to request asylum were professionals working for Romanian institutions that had partnerships in Germany, as well as artists, singers, athletes and even tourists. Many of these refugees managed to bring their families with them. Even though migration from Romania increased during the 1980s, the number of non-ethnic emigrants was significantly lower than that of ethnic Germans. Some ethnic Germans crossed the border with the former Yugoslavia between 1980 and 1989. Even though they left the country through irregular channels, when they arrived in the former Yugoslavia, they were allowed to continue further to Western Europe. Steiner and Maghet (2009) estimated that around 16 thousand irregular migrants tried to enter the former Yugoslavia between 1980 and 1989 (Horváth, 2007; Horváth and Gabriel Anghel, 2009).

Bilateral Agreement with Israel

After World War II, approximately 350 thousand Jews were living in Romania. They represented the second-largest Jewish population in Europe at that time. During the second half of the 20th century, many Romanian Jews emigrated to Israel. Israel supported this movement through the "Law of Return", which offered citizenship to those arriving. Despite the restrictions on emigration, the Romanian Government allowed Jews to emigrate between 1948 and 1951. During this period, 120 thousand of Jews emigrated. In 1952 the Romanian Government changed the policy on Jewish emigration, which led to an additional 150 thousand Jews emigrating between 1952 and 1989. In return, the Romanian Government received economic aid from Israel. Initially, the Romanian Government did not support the emigration of highly skilled Romanian Jews, but by the end of the 1970s

Table 4.1: Composition of Romanian and emigrant populations by ethnicity (1977 in %)

Ethnicity	Ethnicity (%)	Emigrants (%)	Total (mil.)
Romanians	87%	35.5%	17.6
Germans	1.6%	44.2%	0.359
Hungarians	7.9%	12.8%	1.71
Jews	0.1%	5.5%	0.024
Others	3.3%	2.1%	1.71

Source: (INSSE, 1977)

Note: In 1977, Romania had a total population of 21.5 million inhabitants. Data on population stock.

and the beginning of the 1980s, the Government lifted these restrictions (OECD, 2019).

The emigration of ethnic Hungarians increased after 1985, with many crossing the border illegally without resident permits. This irregular emigration increased due to the restrictions imposed by the communist authorities, who feared a potential negative impact of the uncontrolled migration outflows. Another form of legal migration was family reunification, though the information regarding this type of migration is minimal. Table 4.1 shows the share of ethnic minorities in Romania and the share of emigrants according to ethnicity. As Census data from 1977 shows, Germans, together with Hungarians, represented more than 50% of all emigrants. That is to say, in 1977, around 1 million emigrants were ethnic Germans and Hungarians (Anghel et al., 2016; Horváth, 2007).

4.1.3 Emigration after 1989

The political changes in Romania after 1989 brought significant changes to Romania's emigration pattern (OECD, 2019). These changes also significantly impacted the migration system and its governance. For instance, at border crossings, those leaving were obliged to prove they had a certain amount of money. This measure did not have any impact on emigration flows. Irregular emigration increased during this period. The Romanian authorities created the Labour Force Migration Office in 2002 to regulate the emigration flows. The office's role was to administer the inflows of foreigners and provide information and guidance to potential Romanian emigrants. The office was also in charge of recruitment and work placement abroad. In this regard, Romania signed bilateral agreements with Spain and Italy on labour migration and contracts with private job agencies (Horváth, 2007).

Horváth and Gabriel Anghel (2009) divide the post-socialist emigration from Romania into six emigration periods or phases mainly on the bases of their distinct characteristics (see Table 4.2): the first phase between 1990 and 1993; the second phase between 1994 and 1996; the third phase between 1997 and 2001; the fourth phase between 2002 and 2006; the fifth phase between 2007-2009; and the sixth phase after 2009 (Horváth and Gabriel Anghel, 2009).

The period after 1989 represents the shift from mainly ethnic migration to labour

Table 4.2: Phases of Romanian emigration

Period	Time horizon for migration	Main goal of migration	Major countries of destinations	Main characteristics
1990-1993	Definitive	Reallocation	Germany, Hungary, France	Ethnic migration; asylum seekers
1994-1996	Temporary/ circular	Labour	Hungary, Israel, Turkey	Labour migration emerges
1997-2001	Circular/ prospects for long-term legal residence	Labour	Hungary, Italy, Spain, Ireland	Labour migration grows significantly (mostly irregular); Romanian migrants in Italy and Spain enter regularization programmes
2002-2006	Prospects for long-term legal residence	Labour, long-term residence	Italy, Spain	
2007-2009	Possibility for long-term legal residence; formal employment	Labour, long-term residence	Italy, Spain, other EU countries	Labour migration continues but at lower levels; limited return migration
After 2009	Mixed: long-term, temporary	Labour, long-term residence	Decreasing communities in Italy and Spain, migration oriented to Germany and the UK	Labour migration continues. New patterns of migration; seasonal work in Germany; temporary migration to the UK; increasing return migration; re-emigration from Italy and Spain towards Germany and the UK ; visible precarious migration in many European countries.

Source:(Horváth and Gabriel Anghel, 2009)

migration and the exodus of the young Romanian workforce. During the first years after the change in regime, the emigration of ethnic Germans, Jews and Hungarians continued. In addition, there were some asylum seekers, primarily ethnic Romas (Sandu, 2018; Anghel et al., 2016). After 1993, the emigration of ethnic Germans ended, but new destinations appeared. In 1994 labour emigration increased significantly among Romanians while the ethnic emigration of Hungarians and some asylum seekers continued. Furthermore, irregular migration, shuttle migration, and marriage migration from Romania also increased. This trend continued until 1996. In 1997, circular migration and human trafficking were also increasing. In 1999, bilateral agreements for labour migration were signed with Spain and Germany, and some specific recruitment policies emerged. After 2002, Romanians were allowed to enter the European Union without visas which led to increasing irregular migration flows toward Spain and Italy due to the demand for unskilled labour. In 2007 Romania became a member of the European Union, allowing irregular migrants already living and working in other EU countries to regularise their migration status (Anghel et al., 2016).

1990 to 1993

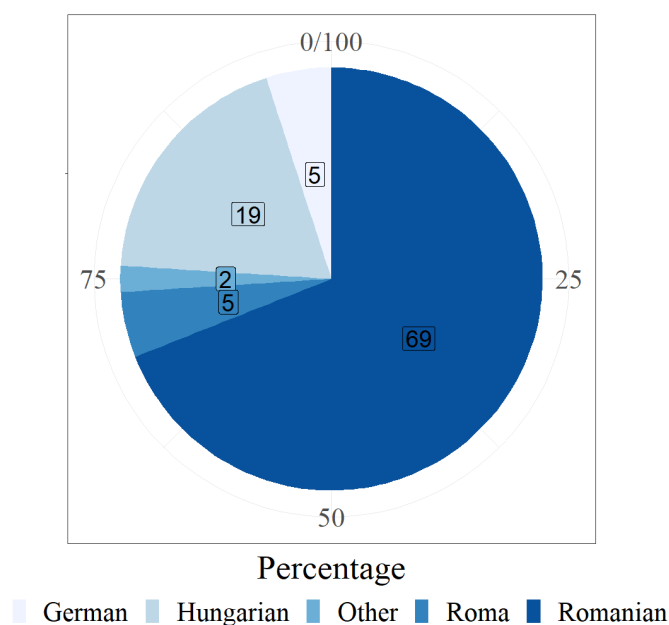
During the first two years after the regime change, most ethnic Germans managed to migrate to Germany while the emigration of other Romanians increased together with a flow of asylum applicants. Shortly after 1990, Germany's migration policy became more restrictive. This period of emigration was vital for the development of Romania's subsequent emigration flows (Anghel et al., 2016; Horváth, 2007).

Most ethnic Germans that migrated before and after 1989 kept their ties to their

communities of origin. The emigration of ethnic Germans caused further emigration of non-German family members towards Germany. Table 4.1 shows the share of emigrants by ethnicity. The share of Romanian emigrants increased from 35.5% in 1977 to 69% in 1992, followed by ethnic Hungarians with 19% and 5% of ethnic Germans. In 1977, ethnic Germans represented most of the emigrants, with 44.2%.

By 1989 most German ethnics from Romania had managed to emigrate, leaving just a few ethnic behind. Therefore, the share of ethnic German emigrants decreased significantly during this period. According to the 1992 Romanian Census, most emigrants identified as Romanian complementing the theory that after 1993, there was a shift in the emigration pattern from mainly ethnic to mainly labour (see Figure 4.2).

Figure 4.2: Share of Romanian emigrants by ethnicity (1992)



Source: (IPUMS, 2020)

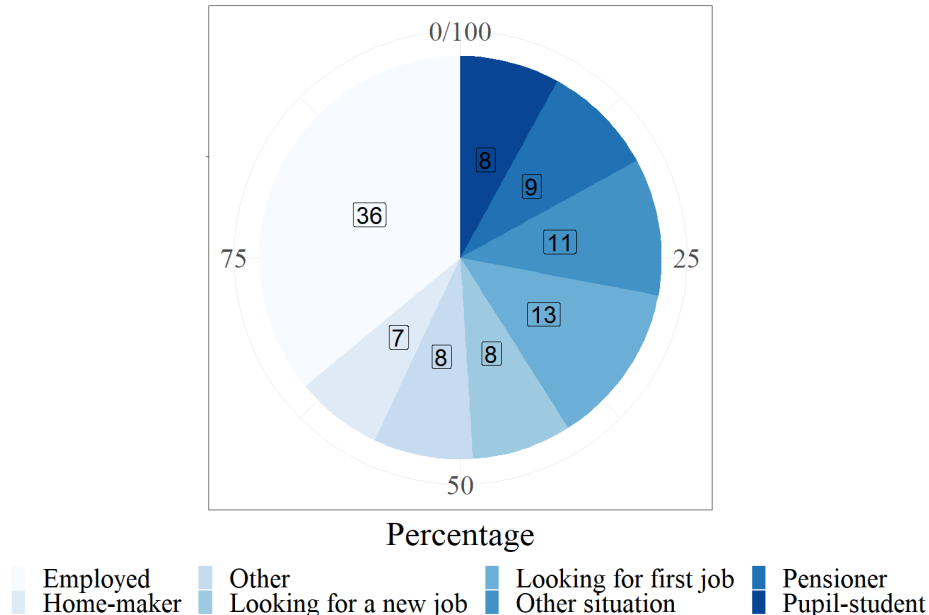
The migration of ethnic Germans from Romania to Germany was not only return migration, but it had a certain degree of circularity due to their involvement at the origin. As a result, at the beginning of the 1990s, ethnic organisations were born in Romania. These networks became the foundations of the temporary labour migration to Germany and other EU countries (Anghel et al., 2016; Michalon, 2003a,b).

The period between 1990 and 1993 was marked by a strong wave of Romanians that requested political asylum in Germany, representing the second-largest category of Romanian emigrants until 1994. Romanians also represented the largest groups of citizens applying for political asylum during this time in Germany. In 1992, Germany received about 60 thousand asylum applications. In 1993, more than 140 thousand asylum applications were from Romanian citizens. Around half of the asylum applicants were ethnic Roma complaining about increasing discrimination in Romania. But in 1993, Romania was considered a safe country, and political asylum applications were denied

(Reyniers, 2003; Kurthen, 1995; Anghel et al., 2016). During this first phase of emigration, Germany was the main destination for Romanian emigrants. Emigration to Germany continued after 1993 at a much lower pace, mainly through migration for marriage and labour. Between 1980 and 1993, Germany was the main entry point of Romanians to Western Europe. Around 500 thousand migrants from Romania emigrated to Germany within this period. Between 1990 and 1994, Germany issued an average of 180 thousand tourist visas for Romanian citizens - the largest number of tourist visas issued and greater than the number of visas issued for all the other European countries combined. Many Romanians who received these invitations went to other European countries afterwards (Anghel et al., 2016).

Another important wave of emigration was to Hungary. After the fall of communism, the emigration of ethnic Hungarians continued in the form of permanent and temporary migration to fill jobs in the primary or secondary labour markets (Anghel et al., 2016). According to the 1992 Census (see Figure 4.3), 36% of Romanian emigrants were employed in the host country, 16% were looking for a job, around 9% were students, 11% were pensioners, around 7% were home-makers and another 8% were supported by another person.

Figure 4.3: Relative distribution of Romanian emigrants living abroad by economic activity (1992)

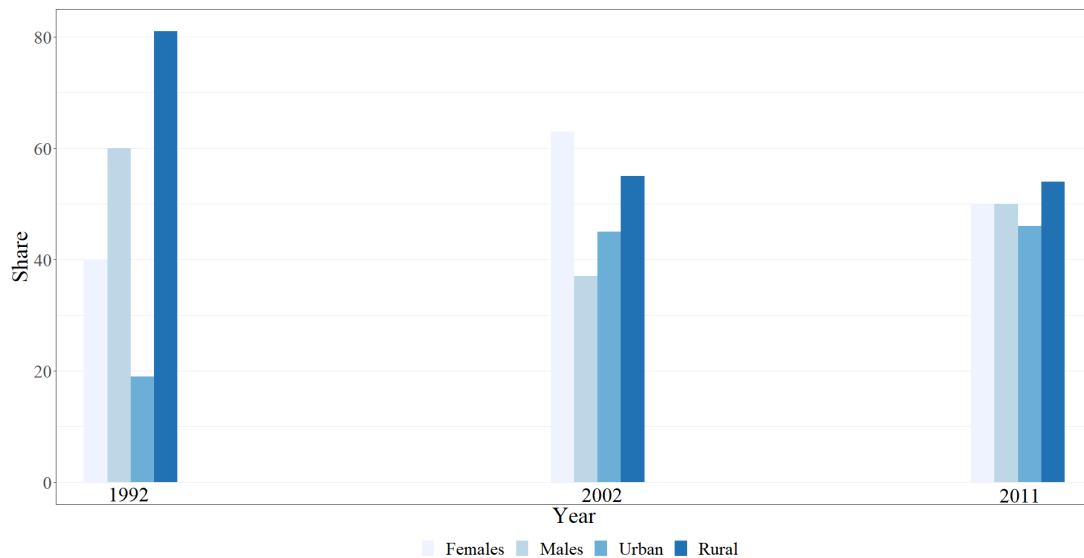


Source: (IPUMS, 2020)

In addition to the flows to Germany and Hungary, other forms of international mobility, such as petty trade, began in the former Yugoslavia, Turkey, Poland, and Hungary. Romanian petty traders emigrated in search of alternative economic niches while maintaining their residence in Romania. Some of the workers recruited during the communist regime to work in several Arab countries, such as Libya, Iran, Iraq, and Egypt, became pioneers in the emigration to Western Europe. Some of these pre-1989 emigrants

were members of the Adventist church and used the church's network to emigrate to other countries. Many of them were bricklayers or carpenters who found employment in Spain. This network expanded over the years, and many of their Orthodox relatives and friends managed to emigrate afterwards (Anghel et al., 2016).

Figure 4.4: Relative distribution of Romanian emigrants by gender and urban/rural classification (1992-2011)



Source: (IPUMS, 2020)

In 1992, the first Romanian Census (INSSE, 1992) after the change in the political system was conducted. The Census data shows that emigration from Romania was predominantly male and from urban areas (see Figures 4.4).

1994 to 1996

The second phase of Romanian emigration occurred between 1994 and 1996. This period is marked by less intense international emigration but is still diversified. During this time, seasonal and circular emigration was predominant, followed by a brain drain, mainly consisting of students, ethnic emigrants, marriage migrants and disguised tourists. As a result, the church played an essential role for Romanian emigrants again. Different from the previous phase was the fact that this time the Catholic Church helped catholic confidants from the Moldova region of eastern Romania to migrate to Italy. At the same time, religious organisations supported neo-Protestants to move to Germany and Spain. Throughout the 1990s, religion played an essential role in the decision-making of Romanians to migrate or not. Stan (2005) pointed out an important aspect of the marked differences between Catholic and Orthodox Church members that emigrated abroad. He found that catholic migrants from eastern Romania had better accommodation and labour market opportunities using their ties to the Catholic Church in Italy, while members of the Orthodox Church abroad did not find a network that could help them (Anghel et al.,

2016; Stan, 2005). There is a lack of literature regarding the emigration of Romanians from cities. However, several studies on brain drain, such as the studies of Ferro (2004) and Nedelcu (2000), indicate that migration from cities happened on an individual level and not within a network, as mentioned above. Furthermore, these studies indicate that the emigration of qualified Romanian workers was more common in urban than rural areas. Two studies by Potot (2000, 2003) highlight the importance of individual decision-making by young people from urban areas migrating to Nice (France) and London between 1994 and 1995 (Anghel et al., 2016). Potot interviewed several migrants from Romania who planned to live abroad for a short time and then return to Romania to open a small business. The interviewed migrants moved to France by requesting political asylum and managed to make a living by selling newspapers. Another critical aspect pointed out by Potot (2000, 2003) is the fact that Romanian emigrants from urban areas were more likely to move abroad than Romanian emigrants from rural areas (Anghel et al., 2016; Potot, 2000).

Until 1995, temporary emigration rates were relatively low, below 5 per thousand inhabitants per year. Different from the first period, the main destination countries were now Israel, Turkey, Hungary, and Italy. Emigration from urban areas was still predominant, and most of the emigrants were middle-aged, between 30 and 54 years old (Stan et al., 2009).

1997 to 2001

The third stage of Romanian emigration from 1997 to 2001 was marked by the de-industrialisation of the former socialist industries and the population's impoverishment. The process of de-industrialisation generated much pressure among Romanians, many of whom lost their jobs, creating a large class of potential migrants. A study by Grigoraş (2001) highlights the case of a small mono-industrial town in Transylvania. This town developed during the communist regime due to internal migration and was marked by the emigration of ethnic Germans during the communist regime. Nevertheless, its most significant emigration wave occurred in 1990, after all the industries closed. Therefore, this massive restructuring in Romania, with the de-industrialisation of most of the former socialist industries, where from 9.5 million jobs in 1990, only 4.5 million remained active by 1999, created a huge mass of potential emigrants. This partially explains the development of Romanian emigration after 1997. Through the increase in emigration, some emigration patterns became more explicit, different from the previous pattern when irregular migration was mainly exploratory. Furthermore, after 1997 emigration from Romania developed a high degree of regionalisation. For example, people from western Romania, a region that ethnic Germans previously inhabited, tended to migrate to Germany. Ethnic Hungarians were still emigrating to Hungary, while ethnic Romas from the Cluj region, Transylvania, tended to move to France. Emigration to Turkey and Israel was mainly from eastern

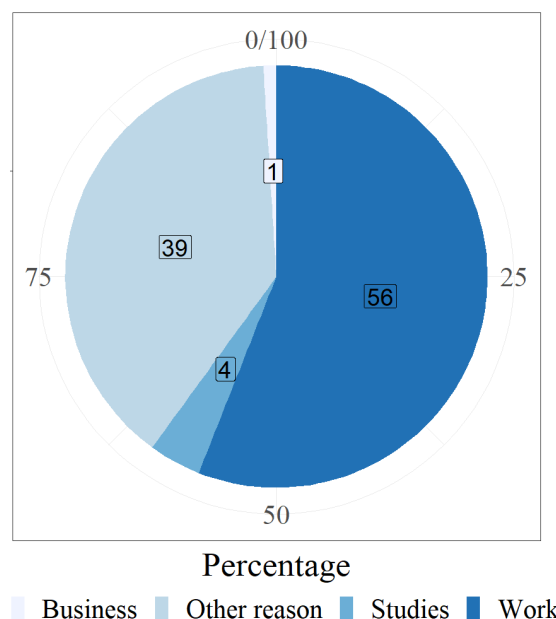
Romania. By 1999, Israel had about 70 thousand labour migrants from Romania within the construction sector coming from eastern Romania. Many emigrants from southern Romania and Transylvania began moving to Spain and emigrated to Italy from eastern Romania (Anghel et al., 2016; Sandu, 2018).

Research on Romanian migrants in Italy (Anghel et al., 2016; Cingolani and Piperno, 2006; Vlase, 2008; Bleahu, 2007) Spain (Şerban, 2008; Şerban and Grigoraş, 2000; Elrick and Ciobanu, 2009), or France (Diminescu et al., 2003) indicate that the main factor behind this regionalisation was the presence of solid migration networks. Other authors consider Romania's emigration circular with migrants shuttling between Romania and other European countries. According to Stan (2005), Romanians first did not see the host countries as countries of settlement but rather as countries that could provide a good income. This issue is valid for the period until 2001, when most Romanian migrants in Spain and Italy did not have a legal status (Anghel et al., 2016).

2002 to 2006

Between 2000 and 2002, some institutional changes significantly impacted Romania's migration dynamics. In 2000, Romania was invited to join the European Union, and the visa regime for Western European countries was abolished. Starting in 2002, Romanian citizens had the right to free movement within the European Union. This generated mass emigration from Romania towards Western Europe, primarily to Spain and Italy. After 2002 migration was less costly and spread all over Romania (Anghel et al., 2016).

Figure 4.5: Reasons of the absence of Romanian emigrants (2002)



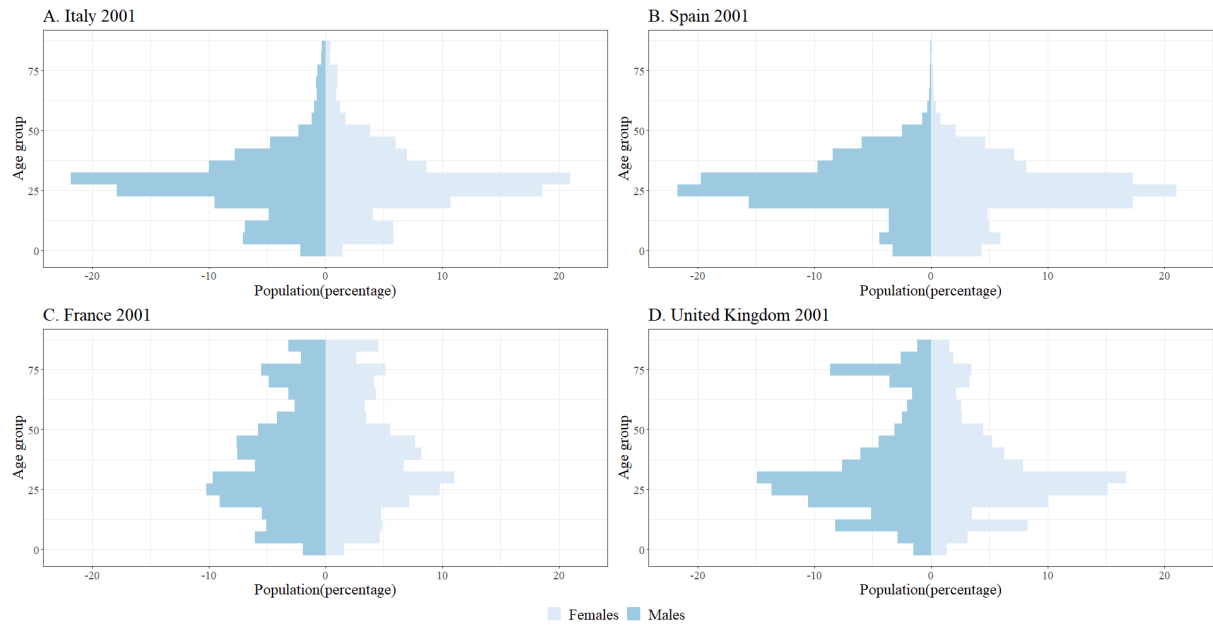
Source: (IPUMS, 2020)

Note: The category of "other reasons" includes family reasons.

Census data from 2002 shows that emigration from Romania became predominantly

female and from urban areas (see Figure 4.4) Compared with the urban-rural classification from the previous 1992 Romanian Census, emigration from rural areas increased significantly during this period, from 19% to 45%. As of 2002, more than half of all Romanian emigrants were absent for labour reasons and 39% for other reasons, including mostly family reason (see Figure 4.5).

Figure 4.6: Age structure of Romanian emigrants by country of destination (2001)



Note: Data on the stock of Romanian immigrants from the 2001 Censuses of Italy, Spain, France and UK.
Source: (CensusHub, 2014)

To better understand the age and gender distribution of the Romanian emigrants, we analysed the data on the stock of Romanian immigrants in the main destinations, Italy, Spain, France, and the UK (figure 4.6). Data from the Italian Census 2001 indicates that most Romanians are concentrated within the age group of 20 to 34 years. The pattern of Romanian migrants in Spain is similar to that observed in Italy. In the case of France, the pattern changed utterly. Most Romanian migrants living in France were concentrated in two age groups: between 20 and 34 and between 40 and 54 years. In France, females predominate in the age groups of 25-34 years, and there is a higher concentration of Romanian migrants between the ages of 65 to 75 years compared to the other three destinations. As for the UK, females predominate in the age group between 30 and 34 years. Between 70 and 75 years, there is a higher concentration of Romanian male migrants in the UK. The census data from these four main destinations reveals that Romanian migrants are relatively young, except for France.

2007 to 2009

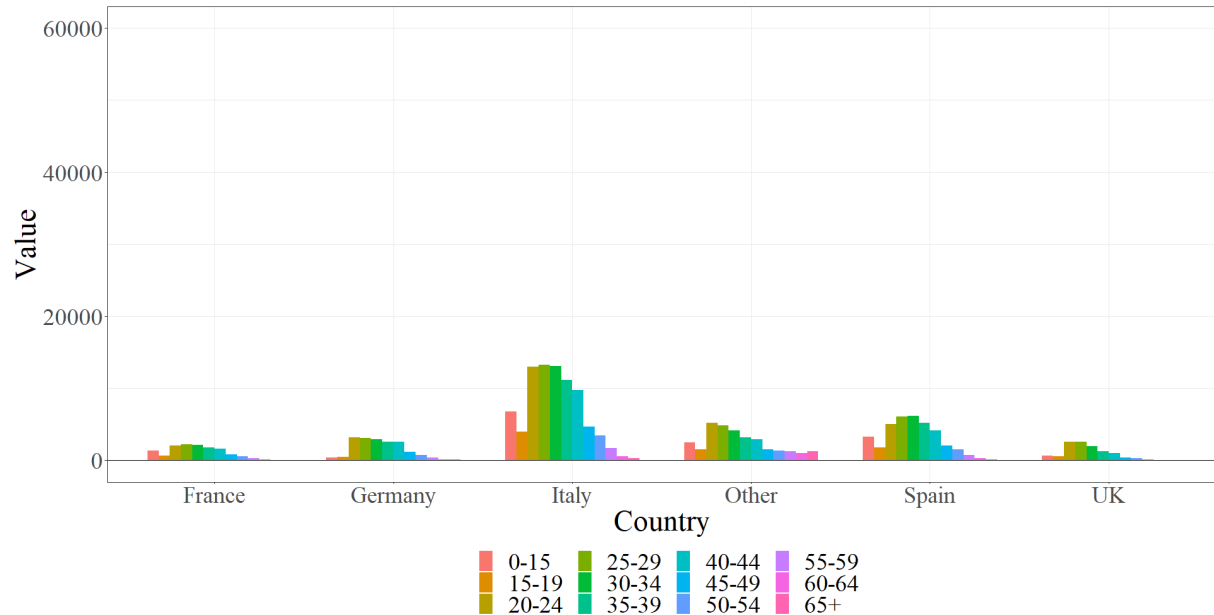
The year 2007 was marked by the entrance of Romania to the European Union. With this change, emigration to the European Union was fully legalised, and the outflow of Romanian emigrants increased significantly. A year after Romania joined the EU, the 2008 global financial crisis impacted the patterns of Romanian migration again since the two main countries of destination, Italy and Spain, were severely affected by the crisis. The most affected sector was construction, which experienced a significant cut in the labour force and many people, including many Romanian migrants, lost their jobs. According to the World Bank, the unemployment rate in Spain increased from 8.23% in 2007 to 26.09% in 2013. In Italy, the unemployment rate increased from 6.08% in 2007 to 12.68% in 2014 (World-Bank, 2021; Goschin et al., 2010). The study of Stănculescu et al. (2012) indicates that men were more affected than women since most men worked in the construction sector while most women worked in the care sector. Western European countries were already characterised by ageing populations and had a labour deficit in the care sector. Therefore, women were able to keep their jobs (Stănculescu et al., 2012). A survey conducted by Marcu (2011) A survey conducted by Marcu (2011) in the Madrid area indicated that 71% of Romanian migrants had return intentions. Another study conducted by Mara (2012) Italy compared Romanian migrants who arrived in Italy before 2007 to those who arrived after 2007. The study concluded that most Romanian migrants that arrived before 2007 had long-term migration intentions, while those who arrived after had no predefined plans regarding their stay. The economic crisis forced Romanian migrants to find alternative ways. In 2014, many Romanians emigrated to northern Europe, mainly to Germany, the UK, and Scandinavian countries. The growing number of Romanian emigrants to the UK is explained by the job opportunities in the secondary sector. The significant emigration to Germany was related to the previously established links but also the increasing seasonal job opportunities for European citizens in agriculture (INSSE, 2022; World-Bank, 2021). According to Ceobanu and Koropecj-Cox (2013), it is plausible to affirm that many Romanian migrants in Spain re-emigrated to other European countries in search of jobs (Anghel et al., 2016). At the same time, the impact of the economic crisis was powerful in Romania, with the annual unemployment rate increasing from 4.1% in 2007 to 7.8% in 2011. Compared to Italy and Spain, the effects on unemployment were lower since over two million Romanians were working abroad (Goschin et al., 2010).

After 2009

In 2011 countries of the European Union held their population census. Data from the 2011 Romanian Census refers to the stock of Romanian emigrants. The Census categorised migrants as long-term emigrants and short-term emigrants. Long-term emigrants are persons that left Romania for a period longer than 12 months. Short-term emigrants are

persons that leave Romania for a period shorter than 12 months. Figure 4.7 shows the main destinations for short-term Romanian emigrants by age group.

Figure 4.7: Main countries of destination of short-term Romanian emigrants (2011)



Note: Data on short-term emigration, less than 12 months.

Source: INSSE (2011b)

According to the census data, most short-term emigrants emigrated to Italy for economic reasons. Short-term emigrants usually engage in seasonal or temporary jobs in agriculture and construction. This type of emigration primarily includes young people between 20 and 40 years (Horváth, 2007). In the other four main destinations, Spain, France, the UK and Germany, short-term Romanian migrants follow the same age pattern as in Italy.

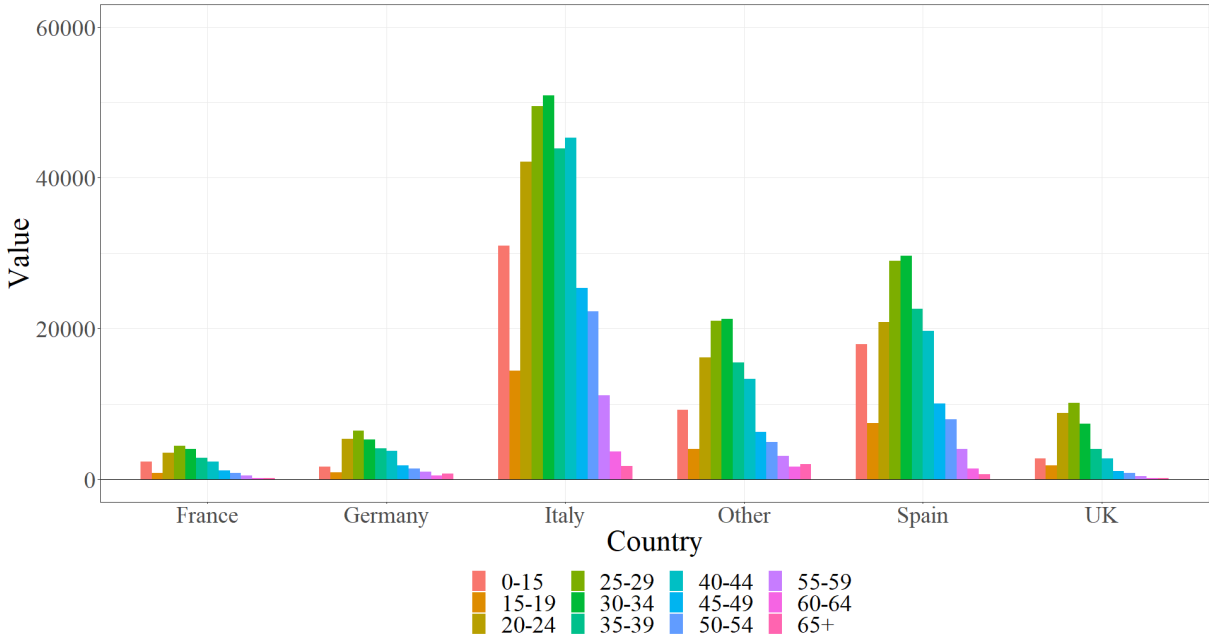
Figure 4.8 presents the data on long-term Romanian emigration according to their main countries of destination by age group. The pattern is similar to the case of short-term emigration. By 2011, most Romanian emigrants were in Italy. Many long-term Romanian migrants in Italy are between 20 and 45 years old. A similar age pattern was observed in Spain, France, the UK, and Germany.

Between 1992 and 2002, emigration from Romania became predominantly feminine. By 2011, the share of female emigrants was almost equal to that of male emigrants (figure 4.4)

The majority of emigrants come from urban areas, 54%, while 46% come from rural areas. Between 1992 and 2011, emigration from rural areas increased significantly from 19% to 46% (figure 4.4).

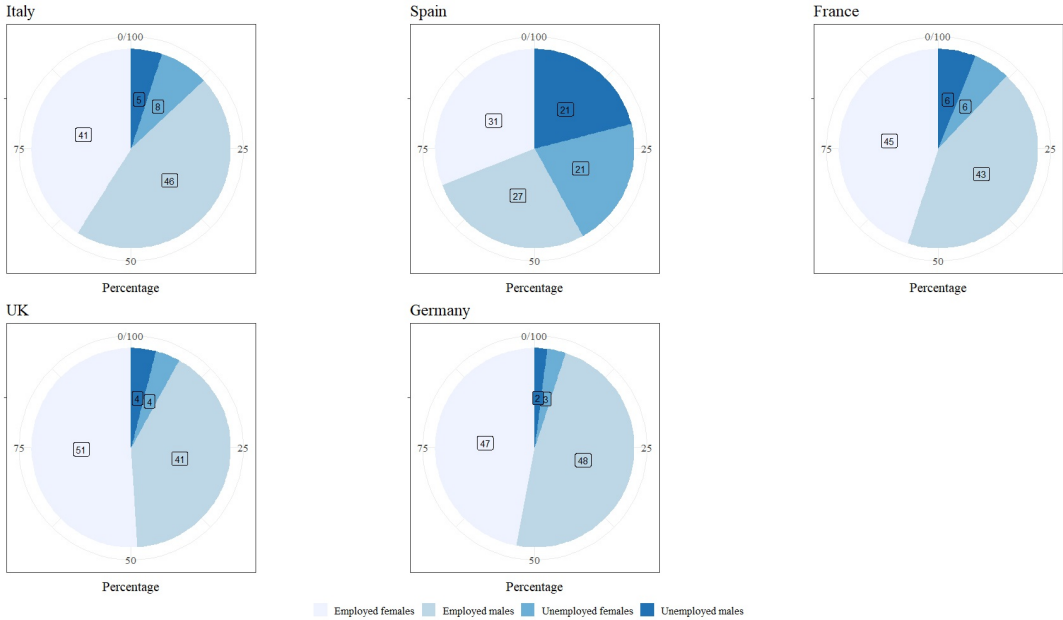
Based on census data from the main countries of destination, Italy, Spain, France, the UK, and Germany (CensusHub, 2014) figure 4.9 The figure shows the proportion of

Figure 4.8: Main countries of destination of long-term Romanian emigrants (2011)



Note: Data on long-term emigration stock, more than 12 months.
Source: INSSE (2011b)

Figure 4.9: Relative distribution of Romanian emigrants living abroad by economic activity (2011)



Note: Data on long-term emigration stock, more than 12 months.
Source: (INSSE, 2011b)

Romanian migrants participating in the labour market in these countries. Spain had the highest rate of unemployed Romanian migrants. Among Romanian male migrants, 21% were unemployed, and among Romanian female migrants, 21% were unemployed. Among these countries, the UK had the highest proportion of Romanian male migrants employed,

51%. Germany had the highest share of Romanian female migrants employed, 47%. The lowest share of Romanian migrants unemployed was observed in Germany, with only 2% of male migrants and 3% of female migrants were unemployed.

Figure 4.10 refers to Romanian migrants born in Romania and people with Romanian citizenship (not necessarily born in Romania). Therefore, those belonging to the age groups 0 to 10 years are supposed to be born at the destination. Between 2001 and 2011, the migration of Romanians to Italy and Spain intensified. The same pattern appears in France and the UK.

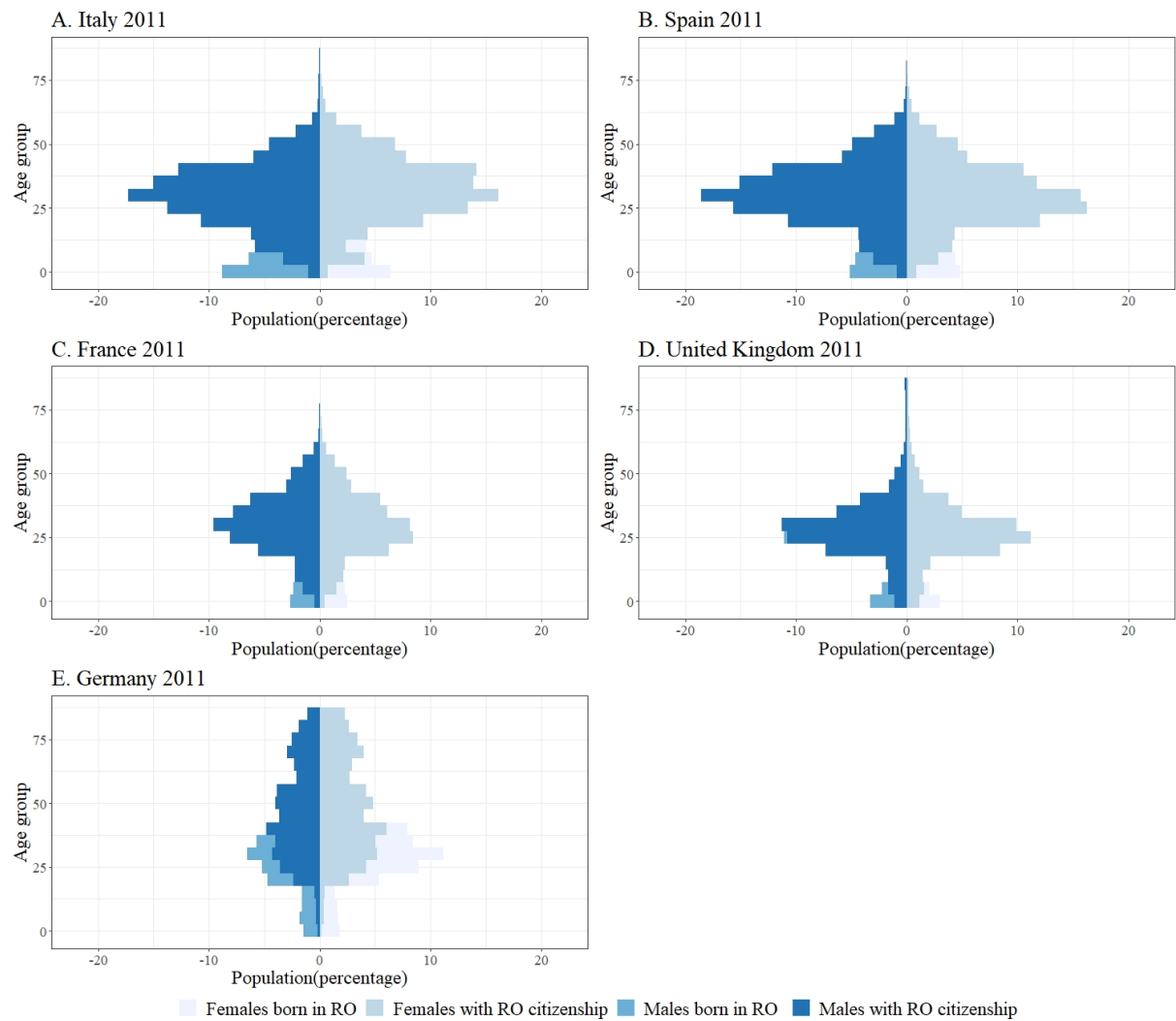
Romanian migrants in Germany follow a very different pattern than the one observed in Italy, Spain, the UK, and France. Romanian migrants in Germany are much older, and most do not have Romanian nationality anymore. This is explained by the emigration of ethnic Germans during the 1980s and 1990s. The emigration of ethnic Germans was supported through bilateral agreements between Germany and Romania during the communist period. Therefore, those emigrating were granted German citizenship and specific benefits, as mentioned in section 3.1.2 (Emigration During the Communist Regime) (Horváth, 2007; Horváth and Gabriel Anghel, 2009).

The data suggests that Romania's emigration profile went through many phases primarily because of political changes, from a communist regime to a democratic system and becoming a member of the European Union. At the beginning of the 1990s, emigration was concentrated within more advanced age groups. Along with the shift from ethnic migration to labour migration, there was also a shift within the age groups and emigration became more predominant among people in the working-age group between 20 and 34 years of age. Because of large emigration flows and fertility under replacement level, Romania is losing its young labour force and experiencing an accelerated ageing process. Since 2002, many institutions assisting and fostering migration developed in Romania. These included interpersonal networks, transportation facilities and information resources (Horváth and Gabriel Anghel, 2009). Furthermore, in 2002, the Spanish government signed a bilateral agreement with the Romanian government. This agreement allowed Romanian workers to work temporarily in Spain. The same year the Schengen visa requirements were lifted, enabling Romanians to stay up to three months in the Member States. Those who wanted to stay longer needed to prove they could support themselves financially (Rodriguez, 2022).

From Permanent to Temporary Emigration

During the communist regime, emigration from Romania was primarily permanent. Most emigrants were ethnic German, Hungarians and Jews. The communist government had control over the migration flows. Therefore, when emigrants moved abroad, they had to establish their legal residence at the destination. Once emigrants established their domicile abroad, they were categorised as permanent emigrants. Until 1993, permanent emigration was constant. In 1994, the number of permanent emigrants decreased from

Figure 4.10: Age structure of Romanian emigrants by country of destination (2011)



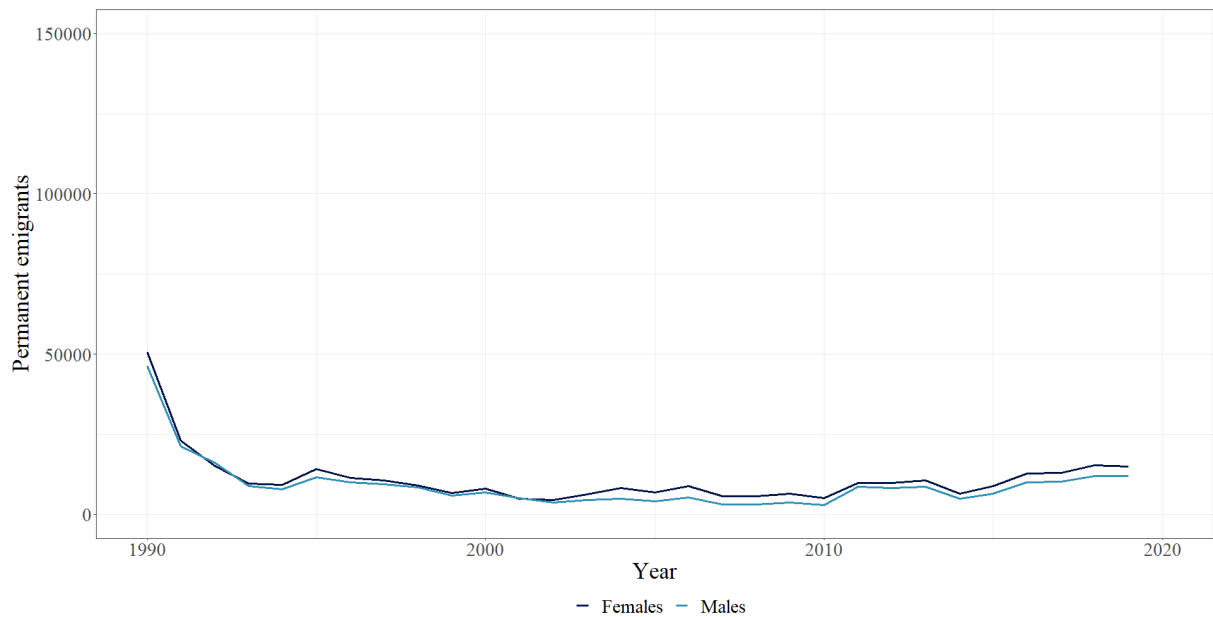
Note: This graphic refers to the stock of Romanian migrants in the main destinations countries. The graphics present the share of Romanian migrants born in Romania and the share of Romanian migrants with Romanian nationality, not necessarily born in Romania.

Source: (CensusHub, 2014)

about 100 thousand to approximately 20 thousand annually 4.11).

In the meantime, temporary emigration increased significantly, meaning that most Romanian migrants kept their permanent legal residence or domicile in Romania. By keeping their permanent legal residence in Romania, temporary emigrants have a higher probability of returning to Romania due to the access to social security social benefits that the permanent residency status offers them (figure 4.12). In absolute numbers between 2008 and 2018, temporary emigration was about ten times higher than permanent emigration. For example, in 2010, there were around 10 thousand total permanent emigrants compared to 197 thousand total temporary emigrants (INSSE, 2022). Figure 4.12 shows the feminisation of the temporary emigration process between 2008-2014.

Figure 4.11: Annual flow of Romanian permanent emigrants (1992-2019)



Note: Permanent emigration refers to long-term emigration lasting longer than 12 months and includes emigrants that change their legal residence or domicile at their destinations.

Source: (INSSE, 2022)

Figure 4.12: Annual flow of Romanian temporary emigrants (2008-2019)



Note: Temporary emigration refers to long-term emigration, longer than 12 months and includes emigrants that did not change their legal residence or domicile at their destinations.

Source: (INSSE, 2022)

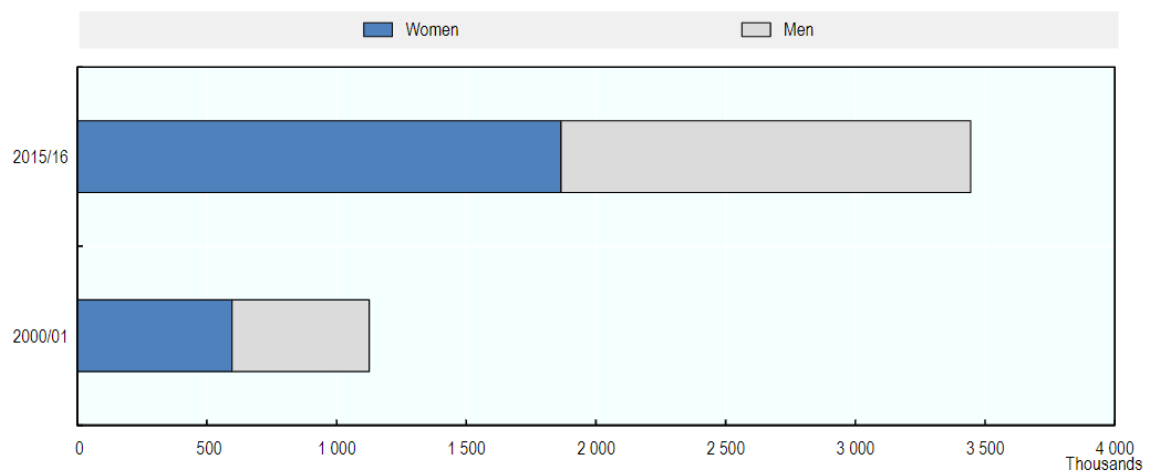
Feminisation of the Emigration Process

Recent data on Romanian temporary emigration flows from 2008 indicate that emigration became predominantly female. A possible explanation for the feminisation of

Romanian emigration might be the increasing demand for labour in care services in other European countries. Romanians in Italy and Spain contributed massively to staffing the older-adult care sector (Cangiano, 2014; León, 2010; Thévenon, 2013). These temporary emigration flows consist mainly of women working in Germany, Spain, Italy, the United Kingdom and other Western European countries.

More than half of the Romanian migrants living in the Organisation for Economic Co-operation and Development (OECD) countries between 2015-2016 were women (1.89 million), compared to 1.57 million Romanian male migrants. The number of Romanian women migrants grew by 213% between 2000 and 2016, while the number of Romanian male migrants increased by 197% during this period (see Figure 4.13) (OECD, 2019).

Figure 4.13: Gender composition of Romanian migrants in OECD Countries (2000-2001 and 2015-2016)



Source: (OECD, 2019)

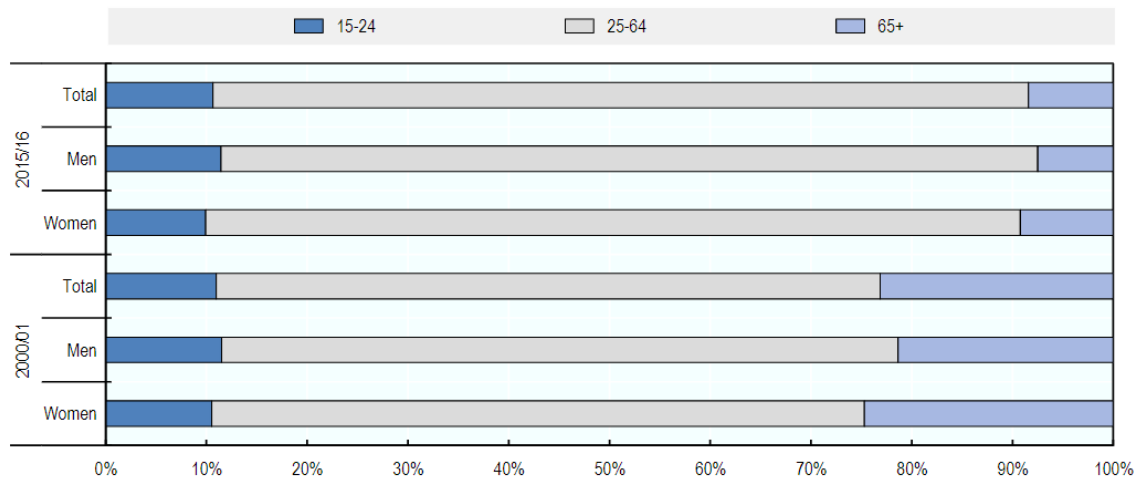
Changes in Migrants' Age-Structure

According to the 2019 OECD report on Romania (OECD, 2019), most Romanian migrants in OECD countries in 2015-2016 were of working age (92% of adults). Migrants aged 15 to 24 years represented 11% of all adults, while those between 25 and 64 years represented 81% of the adult population. Emigration from Romania is predominantly young. Between 2000-2016, Romania's emigration profile underwent a rejuvenation process, with the share of working-age migrants increasing by 15%, from 77 to 92%. During the same period, the share of Romanian migrants above 65 years decreased from almost a quarter in 2000-2001 to 8% in 2015-2016. Women contributed more to this rejuvenation process with 16%, while men contributed with 14% (see Figure 4.14). (OECD, 2019).

Changes in the Destinations of Romanian Emigrants (1990-2019)

As shown in the previous sections, Romania went through various phases of emigration over the past 30 years. The pattern changed from ethnic to labour emigration,

Figure 4.14: Age and gender distribution of Romanian emigrants in OECD countries (2000-2001 and 2015-2016)



Source: (OECD, 2019)

and the countries of destinations also changed over this period. In 1993, Romania signed the Agreement for Association with the European Union. This connected trade and cooperation accord with the EU to policy reforms in Romania. This was a turning point in Romania's domestic conditions and increased emigration towards Western European Countries. The official negotiations for accession to the European Union began in 2000, and the European Union lifted visa requirements for Romanians in 2002. This change eased the emigration of many Romanians and resulted in temporary circular migration due to restrictions on the length of stay. Romanians could stay 90 days without requesting a visa in Schengen countries. During this period, emigration to Italy and Spain increased significantly. In 2007, Romania joined the European Union, but Romanians did not have immediate access to free movement and labour markets within the bloc. Even though Article 45 of the Lisbon Treaty granted all EU citizens free movement and access to the labour market, many member states imposed transitional restrictions for Romanians to access the labour market. Therefore, a seven-year transitional period was imposed and divided into three phases, the so-called "2+3+2" period. During the first two years (first phase), national laws could regulate access to the labour market. The Member States were allowed to extend restrictions for an additional three years (second phase) upon notification to the European Commission. A final two-year (third phase) period of restrictions was allowed in certain situations, for example, if the Member States presented evidence of serious disturbance in their labour markets. These restrictions varied across the Member States, some simplifying the entrance into the labour market. The Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Poland, Slovenia, Slovakia, Finland and Sweden opened their labour market to Romanian migrants in 2007. In 2009, Denmark, Greece, Spain, Hungary, and Portugal removed the restrictions. Spain invoked the safeguard clause and re-imposed

restrictions for Romanian migrants in 2011. The same year, Italy and Ireland removed the restrictions after the second phase. Romanian migrants gained full access to labour markets across all Member States, including the UK, in 2014 (OECD, 2019).

The accession in 2007 and the global crisis in 2008 both shaped emigration flows from Romania. In 2007 and 2008, emigration flows were directed mainly towards Italy and Spain. After the global economic crisis, Italy and Spain experienced a sharp decrease in Romanian migration flows. As a result, flows of Romanian emigrants were reoriented towards Germany and later the United Kingdom. Between 2015 and 2016, Belgium, Netherlands and Denmark were in the top ten destinations for Romanian migrants. Between 2013 and 2014, Germany experienced a significant increase in Romanian migrant flows, from 140 thousand in 2013 to 200 thousand in 2014. The economic crisis could explain this increase. According to OECD, during the crisis, adverse economic conditions in Spain and Italy diverted Romanian flows of migrants from these two countries to Germany. Between 2012 and 2016, the United Kingdom became the second main destination for Romanian migrants. Overall, emigration to the United Kingdom increased fivefold between 2009 and 2016 (OECD, 2019). Furthermore, in 2016, Brexit negotiations with the European Union started, resulting in increased emigration flows to the United Kingdom. Studies (Acosta, 2021; Portes, 2022; Markova and King, 2021) show that the future of migrants in the United Kingdom is still uncertain, with some considering staying in the United Kingdom, some considering returning, and some considering moving elsewhere in Europe (Lulle et al., 2018).

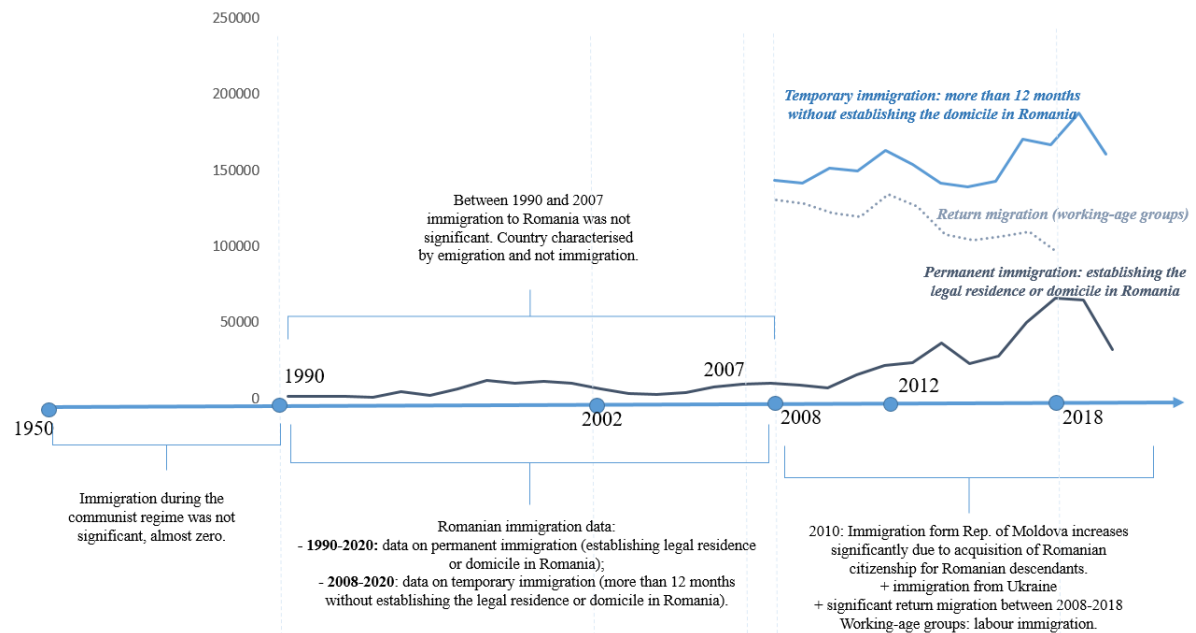
4.2 Romania's Immigration Profile

Figure 4.15 summarises Romania's immigration profile, showing the phases of immigration, from permanent to temporary and to return migration.

4.2.1 Immigration During the Communist Regime

During the communist regime, immigration to Romania was restricted. The entry of foreigners, especially from the West, was perceived as a potential threat to national security by the communist authorities. According to (Lazaroiu et al., 2003), during the communist regime, two types of immigrants came to Romania: Western foreigners that usually came to visit their families and friends and were strictly monitored, and international students. Western foreigners that came to visit family members or friends should not be considered immigrants since they were coming for short periods. On the other hand, international students from the Middle East and North African countries were allowed to enter Romania for study purposes. These students paid thousands of dollars for their studies and provided a significant amount of hard currency to public universities (Lazaroiu et al., 2003). In 1981,

Figure 4.15: Time-line of Romania's immigration profile



Source: (World-Bank, 2021; INSSE, 2022)

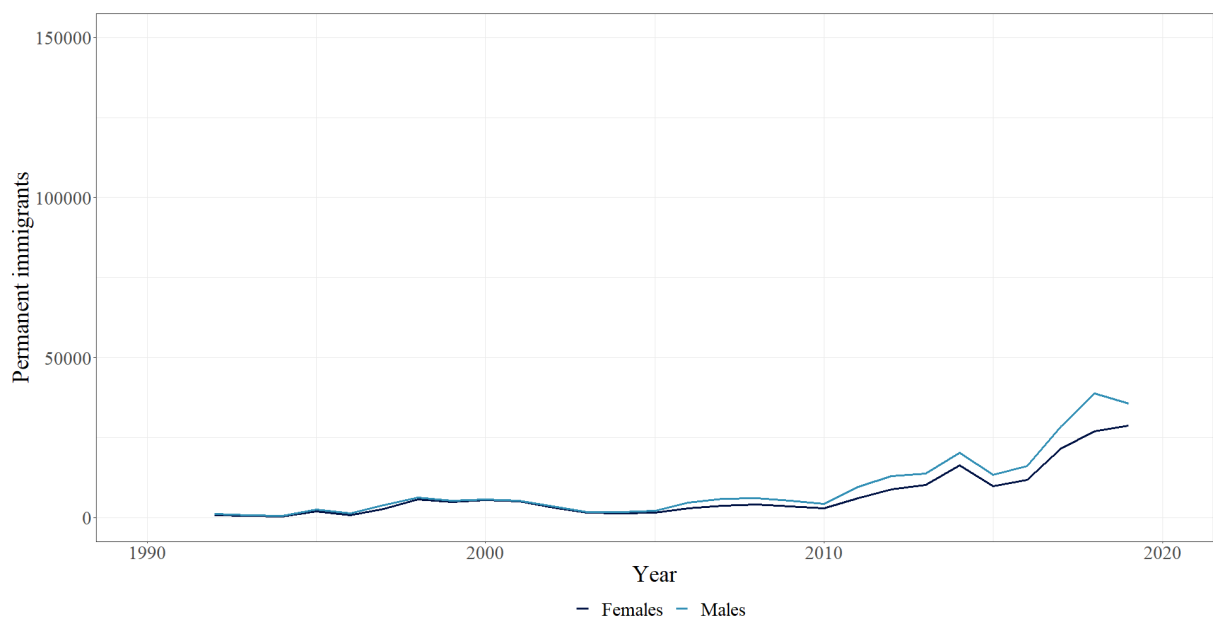
Romania registered the highest number of international students, around 17 thousands. At the time, these represented around 7% of the total students in Romania. The entrance of foreign students was based on the bilateral agreements called “Treaties of Friendship and Cooperation” between Romania and other developing countries. Between 1973 and 1985, thirteen such treaties were signed with 10 African countries. Therefore, during the communist period, immigration flows to Romania were insignificant (Lazaroiu et al., 2003; Hamberger, 2010).

4.2.2 Immigration after 1989

After 1990 with the fall of the communist regime, Romania had a relatively modest level of immigration. During the first years after the regime change, most immigrants coming to Romania were business people, labour migrants, and family members of former students that immigrated before 1990. Most of these immigrants came from Turkey, Syria, Jordan and China. Later in 1993, the National Office for Labour Force Migration from Romania identified other groups of business-related migrants in Romania. These were drivers and traders from Pakistan, India and Chinese immigrants working in gastronomy. At the beginning of the 1990s, the number of immigrants coming to Romania decreased compared to 1988, when around 12 thousand immigrants entered Romania, mainly as students. Between 1999 and 2001, the annual inflow of immigrants stabilised at 10 to 11 thousands (see Figure 4.16). Compared to other EU countries, immigration to Romania (2011) is very modest, representing only around 0.4% of the total population. Due to

Romanian's shortage of workers and high emigration, there is a continuing increase in labour demand in some economic sectors. Rapid ageing and the decline in domestic population make possible a scenario of increasing labour immigration in the coming years. Romania's accession to the EU has generated an essential stimulus for immigrants who want to enter the European Union and for whom Romania could be a first step towards the final destination, another EU country. Labour migration is closely linked to the possession of work permits. In 1996 only a few hundred work permits for foreigners were issued, but in 2008 the Romanian authorities issued more than 15 thousand work permits. Most foreign citizens working in Romania are from the Republic of Moldova, Turkey, China, Syria, Ukraine, Tunis and other countries (Stoica et al., 2009).

Figure 4.16: Annual flow of permanent immigrants in Romania (1992-2019)

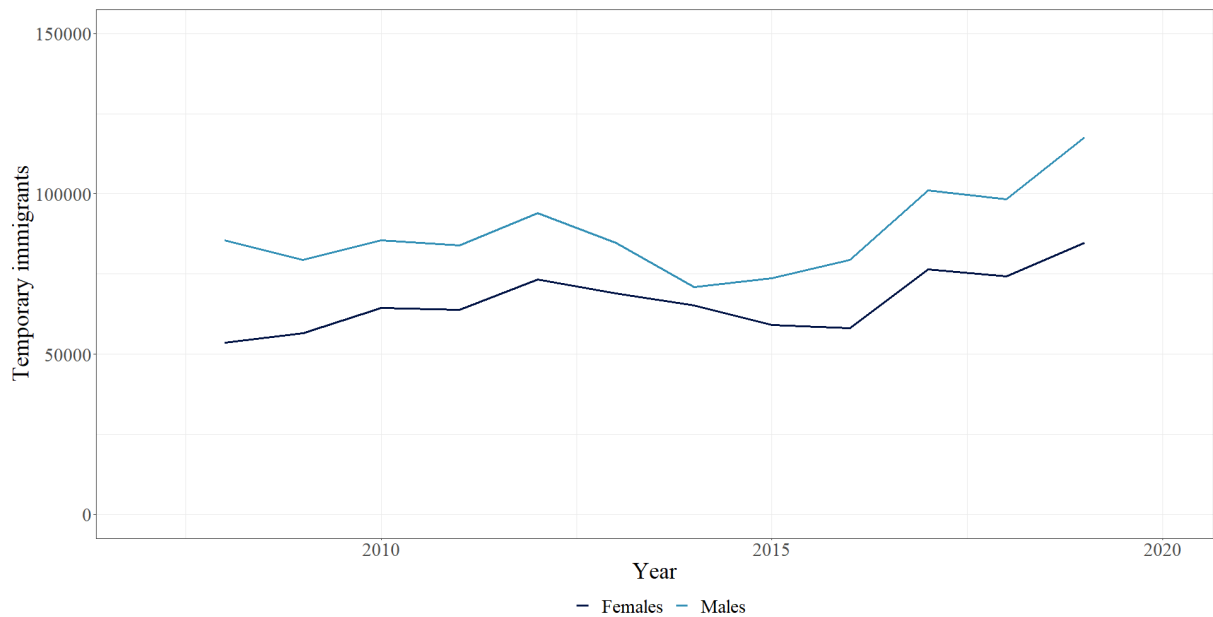


Source: (INSSE, 2022)

Note: Permanent immigrants are long-term immigrants that establish their legal permanent residence or domicile in Romania.

In 2008, 20% of the immigrants were from the Republic of Moldova, 13% were from Turkey, and 10% were Chinese nationals. The Romanian authorities supported immigration from the Republic of Moldova due to their shared historical links and common language (figure 4.17). The Romanian state is granting ethnic Romanians living in neighbouring countries privileged access to citizenship in the form of dispensation from the naturalisation requirements of other foreigners. Therefore, many citizens from the Republic of Moldavia have acquired Romanian citizenship (Iordachi, 2004). Meanwhile, immigration from the Republic of Moldova has increased due to labour demand in agriculture, especially in rural areas. After the EU accession, immigration flows from Moldova intensified and the number of Moldavian citizens who applied for citizenship - an estimated 500 thousand in 2007 (Stoica et al., 2009).

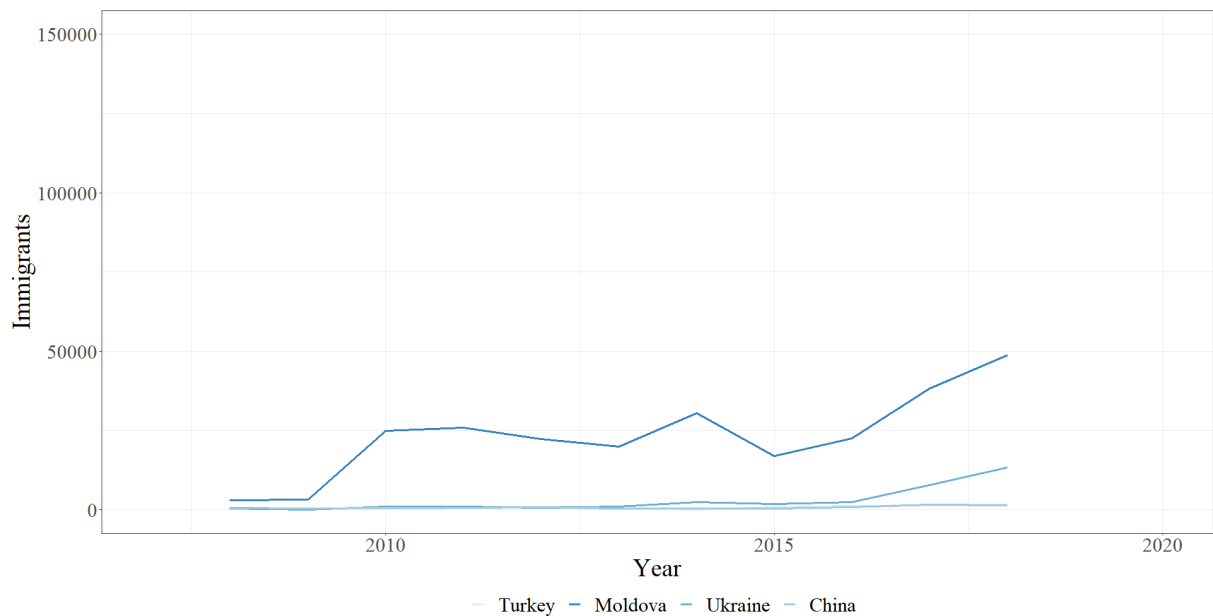
Figure 4.17: Annual flow of Romanian temporary immigrants (2008-2019)



Note: Temporary immigration refers to long-term immigration, longer than 12 months and includes emigrants that did not change their legal residence or domicile at their destinations.

Source: (INSSE, 2022)

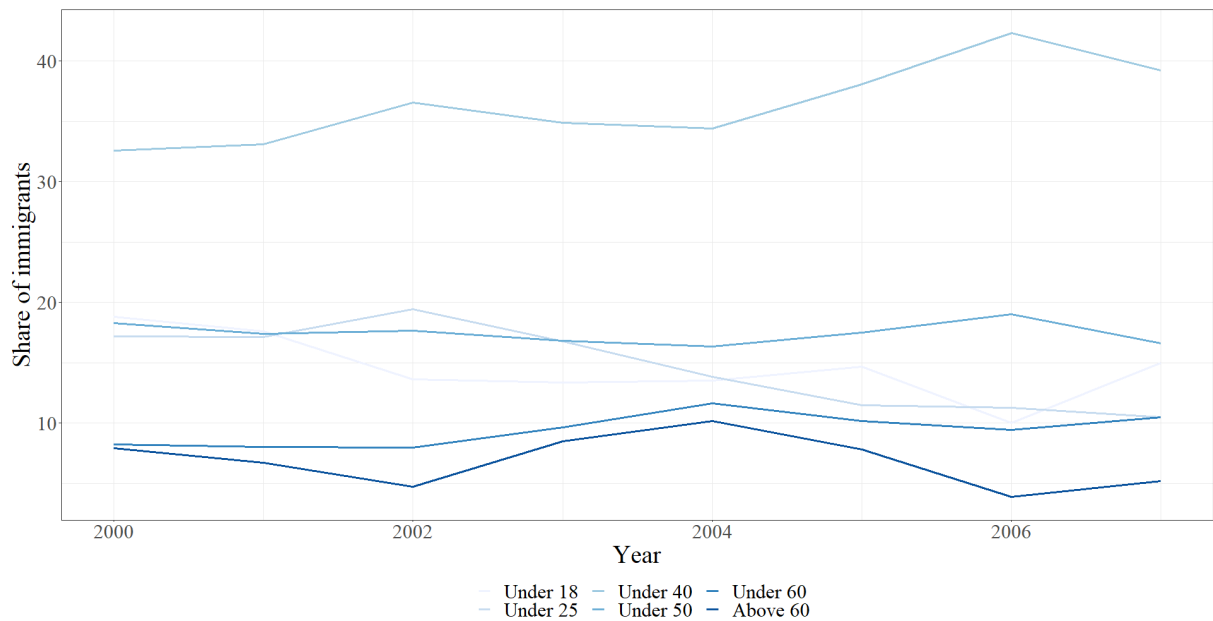
Figure 4.18: Annual flow of immigrants in Romania by country of birth (2008-2019)



Source: (Eurostat, 2021a)

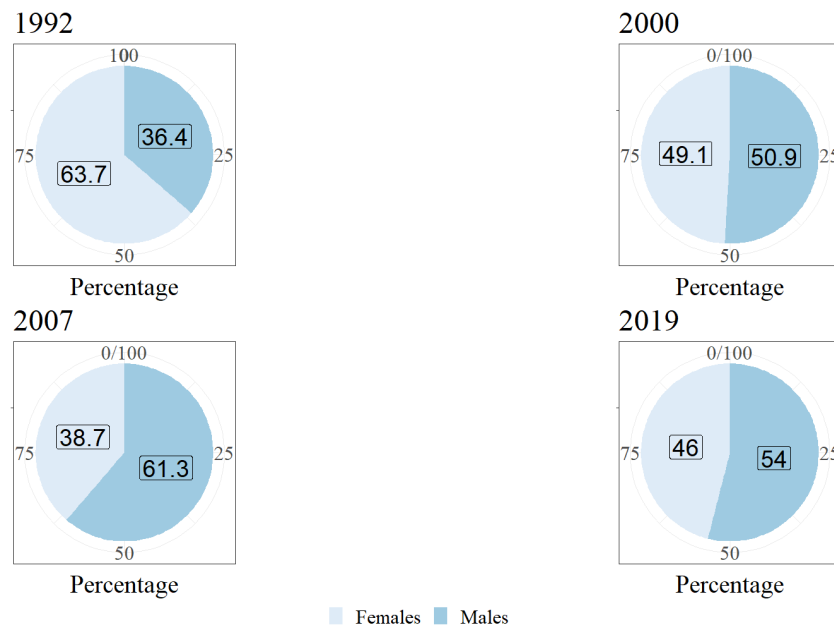
According to the Romanian National Institute of Statistics, between 30% and 40% of the immigrants moving to Romania are young adults below 40 years of age (see Figure 4.18), with great potential for integrating into the labour force. By 2008, the share of immigrants under 25 years and above 61 years decreased, and the share of immigrants between 25 and 60 years increased (Stoica et al., 2009).

Figure 4.19: Share of immigrants in Romania by age group (2000-2007 in %)



Source: (Yearbook, 2009)

Figure 4.20: Immigrants by gender in Romania (1992-2019)



Source: (Yearbook, 2009, 2016, 2020)

As seen in figures 4.19 and 4.20, the structure of immigrants in Romania changed over the past three decades. In 1992, female immigrants accounted for 63.7% of the total. Nevertheless, this pattern changed over the years, and immigration became predominantly male. In 2000 the share of female immigrants had decreased to 49.09%, with a further decrease by 2007, representing 38.27% of all immigrants. Recently, the share of female immigrants increased by 8 points, reaching 46% in 2019. So far, immigration to Romania is still modest compared to other Western European countries and to the country's emigration

flow towards Western Europe. Immigration to Romania has two main components: one flow originating from poorer neighbouring countries (Republic of Moldova and Ukraine) mainly due to historical ties, language and geographical proximity, and another from Asian countries such as China, Vietnam, Pakistan and Afghanistan. According to Fleşer (2012), Romania's immigrant workforce reflects the Romanian emigrants' profile. The growth and the decline in the number of migrant workers are directly proportional to the demand in the labour market. Most immigrants are found in the following sectors: construction, transportation infrastructure and shipyards, trade and public catering services, domestic, childcare, and other services, including hotels, restaurants, manufacturing and agriculture. Immigrants in Romania have a high school degree, consistent professional experience and skills in their profession (Fleşer, 2012; Stoica et al., 2009).

4.2.3 Return Migration

Several studies have shown a certain level of return intentions among Romanians living abroad (Ambrosini et al., 2015; Anghel et al., 2016). An OECD report from 2019 (OECD, 2019) on the social conditions and integration of foreign citizens between 2011 and 2012 are shown in figure 4.21:

Figure 4.21: Current intentions of Romanian emigrants to stay in Italy or return to Romania (2011-2012 in %)

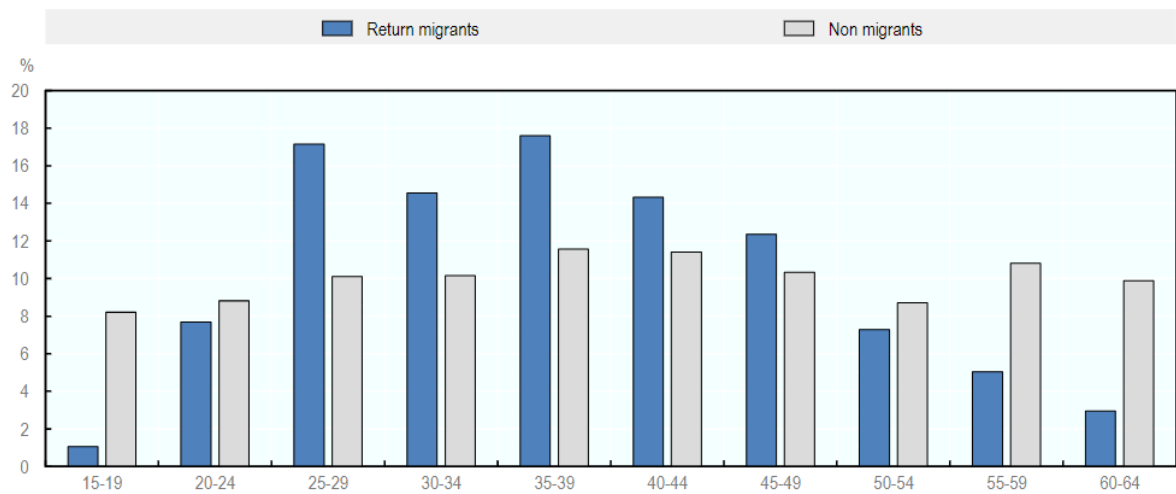
Current intention	Stay in Italy	Return to Romania	Total
Intention at arrival			
Stay in Italy forever	93.2	6.8	100
Stay for a while and return	42.1	57.9	100
No defined project	67.3	32.7	100

Source: Survey "Social Conditions and Integration of Foreign Citizens", 2011-2012, Istat. (OECD, 2019)

This survey shows a particular intention to return to Romania after some years spent in Italy. Those who intended to stay forever after arriving in Italy maintained their intentions, and only a few intended to return to Romania (6.8%). Those who emigrated to Italy with the intention of returning after a while changed their intentions over time, with 57.9% intending to return to Romania. Moreover, the majority of those who did not have a definite project preferred to remain in Italy (67.3%) (OECD, 2019).

Current data from Tempo-Online and Eurostat databases show that between 2015 and 2017, at least 160 thousand Romanian emigrants returned to Romania yearly. Return migration is very prevalent in Romania. The OECD (2019) estimated that between 2002 and 2004, return migration represented 7% of Romania's population aged 24 to 65 years, around 820 thousand individuals. By 2008, Martin and Radu (2012) showed that return

Figure 4.22: Age distribution of return migrants and non-migrants aged 15-64 in Romania (2014)



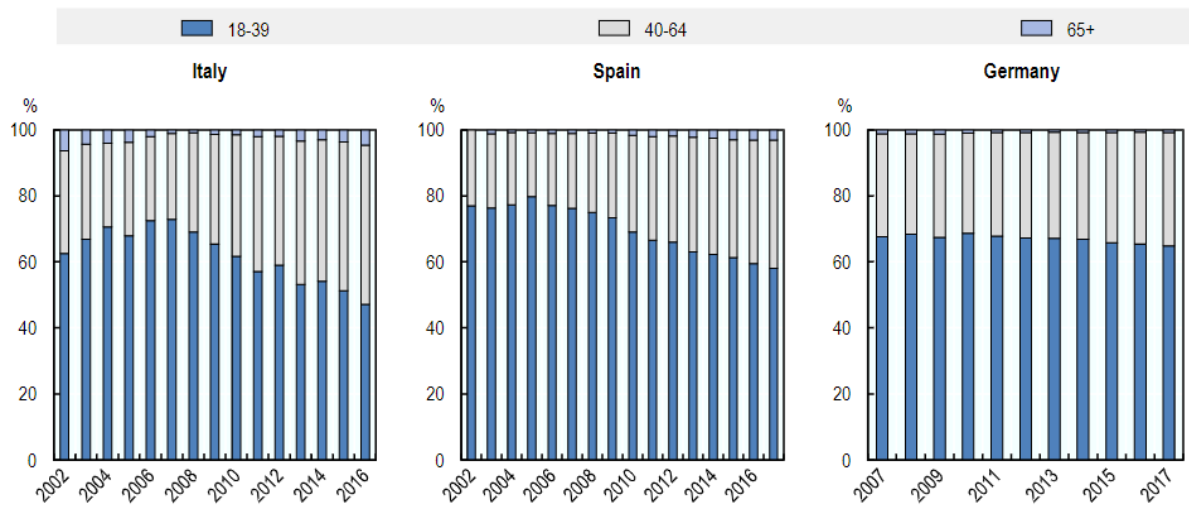
Source: Romania EU-Labour Force Survey, 2014, Eurostat. (OECD, 2019)

migration had increased to almost 8% of the population between 24 and 65 years old, more precisely, about 900 thousand. According to the OECD (2019), returnees are much younger than non-migrants. Figure 4.22 shows the age distribution of returnees and non-migrants (OECD, 2019):

Data from the 2014 Labour Force Survey indicates that 63% of Romanians who worked abroad between 2004 and 2014 and then returned to Romania were aged between 25 and 44 years, while the same age group represented only 43% of non-migrants. Most return migration flows come from Italy, Spain, and Germany. Most returnees are between 18 and 39 years old, as shown in figure 4.23. The Romanian Labour Force Survey results indicate that more than half of returnees are under the age of 45. This evidence supports the hypothesis of return migration at younger and not older ages.

On average, the share of returnees aged 18 and 39 was 62% from Italy, 70% from Spain and 67% from Germany. Return migration of the old-age groups - above 65 years of age - was low in these three countries: 3% in Italy, 1.5% in Spain and 1% in Germany. Spain and Italy experienced a decrease in the share of young returnees since 2007, while return migration from Germany between the ages of 18 and 39 was constant. Over the past 10-15 years, Romania sent many emigrants, especially to the other EU-Member States, which also led to significant inflows of return migration to Romania. Free movement inside the European Union allowed many Romanians to make multiple migratory movements. At the same time, it reduces part of the government's ability to monitor multiple movements. Over the past years, the mobility patterns of Romanian migrants have become more complex and diverse, often characterized by circular, temporary and multiple movements. Therefore, Romanian migrants are more likely to engage in complex migration trajectories inside the European Union but also outside. These complexities pose a challenge to efficiently accompanying return migrants and their reintegration back home (OECD, 2019).

Figure 4.23: Age distribution of return migrants aged 18+ from Italy, Spain and Germany



Source: Instituto Nazionale di Statistica Italy; Instituto Nacional de Estadística, Spain; Destatis, Germany. (OECD, 2019)

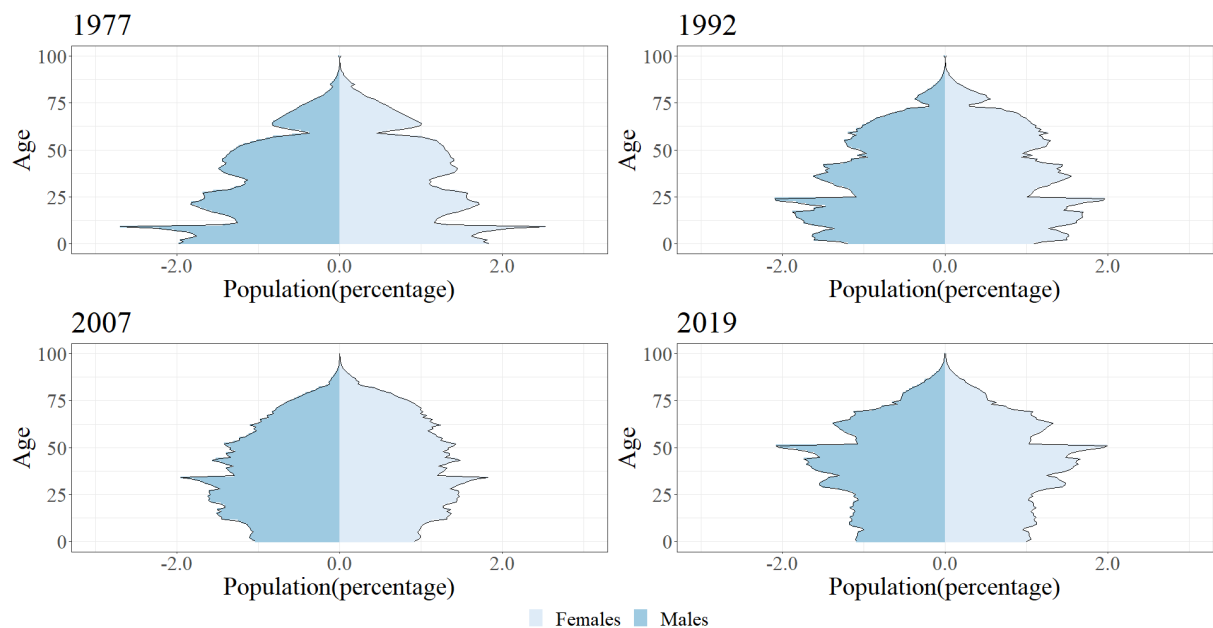
Chapter four illustrates Romania's migration profile during the 20th and 21st centuries. First, it describes the emigration process before and during the communist regime. It also shows the evolution of Romania's emigration profile during the transition from the communist to the democratic regime. During this period, emigration shifted from ethnic to labour and permanent to temporary. Since the end of the communist regime, the main countries of destination have also changed. Furthermore, after the transition to the democratic regime and after Romania joined the European Union, we observed the feminisation of the emigration process. Second, this chapter illustrates Romania's immigration profile. During the communist regime, immigration was strictly under control by the Romanian government. The majority of the immigrants were coming to Romania for studying purposes. Between 1990 and 2007, immigration to Romania was not significant. After the accession to the European Union, immigration to Romania became more relevant, especially from neighbouring countries such as the Republic of Moldova and Ukraine. Most recently, immigration from Asian countries increased as well. Third, this chapter shows that return migration became more significant between 2008 and 2018. This broad description of Romania's migration profile is essential for the decomposition analysis of this dissertation. This chapter highlights the importance of the migration component over the population dynamics of Romania from 1977 to 2019. The following chapter will present the results and findings of this investigation.

5 Results and Findings

5.1 Decomposition of the Working-Age Population (1977-2019)

Between 1977 and 2019, the age structure of Romania's population changed significantly. First, between 1977 and 1991, Romania experienced positive natural growth because of the decree making abortion illegal, introduced in 1967. By 1977 the effects of the decree were already visible. During the first year after the prohibition of abortion, Romania's total fertility rate increased from 1.9 to 3.66 children per woman. Four years later, the total fertility rate began to decline again because of increasing clandestine abortions. Even though fertility was declining, only by 1990 did fertility fall below replacement level (see Figure 1.1).

Figure 5.1: Age structure of Romania's population



Source: Own calculations based on data from (INSSE, 2022)

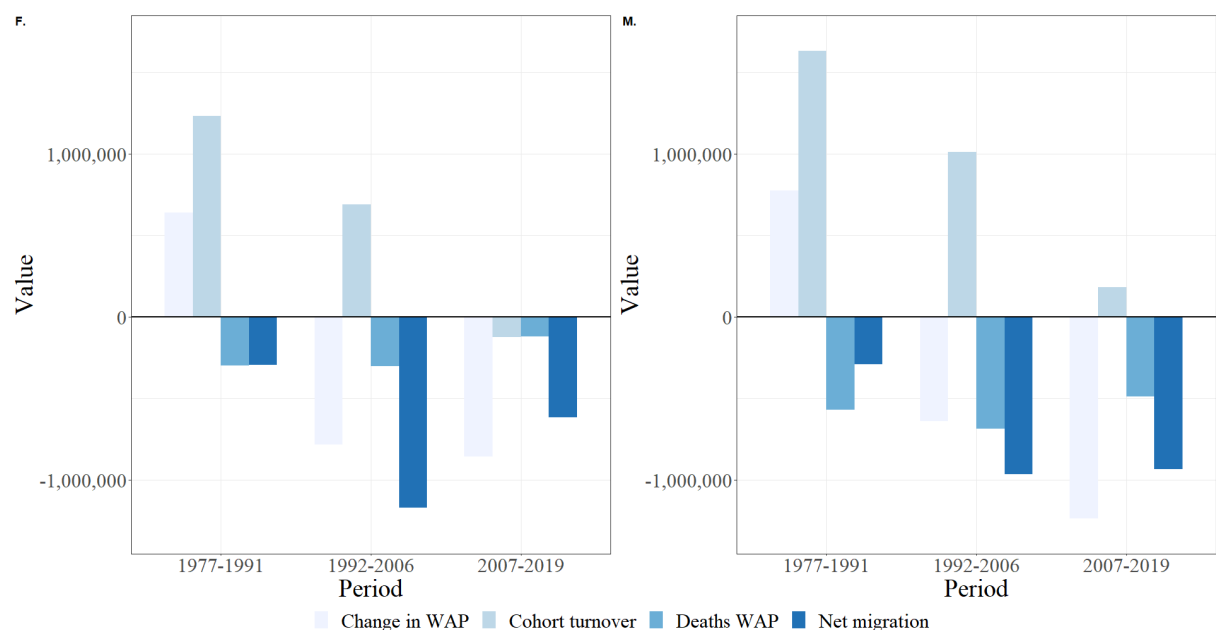
Between 1992 and 2006, Romania's population continued to decline significantly because of negative natural growth and emigration. According to the Romanian Population census data INSSE (1992, 2011b), between 1992 and 2011, Romania's population decreased

by 11.3%. Figure 5.1 illustrates the population distribution by single age during the period of analysis where we can observe the accelerating ageing process. Between 1977 and 2019, the share of females aged 10 to 24 decreased from 21.57% to 16.25%. The male population between the same age groups decreased from 23.16% to 16.98%. Furthermore, the female old-age group of 65 years and over increased from 11.49% to 15.1% between 1977 and 2019. The male old age group increased from 8.95% to 15% during the same period. The decomposition of the working-age population at the national level by gender will help us understand which of the three components, mortality, cohort turnover, and net migration, most contributed to the changes in the working-age population.

5.1.1 National Level (1977-2019)

Figure 5.2 summarises the estimated effects of the decomposition of Romania's working-age population on the national level, by component and gender between 1977-1991, 1992-2006 and 2007-2019. It also summarises Romania's emigration history, more precisely in the second and third part of the analysis, illustrating exactly the amplification of Romania's emigration phenomenon before and after entering the European Union. In addition, we can identify the feminisation of the emigration process in absolute numbers as well. The evolution of the net migration effect on the working-age population conceded with the main political changes that occurred in Romania. The graphic illustrates the evolution of Romania's working-age population.

Figure 5.2: Decomposition of the working-age population on national level by gender (1977-2019)

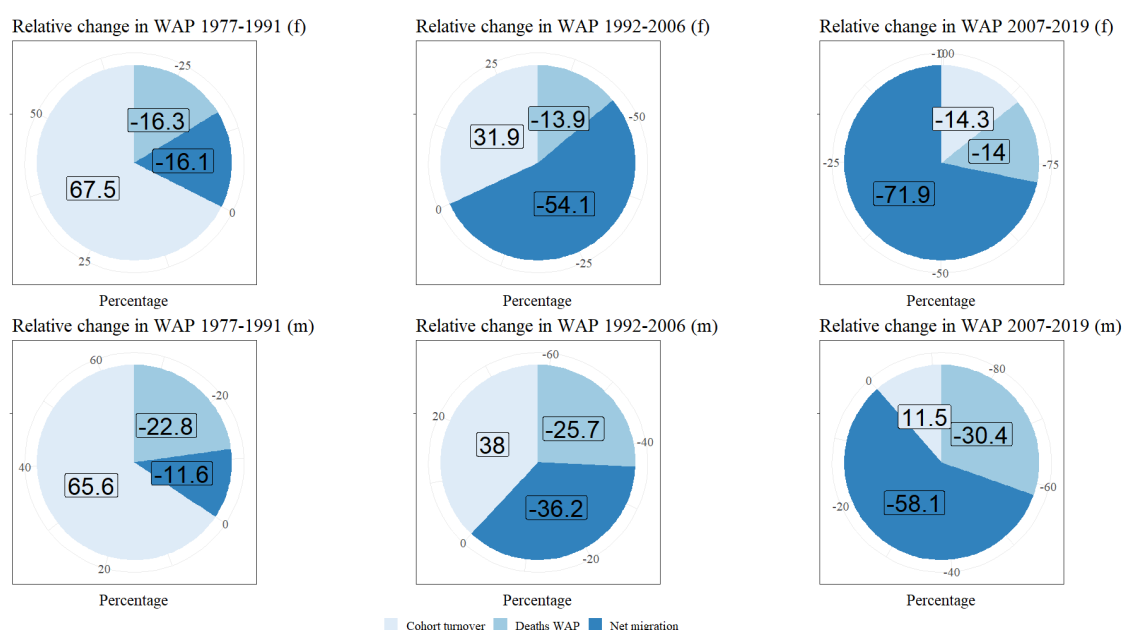


Note: F - females; M - males. Results are in absolute numbers.

Source: Own calculations based on data from (Eurostat, 2022; INSSE, 2022)

In the first period of the analysis, 1977-1991, the positive change in WAP resulted from positive cohort turnover. Net migration and mortality effects were negative, however the change in the working-age population during this period was positive. Starting with the second period of analysis, 1992-2006, the change in WAP became negative because of negative net migration, deaths, and decreasing cohort turnover effect. During the second period of analysis, the effect of mortality increased for the male WAP because of increasing cardiovascular diseases and increased alcohol and cigarette consumption combined with a sanitary crisis (Dolea et al., 2002). Table A.1 from the Appendix summarises the decomposition results, in absolute values, at the national level.

Figure 5.3: Relative change in the working-age population by gender and age groups (1977-2019)



Source: Own calculations based on data from (Eurostat, 2022; INSSE, 2022)

1977-1991

During the first period of the analysis, between 1977 and 1991, Romania's working-age population increased by 1.4 million. The female working-age population increased by 630 thousand while the male working-age population increased by 777 thousand. The component that most contributed to the increase in both working-age populations was the cohort turnover effect. Therefore, more people were entering the working-age group during this period than leaving it. For females, cohort turnover represented 67.5% of the change in WAP, and for males, 65.6%. Net migration was negative both genders. The negative net migration effect corresponds to the emigration of ethnic Germans, Hungarians and Jews that occurred during the communist period via bilateral agreements between the Romanian Government and the governments of Germany, Hungary and Israel. The third component, mortality, contributed negatively to the change in WAP, namely 16.3% for

females and 22.8% for males (see Figure 5.3).

According to Keyfitz et al. (1968), during the communist regime, Romania had among the lowest life expectancies in Europe. Throughout the 1980s, life expectancy stagnated, and since 1985, there have been significant fluctuations in mortality in Romania and other Eastern European countries (Vallin and Meslé, 2004). According to Cunningham (2009), in the late 1980s, communist governments crumbled. Although it was a period of major reforms and expectations, life expectancy in Romania and many Eastern European countries continued to decline. In Romania, the pace of the declining male life expectancy accelerated during public health crises.

Cunningham (2009) showed that, between 1976 and 1987, deaths from respiratory diseases among children and the elderly decreased while deaths by accidents, violence and diseases of the digestive system, cardiovascular and circulatory systems increased at almost all ages, especially for men. Working-age men had a lower life expectancy in 1988 than working-age men 30 years before. Furthermore, between 1987 and 1991, most of the improvements in mortality resulted from decreased child mortality from respiratory, digestive, infectious and parasitic diseases. During these four years, male life expectancy increased by 0.7 years with slight decreases in respiratory, cardiovascular and circulatory diseases. Unlike the male life expectancy, the female life expectancy increased by 1.3 years with improvements in the cardiovascular, circulatory system and digestive diseases at older ages. (Cunningham, 2009; Dolea et al., 2002).

1992-2006

The second period of the analysis, 1992-2006, represents the period of transition to the accession to the European Union. Since the fall of the communist regime, Romania's population began to decline, and the change in WAP became negative. For females, the cohort turnover effect represented only 31.9% of the change in WAP. For males, the cohort turnover effect decreased as well, and during the second analysis period, it represented only 38% of the change in WAP.

Furthermore, the contribution of net migration to the change in WAP continued negative. For females, net migration contributed negatively, with 54.1% to the change in WAP. For the male working-age group, net migration's contribution was also negative, representing 36.2% of the change. The effect of mortality increased during the second analysis period through the mortality crisis between 1990-1996. This crisis affected more men than women. The relative contribution of deaths between the ages 15 and 64 for males, was 25.7%. For females, the relative contribution of deaths to the change in WAP was lower, 13.9%. During this second period of analysis, the feminisation of the emigration process becomes visible (see Figure 5.3). The second period of analysis highlights the role of net migration in the female WAP. More than half of the change in the female WAP is explained by negative net migration. Since 1994, economic motives have become

the trigger of emigration from Romania. Romania's vulnerability during the transition period from a socialist to a capitalist economy and high labour demand in other European countries shaped emigration from Romania, especially among women.

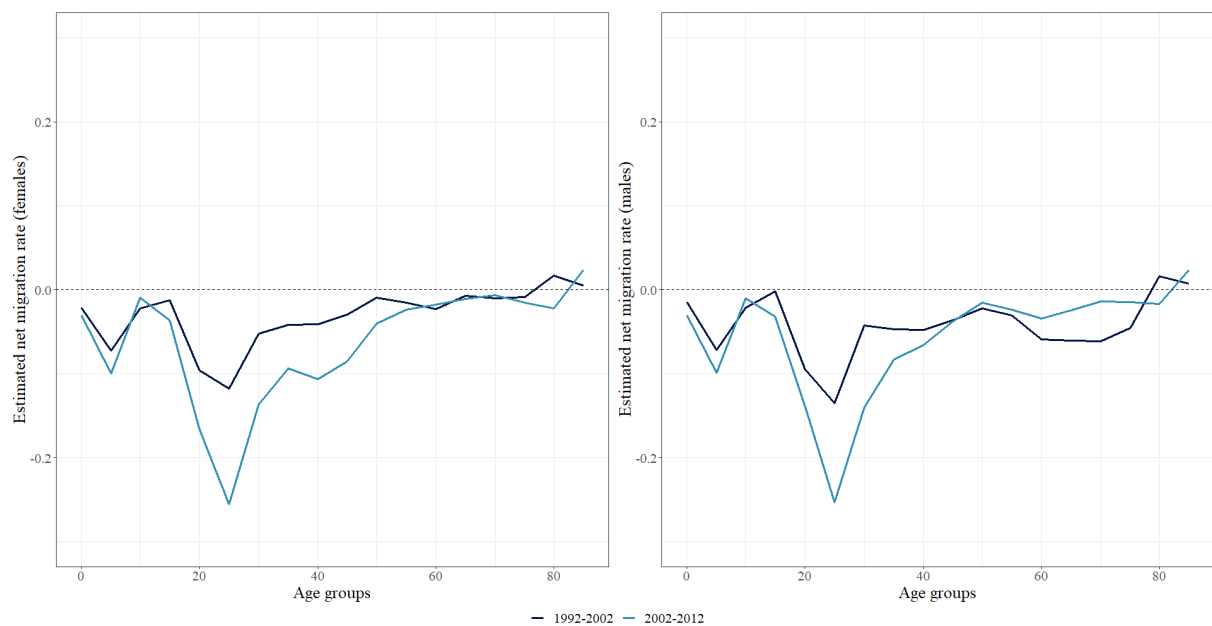
2007-2019

The third period of the analysis captures Romania's current scenario after the European Union's accession. During this period, the effects of mortality and the cohort turnover effect diminished significantly. For females, mortality negatively contributed 14% to the change in WAP. Breast-cancer mortality was the leading cause of cancer-related deaths in females in Romania. After the transition to the democratic regime, deaths by breast cancer increased. Compared to other European countries, the female mortality model in Romania was worsening, and the health gap was increasing compared to other European female populations. Due to this pattern, Romania needed to act urgently and implement population-based screening. After accessing the European Union, Romania got the opportunity to develop screening programmes through the Partnership Agreement with the EU for 2014-2020 (Furtunescu et al., 2021; Muntele et al., 2020). The female cohort turnover effect turned negative and represented 14.3% of the negative change in the female WAP suggesting that the demographic bonus period ended. In the case of males, the contribution of the mortality effect increased from 25.7% to 30.4% and the contribution of the of the cohort turnover effects decreased from 38% to 11.5%. After Romania became part of the European Union, the effect of net migration on the changes in WAP increased for both sexes. In the case of females, the effect was significantly amplified, with 71.9% of the change in WAP accounted for by negative net migration. For the change in the male WAP, net migration contributed negatively with 58.1% (see Figure 5.3). These results concede with Romania's access to the European labour market after 2012. To corroborate our findings from the decomposition and the role of net migration on the changes in the working-age population. Figure 5.4 presents the intercensal net migration rate by gender and age groups. The indirect estimations of the net migration rate between 1992, 2002, and 2012 confirm the pattern described in chapter 3, with emigration being dominated by the 25-34-year-old group. Furthermore, the feminisation process of Romanian emigration occurs between the ages of 35 and 54 years. These figures show that emigration from Romania intensified during the second period under analysis (2002-2012) for both females and males, and the predominant age groups continued to be 25 to 34 years.

In order to consolidate our findings from the decomposition and the role of net migration on the changes in the working-age population, the following graphic (see Figure 5.4 presents the intercensal net migration rate by gender and age groups. The indirect estimations of the net migration rate between 1992, 2002 and 2012 confirm the pattern described in chapter 3, with emigration being dominated by the 25-34-year-old group. Furthermore, the feminisation process of Romanian emigration occurs between the ages of

35 and 54 years. These graphics show that emigration from Romania intensified during the second period under analysis, 2002-2012 for both females and males, and the predominant age groups continued to be 25 to 34 years. Furthermore, the outflow indirectly affects the population's age structure when emigration occurs. Female emigrants, who have not passed the childbearing age, will not give birth to any more children in Romania, which they may have done if they had not emigrated. As a result, the difference between the population sizes of non-emigrants and emigrants also consists of the number of children of emigrant women that were not born in Romania (Fihel et al., 2018).

Figure 5.4: Indirect estimations of the inter-census net migration rate by gender



Note: females-(left); males-(right).

Source: Own calculations based on data from the Romanian Censuses: INSSE (1992, 2002, 2011b)

5.2 Decomposition of the Working-Age Population, NUTS-3 (1992-2019)

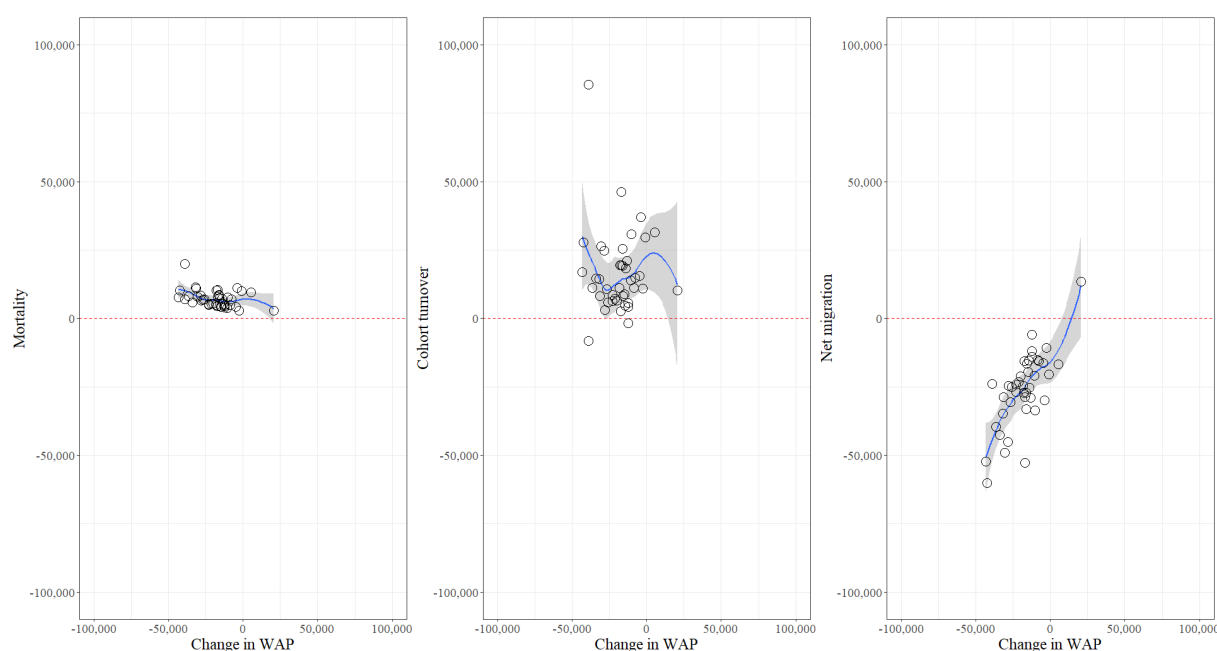
This second part of the decomposition model focuses on a regional level, more precisely on NUTS-3 or county level. The decomposition on a regional level consists of two parts. First, we apply the concept of the conventional working-age population between 15 and 64 years. Second, we apply the concept of the prospective working-age population between 15 years and the corresponding prospective age for each NUTS-3 region. Figure 3.1 from chapter three illustrates Romania's territorial division by NUTS-2 and NUTS-3.

5.2.1 Decomposition of the Conventional and Prospective Working-Age Population, NUTS-3 (1992-2006)

Conventional WAP (1992-2006)

The following figures 5.5 and 5.6 illustrate the bivariate relationship between each component (mortality, cohort turnover, and net migration) and the changes in the working-age population between 1992 and 2006. The relationship between the variables is given by the locally weighted scatter plot smoothing (LOWESS) ¹ method using a 95% confidence interval. This function helps us visualise the distribution of the effects under analysis and identify the variability across these three components (Ghio et al., 2022; Cleveland, 1979; Dias and Ronaldo, 2004; Glen, 2022). The graphic represents the bivariate relationship between these components between 1992 and 2006 for the female WAP. It indicates that the mortality effect is more concentrated among the 42 regions. During this period, the cohort turnover and net migration effects had higher relative volatility. Cohort turnover and net migration effect responded more promptly to the structural changes in Romania between 1992 and 2006 than the other two components.

Figure 5.5: Relationship between components and changes in the conventional WAP, females (1992-2006)



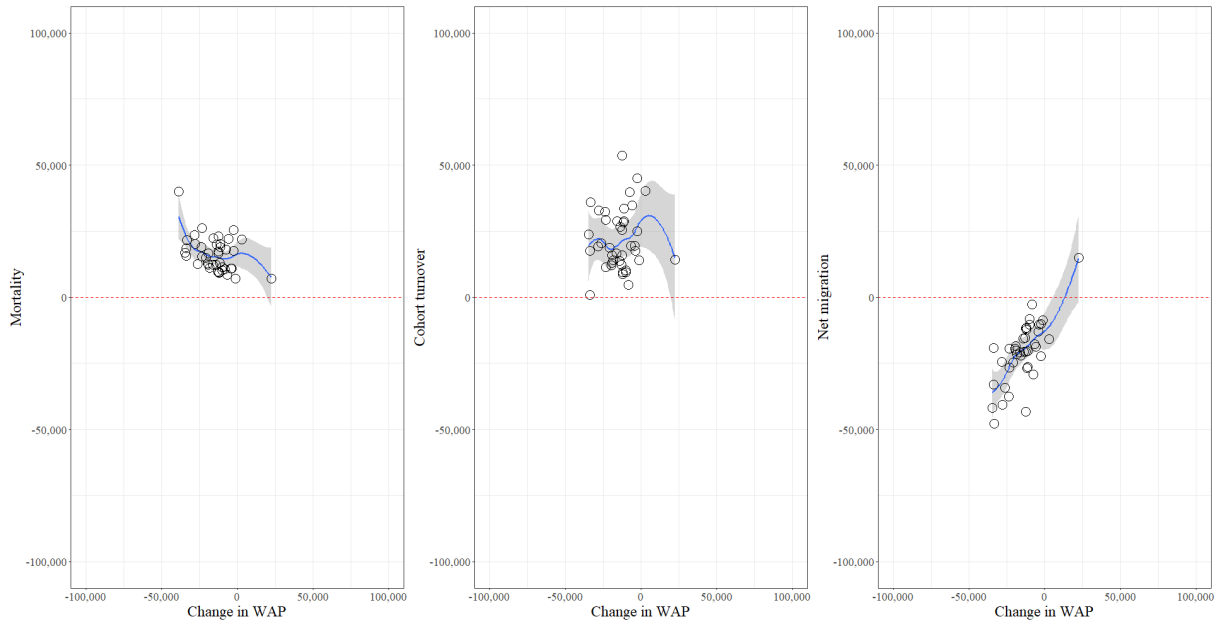
Source: Own calculations based on data from (INSSE, 2022)

Figure 5.6 presents the bivariate relationship between the components of the male working-age population between 1992 and 2006. The observed pattern is similar to the

¹LOWESS (Locally Weighted Scatterplot Smoothing), called LOESS (locally weighted smoothing), creates a smooth line through a time plot or scatter plot to see the relationship between variables and foresee trends. The method consequently makes no assumptions about the form of the relationship and allows the form to be discovered using the data itself (Cleveland, 1979; Dias, 2004; Glen, 2022).

one identified for the female WAP, thus slightly more volatile mortality effect. On the regional level, the mortality effect was more volatile and responded quite differently to the structural changes than the female WAP. However, the net migration and cohort turnover effect remained more volatile.

Figure 5.6: Relationship between components and changes in the conventional WAP, males (1992-2006)



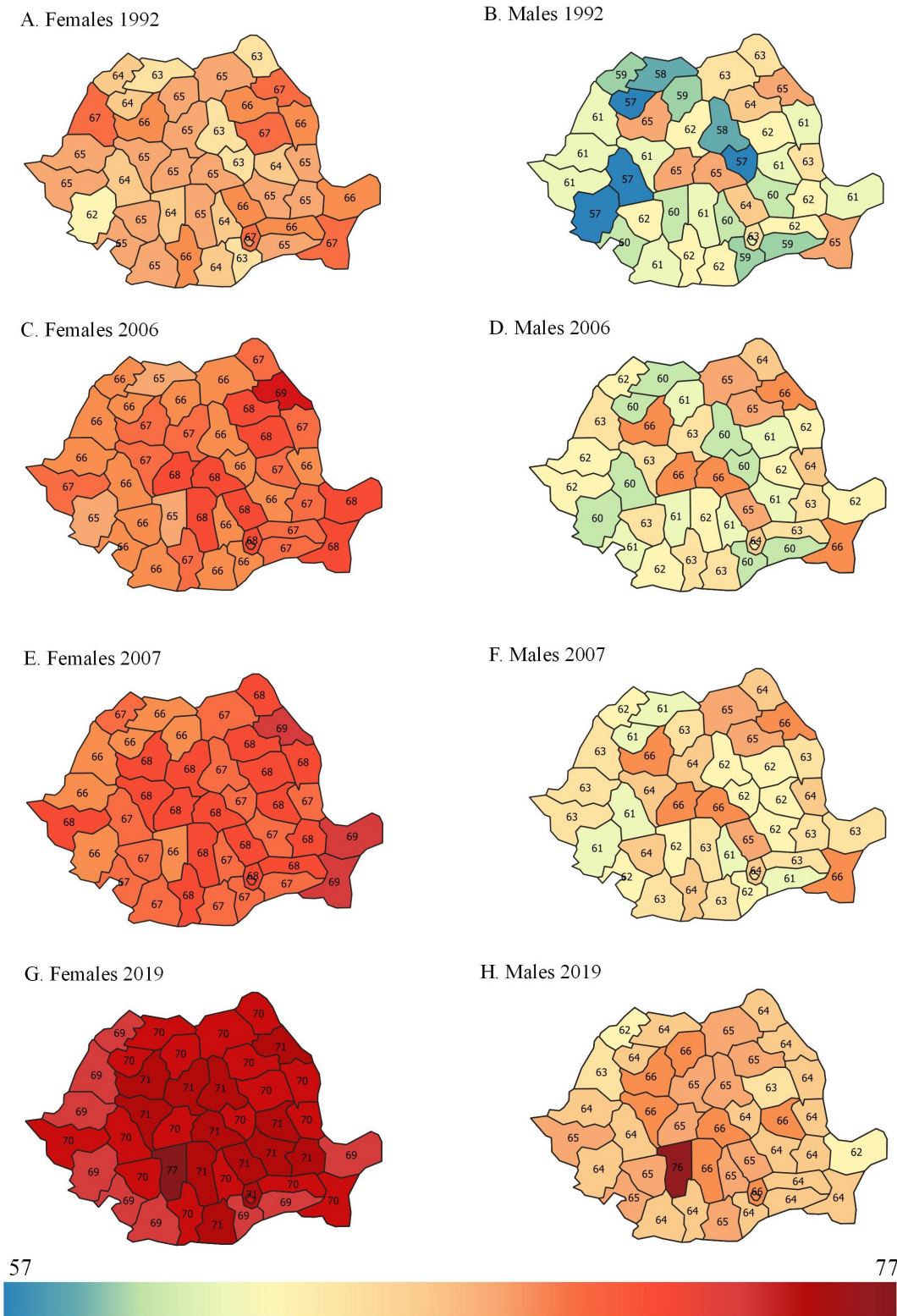
Source: Own calculations based on data from (INSSE, 2022)

Prospective WAP (1992-2006)

Figure 5.7 illustrates the prospective ages by gender for each NUTS-3 region corresponding to 1992, 2006, 2007, and 2019. The prospective ages corresponding to the female WAP were more homogeneous over these years, while the prospective ages corresponding to the male WAP were more heterogeneous. The prospective ages also indicate the differences in age variability at death between men and women. Furthermore, it shows the differentials of mortality gains concentrated in the WAP of men and women. Males and females in Romania have lower life expectancy than Western countries and, therefore, greater variability in the age at death. The stagnation of female life expectancy and the reversal of male life expectancy at birth in the 1990s, followed by the continued increase in life expectancy since the 2000s, indicate that the distribution of deaths is shifting to older ages. In addition, these prospective ages indicate that the compression of female mortality is more advanced than that of the males Gonzaga et al. (2018); Palloni and Pinto-Aguirre (2011); Alvarez et al. (2020). By applying the prospective age to Romania's working-age population by gender, the working-age population displayed different patterns.

Overall, the female working-age group by NUTS-3 regions were extended by applying the prospective age, except for six regions in 1992. These six counties, Botosani, Caras-

Figure 5.7: Prospective ages (1992-2019)



Note: Prospective age refers to the age at which the remaining life expectancy is 15 years.

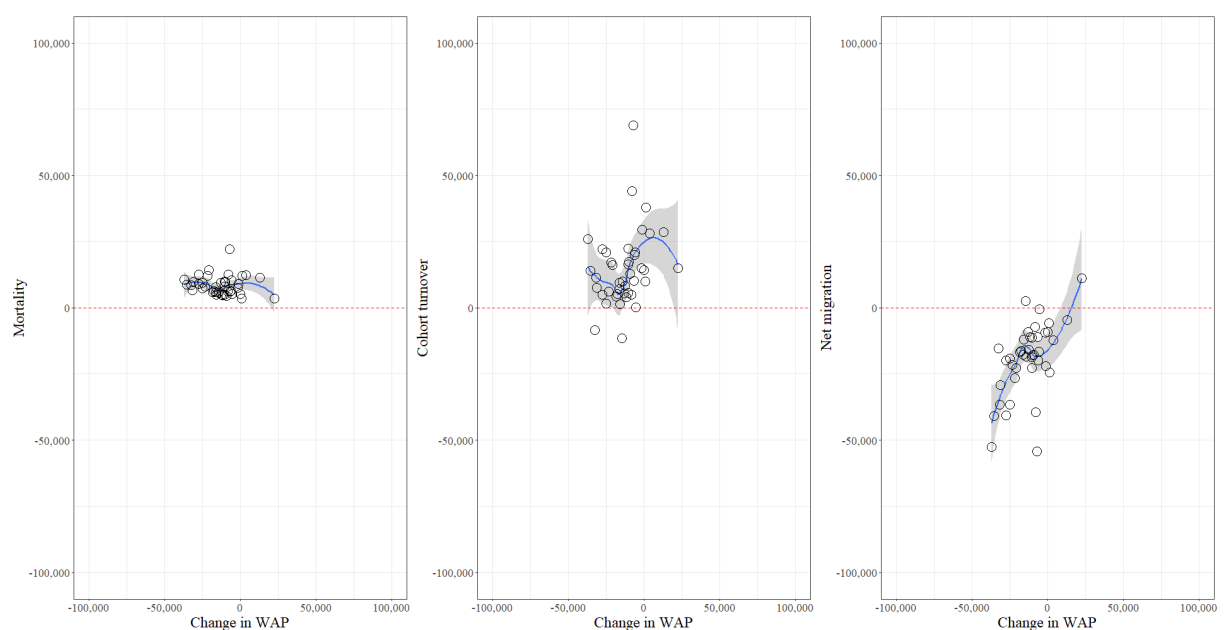
Source: Own calculations based on data from (Eurostat, 2019; INSSE, 2022)

Severin, Covasna, Giurgiu, Harghita, and Maramures, had prospective ages between 62 and

63 years. The other eight counties Dambovită, Hunedoara, Salaj, Satu Mare, Teleorman, Valcea, and Vrancea, kept the working-age population between 15 and 64 years when applying the prospective age. The rest of the twenty-eight counties increased their working-age groups by one, two, and three years. Starting with 2006, the prospective age increased the size of the female working-age population in all 42 counties. By 2019 the prospective female ages ranged between 69 and 77 years. In contrast, the male working-age population groups took a different path than the female WAP. In 1992, most prospective male ages were below the conventional age. Thirty-five counties had prospective ages between 57 and 63 years. The prospective ages of the two counties, Neamţ and Prahova, were equal to the conventional age, namely 64. Only five counties, Brasov, Cluj, Constanta, Iasi, and Sibiu, had prospective ages above the conventional age. Between 2007 and 2019, the prospective male ages increased with more variations than the prospective female ages. By 2019, half of the counties (21 to be precise) had prospective ages above the conventional age, between 65 and 76 years. Eighteen counties had their prospective ages equal to the conventional age, and three regions, Bacău, Satu-Mare, and Tulcea, had their prospective ages below the conventional age, between 62 and 63 years. In 2019, the county of Valcea reached the highest prospective age for both genders, 77 for females and 76 for males.

As a consequence of applying the prospective age for each Romanian region by gender, the male working-age population narrowed its size, reducing the mortality effect. On the contrary, the female working-age groups gained more workforce but amplified its mortality effect. Table A.2 in the Appendix summarises the prospective ages by NUTS-3 and gender for each year in the study.

Figure 5.8: Relationship between components and changes in the prospective WAP, females (1992-2006)



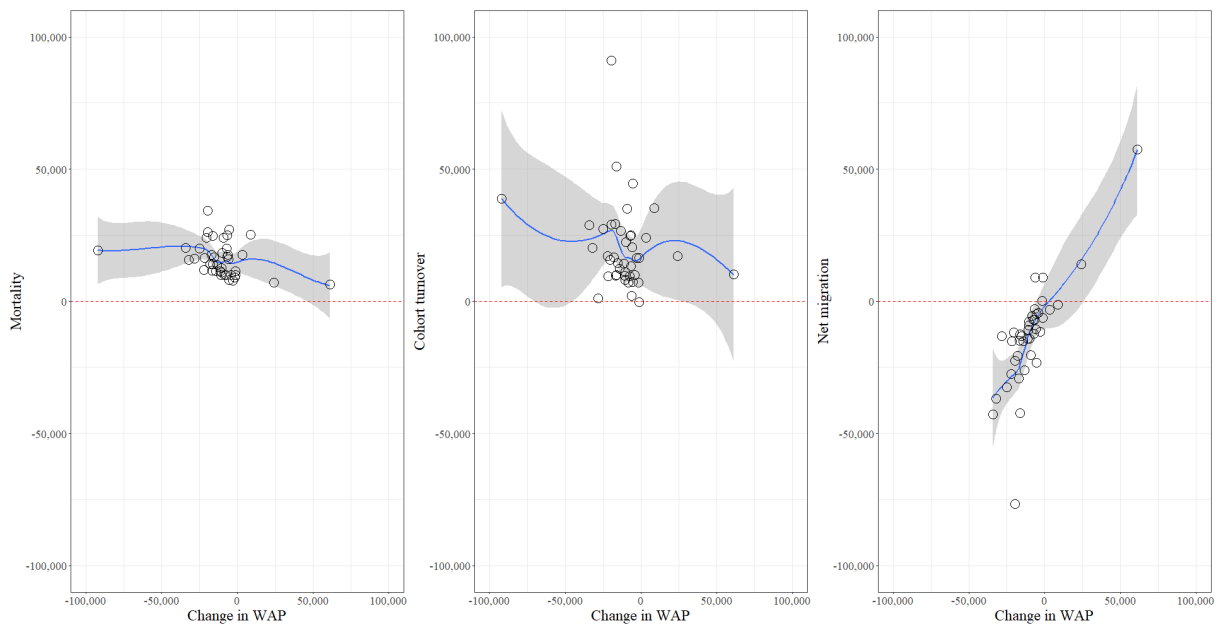
Source: Own calculations based on data from (Eurostat, 2019; INSSE, 2022)

Figure 5.8 illustrates the bivariate relationship between the demographic components

and prospective female WAP between 1992 and 2006. The mortality effect is more concentrated, similar to the conventional WAP's bivariate relationship. The correlation between the effect of cohort turnover respectively net migration and the changes in the prospective WAP remained more volatile. Therefore, the correlations between the components and the prospective WAP are similar to the correlations within the conventional WAP.

When looking at the male prospective WAP in figure 5.9, the differences in the relationship between the components and the change in WAP become more prominent. The effects of mortality and cohort turnover are less concentrated because of the variability of the prospective ages. Furthermore, the variability in the net migration effect increases as well. In the regions where the prospective age is below the conventional age, the tendency for net migration is to become less negative toward positive. The regions with increased WAP tend to have a less negative net migration effect. This leads to the conclusion that in the case of males, net migration may become more significant in older ages.

Figure 5.9: Relationship between components and changes in the prospective WAP, males (1992-2006)



Source: Own calculations based on data from (Eurostat, 2019; INSSE, 2022)

Conventional and Prospective Female WAP (1992-2006)

Figure 5.10 compares the conventional and prospective female WAP decomposition results on the NUTS-3 level. Between 1992 and 2006, 95.24% of the NUTS-3 regions (A. in 5.10) experienced a negative change in the conventional female WAP.

The female WAP in Ilfov, the county surrounding Romania's capital Bucharest, experienced the highest growth in WAP, with more than 20 thousand females during the reference period. Ilfov county's growth was due to emigration from the capital city

Bucharest towards the suburban localities.

Data from the Romanian Census 2011 shows that between 2002 and 2011, around 40 thousand females changed their domicile from Bucuresti to Ilfov. From Ilfov to Bucuresti only 10 thousand women changed their domicile (see Table 5.1).

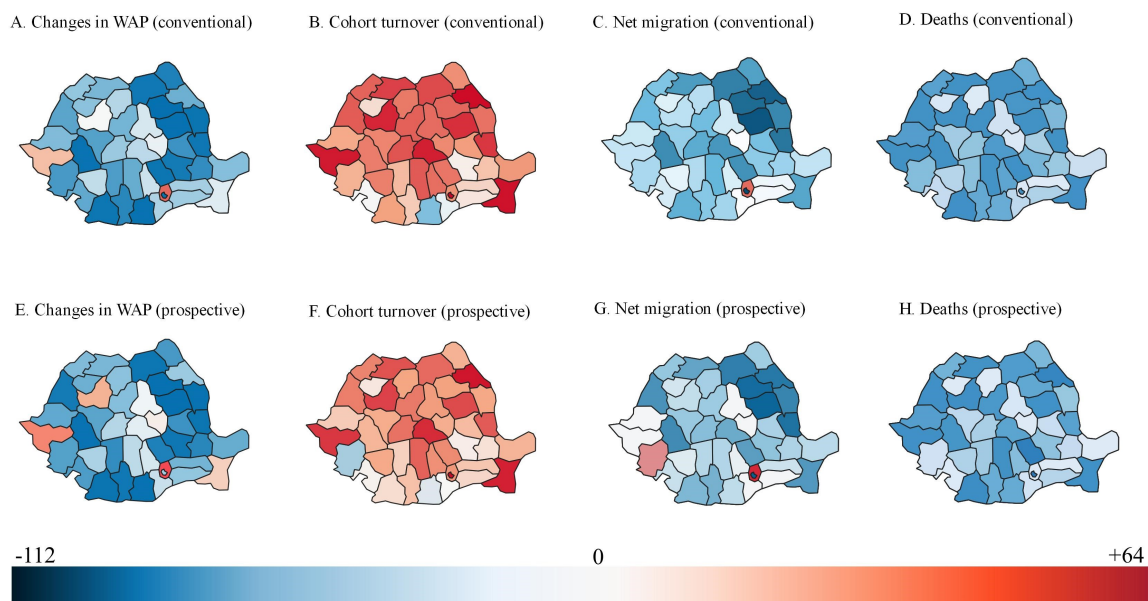
Table 5.1: Domicile change between Bucuresti and Ilfov counties, females (2002-2011)

Domicile change	Previous		
	County	Bucuresti	Ilfov
Current	Bucuresti		10001
	Ilfov	40387	

Source: INSSE (2011b)

Timis, the other county that experienced a positive change in the female WAP, is a region located in the western part of Romania at the border with Hungary and Serbia (former Yugoslavia). The changes in the conventional female WAP concede with the net migration (C. in 5.10) effect on the NUTS-3 level. The only two regions that experienced positive net migration were Ilfov and Timis. This indicates that the positive and negative changes in the conventional WAP are explained mainly by the net migration effect, followed by the mortality effect. Even though the cohort turnover effect was positive in 41 out of 42 NUTS-3 regions during the reference period, the demographic bonus was not strong enough to keep or increase the conventional female WAP.

Figure 5.10: Relative change in WAP, females (1992-2006)



Note. Relative changes between 1992 and 2006 in the: (A.) size of the conventional working age population (WAP) females (15-64); (B.) cohort turnover females; (C.) net migration females (15-64 years); (D.) deaths females (15-64 years); (E.) size of the prospective female WAP (15-prospective age); (F.) cohort turnover females (prospective age); (G.) net migration females (15-prospective age); (H.) deaths females (15-prospective age). Values of variables are expressed in thousands. Prospective age is defined as the age where the remaining life expectancy is 15 years. In 1992 the female prospective age in Romania by region ranged between the ages of 62 and 67. In 2006 it ranged between the ages of 65 and 69.

Source: Own calculations based on data from (INSSE, 2022)

The results of the decomposition of the female prospective WAP between 1992 and 2006 are displayed within the same figure 5.10 letters E, F, G and H. By 2006, the female life expectancy in all regions had increased enough to expand the WAP. As a result, two additional regions Cluj and Constanta, had positive changes in the prospective WAP (see letter E. 5.10). The net migration effect slightly changed. One additional region, Timis, had positive net migration. The fact that the prospective age concept extended the WAP in Timis region and the net migration effect turned positive implies that the regions received an inflow of older people. Because of the limitation of the model on the regional level, we cannot distinguish between internal and international migration. Additional information regarding the annual change of residence and annual net change of domicile for NUTS-3 can be found in the appendices A.11, A.12, A.13, A.14, A.15 and A.16. This information refers to internal and a combination of internal and international migration. The tables give us an idea of the annual net change of residence and domicile for the total population. In addition, tables A.17, A.18 and A.19 in the appendices provide the international net migration rate of the permanent female migrants for females by NUTS-3 regions between 1992-2019. According to tables A.17 and A.18, the region Timis had positive net migration by domicile (permanent international female migrants) between 1992 and 2006. This information sustains our results for this region in both decomposition models. The other regions have mixed results suggesting that positive net migration resulted from internal and international migration. The cohort turnover and mortality effect of the decomposition of the prospective WAP did not show significant changes.

Conventional and Prospective Male WAP (1992-2006)

The decomposition of the male conventional and prospective WAP during the reference period 1992 and 2006 are summarised in figure 5.11. As in the case of the conventional decomposition of the female WAP, the same regions, Ilfov and Timis, are the only regions with a positive change in the conventional WAP (A.). The rest of the 40 NUTS-3 regions experienced a negative change in the conventional WAP.

Table 5.2: Domicile change between Bucuresti and Ilfov counties, males (2002-2011)

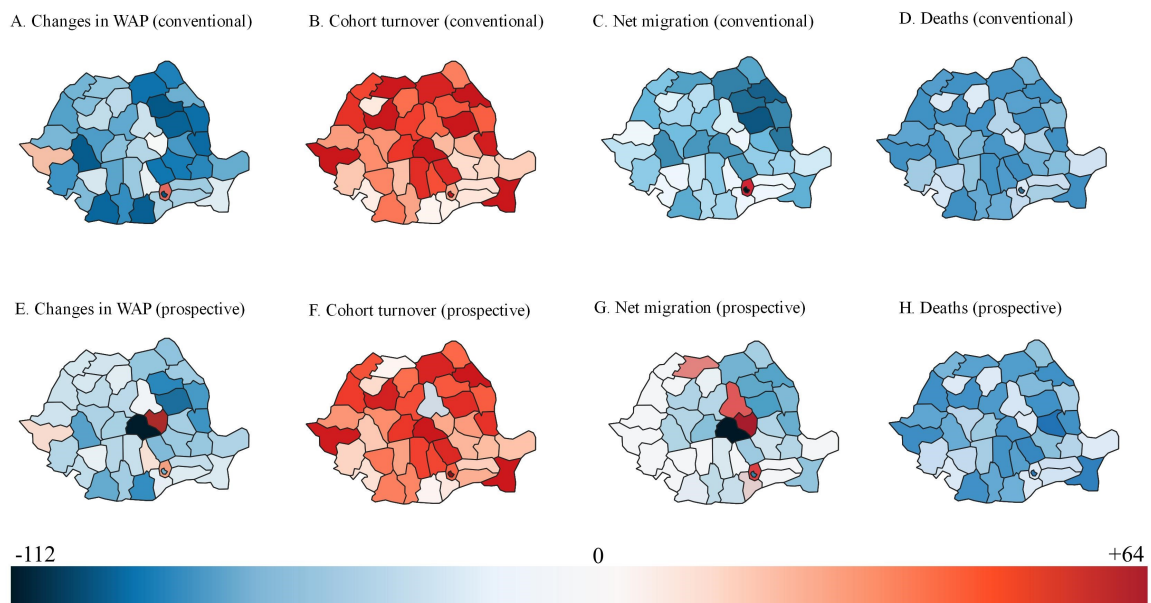
Domicile change	Previous		
	County	Bucuresti	Ilfov
Current	Bucuresti		6923
	Ilfov	38339	

Source: INSSE (2011b)

The conventional decomposition model's net migration effect (C.) was positive in one region, Ilfov. According to tables A.11 and A.12, Ilfov, had a positive annual net change in residence. As in the case of the female population in Ilfov, the male population experienced growth as a result of emigration from the capital to the cities and localities

around it (see Table 5.2). The observed data from the table mentioned in the appendix complete our results of the decomposition of the conventional male WAP. The cohort-turnover effect (B.) was positive during the reference period in all the NUTS-3 regions. Since the results on the national level illustrate that between 1992 and 2006 mortality effect played a significant role in the change in the conventional WAP, we can assume that on the regional level, mortality (D.) contributed more to the change in the conventional WAP than the net migration effect.

Figure 5.11: Relative change in WAP, males (1992-2006)



Note. Relative changes between 1992 and 2006 in the: (A.) size of the conventional working age population (WAP) males (15-64); (B.) cohort turnover males; (C.) net migration males (15-64 years); (D.) deaths males (15-64 years); (E.) size of the prospective male WAP (15-prospective age); (F.) cohort turnover males (prospective age); G. net migration males (15-prospective age); H. neaths males (15-prospective age). Values of variables are expressed in thousands. Prospective age is defined as the age where the remaining life expectancy is 15 years. In 1992 the male prospective age in Romania by region ranged between the ages of 57 and 65. In 2006 it ranged between the ages of 60 and 66.

Source: Own calculations based on data from (INSSE, 2022)

By applying the prospective age to the conventional male WAP, many NUTS-3 regions reduced their size at the beginning of the reference period because the respective prospective ages were below the conventional age of 65. The decomposition of the prospective male WAP brings surprising results. In this decomposition, four NUTS-3 regions had a positive change in their WAP (E.), Covasna, Dambovit, Ilfov, and Timis. These four regions also had a positive net migration effect (G.). Furthermore, four additional NUTS-3 regions had positive net migration while ten additional NUTS-e regions reduced their net migration effect. The region of Brasov diminished its effect on net migration even more when applying the prospective age concept. Even though these regions had positive net migration, it was not enough to maintain the size of the prospective WAP from the beginning of the reference period, 1992. Brasov had a prospective age above the conventional age of 65 years. This suggests that the negative net migration occurred

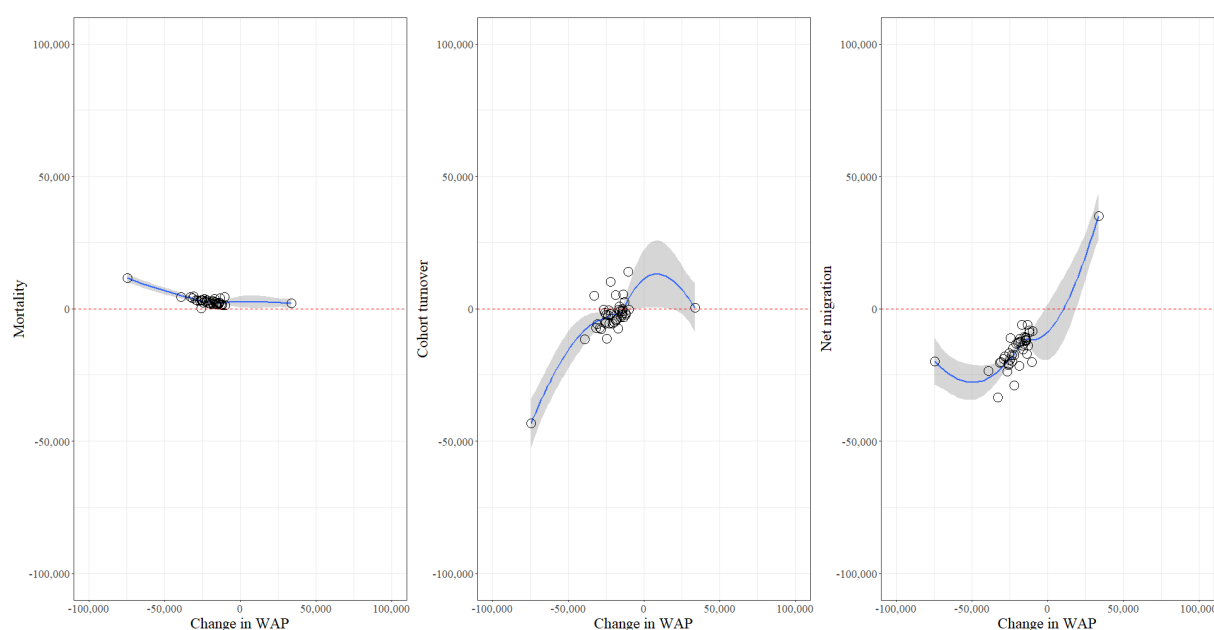
at older ages. These results correspond to the emigration of ethnic Germans. Ethnic emigration occurred overall at older ages until 1994. Furthermore, Brasov was one of the regions with the highest proportion of ethnic Germans. The cohort turnover and mortality effects were not altered by applying the prospective age concept.

5.2.2 Decomposition of the Conventional and Prospective Working-Age Populations, NUTS-3 (2007-2019)

Conventional WAP (2007-2019)

Figure 5.12 illustrates the relationship between the components and changes in the conventional female WAP between 2007 and 2019. The mortality effect remained more concentrated across the regions. Unlike the first period under analysis (1992-2006), the cohort turnover effect has higher volatility together with the net migration effect. This pattern was also identified by (Ghio et al., 2022) across all European NUTS-3 regions.

Figure 5.12: Relationship between components and changes in the conventional WAP, females (2007-2019)



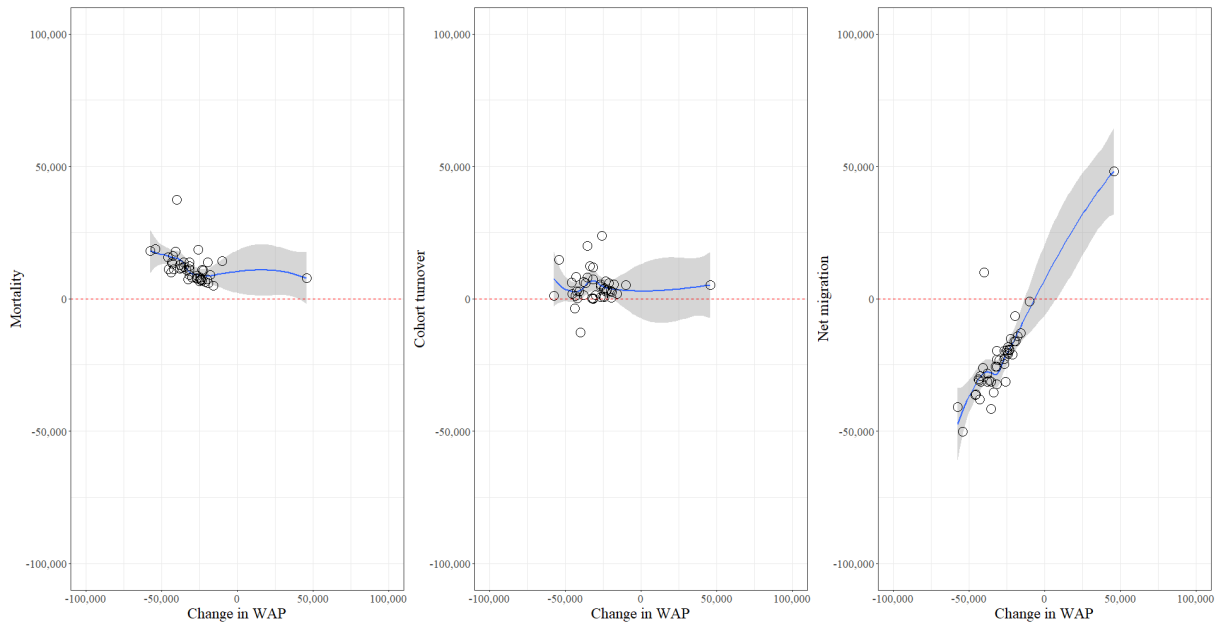
Source: Own calculations based on data from (INSSE, 2022)

Figure 5.13 summarises the correlations between components and changes in the conventional male WAP during the reference period. In the case of males, mortality and cohort turnover effect remained more concentrated, and only the net migration effect had higher relative volatility.

Prospective WAP (2007-2019)

The correlation between the components and the changes in the prospective female WAP between 2007-2019 is given in figure 5.14. Here, the cohort turnover and mortality

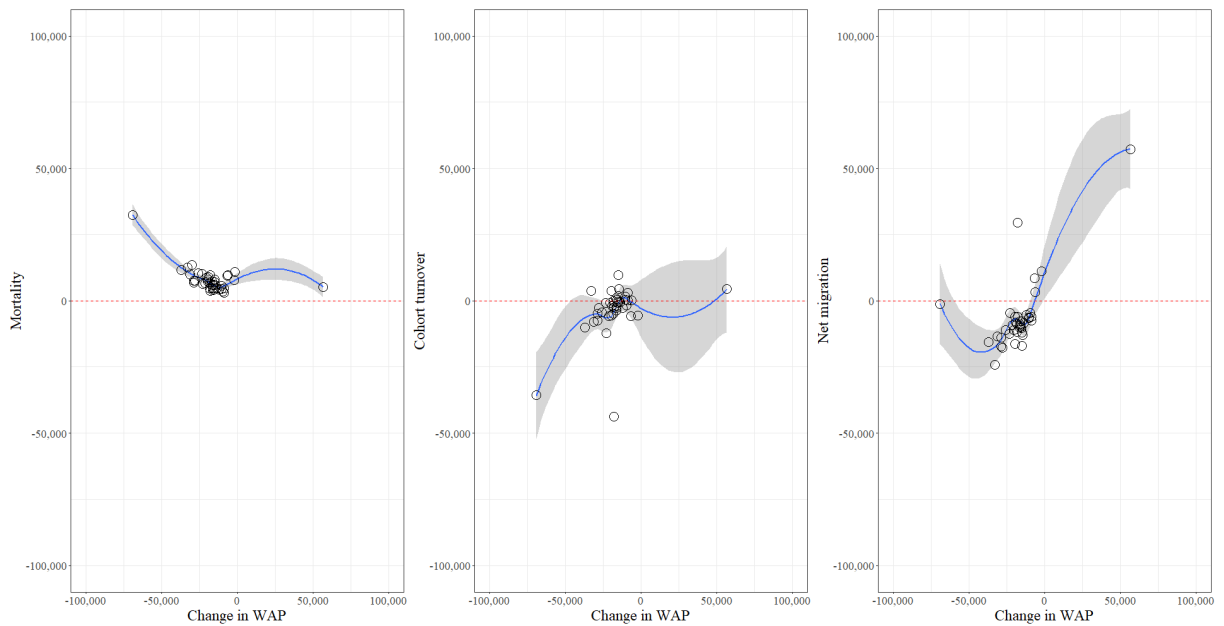
Figure 5.13: Relationship between components and changes in the conventional WAP, males (2007-2019)



Source: Own calculations based on data from (INSSE, 2022)

effects were more concentrated compared to the relationship within the conventional female WAP. The net migration effect had higher volatility than the other two effects during the reference period. However, compared to the correlation of net migration and changes in the conventional WAP, the prospective correlation of the net migration component and changes in WAP seemed more concentrated.

Figure 5.14: Relationship between components and changes in the prospective WAP, females (2007-2019)

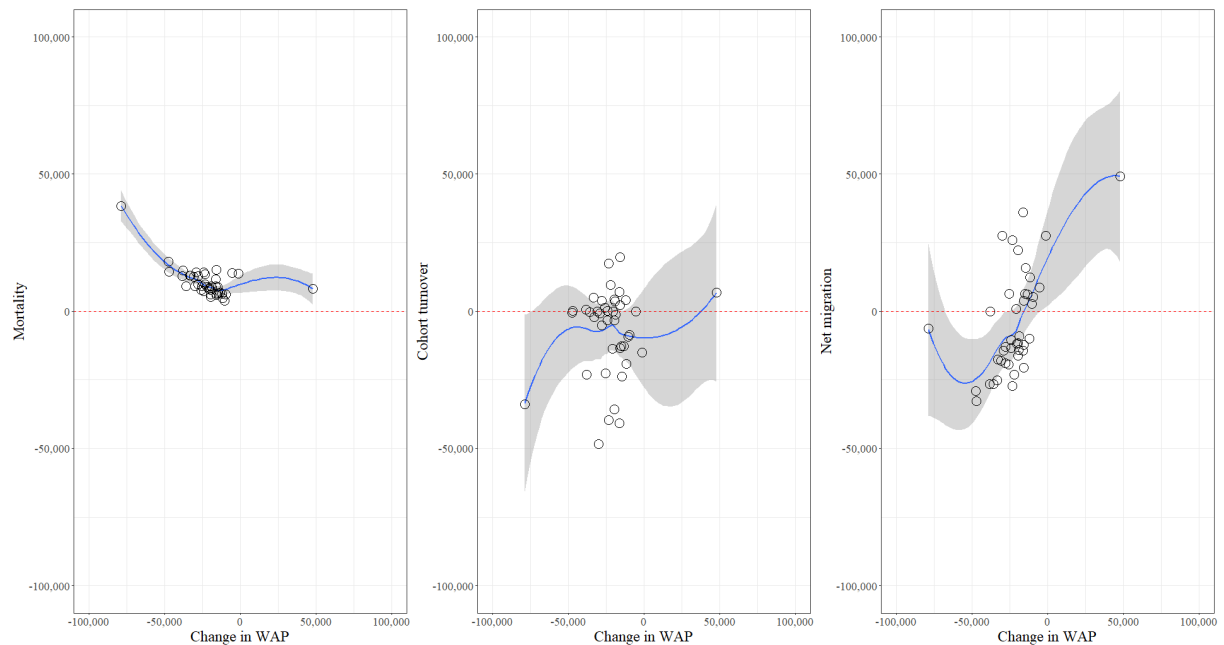


Source: Own calculations based on data from (Eurostat, 2019; INSSE, 2022)

Following the correlation between the components and changes in the prospective

male WAP between 2007 and 2019, we observe some changes. When applying the prospective age to the male WAP, the cohort turnover and net migration effect showed higher relative volatility (see Figure 5.15). The pattern became more similar to the one observed in the conventional female WAP during the reference period and similar to the pattern observed on the European NUTS-3 level identified by (Ghio et al., 2022).

Figure 5.15: Relationship between components and changes in the prospective WAP, males (2007-2019)



Source: Own calculations based on data from (Eurostat, 2019; INSSE, 2022)

This change in pattern indicates that the male life expectancy at exact ages improved over the past 13 years, becoming more similar to the pattern observed within the conventional female WAP.

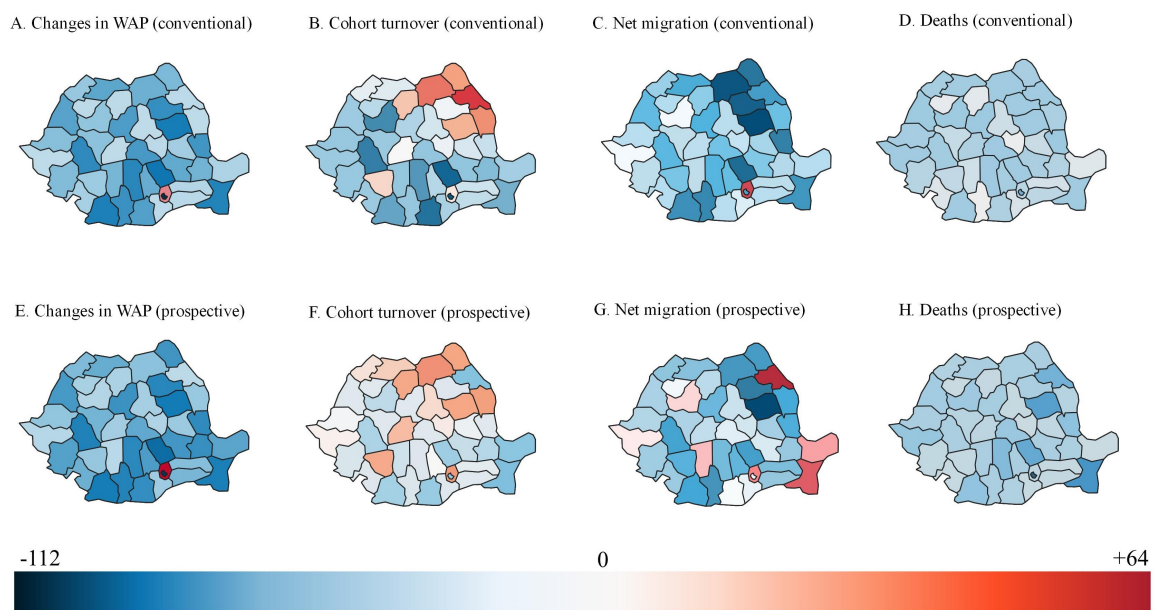
These correlations indicate that over the past 13 years, net migration's effect led to negative changes in both conventional and prospective WAP for both genders. Negative net migration amplified over the years in Romania for both genders, more precisely after becoming a member of the European Union in 2007, as discussed in the previous chapter. The effect amplified after 2012 when all the European countries opened their labour markets for Romania and Bulgaria.

Conventional and Prospective Female WAP (2007-2019)

The results of the decomposition on the regional level of the female conventional and prospective WAP between 2007 and 2019 are presented in figure 5.16. Except for Ilfov county, the other 41 counties experienced a negative change in the conventional and prospective WAP. The difference between the two population types was insignificant (A. and E. 5.16). The net migration effect amplified during this period, except for Ilfov county. This positive net migration and positive change in the conventional WAP from Ilfov are

explained by the outflow of women from the capital city of Bucharest (see Table 5.1). The negative net migration effect from the other counties concedes with the emigration of the female workforce towards Western Europe. Furthermore, the cohort turnover effect turned negative in 34 counties during the reference period (Ghio et al., 2022) show that the cohort turnover effect was primarily negative in Romania between 2015-2019, apart from five counties. During our reference period, we can observe the positive to a negative change in the cohort turnover (B.) effect. After Romania joined the European Union, the social and economic conditions improved significantly. Consequently, female mortality improved (D.).

Figure 5.16: Relative change in WAP, females (2007-2019)



Note. Relative changes between 2007 and 2019 in the: (A.) size of the conventional working age population (WAP) females (15-64); (B.) cohort turnover females; (C.) net migration females (15-64 years); (D.) deaths females (15-64 years); (E.) size of the prospective female WAP (15-prospective age); (F.) cohort turnover females (prospective age); (G.) net migration females (15-prospective age); (H.) deaths females (15-prospective age). Values of variables are expressed in thousands. Prospective age is defined as the age where the remaining life expectancy is 15 years. In 2007 the female prospective age in Romania by region ranged between the ages of 66 and 69. In 2019 it ranged between the ages of 69 and 77.

Source: Own calculations based on data from (INSSE, 2022) (Eurostat, 2019)

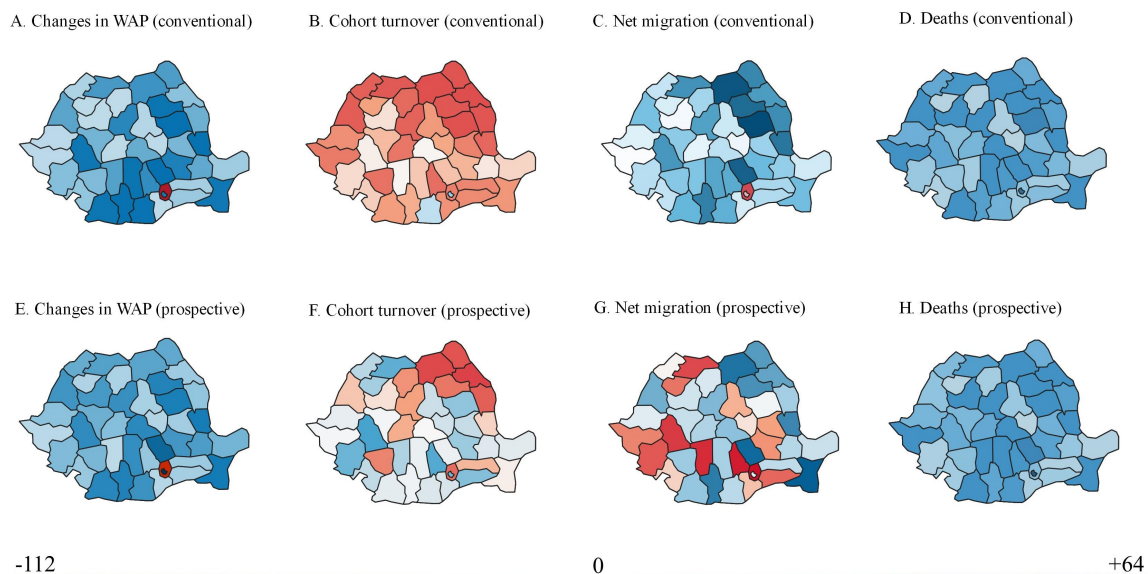
The decomposition for the female prospective WAP illustrates some difference during this period. The prospective WAP (E.) change was neither amplified nor reduced. The net migration effect turned positive in 7 regions, Cluj, Iasi, Timis, Valcea, Constanta and Tulcea was positive. However, it was not high enough to have positive changes in the prospective WAP. The positive net migration effect in Cluj, Iasi, and Timis was expected because of the economic growth over the past years. From an economic point of view, Valcea is not as developed as Cluj, Iasi, Timis, Constanta and Tulcea. However, Valcea is the region with the highest prospective age in 2019, 77 for females. The only possible explanation for the fact that this specific region has the highest life expectancy is the geographical location in the mountains, the quality of the air, and its climate (Chirilă et al., 2020).

The cohort turnover effect (F.) for females with the prospective age became positive in three counties. The prospective female WAP mortality effect (H.) amplified slightly through the expansion of the working-age groups, including more deaths than the conventional female WAP.

Conventional and Prospective Male WAP (2007-2019)

Between 2007 and 2019, the conventional male WAP by NUTS-3 regions (see Figure 5.17) had mainly negative changes in WAP (A.) except for Ilfov county, as in the case of the changes in the female WAP. The net migration effect comes along with the negative changes in WAP. Only one regions out of 42 had a positive net migration, Ilfov (C.). As in the case of the female WAP, the exact reason for high net migration applies to the conventional male WAP in Ilfov, namely emigration from the capital to the suburban and urban regions 5.2.

Figure 5.17: Relative change in WAP, males (2007-2019)



Note. Relative changes between 2007 and 2019 in the: (A.) size of the conventional working age population (WAP) males (15-64); (B.) cohort turnover males; (C.) net migration males (15-64 years); (D.) deaths males (15-64 years); (E.) size of the prospective male WAP (15-prospective age); (F.) cohort turnover males (prospective age); G. net migration males (15-prospective age); H. neaths males (15-prospective age). Values of variables are expressed in thousands. Prospective age is defined as the age where the remaining life expectancy is 15 years. In 2007 the male prospective age in Romania by region ranged between the ages of 61 and 66. In 2019 it ranged between the ages of 62 and 76.

Source: Own calculations based on data from (INSSE, 2022)

The decomposition on the regional level of the male WAP points out the importance of the net migration effect on the changes in the WAP. As in the case of the female WAP, net migration became the leading cause of population decline within the working-age groups.

The cohort turnover effect (B.) remained positive in most regions except for Giurgiu county. The mortality effect (D.) decreased compared to the previous analysis period.

However, the gap between female and male mortality is persisting.

The changes in the prospective WAP during the reference period were similar to those in the conventional WAP. Even when applying the prospective age concept, Ilfov was the only county with positive change. The net migration effect was altered in 16 additional counties, Maramures, Zalau, Timis, Caras-Severin, Mehedinti, Hunedoara, Valcea, Dambovita, Giurgiu, Ialomita, Harghita, Covasna, Vrancea, Iflov, Buzau. However, as in the case of the female prospective WAP, the positive net migration does not positively impact the changes in the male prospective WAP. Valcea is the region with the highest life expectancy at birth and the region with the highest prospective male age, 76 (2019).

The cohort turnover effect (F.) on the prospective male WAP became negative in 14 NUTS-3 regions compared to the conventional male WAP, where only one region was negative. As in the case of positive net migrations, the positive cohort turnover effect was insufficient to impact the prospective WAP changes positively. The decomposition of the prospective male WAP indicates that those regions with a positive net migration effect had a negative cohort turnover effect, and regions with a negative net migration effect had a positive cohort turnover effect. The only exception with positive net migration, positive cohort turnover, and positive change in WAP was Ilfov county.

5.3 Net Migration and the Prospective Age Concept

The decomposition of the working-age population at the regional level between 1992 and 2019 underlines the role of the net migration effect on Romania's WAP by gender. During this period, migration became the main driver of population loss in the working-age group followed by the evolution of the cohort turnover from positive to negative. Overall, the negative net migration effect was greater for the female WAP than the male WAP (see Figure 5.18).

The prospective age concept increased the net migration effect between 1992 and 2006 for both sexes. However, during the last interval analysed (2007-2019), the prospective age concept became more significant in the estimation of the net migration effect. Between 1992 and 2006, the female net migration effect for the prospective WAP was positive in two regions. Compared to the conventional WAP, one additional regions had positive net migration. These regions saw their WAP increase when using the prospective age. This suggests that the positive net migration was concentrated at older ages.

Between 2007 and 2019, the female negative net migration effect intensified in 41 regions out of 42. With the prospective age concept, this intensification was reduced in six additional regions. The intensity of the prospective age increased compared to the previous period, 1992-2006.

Furthermore, the prospective age concept influenced the male WAP between 1992 and 2006. The positive impact of the prospective age concept on the male WAP was given

6 Conclusions

This study examined the contribution of migration to Romania's population ageing, particularly to its declining working-age population. The main objective was to identify which of the three demographic components, namely mortality, cohort turnover, and net migration, most contributed to the decline in the working-age population in the past.

First, we reconstructed Romania's changing migration profile to understand its dynamics from a historical perspective. During the communist regime, emigration was restricted. However, the Romanian government made agreements with Germany and Israel that allowed ethnic Germans and Jews to emigrate to these countries. In addition, many qualified Romanians were allowed to work abroad through agreements between the Romanian government and countries in the Middle East, Asia, and North Africa. After fulfilling their contracts, Romanians who were working abroad were obliged to return to Romania.

We showed that after the end of the communist regime, emigration from Romania consisted primarily of ethnic Germans, Hungarians, and Jews. This ethnic emigration lasted until 1994. After 1994, emigration from Romania became labour orientated. On the one hand, the slow economic development after the change in the country's socio-political regime and the privatisation of state companies led to very high unemployment rates during the 1990s. On the other hand, Western European countries were already experiencing workforce shortages in sectors such as agriculture and construction. These two factors created the perfect opportunity for Romanians to emigrate to Western Europe. Then, the primary destinations were Italy, Spain, France, the United Kingdom, and Germany. After accessing the European Union in 2007, emigration from Romania reached its highest levels, displaying a pattern of feminisation of emigration flows. Overall, more women than men began to leave Romania.

Immigration to Romania was less significant during the communist regime. Some countries in North Africa, as well as countries from the Warsaw Pact (Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland and the Soviet Union), had agreements with Romania to allow international students to attend the country's universities.

After 1989, immigration to Romania increased slowly. Only after Romania joined the European Union did immigration become more significant. Immigrants from neighbouring countries and other countries in Asia began to move to Romania, primarily for economic

reasons. In addition, between 2012 and 2019, return migration increased as well.

Second, we identified which of the three demographic components, namely mortality, cohort turnover, and net migration, most contributed to the decline in the working-age population at the national and regional level by gender. The decomposition was divided into three periods. The first period, between 1977 and 1991, encompasses Romania during the communist regime and before the first democratic elections. The second period comprises Romania during the transition to a capitalist economy until becoming a member of the European Union, from 1992 to 2006. The third period comprises Romania as a member of the European Union from 2007 until 2019, before the COVID-19 pandemic and before the full implementation of Brexit.

In addition to the conventional age, we applied the prospective age concept at the regional level to redefine the working-age population groups and incorporate the mortality dynamics over the period of analysis. Through the prospective age concept, we defined the prospective working-age population as the group between 15 years and the prospective age of each region by gender. We defined the prospective age as the age at which the remaining life expectancy is 15 years. In the case of the female prospective WAP, we expanded the working age groups. However, in the case of the male prospective WAP we had to narrow the working-age groups because, in some regions, the age at which the remaining life expectancy was 15 years was below the conventional age of 65. Therefore, the female prospective WAP had a surplus of the potential workforce, while the male prospective WAP had a shortage of potential workforce.

This study represents one of the first explorations of working-age population loss and its leading demographic causes in Romania. The study covers a period of 43 years during three major structural social-political changes, the transition from a communist regime to a capitalist economy to membership in the European Union. Furthermore, few studies have focused on population ageing in traditionally migrant-sending countries (for an exception see Fihel et al. (2018); Hoff (2008)).

The decomposition by gender at the national level showed how the effect of net migration intensified over time. During the communist regime, between 1977 and 1991, the net migration effect was negative, however less significant. The cohort turnover effect positively impacted the change in the working-age population. The Romanian government strictly controlled migration, emigration was ethnic conceding with the negative net migration effect of the working-age population Lazaroiu et al. (2003); Hamberger (2010). During this period, both female and male working-age populations increased significantly. The mortality effect was more predominant in the male than in the female WAP due to the decline in life expectancy during the 1980s. The male life expectancy at birth decreased between 1980 and 1990 while the female life expectancy stagnated. This period was characterized by increased alcohol and tobacco consumption and cardiovascular, digestive and circulatory system diseases. By 1991, life expectancy at birth for men was 66.9 years

and for women 73.4 years (Aburto and van Raalte, 2018; Aburto, 2019; Aburto et al., 2020; Dolea et al., 2002). Even though it comes with limitations and the residual net migration effect can not distinguish between internal and international migration flows, this indirect estimation has the advantage of integrating age specific (15-64 years) and spatial patterns (NUTS-3 level) of the migration flows by comparing the stock of net migrants at the beginning and at the end of the interval (Goujon et al., 2021). In addition to this, we estimated the indirect inter-census net migration rate between 1992-2002 and 2002-2012 to complement the results of the decomposition model. The indirect estimation of the inter-census net migration rate expresses the average number of net migrants per 1000 population. This estimation consolidates the theory of the feminisation of the emigration process and the emigration of the working-age population. However, the two measures, the residual net migration effect and the indirect estimation of the inter-census net migration rate cannot be compared to each other.

After the fall of communism and the transition to a capitalist economy, from 1992 to 2006, the scenario changed completely. During this period, Romania witnessed a feminisation of its emigration flows. The negative net migration effect intensified for both genders. After the fall of the communist regime, migration was mostly ethnic and permanent, and starting with 1994, emigration became primarily labour-oriented, temporary and circular. Throughout these years, the emigration of low-skilled workers and agricultural workers increased significantly (Horváth and Gabriel Anghel, 2009). Furthermore, in 2002 the Schengen visa requirement was lifted, enabling Romanians to stay up to three months in the Member States, with those who wanted to stay longer having to prove that they could support themselves financially. This policy change allowed more Romanians to emigrate, especially to Italy and Spain (Rodriguez, 2022). Although the cohort turnover effect remained positive during this period, it could not counterbalance the negative net migration and mortality effects, although with some differences by gender. Net migration was the component that most contributed to a negative change in the female and male WAP.

During the last period, after joining the European Union (2007-2019), the net migration effect intensified for both genders, becoming the main trigger for the declining working-age population. The decomposition showed that 71.9% of the loss in the female WAP and 58.1% of the loss in the male WAP was explained by negative net migration. During this period, the mortality effect decreased significantly, primarily as a result of mortality improvements after Romania became a member of the European Union. Between 2007 and 2019, the cohort turnover effect decreased from 31.9% to -14.1% in the female WAP and from 38% to 11.5% in the male WAP.

At the national level, the decomposition highlights the role of net migration in the changes observed in Romania's WAP throughout the last four decades and how net migration counterbalanced the demographic bonus after 1992. After Romania became a

member of the European Union in 2007 and gained full access to the European labour market, emigration increased. Furthermore, female emigration became more significant than male emigration. Besides the right to free mobility, the nature of emigration changed from predominantly permanent to predominantly temporary. This, combined with the negative natural growth since 1990, the result of the sharp fall in fertility, intensified the process of population ageing in Romania. Because of the decline in the working-age population, the share of Romania's elderly population is increasing fast. In 2019, the largest cohort in Romania was 52 years old. This is the cohort born after 1967, when the communist government prohibited abortion. This is alarming because the cohort retiring by 2032 represents more than 4% of the total population. It is expected that in 2032, Romania will face challenges related to the sustainability of its welfare and health systems (Sala, 2018).

At the regional level, the decomposition of the conventional WAP by gender showed that between 1992 and 2006, 95.24% of the NUTS-3 regions had experienced a negative change in WAP. The female cohort turnover effect was positive in 97.61% of the NUTS-3 regions. The male cohort turnover effect was positive in all regions. However, the net migration and mortality effects counterbalanced the cohort turnover effect in 95.24% of the regions for both genders. Between 2007 and 2019, in 97.61% of the NUTS-3 regions, the change in WAP was negative for both genders. The female cohort turnover effect was negative in 80% of the NUTS-3 regions. The male cohort turnover was negative in 66.6% of the NUTS-3 regions. Once again, the negative net migration and mortality effect counterbalanced the positive cohort turnover effect leading to a negative change in the WAP for both genders. In line with the dynamics observed at the national level, these results indicate that the leading cause of population ageing in Romania was negative net migration. Due to its negative contribution to the changes in WAP, migration becomes a factor accelerating the ageing process in Romania.

For the second part of the regional decomposition model, we applied the prospective age concept as a measure to decelerate population ageing, identifying the age at which the remaining life expectancy was 15 years for each NUTS-3 region. The main idea of the prospective age concept is to alter the retirement age according to 15 years of remaining life expectancy. Consequently, the working-age groups would be expanded, and the share of the elderly population would be reduced. The prospective ages indicate the differences in age variability at death between men and women. They showed the differentials of mortality gains concentrated in the WAP of men and women. The compression of female mortality is more advanced than that of males.

Increasing the retirement age has been part of the political strategies to deal with Romania's rapidly ageing population. Currently, the legal retirement age for females is 63 and 65 for males. However, the gap between female and male life expectancy in Romania is still high, 7.6 years in 2019. Furthermore, the gap in life expectancy at older ages by

gender is also high.

The prospective male working-age groups reduced in size in all the NUTS-3 regions between 1992 and 2006. In 1992, none of the regions had the prospective age above 65 years. Only 11.90% of the regions had prospective ages equal to the conventional age of 65. The remaining 88.1% had prospective ages below the conventional age of 65. By 2006, in 11.90% of the regions the male prospective age was above 65 years and in 80.9% of the regions, the prospective ages remained below 65 years. By 2019, 21.43% of the NUTS-3 regions had prospective ages above 65 years, 26.9% had prospective ages equal to the conventional age, and 47.62% were still below the age of 65. However, the use of the prospective age expanded the female working-age population groups by NUTS-3 regions except for 1992. In 1992, 26.19% had their prospective ages above 65, 38% equal to the conventional age, and 47.62% of the regions had their prospective ages below 65. Because of female mortality improvements, by 2006, 7.14% of the regions had their prospective ages equal to conventional 65, and 92.86% had their prospective above 65 years.

Even with this limitation, we applied the concept to both populations. Between 1992 and 2006, in 90.74% of the NUTS-3 regions, changes in the female prospective WAP were negative. This suggests that compared to the conventional decomposition model, 4.78% of additional NUTS-3 regions had a positive change in the female WAP. The female net migration effect was positive in one additional NUTS-3 region. The female cohort turnover effect was slightly altered by using the prospective age concept. The regions where the female WAP was expanded with the prospective age displayed higher mortality because of adding more potential females to the WAP. In the case of the prospective male WAP, the changes were different. As in the case of the female prospective WAP, 4.78% of additional NUTS-3 regions experienced a positive change in WAP. The cohort turnover effect was slightly affected. However, the changes in net migration were more prominent. In 11.9% of the NUTS-3 regions, the effect of the male net migration from the prospective decomposition was positive compared to 2.3% from the conventional decomposition. These results suggest that more positive migration can occur when the prospective male working-age groups reduce their size. The potential explanation for these results is that potential older migrants were excluded from the WAP.

From 2007 to 2019, the effects of the prospective age on the female WAP were slightly intenser. The use of the prospective age did not alter the change in the female WAP. The same 97.61% of NUTS-3 regions had a negative change in the prospective WAP. In this case, the cohort turnover effect was less negative than in the conventional decomposition model. As for the female net migration effect, the changes were more significant, 16.6% of the NUTS-3 regions had positive net migration effect. The changes in the prospective male WAP were not altered. The same 97.61% NUTS-3 regions experienced a negative change in WAP. The male cohort turnover effect was altered, 66.6% of the NUTS-3 regions displaying a negative cohort turnover effect. Furthermore, 33.3% of additional NUTS-3

regions identified a positive net migration effect. The regions with positive net migration effect experienced negative cohort turnover effect. We can conclude from the prospective decomposition model that the prospective age concept did not bring significant positive changes to the working-age population. As a measurement for the ageing process, this concept could not ultimately decelerate the declining working-age populations within the NUTS-3 regions by gender. The negative net migration counterbalanced the possible effects of the prospective age. In addition, the regions where the net migration effect turned positive by applying the prospective age concept to the decomposition model, indicates that positive net migration occurs at older ages. Moreover, these flows of positive net migration could be returnees at older ages or inflow of old-aged persons.

These results are alarming, given that the decline in Romania's WAP by gender occurred at a faster pace and much larger scale than expected. The results indicate that the ageing process in Romania is very advanced, and the pace of the WAP decline is fast. In addition, these results reveal the substantial effect of the process of feminisation of emigration on the size and composition of Romania's WAP and how emigration became the central component accelerating the population ageing phenomenon in Romania.

This research represents an important contribution to the methodology of (De Beer et al., 2011; Goujon et al., 2021; Ghio et al., 2022) by expanding the period of analysis to 43 years, by focusing on one country affected by fertility below replacement level, increasing longevity and high rates of emigration.

Our analysis provides insights regarding the severity of the emigration phenomenon in Romania and could help address short and medium-term policy interventions. The decline in WAP challenges the sustainability of Romania's welfare and health system. The Romanian government has to rethink its policies regarding the ageing phenomenon. Policies that aim the raise of the retirement age could be effective. There is still a gap between female and male life expectancy, and female life expectancy is higher than male. However, male life expectancy is going in the same direction and tends to increase. Therefore, Romania will need policies to promote higher labour force participation at older ages. Furthermore, if policies aim to raise the retirement age, finding ways to help older workers remain productive will be essential. Older workers will need more health support, an appropriate work structure and inclusive policies that protect them.

In many cases, the contribution of diaspora to the development of the countries of origin is widely recognised. However, origin governments lack engagement with diasporas as development partners in the long term. Therefore, from this perspective, origin governments should engage more with the diaspora communities, promote better policies and work together to as development partners. These approach could lead to more return migrations within the working-age population groups.

Future research could explore the impact of Brexit and the COVID-19 pandemic on Romania's working-age population dynamics at the national and regional levels. Fur-

thermore, this decomposition model could include the human capital into analysis, such as educational attainment. By decomposing the working-age population by educational attainment, especially in contexts with fertility below replacement level, increasing longevity and high rates of emigration, the analysis could reveal if the emigration of high skilled workers increased over the past years. In addition, using survival ratios, instead of deaths, may be useful for the estimation of the migration effect.

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Appendix A

Annexes

Table A.1: Decomposition of the conventional working-age population (WAP) by gender, national level (1977-2019)

Period/Gender	Change in WAP	Deaths in WAP	Cohort turnover	Net migration
Females				
1977-1991	639863	297889	1231619	-293868
1992-2006	-779587	300256	689297	-1168628
2007-2019	-856262	108378	-122747	-613435
Males				
1977-1991	777744	566686	1631782	-293868
1992-2006	-635964	683758	1010771	-962978
2007-2019	-1259878	487090	184701	-930695

Source: Own calculations based on data from INSSE (2022)

Table A.2: Prospective ages by gender and NUTS-3 region

NUTS-3	Females				Males			
	1992	2006	2007	2019	1992	2006	2007	2019
North-West								
Bihor	67	66	66	69	61	63	63	63
Bistrita-Nasaud	65	66	66	70	59	61	63	66
Cluj	66	67	68	71	65	66	66	66
Maramures	63	65	66	70	58	60	61	64
Salaj	64	66	66	70	57	60	61	64
Satu Mare	64	66	67	69	59	62	62	62
Centre								
Alba	65	67	68	71	61	63	64	66
Brasov	65	68	68	71	65	66	66	66
Covasna	63	66	67	70	57	60	62	64
Harghita	63	66	67	71	58	60	62	65
Mures	65	67	68	71	62	63	64	65
Sibiu	65	68	68	70	65	66	66	65
North-East								
Bacau	67	68	68	70	62	61	62	63
Botosani	63	67	68	70	63	64	64	64
Iasi	67	69	69	71	65	66	66	64
Neamt	66	68	68	70	64	65	65	65
Suceava	65	66	67	70	63	65	65	65
Vaslui	66	67	68	70	61	62	63	64
South-East								
Braila	65	67	68	71	62	63	63	64
Buzau	65	66	67	71	60	61	62	64
Constanta	67	68	69	70	65	66	66	64
Galati	65	66	67	70	63	64	64	64
Tulcea	66	68	69	69	61	62	63	62
Vrancea	64	67	68	71	61	62	62	66
South-Muntenia								
Arges	65	68	68	71	61	62	63	66
Calarasi	65	67	67	69	59	60	61	64
Dambovita	64	66	67	70	60	61	61	65
Giurgiu	63	66	67	69	59	60	62	64
Ialomita	66	67	68	70	62	63	63	64
Prahova	66	68	68	71	64	65	65	65
Teleorman	64	66	67	71	62	63	63	65
Bucuresti-Ilfov								
Ilfov	67	68	68	71	63	64	64	66
Bucuresti	65	68	68	70	61	62	63	66
South-West Oltenia								
Dolj	65	66	67	69	61	62	63	64
Gorj	65	66	67	70	62	63	64	65
Mehedinti	65	66	67	69	60	61	62	65
Olt	66	67	68	70	62	63	64	64
Valcea	64	65	66	77	60	61	62	76
West								
Arad	65	66	66	69	61	62	63	64
Caras-Severin	62	65	66	69	57	60	61	64
Hunedoara	64	66	67	70	57	60	61	64
Timis	65	67	68	70	61	62	63	65

Source: Own calculations based on data from [EUROSTAT and INSSE, 2002]

Table A.3: Decomposition of the conventional female working-age population (WAP), NUTS-3 (1992-2006)

NUTS-3	Change in WAP	Deaths in WAP	Cohort turnover	Net migration
North-West				
Bihor	-17859	10177	19457	-27138
Bistrita-Nasaud	-10700	3881	13991	-20810
Cluj	-830	9925	29594	-20499
Maramures	-16114	8365	25396	-33146
Salaj	-14721	4148	4674	-15248
Satu Mare	-14057	7249	18362	-25170
Centre				
Alba	-18574	5051	11108	-24631
Brasov	-10371	7704	30889	-33556
Covasna	-2600	2823	11052	-10829
Harghita	-4861	4259	15635	-16238
Mures	-16412	8617	19263	-27058
Sibiu	-13092	5380	21200	-28913
North-East				
Bacau	-42351	10169	27850	-60032
Botosani	-26709	6747	10744	-30706
Iasi	-17050	10543	46149	-52656
Neamt	-43153	7825	16848	-52176
Suceava	-28725	8448	24786	-45063
Vaslui	-33979	5909	14632	-42702
South-East				
Braila	-23067	5262	6369	-24175
Buzau	-28009	6520	3193	-24682
Constanta	-4156	11133	36963	-29987
Galati	-30695	8059	26523	-49160
Tulcea	-14980	4368	8842	-19454
Vrancea	-23030	4922	8710	-26818
South-Muntenia				
Arges	-17118	8026	19552	-28644
Calarasi	-12475	4853	4197	-11819
Dambovita	-7818	7036	14831	-15613
Giurgiu	-12251	4581	-1757	-5913
Ialomita	-12409	4134	5734	-14009
Prahova	-31759	11329	14330	-34761
Teleorman	-39145	6927	-8255	-23963
Bucuresti-Ilfov				
Ilfov	20745	2910	10277	13377
Bucuresti	-39272	19860	85588	-105001
South-West Oltenia				
Dolj	-31555	10965	8143	-28734
Gorj	-8738	4847	11134	-15026
Mehedinti	-17348	4375	2708	-15682
Olt	-26135	7020	5838	-24953
Valcea	-19889	5387	6662	-21164
West				
Arad	-15681	7394	8140	-16427
Caras-Severin	-21253	5392	7239	-23100
Hunedoara	-36749	8229	11149	-39670
Timis	5358	9519	31556	-16679

Source: Own calculations based on data from INSSE (2022)

Table A.4: Decomposition of the conventional male working-age population (WAP), NUTS-3 (1992-2006)

NUTS-3	Change in WAP	Deaths in WAP	Cohort turnover	Net migration
North-West				
Bihor	-15730	22397	28724	-22057
Bistrita-Nasaud	-6894	8583	19471	-17782
Cluj	-5895	22156	34872	-18612
Maramures	-11529	18997	33691	-26222
Salaj	-12113	9199	9426	-12340
Satu Mare	-12585	17444	25435	-20576
Centre				
Alba	-16522	12423	16613	-20711
Brasov	-7474	18108	39872	-29238
Covasna	-1485	7001	14080	-8564
Harghita	-4381	11019	19545	-12908
Mures	-14010	19947	26573	-20636
Sibiu	-11605	12947	28222	-26881
North-East				
Bacau	-33407	21631	35979	-47755
Botosani	-20938	15025	18735	-24648
Iasi	-12732	22979	53586	-43340
Neamt	-34836	16885	23763	-41715
Suceava	-23946	18911	32455	-37490
Vaslui	-26476	12655	20483	-34305
South-East				
Braila	-19846	12741	12210	-19315
Buzau	-23298	15352	11440	-19385
Constanta	-2653	25549	45124	-22229
Galati	-28051	20233	32807	-40625
Tulcea	-12921	9812	12297	-15406
Vrancea	-18524	11102	14090	-21513
South-Muntenia				
Arges	-11489	20123	28882	-20248
Calarasi	-10066	11369	9474	-8172
Dambovita	-2611	17583	25065	-10094
Giurgiu	-8423	10565	4815	-2673
Ialomita	-10261	10092	10103	-10272
Prahova	-23580	26162	29219	-26637
Teleorman	-33855	15610	905	-19151
Bucuresti-Ilfov				
Ilfov	22310	7051	14320	15042
Bucuresti	-38735	40019	116599	-115315
South-West Oltenia				
Dolj	-28613	23464	19345	-24494
Gorj	-3698	11018	17578	-10258
Mehedinti	-12268	9383	8671	-11556
Olt	-19273	16533	15807	-18547
Valcea	-14360	12427	13684	-15618
West				
Arad	-12554	16543	15816	-11828
Caras-Severin	-19244	12321	13128	-20051
Hunedoara	-34029	18434	17495	-33091
Timis	2637	21977	40375	-15762

Source: Own calculations based on data from INSSE (2022)

Table A.5: Decomposition of the conventional female working-age population (WAP), NUTS-3 /2007-2019)

NUTS-3	Change in WAP	Deaths in WAP	Cohort turnover	Net migration
North-West				
Bihor	-23744	3722	-2512	-17510
Bistrita-Nasaud	-12918	1608	2645	-13955
Cluj	-17061	3649	-7475	-5937
Maramures	-23307	3049	-478	-19781
Salaj	-12095	1381	-1765	-8950
Satu Mare	-16795	2629	-346	-13820
Centre				
Alba	-18189	1850	-3767	-12572
Brasov	-25591	3305	-5517	-16769
Covasna	-10075	1298	-318	-8459
Harghita	-14336	1793	-799	-11744
Mures	-25040	3373	-2243	-19424
Sibiu	-14209	2344	34	-11899
North-East				
Bacau	-33002	4504	4971	-33469
Botosani	-18879	2550	5205	-21535
Iasi	-10424	4386	14095	-20133
Neamt	-26943	3109	-213	-23620
Suceava	-22000	3293	10215	-28923
Vaslui	-13826	2433	5525	-16918
South-East				
Braila	-20859	2097	-5561	-13201
Buzau	-22994	2524	-5548	-14922
Constanta	-30841	4780	-5908	-20154
Galati	-26069	3373	-1480	-21217
Tulcea	-14774	1625	-2343	-10806
Vrancea	-15869	1848	-733	-13288
South-Muntenia				
Arges	-29444	3395	-7165	-18884
Calarasi	-14572	1969	-1646	-10957
Dambovita	-22159	2757	-1940	-17461
Giurgiu	-12073	1707	-2249	-8117
Ialomita	-14579	1723	-1110	-11746
Prahova	-39249	4427	-11428	-23395
Teleorman	-24475	2282	-11239	-10954
Bucuresti-Ilfov				
Ilfov	33480	1979	404	35054
Bucuresti	-74706	11657	-43165	-19884
South-West Oltenia				
Dolj	-31610	4098	-7105	-20407
Gorj	-16378	1919	997	-15456
Mehedinti	-15559	1704	-3185	-10669
Olt	-26103	273	-4987	-20843
Valcea	-19791	1771	-5050	-12970
West				
Arad	-18498	2941	-4326	-11232
Caras-Severin	-18791	2001	-4314	-12476
Hunedoara	-28574	3003	-7671	-17899
Timis	-13340	3957	-3251	-6132

Source: Own calculations based on data from INSSE (2022)

Table A.6: Decomposition of the conventional male working-age population (WAP), NUTS-3 (2007-2019)

NUTS-3	Change in WAP	Deaths in WAP	Cohort turnover	Net migration
North-West				
Bihor	-31949	13833	7436	-25551
Bistrita-Nasaud	-21411	6302	5866	-20975
Cluj	-19669	13678	517	-6507
Maramures	-35376	12103	8085	-31359
Salaj	-19188	5793	2616	-16012
Satu Mare	-23640	10943	6645	-19342
Centre				
Alba	-30031	8079	1293	-23245
Brasov	-31868	12343	51	-19577
Covasna	-15855	4860	1886	-12882
Harghita	-23380	6928	2802	-19253
Mures	-37845	12923	6395	-31318
Sibiu	-17879	9108	5368	-14140
North-East				
Bacau	-54253	18785	14723	-50192
Botosani	-33997	10921	12306	-35383
Iasi	-26065	18565	23838	-31339
Neamt	-43158	13335	8192	-38015
Suceava	-35399	13767	19945	-41578
Vaslui	-31715	11216	11751	-32250
South-East				
Braila	-31870	9106	293	-23058
Buzau	-38073	11401	1479	-28152
Constanta	-41054	17830	2843	-26067
Galati	-45901	15596	6108	-36413
Tulcea	-24427	6992	674	-18109
Vrancea	-26794	8657	4700	-22837
South-Muntenia				
Arges	-43422	13686	1156	-30892
Calarasi	-24682	8163	3850	-20369
Dambovita	-36661	11700	5859	-30821
Giurgiu	-20249	7336	3157	-16070
Ialomita	-24106	7270	4084	-20920
Prahova	-57751	18144	1203	-40811
Teleorman	-43769	9960	-3528	-30282
Bucuresti-Ilfov				
Ilfov	45549	7781	5151	48179
Bucuresti	-39986	37395	-12646	10055
South-West Oltenia				
Dolj	-42734	16192	2738	-29281
Gorj	-26782	7727	5524	-24579
Mehedinti	-24905	6526	970	-19350
Olt	-45426	11242	1871	-36055
Valcea	-32583	7223	122	-25483
West				
Arad	-22541	10749	3365	-15158
Caras-Severin	-26667	7577	570	-19660
Hunedoara	-42305	11131	178	-31353
Timis	-10058	14234	5264	-1088

Source: Own calculations based on data from INSSE (2022)

Table A.7: Decomposition of the prospective female working-age population (WAP), NUTS-3 (1992-2006)

NUTS-3	Change in WAP	Deaths in WAP	Cohort turnover	Net migration
North-West				
Bihor	-21617	12111	17163	-26669
Bistrita-Nasaud	-9278	4354	12725	-17648
Cluj	3535	12395	28148	-12217
Maramures	-10398	10041	22298	-22655
Salaj	-11717	4708	4038	-11047
Satu Mare	-10348	8000	16290	-18639
Centre				
Alba	-14439	6044	10009	-18403
Brasov	-1451	8897	29521	-22075
Covasna	610	3404	9872	-5858
Harghita	-125	5129	14243	-9239
Mures	-10185	9617	17457	-18024
Sibiu	-6180	6382	20008	-19806
North-East				
Bacau	-37256	10732	25977	-52501
Botosani	-16257	7920	9470	-17807
Iasi	-7972	12699	44062	-39335
Neamt	-35706	8662	13946	-40990
Suceava	-25191	9448	20916	-36659
Vaslui	-31704	6619	11455	-36540
South-East				
Braila	-18375	5859	4283	-16799
Buzau	-24944	7385	1492	-19051
Constanta	1178	12165	37764	-24422
Galati	-27464	8970	22089	-40583
Tulcea	-12454	4839	8222	-15837
Vrancea	-16343	5837	7112	-17617
South-Muntenia				
Arges	-5995	10495	20961	-16461
Calarasi	-8432	6142	5017	-7307
Dambovita	-1971	7495	14945	-9421
Giurgiu	-5617	5233	134	-518
Ialomita	-10477	4875	5717	-11318
Prahova	-20794	14199	16084	-22679
Teleorman	-32448	8537	-8478	-15433
Bucuresti-Ilfov				
Ilfov	22489	3600	14890	11198
Bucuresti	-7373	22046	68960	-54288
South-West Oltenia				
Dolj	-27476	12499	4891	-19869
Gorj	-6894	6165	10256	-10985
Mehedinti	-15736	5063	1340	-12012
Olt	-23466	8004	6162	-21624
Valcea	-17443	6453	5271	-16260
West				
Arad	-13121	9445	5443	-9119
Caras-Severin	-14678	5748	-11551	2621
Hunedoara	-31288	9665	7571	-29193
Timis	12667	11291	28521	-4563

Source: Own calculations based on data from INSSE (2022)

Table A.8: Decomposition of the prospective male working-age population (WAP), NUTS-3 (1992-2006)

NUTS-3	Change in WAP	Deaths in WAP	Cohort turnover	Net migration
North-West				
Bihor	-6776	24939	25049	-6886
Bistrita-Nasaud	-2851	7885	16478	-11444
Cluj	-9181	23965	35022	-20238
Maramures	-6370	17491	2126	8995
Salaj	-5713	8093	7288	-4908
Satu Mare	-5941	16001	20538	-10478
Centre				
Alba	-11440	11386	14144	-14197
Brasov	-92230	19249	38728	-111709
Covasna	61265	6339	10268	57336
Harghita	-1156	9925	-270	9038
Mures	-10121	18382	22413	-14153
Sibiu	-13243	13795	26630	-26078
North-East				
Bacau	-34112	20204	28877	-42785
Botosani	-18052	13999	16599	-20651
Iasi	-16140	24797	51055	-42399
Neamt	-32304	15764	20185	-36725
Suceava	-17366	17580	29306	-29093
Vaslui	-22138	11922	17178	-27395
South-East				
Braila	-16729	11596	9704	-14837
Buzau	-16545	14048	9913	-12409
Constanta	-5674	27030	44614	-23258
Galati	-25102	20051	27380	-32430
Tulcea	-10931	9900	9701	-10731
Vrancea	-14256	11342	12260	-15174
South-Muntenia				
Arges	-7344	19933	24758	-12170
Calarasi	-4315	9981	10017	-4352
Dambovita	3241	17543	23958	-3175
Giurgiu	-1904	9122	7015	203
Ialomita	-7672	10012	9422	-7083
Prahova	-19539	26211	29113	-22441
Teleorman	-28336	16154	1066	-13249
Bucuresti-Ilfov				
Ilfov	24072	7013	17157	13928
Bucuresti	-19785	34280	91063	-76567
South-West Oltenia				
Dolj	-20369	24146	15626	-11850
Gorj	-1333	11342	16318	-6309
Mehedinti	-8416	9909	7114	-5621
Olt	-15468	16725	14552	-13295
Valcea	-10530	12602	11160	-9088
West				
Arad	-6570	16939	13283	-2913
Caras-Severin	-10562	10839	8035	-7758
Hunedoara	-21868	16308	9482	-15043
Timis	8756	25191	35277	-1331

Source: Own calculations based on data from INSSE (2022)

Table A.9: Decomposition of the prospective female working-age population (WAP), NUTS-3 (2007-2019)

NUTS-3	Change in WAP	Deaths in WAP	Cohort turnover	Net migration
North-West				
Bihor	-19061	8888	-2050	-8123
Bistrita-Nasaud	-8976	4655	3116	-7437
Cluj	-6753	9591	-5778	8616
Maramures	-16811	7406	788	-10193
Salaj	-9834	3443	-1698	-4693
Satu Mare	-15806	6188	295	-9912
Centre				
Alba	-16250	5805	-2707	-7738
Brasov	-17973	9615	-2424	-5934
Covasna	-8833	3127	251	-5958
Harghita	-10380	4556	366	-6190
Mures	-20618	8667	-834	-11117
Sibiu	-10639	5712	1550	-6477
North-East				
Bacau	-33103	12609	3764	-24258
Botosani	-19859	7407	3776	-16228
Iasi	-1730	11015	-112764	122049
Neamt	-27993	7510	-2801	-17682
Suceava	-15178	8047	9784	-16915
Vaslui	-14527	5925	4450	-13051
South-East				
Braila	-21445	6506	-5900	-9039
Buzau	-19527	8018	-5567	-5943
Constanta	-30233	13433	-127001	110201
Galati	-23424	10298	-745	-12381
Tulcea	-18077	3831	-43812	29566
Vrancea	-13809	4799	-560	-8450
South-Muntenia				
Arges	-26041	10551	-4469	-11020
Calarasi	-16152	4689	-2031	-9432
Dambovita	-18558	6827	-45	-11686
Giurgiu	-12135	4163	-2645	-5327
Ialomita	-15393	4288	-691	-10415
Prahova	-37239	11639	-10012	-15588
Teleorman	-23054	6374	-12151	-4530
Bucuresti-Ilfov				
Ilfov	56728	5076	4503	57301
Bucuresti	-69364	32474	-35715	-1175
South-West Oltenia				
Dolj	-31366	9878	-8014	-13474
Gorj	-14995	4742	1758	-12012
Mehedinti	-16520	4103	-3540	-8877
Olt	-28868	6776	-4768	-17324
Valcea	-2087	7833	-5483	11229
West				
Arad	-15091	7016	-345	-7731
Caras-Severin	-18233	4759	-4863	-8612
Hunedoara	-28888	7475	-7435	-13978
Timis	-6254	9625	68	3303

Source: Own calculations based on data from INSSE (2022)

Table A.10: Decomposition of the prospective male working-age population (WAP), NUTS-3 (2007-2019)

NUTS-3	Change in WAP	Deaths in WAP	Cohort turnover	Net migration
North-West				
Bihor	-25811	7685	1272	-19397
Bistrita-Nasaud	-12372	6480	4130	-10022
Cluj	-24332	14172	202	-10362
Maramures	-23595	9822	-39665	25891
Salaj	-11679	4692	-19242	12255
Satu Mare	-21016	8264	-13677	925
Centre				
Alba	-20375	8353	-163	-11859
Brasov	-30822	12702	-71	-18049
Covasna	-10561	3949	-9334	2722
Harghita	-13437	6875	-12612	6050
Mures	-28090	12860	3787	-19017
Sibiu	-19383	9051	3728	-14061
North-East				
Bacau	-37987	14827	-23021	-139
Botosani	-22331	8968	9619	-22982
Iasi	-16002	15243	19741	-20501
Neamt	-33422	13154	4972	-25241
Suceava	-23451	13612	17370	-27210
Vaslui	-16515	9260	7158	-14412
South-East				
Braila	-24088	7341	-3293	-13454
Buzau	-25476	9242	-22686	6452
Constanta	-46981	14382	76	-32675
Galati	-38607	12717	536	-26425
Tulcea	-19817	5145	-3193	-11478
Vrancea	-15299	8890	-12805	6396
South-Muntenia				
Arges	-29266	14191	-716	-14359
Calarasi	-14524	6673	-23660	15809
Dambovita	-16226	11620	-40712	36105
Giurgiu	-9474	6069	-8547	5142
Ialomita	-16049	5953	2128	-12224
Prahova	-47428	18066	-411	-28952
Teleorman	-27945	9936	-5071	-12938
Bucuresti-Ilfov				
Ilfov	47823	8129	6780	49172
Bucuresti	-78655	38489	-33832	-6334
South-West Oltenia				
Dolj	-32825	13117	-2151	-17558
Gorj	-19589	7690	4289	-16188
Mehedinti	-16071	6490	-13514	3932
Olt	-35993	9194	-194	-26604
Valcea	-1192	13724	-15022	27553
West				
Arad	-18793	8620	-1224	-8949
Caras-Severin	-19482	6050	-35791	22359
Hunedoara	-30093	9048	-48490	27445
Timis	-5464	14088	-147	8770

Source: Own calculations based on data from INSSE (2022)

Table A.11: A. Annual net change of residence by NUTS-3

NUTS-3	1992	1993	1994	1995	1996	1997	1998	1999	2000
North-West									
Bihor	-297	-310	-761	-888	-404	-234	182	-360	-474
Bistrita-Nasaud	-2014	-1490	-1618	-2035	-2822	-3139	-3055	-2947	-2537
Cluj	5896	5932	7790	10588	12283	12348	13484	14297	12313
Maramures	-3743	-2832	-3863	-4940	-5012	-5256	-4684	-4392	-4173
Salaj	-1831	-1627	-1796	-2187	-1815	-2219	-1369	-1700	-1302
Satu Mare	-2748	-2120	-2401	-2756	-3023	-3037	-2582	-2515	-2339
Centre									
Alba	-1189	-1360	-1586	-1762	-2392	-1857	-1776	-2496	-2783
Brasov	14987	11740	11388	10187	8887	9403	7651	6724	5842
Covasna	1014	1203	488	663	699	451	229	-145	-221
Harghita	207	814	521	314	299	210	168	-91	-345
Mures	-1937	-2129	-1949	-1989	-2040	-2343	-1578	-1780	-1334
Sibiu	4501	2850	3995	2782	2382	2838	3437	2985	2889
North-East									
Bacau	-10152	-8666	-8291	-8006	-6903	-6631	-5488	-5339	-4667
Botosani	-12494	-10313	-10180	-9146	-8744	-9109	-7620	-6786	-6332
Iasi	4437	5189	6191	7831	10546	10022	10373	11383	10896
Neamt	-11988	-10200	-10128	-8758	-8764	-9479	-7868	-7238	-7148
Suceava	-5877	-4794	-4335	-4916	-4317	-4557	-3470	-3435	-3259
Vaslui	-11036	-9708	-9717	-9597	-9945	-10782	-8841	-8166	-7444
South-East									
Braila	-814	-777	-1645	-1984	-2427	-2696	-2766	-3232	-3489
Buzau	-5273	-4480	-4153	-4881	-4784	-4627	-3763	-4299	-4482
Constanta	9062	7176	6521	5309	4996	4452	3606	1452	875
Galati	-3245	-2265	-1029	-482	-978	-573	-109	-386	-275
Tulcea	85	-185	301	-322	-412	-368	-319	-315	-955
Vrancea	-4493	-3844	-3934	-3891	-3695	-3420	-3033	-2809	-2430
South-Muntenia									
Arges	-1773	-1982	-2207	-2688	-2486	-2145	-1917	-2275	-2908
Calarasi	392	-456	-639	346	-405	-677	-540	-824	-517
Dambovita	-1025	-1351	-1487	-1671	-1994	-1863	-1429	-2112	-2181
Giurgiu	235	-245	135	-350	-54	-7	36	-116	-388
Ialomita	-2253	-1764	-1736	-1878	-1831	-1621	-1574	-1755	-2133
Prahova	143	-777	-1646	-1816	-2000	-2885	-3674	-3646	-3806
Teleorman	-4849	-4806	-4610	-4998	-4186	-4182	-3616	-3562	-3600
Bucuresti-Ilfov									
Ilfov	N\A	N\A	N\A	N\A	1835	1981	1334	-320	71
Bucuresti	N\A	N\A	N\A	N\A	27994	29361	27398	31245	32791
South-West Oltenia									
Dolj	-2222	-1641	-427	-12	-576	421	1444	1615	1740
Gorj	994	497	1391	-51	-314	35	-488	-1698	-1891
Mehedinti	-1048	-788	-1410	-1424	-1500	-2020	-1051	-1368	-1929
Olt	-5334	-4901	-5933	-5965	-4726	-5852	-5273	-5095	-5352
Valcea	-3903	-3462	-4474	-4651	-4180	-4856	-4294	-4201	-3938
West									
Arad	3931	2950	2704	1765	1537	2012	3361	2063	1580
Caras-Severin	5533	4992	4005	2609	2291	2587	3417	1872	1369
Hunedoara	5502	4971	4449	3996	3939	3935	-292	-224	-367
Timis	12059	8324	10578	14072	15041	16379	6349	11991	14633

Source: INSSE (2022)

Table A.12: B. Annual net change of residence by NUTS-3

NUTS-3	2001	2002	2003	2004	2005	2006	2007	2008	2009
North-West									
Bihor	388	1957	2566	989	1392	1403	1297	831	952
Bistrita-Nasaud	-2763	-1669	-1108	-931	-2383	-745	-2152	-1832	-1326
Cluj	14699	5770	2283	5922	19181	7275	17607	15623	13026
Maramures	-4017	-2123	-1410	-1851	-2998	-1440	-2661	-2567	-2263
Salaj	-1730	-506	-729	-153	-1562	-1191	-1854	-1699	-1612
Satu Mare	-2791	-1340	-1229	-867	-2209	-1105	-2745	-2419	-2126
Centre									
Alba	-2468	-1205	309	150	-2447	-586	-2510	-3010	-1504
Brasov	5323	651	1333	2729	2293	2598	-459	3334	3109
Covasna	-120	210	-18	-642	-657	-582	-822	-1013	-1129
Harghita	-414	89	66	224	-692	-760	-691	-452	-370
Mures	-1562	243	368	-1166	-1915	-339	-1001	-859	-81
Sibiu	3628	2014	2416	3023	2196	2511	2427	1823	2388
North-East									
Bacau	-4880	-1517	-2372	-2941	-2174	-2069	-1790	-2903	-3104
Botosani	-6059	-2412	-3875	-4546	-2871	-2401	-2138	-3053	-3495
Iasi	12930	-2376	6162	12987	4672	4425	2106	5139	7244
Neamt	-6465	-2206	-4367	-4472	-3432	-2677	-2399	-2874	-3480
Suceava	-3953	-940	-2071	-2181	-2440	-1792	-1695	-1617	-2017
Vaslui	-7349	-2602	-2012	-5282	-3237	-2886	-2557	-3349	-4174
South-East									
Braila	-3141	-1376	-1405	-763	-1600	-1515	-1757	-2056	-2095
Buzau	-3665	-2513	-2258	-2113	-1810	-2065	-2561	-3821	-4044
Constanta	1355	1323	1260	661	437	727	275	476	360
Galati	-793	-38	-1268	-1547	-248	-666	-1344	-1719	-1976
Tulcea	-839	-396	-697	-713	-716	-988	-674	-879	-1006
Vrancea	-1986	-822	-536	-1009	-744	-529	-576	-1099	-1242
South-Muntenia									
Arges	-2253	-447	457	-1367	-1390	-1236	-1608	-1670	-2736
Calarasi	-523	-900	-855	-907	-495	-728	-1325	-1719	-1718
Dambovita	-1070	-1405	-1579	-1412	-1138	-1132	-1314	-2218	-2130
Giurgiu	-36	382	402	48	420	-104	-241	-201	51
Ialomita	-1643	-1602	-1539	-1279	-870	-1294	-1404	-1741	-1725
Prahova	-3522	-526	-707	-789	-86	-1856	-2489	-2816	-2579
Teleorman	-2940	-2158	-1951	-1707	-1816	-1936	-2207	-1850	-2276
Bucuresti-Ilfov									
Ilfov	142	-313	-323	-317	-242	-393	664	1147	1985
Bucuresti	23905	16291	13362	12608	12067	17048	22423	25306	25734
South-West Oltenia									
Dolj	1705	438	-442	-1192	817	177	1197	1252	1350
Gorj	-1572	-838	-661	-432	-1029	-925	-1898	-2920	-3317
Mehedinti	-1907	-375	-938	-116	-304	-710	-1319	-1898	-1808
Olt	-4952	-2945	-1951	-1613	-2701	-2875	-3750	-3983	-3752
Valcea	-3365	-1606	-2174	-1764	-2049	-1659	-2403	-2874	-3113
West									
Arad	1178	1376	1323	1298	1102	993	723	207	317
Caras-Severin	748	408	-317	-686	-540	-558	-1367	-1905	-1912
Hunedoara	-1555	762	631	525	-934	-273	-1733	-2318	-2358
Timis	14332	5242	5854	3594	3152	2858	6725	10196	9952

Source: INSSE (2022)

Table A.13: C.Annual net change of residence by NUTS-3

NUTS-3	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
North-West										
Bihor	889	1234	1276	1331	1238	1323	1400	1497	1254	1453
Bistrita-Nasaud	-1384	-1268	-1157	-1175	-978	-443	-624	-636	-688	-750
Cluj	13288	12018	9420	9024	8236	4341	5028	4638	4703	4685
Maramures	-2126	-1775	-1536	-1390	-1287	-826	-1207	-896	-872	-858
Salaj	-1685	-1574	-1199	-1015	-870	-522	-425	-495	-537	-472
Satu Mare	-2010	-2042	-1622	-1606	-1447	-957	-616	-1053	-1189	-1125
Centre										
Alba	-1386	-1078	-876	-765	-719	-170	-38	-52	-108	-65
Brasov	3864	3883	4229	4478	4222	3497	3241	3240	2542	2835
Covasna	-1190	-1037	-985	-878	-627	-555	-525	-516	-338	-246
Harghita	-189	-267	-236	-220	-60	117	-87	245	268	125
Mures	24	338	620	444	505	1064	1177	1289	1150	1026
Sibiu	1608	1657	1529	1425	1095	847	761	614	1110	1066
North-East										
Bacau	-3209	-2280	-3147	-3359	-3187	-2891	-2886	-2709	-2237	-2242
Botosani	-3347	-2312	-4029	-3697	-3525	-3409	-2886	-3113	-2963	-2716
Iasi	6802	2824	12952	12233	12860	11562	10064	9415	8352	7963
Neamt	-3073	-2185	-4079	-3996	-4230	-3635	-3299	-2873	-2697	-2693
Suceava	-2033	-1219	-2416	-2481	-2907	-2107	-2242	-1903	-2195	-2074
Vaslui	-3541	-1958	-4246	-4035	-4035	-3665	-3423	-3581	-3406	-3095
South-East										
Braila	-2196	-1744	-1508	-1735	-1672	-1125	-1037	-1131	-898	-851
Buzau	-3823	-3136	-2877	-3302	-3210	-1872	-1708	-1658	-1331	-1138
Constanta	679	650	901	663	840	788	134	589	719	454
Galati	-1594	-1462	-1666	-2126	-2246	-2033	-2268	-2081	-1937	-1996
Tulcea	-1289	-773	-821	-685	-756	-810	-585	-790	-699	-728
Vrancea	-1459	-1111	-1259	-1634	-1480	-1179	-1097	-1322	-1240	-1244
South-Muntenia										
Arges	-2487	-1452	-879	-2441	-2129	-1623	-2504	-1930	-2189	-2163
Calarasi	-1640	-1413	-1083	-1030	-1371	-1384	-917	-1756	-1595	-1769
Dambovita	-2193	-2021	-1584	-1889	-2018	-1775	-1657	-1943	-1738	-1482
Giurgiu	2	-36	89	1694	-13	168	1947	-19	203	-43
Ialomita	-1703	-1368	-1042	-1306	-1123	-408	-237	-326	-21	-76
Prahova	-2393	-1858	-1201	-2269	-2220	-948	-1255	-1005	-312	-142
Teleorman	-2356	-2110	-1664	-1924	-1792	-1402	-379	-1414	-1351	-1274
Bucuresti-Ilfov										
Ilfov	1618	1336	1860	2726	1984	2219	3421	2104	1310	1432
Bucuresti	24872	18943	12250	16522	18952	11592	7860	12825	12711	10511
South-West Oltenia										
Dolj	1594	1612	1696	1243	1127	1276	947	1421	936	1003
Gorj	-3186	-2334	-2316	-2506	-2358	-2665	-2888	-2789	-3099	-2790
Mehedinti	-1925	-1331	-1145	-992	-1163	-920	-614	-1160	-1190	-721
Olt	-3937	-3909	-3559	-3605	-3700	-3062	-2122	-2883	-3062	-2429
Valcea	-2786	-2465	-1934	-2170	-2133	-1531	-1374	-1433	-1434	-996
West										
Arad	-289	-8	108	144	111	91	407	307	396	521
Caras-Severin	-1987	-1036	-1026	-568	-569	-478	-381	-484	-391	-105
Hunedoara	-2649	-1653	-1432	-1347	-1258	-768	-1287	-845	-874	-812
Timis	9825	5720	5594	4219	3913	4278	4181	4612	4937	4021

Source: INSSE (2022)

Table A.14: A. Net rate of domicile change (internal and international domicile change) by NUTS-3

NUTS-3	1992	1993	1994	1995	1996	1997	1998	1999	2000
North-West									
Bihor	-0.192	-0.090	-0.011	-0.099	-0.060	-0.028	0.043	0.027	-0.008
Bistrita-Nasaud	-0.419	-0.199	-0.256	-0.281	-0.303	-0.381	-0.310	-0.260	-0.261
Cluj	-0.066	0.012	-0.050	-0.019	-0.025	0.064	0.147	0.137	0.140
Maramures	-0.552	-0.343	-0.342	-0.456	-0.349	-0.363	-0.300	-0.260	-0.331
Satu Mare	-0.397	-0.207	-0.228	-0.220	-0.181	-0.054	-0.016	0.014	-0.074
Salaj	-0.470	-0.279	-0.246	-0.211	-0.227	-0.313	-0.254	-0.235	-0.105
Centre									
Alba	-0.481	-0.390	-0.306	-0.284	-0.250	-0.172	-0.271	-0.236	-0.198
Brasov	0.289	0.086	0.047	-0.234	-0.078	-0.212	-0.159	-0.146	-0.168
Covasna	-0.145	-0.101	-0.163	-0.188	-0.069	-0.094	-0.034	-0.015	-0.011
Harghita	-0.430	-0.253	-0.241	-0.250	-0.193	-0.136	-0.069	-0.093	-0.088
Mures	-0.226	-0.167	-0.029	-0.058	0.013	0.005	0.063	0.017	0.042
Sibiu	-0.592	-0.063	0.005	-0.214	-0.137	-0.122	-0.121	0.001	0.023
North-East									
Bacau	-0.328	-0.221	-0.171	-0.095	-0.141	-0.023	0.011	-0.024	0.037
Botosani	-0.768	-0.447	-0.315	-0.209	-0.176	-0.038	-0.044	-0.065	-0.020
Iasi	-0.402	-0.266	-0.112	-0.040	-0.088	0.146	0.114	0.092	0.043
Neamt	-0.353	-0.167	-0.125	-0.204	-0.221	-0.145	-0.057	-0.004	-0.080
Suceava	-0.340	-0.244	-0.159	-0.117	-0.135	-0.163	-0.054	-0.070	-0.019
Vaslui	-0.702	-0.476	-0.389	-0.149	-0.381	-0.130	-0.204	-0.184	-0.225
South-East									
Braila	-0.003	0.034	0.110	0.190	0.147	0.192	0.172	-0.028	-0.026
Buzau	-0.335	-0.180	-0.181	-0.061	-0.122	-0.035	-0.036	0.015	-0.035
Constanta	0.633	0.387	0.206	0.108	0.173	0.056	0.209	0.083	-0.012
Galati	-0.179	-0.106	-0.082	-0.149	-0.172	-0.032	-0.029	-0.002	-0.028
Tulcea	-0.339	-0.187	-0.165	-0.078	-0.117	-0.101	-0.174	-0.159	-0.100
Vrancea	-0.461	-0.221	-0.270	-0.155	-0.166	-0.118	-0.141	-0.087	-0.113
South-Muntenia									
Arges	0.005	0.006	-0.039	-0.111	-0.096	-0.075	-0.086	-0.035	-0.051
Calarasi	-0.192	-0.225	-0.219	-0.071	0.069	0.006	0.046	0.172	0.170
Dambovita	-0.170	-0.094	-0.060	-0.070	-0.051	0.055	0.017	-0.035	0.013
Giurgiu	-0.564	-0.502	-0.273	-0.189	0.029	0.108	0.069	0.139	0.200
Ialomita	-0.291	-0.159	0.041	0.198	0.012	0.149	0.144	0.078	0.036
Prahova	-0.054	-0.030	-0.050	-0.103	-0.084	-0.106	-0.063	-0.006	0.006
Teleorman	-0.340	-0.215	-0.226	-0.038	-0.161	-0.003	0.022	-0.028	0.049
Bucuresti-Ilfov									
Bucuresti	0.394	0.265	0.041	-0.077	-0.153	-0.101	-0.027	0.072	-0.018
Ilfov	0.361	0.374	0.692	0.129	0.288	0.438	0.285	0.245	0.546
South-West Oltenia									
Dolj	-0.068	0.029	-0.021	-0.087	-0.038	-0.018	0.075	0.093	0.101
Gorj	-0.120	0.031	0.093	0.089	0.123	0.072	-0.044	-0.041	-0.031
Mehedinti	-0.129	-0.065	-0.014	0.010	0.013	-0.090	-0.012	0.078	0.013
Olt	-0.267	-0.245	-0.161	-0.160	-0.125	-0.090	-0.114	-0.110	-0.132
Valcea	-0.301	-0.111	-0.089	-0.098	-0.055	-0.047	-0.066	0.003	-0.024
West									
Arad	0.384	0.054	0.217	0.288	0.267	0.392	0.514	0.433	0.425
Caras-Severin	-0.293	-0.236	-0.226	-0.390	-0.249	-0.288	-0.163	-0.193	-0.160
Hunedoara	-0.098	-0.019	0.000	-0.068	0.013	-0.828	-0.645	-0.501	-0.384
Timis	0.721	0.316	0.147	0.124	0.101	0.201	0.150	0.107	0.143

Source: INSSE (2022)

Table A.15: B. Net rate of domicile change (internal and international domicile change) by NUTS-3

NUTS-3	2001	2002	2003	2004	2005	2006	2007	2008	2009
North-West									
Bihor	-0.093	0.016	-0.043	-0.018	0.001	0.072	0.142	0.090	0.070
Bistrita-Nasaud	-0.176	-0.048	-0.120	-0.131	-0.086	-0.132	-0.152	-0.103	-0.083
Cluj	-0.081	-0.136	-0.097	-0.023	0.040	0.220	0.264	0.332	0.331
Maramures	-0.243	-0.310	-0.187	-0.223	-0.115	-0.230	-0.244	-0.214	-0.145
Satu Mare	-0.038	0.055	-0.140	-0.150	-0.220	-0.169	-0.019	-0.057	-0.016
Salaj	0.005	-0.045	-0.146	-0.114	-0.054	-0.156	-0.175	-0.113	-0.188
Centre									
Alba	-0.034	-0.082	-0.179	-0.146	-0.092	-0.218	-0.160	-0.186	-0.118
Brasov	-0.030	-0.034	-0.038	-0.072	-0.038	-0.054	0.019	-0.017	-0.044
Covasna	-0.023	-0.115	-0.112	-0.164	-0.129	-0.140	-0.087	-0.109	-0.096
Harghita	-0.098	-0.146	-0.127	-0.257	-0.173	-0.186	-0.173	-0.128	-0.108
Mures	0.132	0.088	0.040	-0.055	0.001	-0.060	-0.067	-0.060	-0.070
Sibiu	-0.016	-0.004	-0.080	0.002	-0.054	0.010	0.134	0.209	0.079
North-East									
Bacau	0.020	-0.027	-0.108	-0.107	-0.096	-0.210	-0.131	-0.134	-0.143
Botosani	-0.027	-0.036	-0.107	-0.103	-0.120	-0.408	-0.385	-0.383	-0.341
Iasi	0.027	-0.040	-0.135	-0.246	-0.133	-0.044	-0.026	0.004	0.031
Neamt	-0.046	0.004	-0.110	-0.149	-0.165	-0.286	-0.170	-0.146	-0.060
Suceava	-0.056	-0.133	-0.143	-0.153	-0.066	-0.106	-0.092	-0.064	-0.024
Vaslui	-0.220	-0.317	-0.289	-0.343	-0.278	-0.523	-0.505	-0.491	-0.442
South-East									
Braila	-0.037	-0.049	-0.215	-0.118	-0.129	-0.278	-0.234	-0.237	-0.180
Buzau	0.045	0.074	-0.011	-0.079	-0.074	-0.178	-0.080	-0.089	-0.070
Constanta	0.129	0.089	0.095	0.127	0.089	0.158	0.227	0.189	0.077
Galati	-0.122	-0.144	-0.214	-0.250	-0.169	-0.277	-0.200	-0.215	-0.193
Tulcea	-0.208	-0.223	-0.185	-0.110	-0.140	-0.307	-0.301	-0.274	-0.216
Vrancea	-0.038	0.014	0.012	0.046	-0.035	-0.100	0.009	0.020	-0.033
South-Muntenia									
Arges	-0.103	-0.121	-0.037	-0.064	-0.005	0.031	0.277	0.065	-0.141
Calarasi	-0.344	0.131	0.016	-0.080	-0.022	-0.122	-0.038	0.049	-0.009
Dambovita	-0.014	-0.050	-0.094	-0.030	-0.036	-0.071	-0.091	0.107	0.070
Giurgiu	0.049	0.168	0.058	0.187	0.122	0.184	0.190	0.372	0.163
Ialomita	-0.192	0.087	-0.080	-0.005	-0.130	-0.213	-0.150	-0.217	-0.141
Prahova	-0.037	-0.056	-0.075	-0.065	-0.016	-0.059	-0.013	-0.062	-0.041
Teleorman	-0.199	-0.125	-0.243	-0.285	-0.228	-0.284	-0.190	-0.253	-0.182
Bucuresti-Ilfov									
Bucuresti	0.343	0.263	0.233	0.073	0.069	0.340	0.139	0.018	0.020
Ilfov	0.097	-0.062	1.023	1.707	1.255	1.957	2.043	3.242	2.756
South-West Oltenia									
Dolj	0.092	0.054	-0.038	-0.032	0.023	-0.016	0.021	0.027	-0.004
Gorj	-0.038	-0.009	-0.039	0.010	-0.061	-0.166	-0.131	-0.159	-0.152
Mehedinti	-0.169	-0.020	-0.079	-0.106	-0.093	-0.268	-0.344	-0.265	-0.291
Olt	-0.290	-0.201	-0.251	-0.133	-0.119	-0.333	-0.254	-0.338	-0.242
Valcea	0.075	0.049	-0.044	-0.009	-0.026	-0.136	-0.094	-0.078	-0.056
West									
Arad	0.306	0.285	0.365	0.287	0.143	0.290	0.327	0.300	0.113
Caras-Severin	0.096	0.137	0.139	0.071	0.021	-0.150	-0.181	-0.154	-0.217
Hunedoara	-0.250	-0.367	-0.353	-0.491	-0.325	-0.427	-0.379	-0.356	-0.286
Timis	0.305	0.227	0.229	0.274	0.219	0.562	0.673	0.516	0.449

Source: INSSE (2022)

Table A.16: C. Net rate of domicile change (internal and international domicile change) by NUTS-3

NUTS-3	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
North-West										
Bihor	0.128	0.041	0.060	0.055	0.080	0.019	0.029	0.075	0.050	0.067
Bistrita-Nasaud	-0.206	-0.172	-0.185	-0.177	-0.137	-0.128	-0.132	-0.163	-0.195	-0.206
Cluj	0.580	0.370	0.374	0.400	0.716	0.404	0.469	0.560	0.580	0.659
Maramures	-0.216	-0.103	-0.216	-0.145	-0.138	-0.101	-0.146	-0.150	-0.179	-0.129
Satu Mare	-0.076	-0.088	-0.050	-0.068	-0.039	-0.100	-0.104	-0.161	-0.131	-0.194
Salaj	-0.232	-0.230	-0.191	-0.206	-0.207	-0.188	-0.257	-0.215	-0.279	-0.295
Centre										
Alba	-0.176	-0.122	-0.166	-0.121	-0.094	-0.051	-0.158	-0.196	-0.184	-0.241
Brasov	-0.006	0.011	0.040	0.051	0.084	0.066	0.092	0.141	0.229	0.334
Covasna	-0.220	-0.239	-0.209	-0.204	-0.185	-0.169	-0.210	-0.205	-0.169	-0.212
Harghita	-0.154	-0.108	-0.090	-0.142	-0.117	-0.106	-0.107	-0.127	-0.151	-0.120
Mures	-0.034	-0.068	-0.055	-0.044	-0.052	-0.038	-0.055	-0.053	-0.098	-0.119
Sibiu	0.257	0.045	0.080	0.055	0.152	0.128	0.149	0.223	0.274	0.341
North-East										
Bacau	-0.274	-0.125	-0.096	-0.068	0.172	-0.056	-0.141	0.050	-0.090	-0.227
Botosani	-0.403	-0.223	-0.161	-0.169	-0.241	-0.295	-0.072	-0.030	0.767	0.619
Iasi	0.050	0.204	0.970	1.548	1.962	1.013	0.733	0.939	1.002	1.211
Neamt	-0.081	-0.130	-0.099	-0.150	-0.106	-0.118	-0.182	-0.257	-0.118	-0.155
Suceava	0.015	-0.005	-0.046	0.032	0.162	0.147	0.113	0.711	0.699	0.307
Vaslui	-0.422	-0.218	0.310	1.199	1.514	0.368	0.713	1.405	1.380	1.675
South-East										
Braila	-0.298	-0.229	-0.243	-0.276	-0.354	-0.332	-0.390	-0.481	-0.448	-0.501
Buzau	-0.151	-0.138	-0.091	-0.184	-0.201	-0.214	-0.226	-0.306	-0.316	-0.441
Constanta	0.076	0.017	0.049	-0.014	-0.048	-0.055	-0.073	-0.087	-0.101	-0.100
Galati	-0.197	-0.086	0.135	-0.022	-0.094	-0.209	-0.186	-0.041	0.144	0.481
Tulcea	-0.472	-0.304	-0.301	-0.358	-0.355	-0.423	-0.399	-0.510	-0.596	-0.598
Vrancea	0.029	-0.089	-0.089	-0.096	-0.086	-0.080	-0.179	-0.222	-0.283	-0.310
South-Muntenia										
Arges	-0.145	-0.109	-0.162	-0.131	-0.125	-0.109	-0.167	-0.213	-0.269	-0.301
Calarasi	-0.097	-0.127	-0.062	-0.138	-0.148	-0.201	-0.241	-0.436	-0.381	-0.506
Dambovita	0.062	0.038	0.077	-0.117	-0.074	-0.125	-0.111	-0.200	-0.140	-0.180
Giurgiu	0.278	0.193	0.253	0.058	0.254	0.173	0.188	0.001	-0.078	-0.247
Ialomita	-0.258	-0.190	-0.244	-0.273	-0.280	-0.273	-0.331	-0.426	-0.433	-0.466
Prahova	-0.114	-0.101	-0.134	-0.071	-0.098	-0.156	-0.196	-0.190	-0.243	-0.242
Teleorman	-0.291	-0.242	-0.240	-0.321	-0.332	-0.358	-0.468	-0.632	-0.687	-0.718
Bucuresti-Ilfov										
Bucuresti	-0.045	-0.061	-0.395	-0.589	-0.257	-0.076	-0.099	0.545	0.993	0.934
Ilfov	4.033	3.020	3.664	3.396	3.711	3.595	3.969	3.602	3.073	3.142
South-West Oltenia										
Dolj	-0.029	-0.035	-0.016	-0.057	-0.030	-0.063	-0.070	-0.076	-0.094	-0.118
Gorj	-0.135	-0.182	-0.239	-0.225	-0.303	-0.322	-0.341	-0.383	-0.500	-0.543
Mehedinti	-0.365	-0.227	-0.192	-0.281	-0.318	-0.301	-0.372	-0.390	-0.439	-0.506
Olt	-0.385	-0.265	-0.298	-0.316	-0.331	-0.355	-0.366	-0.426	-0.471	-0.473
Valcea	-0.150	-0.119	-0.181	-0.119	-0.203	-0.253	-0.262	-0.332	-0.383	-0.408
West										
Arad	0.259	0.076	0.091	0.084	0.106	0.109	0.059	0.102	0.126	0.085
Caras-Severin	-0.298	-0.298	-0.345	-0.385	-0.324	-0.342	-0.416	-0.482	-0.539	-0.487
Hunedoara	-0.411	-0.360	-0.373	-0.399	-0.367	-0.367	-0.431	-0.409	-0.421	-0.428
Timis	0.643	0.405	0.444	0.413	0.501	0.418	0.404	0.490	0.527	0.530

Source: INSSE (2022)

Table A.17: A. Net migration rate by domicile (permanent international migrants) females, NUTS-3

	1992	1993	1994	1995	1996	1997	1998	1999	2000
North-West									
Bihor	-0.033	-0.016	-0.020	-0.040	-0.031	-0.024	0.015	-0.001	0.015
Bistrita-Nasaud	-0.369	-0.183	N\A	-0.317	-0.254	-0.202	-0.185	-0.182	-0.183
Cluj	-0.083	-0.049	-0.050	-0.080	-0.065	-0.021	0.063	0.022	0.021
Maramures	-0.216	-0.116	-0.154	-0.150	-0.136	-0.115	-0.048	-0.019	-0.041
Salaj	-0.048	-0.023	-0.024	-0.043	-0.031	0.011	0.011	0.004	-0.023
Satu Mare	-4.012	N\A	-1.505	-2.283	-1.635	-1.612	-1.062	-0.809	-1.081
Centre									
Alba	-0.470	-0.304	-0.267	-0.387	-0.315	-0.321	-0.214	-0.180	-0.249
Brasov	-0.067	-0.024	-0.022	-0.041	-0.028	-0.006	0.016	0.020	0.024
Covasna	-0.356	-0.178	-0.178	-0.349	-0.168	-0.132	-0.074	-0.048	-0.058
Harghita	-0.492	-0.346	-0.246	-0.330	-0.236	-0.221	-0.146	-0.114	-0.143
Mures	-0.872	-0.304	-0.201	-0.276	-0.207	-0.195	-0.085	-0.064	-0.074
Sibiu	-0.183	-0.112	-0.144	-0.281	-0.279	-0.337	-0.271	-0.245	-0.401
North-East									
Bacau	-0.007	-0.006	-0.005	-0.005	-0.012	-0.009	0.016	0.004	0.004
Botosani	-0.039	-0.020	N\A	-0.072	N\A	-0.095	-0.051	-0.033	-0.041
Iasi	-0.007	-0.007	-0.014	-0.022	-0.028	0.032	0.097	0.024	0.039
Neamt	-0.051	-0.028	N\A	-0.063	-0.043	-0.044	-0.018	-0.014	-0.021
Suceava	-0.005	-0.003	-0.004	-0.008	-0.012	-0.003	0.039	0.027	0.046
Vaslui	N\A	-0.135	N\A	-0.284	-0.249	-0.250	-0.215	-0.177	-0.256
South-East									
Braila	-0.012	-0.024	-0.028	-0.018	-0.030	-0.027	-0.031	-0.021	-0.018
Buzau	-0.076	-0.053	N\A	-0.095	N\A	-0.092	-0.066	-0.062	-0.103
Constanta	-0.007	-0.011	-0.014	-0.042	-0.032	-0.007	0.010	0.005	-0.013
Galati	-0.004	-0.005	-0.007	-0.011	-0.010	0.004	0.023	0.022	0.021
Tulcea	-0.013	-0.013	N\A	-0.034	N\A	-0.049	-0.042	-0.037	-0.080
Vrancea	-0.139	-0.108	-0.148	-0.285	-0.288	-0.249	-0.181	-0.173	-0.257
South-Muntenia									
Arges	-0.003	-0.003	-0.005	-0.011	-0.012	-0.003	-0.003	0.003	-0.009
Calarasi	-0.020	N\A	N\A	-0.023	-0.035	-0.034	-0.019	-0.024	-0.043
Dambovita	-0.001	-0.004	N\A	-0.009	-0.007	-0.002	0.012	-0.003	-0.004
Giurgiu	-0.009	-0.007	N\A	-0.012	N\A	-0.017	-0.010	-0.018	-0.021
Ialomita	-0.086	-0.059	N\A	-0.156	-0.154	-0.112	-0.094	-0.061	-0.110
Prahova	0.001	-0.002	-0.001	-0.001	-0.009	0.000	0.010	0.006	0.003
Teleorman	-0.855	-0.554	-0.855	-1.385	N\A	-0.905	-1.344	-0.884	-0.687
Bucuresti-Ilfov									
Ilfov	-1.478	N\A	-1.441	-2.301	-1.988	-1.512	-2.229	-1.460	-1.081
Bucuresti	0.004	0.000	-0.006	0.052	-0.003	0.040	0.166	0.203	0.200
South-West Oltenia									
Dolj	-0.005	-0.004	-0.003	-0.005	-0.011	-0.002	0.002	-0.001	-0.004
Gorj	-0.033	-0.019	-0.030	-0.025	-0.029	-0.035	-0.020	-0.016	-0.027
Mehedinti	-0.016	-0.004	-0.008	-0.018	-0.015	-0.031	-0.015	-0.009	-0.030
Olt	-0.013	N\A	N\A	-0.026	-0.025	-0.026	-0.021	-0.027	-0.040
Valcea	-1.558	-1.432	-1.151	-1.430	-1.123	-1.022	-0.591	-0.412	-0.529
West									
Arad	-0.202	-0.156	-0.134	-0.189	-0.162	-0.108	-0.054	-0.007	-0.058
Caras-Severin	-0.119	-0.070	-0.074	-0.130	-0.088	-0.097	-0.054	-0.036	-0.064
Hunedoara	-0.715	-0.500	-0.566	-0.608	-0.504	-0.407	-0.220	-0.154	-0.189
Timis	0.024	0.019	0.011	0.046	0.027	0.057	0.072	0.047	0.040

Source: INSSE (2022)

Table A.18: B. Net migration rate by domicile (permanent international migrants) females, NUTS-3

	2001	2002	2003	2004	2005	2006	2007	2008	2009
North-West									
Bihor	0.002	-0.012	-0.014	-0.023	-0.018	-0.028	-0.012	-0.008	-0.005
Bistrita-Nasaud	-0.136	-0.171	-0.197	-0.238	-0.174	-0.203	-0.123	-0.137	-0.137
Cluj	0.027	-0.002	-0.034	-0.047	-0.032	-0.039	-0.014	0.007	-0.019
Maramures	-0.025	-0.046	-0.060	-0.090	-0.071	-0.082	-0.032	-0.030	-0.020
Salaj	-0.019	-0.022	-0.015	-0.030	-0.022	-0.018	0.008	0.001	0.000
Satu Mare	-0.661	-0.713	-1.062	-1.457	-1.078	-1.345	-0.810	-0.744	-0.821
Centre									
Alba	-0.147	-0.135	-0.185	-0.238	-0.204	-0.250	-0.166	-0.151	-0.160
Brasov	0.025	0.016	0.005	-0.005	-0.012	-0.005	0.010	0.022	0.014
Covasna	-0.048	-0.065	-0.081	-0.199	-0.160	-0.155	-0.046	-0.051	-0.047
Harghita	-0.107	-0.142	-0.174	-0.283	-0.150	-0.193	-0.096	-0.070	-0.076
Mures	-0.027	-0.065	-0.144	-0.160	-0.111	-0.155	-0.086	-0.073	-0.079
Sibiu	-0.309	-0.220	-0.371	-0.459	-0.469	-0.669	-0.405	-0.363	-0.405
North-East									
Bacau	0.025	0.015	-0.005	-0.006	-0.010	-0.016	-0.004	-0.006	-0.009
Botosani	0.006	-0.009	-0.056	-0.099	-0.100	-0.139	-0.073	-0.077	-0.109
Iasi	0.112	0.075	-0.009	-0.038	-0.065	-0.082	-0.041	-0.013	-0.005
Neamt	0.053	-0.018	-0.062	-0.067	-0.043	-0.063	-0.013	-0.007	-0.014
Suceava	0.060	0.014	-0.001	-0.009	-0.004	-0.005	0.015	0.019	0.018
Vaslui	-0.064	-0.100	-0.185	-0.262	-0.282	-0.337	-0.220	-0.229	-0.272
South-East									
Braila	-0.011	-0.006	-0.017	-0.022	-0.023	-0.025	-0.027	-0.014	-0.017
Buzau	-0.037	-0.034	-0.043	-0.065	-0.070	-0.074	-0.046	-0.058	-0.075
Constanta	0.012	0.004	-0.025	-0.045	-0.042	-0.053	-0.010	-0.010	-0.018
Galati	0.069	0.049	0.010	-0.002	-0.001	-0.003	0.011	0.010	0.008
Tulcea	-0.053	-0.051	N\A	-0.089	-0.124	-0.140	-0.079	-0.048	-0.055
Vrancea	-0.138	-0.080	-0.145	-0.175	-0.133	-0.201	-0.133	-0.142	-0.180
South-Muntenia									
Arges	0.005	0.007	0.000	-0.002	-0.002	0.001	0.005	0.006	0.001
Calarasi	-0.023	-0.005	-0.024	-0.043	-0.029	-0.043	-0.036	-0.038	-0.045
Dambovita	0.008	0.004	-0.001	-0.001	-0.001	0.000	-0.001	0.001	0.005
Giurgiu	-0.011	0.002	-0.013	-0.013	-0.011	-0.011	-0.007	-0.009	-0.011
Ialomita	-0.062	-0.038	-0.072	-0.099	-0.060	-0.102	-0.066	-0.066	-0.085
Prahova	0.004	0.010	0.004	-0.002	0.000	-0.003	0.005	0.005	0.007
Teleorman	-0.403	-0.349	-0.457	-0.574	-0.488	-0.665	-0.461	-0.449	-0.536
Bucuresti-Ilfov									
Ilfov	-0.633	-0.540	-0.714	-0.879	-0.738	-0.979	-0.646	-0.594	-0.675
Bucuresti	0.120	0.085	0.026	0.023	0.047	0.136	0.141	0.129	0.082
South-West Oltenia									
Dolj	0.004	0.001	0.000	-0.002	-0.002	0.000	0.008	0.007	0.003
Gorj	-0.007	-0.007	-0.009	-0.016	-0.014	-0.026	-0.013	-0.016	-0.028
Mehedinti	-0.007	0.002	-0.013	-0.010	-0.015	-0.025	-0.010	0.001	-0.019
Olt	-0.018	-0.014	-0.030	-0.027	-0.015	-0.029	-0.015	-0.021	-0.027
Valcea	-0.290	-0.285	-0.394	-0.525	-0.433	-0.565	-0.361	-0.379	-0.412
West									
Arad	-0.021	-0.028	-0.045	-0.050	-0.053	-0.085	-0.047	-0.037	-0.043
Caras-Severin	-0.038	-0.031	-0.068	-0.083	-0.054	-0.082	-0.062	-0.068	-0.084
Hunedoara	-0.112	-0.106	-0.162	-0.219	-0.184	-0.224	-0.123	-0.137	-0.146
Timis	0.028	0.025	0.023	0.021	0.021	0.024	0.046	0.048	0.045

Source: INSSE (2022)

Table A.19: C. Net migration rate by domicile (permanent international migrants) females, NUTS-3

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
North-West										
Bihor	-0.002	-0.027	-0.037	-0.031	-0.021	-0.022	-0.045	-0.033	-0.042	-0.038
Bistrita-Nasaud	-0.121	-0.162	-0.165	-0.157	-0.100	-0.163	-0.224	-0.209	-0.250	-0.249
Cluj	-0.004	-0.008	-0.007	-0.013	0.292	-0.010	-0.025	-0.004	-0.005	0.027
Maramures	-0.021	-0.036	-0.044	-0.044	-0.028	-0.074	-0.068	-0.062	-0.044	-0.051
Salaj	-0.004	-0.012	-0.015	-0.022	0.004	-0.002	-0.006	0.005	-0.007	-0.009
Satu Mare	-0.588	-0.836	-0.764	-0.876	-0.578	-0.801	-1.105	-1.156	-1.325	-1.199
Centre										
Alba	-0.107	-0.150	-0.122	-0.148	-0.107	-0.168	-0.227	-0.271	-0.301	-0.267
Brasov	0.013	0.015	0.023	0.022	0.034	0.034	0.045	0.066	0.078	0.069
Covasna	-0.031	-0.043	-0.047	-0.044	-0.023	-0.038	-0.035	-0.022	-0.021	-0.029
Harghita	-0.063	-0.106	-0.077	-0.097	-0.063	-0.062	-0.104	-0.112	-0.141	-0.121
Mures	-0.046	-0.074	-0.077	-0.083	-0.045	-0.075	-0.100	-0.096	-0.111	-0.077
Sibiu	-0.326	-0.615	-0.631	-0.638	-0.448	-0.596	-0.946	-0.974	-1.207	-1.310
North-East										
Bacau	-0.003	-0.004	0.044	0.068	0.241	0.095	0.066	0.212	0.156	0.130
Botosani	-0.081	-0.129	-0.056	0.003	-0.043	-0.130	-0.101	-0.009	0.433	0.458
Iasi	-0.003	0.114	0.551	0.730	1.269	0.644	0.419	0.719	0.654	0.860
Neamt	-0.004	-0.104	-0.105	-0.089	0.002	0.012	-0.026	-0.006	0.069	0.108
Suceava	0.014	0.056	0.021	0.024	0.119	0.088	0.095	0.478	0.488	0.296
Vaslui	-0.211	-0.270	0.030	0.535	1.059	0.163	0.296	1.022	1.086	1.587
South-East										
Braila	-0.013	-0.032	-0.004	-0.047	-0.025	-0.035	-0.072	-0.058	-0.076	-0.088
Buzau	-0.056	-0.075	-0.095	-0.118	-0.093	-0.111	-0.171	-0.191	-0.207	-0.194
Constanta	-0.020	-0.044	-0.035	-0.046	-0.032	-0.048	-0.088	-0.085	-0.114	-0.108
Galati	0.007	0.065	0.176	0.123	0.135	0.085	0.118	0.286	0.437	0.707
Tulcea	-0.041	-0.076	-0.062	-0.062	-0.068	-0.077	-0.139	-0.132	-0.158	-0.125
Vrancea	-0.162	-0.299	-0.376	-0.417	-0.299	-0.391	-0.639	-0.594	-0.754	-0.698
South-Muntenia										
Arges	-0.004	-0.011	-0.012	-0.013	-0.008	-0.009	-0.018	-0.019	-0.019	-0.031
Calarasi	-0.041	-0.069	-0.066	-0.080	-0.053	-0.082	-0.117	-0.101	-0.156	-0.129
Dambovita	0.000	0.012	-0.008	-0.013	-0.009	-0.010	-0.008	-0.004	0.070	0.077
Giurgiu	-0.015	-0.026	-0.025	-0.056	-0.026	-0.030	-0.072	-0.056	-0.075	-0.040
Ialomita	-0.061	-0.087	-0.142	-0.141	-0.106	-0.126	-0.225	-0.194	-0.265	-0.211
Prahova	0.003	-0.013	-0.024	-0.019	-0.009	-0.017	-0.029	-0.022	-0.024	-0.019
Teleorman	-0.411	-1.408	-1.372	-1.559	-0.497	-0.736	-1.062	-1.109	-1.296	-1.239
Bucuresti-Ilfov										
Ilfov	-0.496	-1.663	-1.494	-1.600	-0.382	-0.659	-0.896	-0.842	-0.974	-0.840
Bucuresti	0.066	0.176	0.119	0.059	0.098	0.065	0.120	0.412	0.610	0.517
South-West Oltenia										
Dolj	0.001	0.001	-0.001	-0.001	0.005	-0.002	0.000	0.003	0.004	-0.003
Gorj	-0.015	-0.025	-0.017	-0.030	-0.015	-0.023	-0.046	-0.029	-0.037	-0.038
Mehedinti	-0.012	-0.034	-0.063	-0.060	-0.050	-0.062	-0.069	-0.072	-0.107	-0.080
Olt	-0.024	-0.026	-0.033	-0.020	-0.016	-0.020	-0.049	-0.036	-0.040	-0.044
Valcea	-0.323	-0.572	-0.567	-0.546	-0.392	-0.521	-0.788	-0.791	-0.860	-0.872
West										
Arad	-0.019	-0.049	-0.057	-0.065	-0.042	-0.048	-0.073	-0.070	-0.115	-0.102
Caras-Severin	-0.063	-0.104	-0.098	-0.109	-0.068	-0.056	-0.144	-0.158	-0.143	-0.134
Hunedoara	-0.125	-0.229	-0.227	-0.205	-0.123	-0.181	-0.289	-0.274	-0.296	-0.317
Timis	0.032	0.046	0.041	0.032	0.034	0.053	0.069	0.064	0.076	0.078

Source: INSSE (2022)

Table A.20: A. Net migration rate by domicile (permanent international migrants) males, NUTS-3

	1992	1993	1994	1995	1996	1997	1998	1999	2000
North-West									
Bihor	-0.051	-0.013	-0.019	-0.024	-0.018	-0.002	0.024	0.012	0.034
Bistrita-Nasaud	-0.396	-0.185	-0.151	-0.252	-0.234	-0.172	-0.137	-0.141	-0.171
Cluj	-0.104	-0.046	-0.050	-0.065	-0.081	0.001	0.079	0.035	0.014
Maramures	-0.256	-0.112	-0.133	-0.121	-0.143	-0.086	-0.043	-0.009	-0.040
Salaj	-0.072	-0.023	-0.017	-0.015	-0.012	0.055	0.015	0.010	-0.015
Satu Mare	-4.010	-1.911	-1.314	-1.919	-1.312	-1.407	-0.919	-0.656	-0.913
Centre									
Alba	-0.475	-0.281	-0.229	-0.327	-0.248	-0.293	-0.190	-0.154	-0.216
Brasov	-0.070	-0.018	-0.024	-0.014	-0.013	0.010	0.030	0.026	0.038
Covasna	-0.414	-0.161	-0.140	-0.247	-0.131	-0.100	-0.056	-0.034	-0.049
Harghita	-0.481	-0.314	-0.193	-0.267	-0.162	-0.181	-0.123	-0.069	-0.123
Mures	-0.823	-0.281	-0.175	-0.220	-0.174	-0.134	-0.060	-0.039	-0.038
Sibiu	-0.240	-0.111	-0.164	-0.223	-0.276	-0.298	-0.287	-0.242	-0.379
North-East									
Bacau	-0.008	-0.001	-0.006	0.000	-0.011	-0.004	0.019	0.002	0.001
Botosani	-0.047	-0.024	-0.030	-0.057	-0.053	-0.078	-0.057	-0.029	-0.030
Iasi	-0.019	-0.008	-0.016	-0.016	-0.024	0.041	0.102	0.027	0.043
Neamt	-0.056	-0.021	-0.031	-0.043	-0.054	-0.030	-0.016	-0.007	-0.035
Suceava	-0.009	-0.001	-0.004	-0.006	-0.011	0.004	0.043	0.025	0.048
Vaslui	-0.197	-0.133	-0.148	-0.206	-0.209	-0.233	-0.159	-0.157	-0.215
South-East									
Braila	-0.011	-0.010	-0.015	-0.010	-0.030	-0.020	-0.020	-0.012	-0.020
Buzau	-0.096	-0.060	-0.066	-0.075	-0.063	-0.079	-0.045	-0.055	-0.087
Constanta	-0.009	-0.011	-0.015	-0.015	-0.025	0.010	0.022	0.009	0.000
Galati	-0.009	-0.005	-0.008	-0.004	-0.006	0.007	0.022	0.014	0.028
Tulcea	-0.017	-0.013	-0.015	-0.033	-0.055	-0.074	-0.049	-0.038	-0.074
Vrancea	-0.157	-0.096	-0.115	-0.226	-0.245	-0.211	-0.155	-0.154	-0.249
South-Muntenia									
Arges	-0.002	-0.002	-0.004	-0.004	-0.011	-0.002	0.000	-0.001	-0.007
Calarasi	-0.026	-0.008	N\A	-0.030	-0.032	-0.033	-0.013	-0.015	-0.044
Dambovita	-0.004	-0.003	-0.001	-0.001	-0.003	-0.001	0.010	-0.004	-0.001
Giurgiu	-0.010	N\A	N\A	-0.010	-0.019	-0.016	-0.010	-0.018	-0.024
Ialomita	-0.094	-0.053	N\A	-0.129	-0.139	-0.093	-0.072	-0.058	-0.113
Prahova	-0.001	-0.001	0.000	0.006	-0.002	0.006	0.017	0.013	0.008
Teleorman	-0.919	-0.475	N\A	-1.064	-1.000	-0.791	-1.364	-0.829	-0.554
Bucuresti-Ilfov									
Ilfov	-1.595	-0.823	-1.123	-1.804	-1.694	-1.342	-2.306	-1.394	-0.875
Bucuresti	0.003	0.003	-0.003	0.062	0.000	0.055	0.211	0.240	0.239
South-West Oltenia									
Dolj	-0.009	-0.001	-0.005	-0.002	-0.007	-0.001	0.008	0.005	-0.002
Gorj	-0.035	-0.018	N\A	-0.022	-0.024	-0.034	-0.022	-0.016	-0.020
Mehedinti	-0.010	0.000	-0.008	-0.008	-0.008	-0.008	0.001	-0.002	-0.020
Olt	-0.018	-0.009	-0.012	-0.019	-0.023	-0.023	-0.022	-0.026	-0.040
Valcea	-1.706	-1.260	-1.011	-1.198	-1.050	-0.925	-0.567	-0.338	-0.428
West									
Arad	-0.242	-0.126	-0.136	-0.153	-0.144	-0.104	-0.038	0.009	-0.051
Caras-Severin	-0.145	-0.062	-0.068	-0.083	-0.076	-0.053	-0.017	-0.016	-0.043
Hunedoara	-0.728	-0.429	-0.459	-0.477	-0.435	-0.316	-0.195	-0.096	-0.135
Timis	-0.710	-0.388	-0.362	-0.559	-0.423	-0.350	-0.242	-0.206	-0.299

Source: INSSE (2022)

Table A.21: B. Net migration rate by domicile (permanent international migrants) males, NUTS-3

	2001	2002	2003	2004	2005	2006	2007	2008	2009
North-West									
Bihor	0.001	-0.008	-0.004	-0.004	0.003	-0.007	0.018	0.022	0.022
Bistrita-Nasaud	-0.147	-0.137	-0.189	-0.156	-0.107	-0.107	-0.044	-0.063	-0.071
Cluj	0.021	-0.003	-0.026	-0.025	-0.017	-0.007	0.035	0.039	0.013
Maramures	-0.026	-0.031	-0.046	-0.065	-0.040	-0.039	0.008	0.005	0.006
Salaj	-0.022	-0.021	-0.014	-0.018	0.002	-0.003	0.020	0.015	0.015
Satu Mare	-0.627	-0.526	-0.634	-0.804	-0.584	-0.758	-0.381	-0.391	-0.462
Centre									
Alba	-0.149	-0.104	-0.127	-0.134	N\A	-0.159	-0.093	-0.074	-0.097
Brasov	0.023	0.020	0.005	0.005	0.004	0.010	0.034	0.046	0.034
Covasna	-0.045	-0.051	-0.059	-0.139	-0.093	-0.084	-0.002	0.010	-0.003
Harghita	-0.085	-0.105	-0.103	-0.150	-0.088	-0.074	-0.022	-0.010	-0.018
Mures	-0.020	-0.027	-0.054	-0.061	-0.039	-0.069	-0.014	-0.016	-0.019
Sibiu	-0.390	-0.254	-0.261	-0.335	-0.309	-0.424	-0.203	-0.173	-0.215
North-East									
Bacau	0.019	0.010	-0.003	-0.004	-0.003	-0.004	0.008	0.014	0.011
Botosani	0.015	-0.003	-0.038	-0.053	-0.048	-0.074	-0.039	-0.029	-0.059
Iasi	0.124	0.080	0.014	-0.019	-0.037	-0.037	0.000	0.017	0.022
Neamt	0.044	-0.027	-0.041	-0.061	-0.025	-0.038	0.010	0.001	0.011
Suceava	0.055	0.012	0.002	-0.006	0.002	0.009	0.032	0.058	0.048
Vaslui	-0.073	-0.080	-0.133	-0.159	-0.196	-0.208	-0.107	-0.108	-0.152
South-East									
Braila	-0.011	-0.008	-0.012	-0.013	-0.019	-0.007	-0.006	-0.002	0.004
Buzau	-0.045	-0.039	-0.025	-0.031	-0.043	-0.036	-0.021	-0.020	-0.033
Constanta	0.005	0.011	-0.005	-0.026	-0.020	-0.009	0.023	0.030	0.017
Galati	0.067	0.048	0.013	0.003	0.008	0.007	0.020	0.026	0.021
Tulcea	-0.055	-0.033	-0.083	-0.055	-0.101	-0.118	-0.019	-0.003	-0.023
Vrancea	-0.157	-0.076	-0.105	-0.094	-0.075	-0.101	-0.056	-0.036	-0.066
South-Muntenia									
Arges	0.002	0.006	0.001	0.002	0.003	0.007	0.006	0.008	0.008
Calarasi	-0.020	-0.001	-0.022	-0.026	-0.013	-0.016	-0.008	0.001	-0.020
Dambovita	0.002	0.009	0.001	-0.002	0.002	0.002	0.011	0.016	0.012
Giurgiu	-0.010	-0.003	-0.013	-0.011	-0.006	-0.003	0.011	0.014	-0.003
Ialomita	-0.077	-0.037	-0.060	-0.047	-0.043	-0.056	-0.021	-0.027	-0.039
Prahova	0.010	0.014	0.003	0.002	0.003	0.007	0.018	0.021	0.024
Teleorman	-0.386	-0.272	-0.333	-0.340	-0.325	-0.445	-0.290	-0.273	-0.360
Bucuresti-Ilfov									
Ilfov	-0.602	-0.427	-0.531	-0.531	-0.502	-0.644	-0.384	-0.339	-0.430
Bucuresti	0.145	0.118	0.043	0.051	0.100	0.284	0.291	0.257	0.190
South-West Oltenia									
Dolj	0.002	0.001	0.001	0.002	0.004	0.010	0.015	0.018	0.015
Gorj	-0.006	-0.004	-0.005	-0.006	-0.004	-0.006	-0.004	0.003	0.001
Mehedinti	-0.003	0.001	-0.006	-0.005	-0.009	-0.005	0.009	0.008	0.001
Olt	-0.023	-0.014	-0.030	-0.030	-0.012	-0.011	-0.005	-0.005	-0.010
Valcea	-0.250	-0.226	-0.261	-0.280	-0.227	-0.338	-0.180	-0.175	-0.215
West									
Arad	-0.011	-0.023	-0.020	-0.021	-0.024	-0.024	0.003	0.019	0.000
Caras-Severin	-0.026	-0.025	-0.043	-0.037	-0.024	-0.052	-0.010	-0.019	-0.043
Hunedoara	-0.094	-0.076	-0.096	-0.111	-0.097	-0.123	-0.064	-0.061	-0.072
Timis	-0.184	-0.212	-0.271	-0.369	-0.261	-0.297	-0.127	-0.125	-0.158

Source: INSSE (2022)

Table A.22: C. Net migration rate by domicile (permanent international migrants) males, NUTS-3

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
North-West										
Bihor	0.010	-0.014	-0.023	-0.033	-0.015	-0.021	-0.029	-0.022	-0.037	-0.027
Bistrita-Nasaud	-0.061	-0.106	-0.110	-0.106	-0.076	-0.095	-0.146	-0.162	-0.144	-0.166
Cluj	0.017	0.008	0.007	-0.002	0.286	-0.006	0.004	0.024	0.024	0.021
Maramures	0.005	-0.025	-0.022	-0.026	-0.010	-0.028	-0.037	-0.029	-0.012	-0.016
Salaj	0.018	0.003	-0.006	-0.012	0.008	0.019	0.002	0.009	-0.002	0.012
Satu Mare	-0.300	-0.628	-0.620	-0.583	-0.478	-0.606	-0.946	-0.908	-1.094	-1.032
Centre										
Alba	-0.032	-0.095	-0.083	-0.088	-0.063	-0.110	-0.200	-0.191	-0.224	-0.207
Brasov	0.022	0.025	0.036	0.032	0.039	0.039	0.036	0.057	0.069	0.072
Covasna	0.001	-0.032	-0.020	-0.032	-0.029	-0.019	-0.025	-0.017	-0.021	-0.014
Harghita	-0.016	-0.059	-0.045	-0.051	-0.042	-0.048	-0.092	-0.088	-0.115	-0.101
Mures	-0.004	-0.051	-0.053	-0.048	-0.036	-0.044	-0.066	-0.070	-0.091	-0.076
Sibiu	-0.189	-0.614	-0.588	-0.494	-0.318	-0.488	-0.763	-0.809	-1.014	-1.109
North-East										
Bacau	0.010	0.018	0.094	0.101	0.335	0.158	0.121	0.324	0.256	0.176
Botosani	-0.040	-0.081	0.050	0.086	0.086	-0.035	0.184	0.258	1.284	0.998
Iasi	0.029	0.212	0.874	1.122	1.700	1.026	0.634	0.867	0.933	1.142
Neamt	0.013	-0.146	-0.153	-0.083	0.025	0.013	0.004	0.000	0.133	0.216
Suceava	0.032	0.150	0.077	0.117	0.342	0.231	0.220	1.001	1.026	0.469
Vaslui	-0.116	-0.065	0.475	0.978	1.477	0.534	0.927	1.643	1.874	1.986
South-East										
Braila	0.011	-0.013	0.003	-0.045	-0.010	-0.021	-0.042	-0.043	-0.048	-0.058
Buzau	-0.025	-0.055	-0.065	-0.092	-0.061	-0.079	-0.136	-0.143	-0.140	-0.147
Constanta	0.014	-0.015	-0.002	-0.030	-0.012	-0.032	-0.066	-0.070	-0.080	-0.089
Galati	0.018	0.111	0.254	0.194	0.197	0.168	0.247	0.463	0.719	1.091
Tulcea	-0.013	-0.048	-0.031	-0.056	-0.038	-0.064	-0.084	-0.080	-0.121	-0.111
Vrancea	-0.077	-0.202	-0.277	-0.349	-0.236	-0.311	-0.505	-0.503	-0.575	-0.567
South-Muntenia										
Arges	0.007	0.006	0.001	-0.008	-0.008	-0.012	-0.005	-0.009	-0.012	-0.013
Calarasi	-0.019	-0.028	-0.046	-0.067	-0.055	-0.052	-0.078	-0.092	-0.117	-0.118
Dambovita	0.009	0.013	0.002	-0.008	-0.006	-0.003	-0.002	-0.013	0.129	0.126
Giurgiu	-0.001	-0.010	-0.020	-0.036	-0.009	-0.018	-0.062	-0.043	-0.058	-0.037
Ialomita	-0.024	-0.062	-0.104	-0.103	-0.064	-0.106	-0.182	-0.175	-0.201	-0.169
Prahova	0.017	0.000	-0.006	-0.019	-0.013	-0.012	-0.030	-0.016	-0.025	-0.019
Teleorman	-0.274	-1.528	-1.292	-1.463	-0.379	-0.597	-0.868	-0.932	-1.035	-1.041
Bucuresti-Ilfov										
Ilfov	-0.299	-1.810	-1.385	-1.497	-0.261	-0.510	-0.725	-0.713	-0.788	-0.731
Bucuresti	0.143	0.384	0.235	0.092	0.147	0.113	0.244	0.707	1.147	0.821
South-West Oltenia										
Dolj	0.013	0.014	0.010	0.003	0.013	0.010	0.004	0.014	0.003	0.007
Gorj	-0.005	-0.016	-0.012	-0.017	-0.012	-0.014	-0.023	-0.023	-0.032	-0.037
Mehedinti	0.002	-0.023	-0.053	-0.061	-0.032	-0.032	-0.062	-0.044	-0.094	-0.062
Olt	-0.007	-0.018	-0.019	-0.019	-0.008	-0.007	-0.036	-0.021	-0.025	-0.031
Valcea	-0.175	-0.435	-0.431	-0.452	-0.307	-0.389	-0.618	-0.645	-0.750	-0.675
West										
Arad	0.006	-0.015	-0.022	-0.049	-0.029	-0.042	-0.056	-0.058	-0.097	-0.072
Caras-Severin	-0.017	-0.072	-0.081	-0.088	-0.059	-0.031	-0.129	-0.134	-0.137	-0.108
Hunedoara	-0.053	-0.175	-0.153	-0.168	-0.098	-0.127	-0.219	-0.208	-0.257	-0.233
Timis	-0.127	-0.217	-0.228	-0.252	-0.155	-0.252	-0.332	-0.317	-0.360	-0.345

Source: INSSE (2022)

Table A.23: A. Net migration rate (temporary migrants) females, NUTS-3

NUTS-3	2012	2013	2014	2015	2016	2017	2018	2019	2018	2019
North-West										
Bihor	-0.229	-0.232	-0.174	-0.270	-0.432	-0.379	-0.342	-0.195	-0.037	-0.027
Bistrita-Nasaud	-0.224	-0.216	-0.168	-0.258	-0.414	-0.356	-0.351	-0.211	-0.144	-0.166
Cluj	-0.194	-0.217	-0.143	-0.242	-0.407	-0.340	-0.276	-0.118	0.024	0.021
Maramures	-0.158	-0.177	-0.116	-0.213	-0.380	-0.296	-0.267	-0.105	-0.012	-0.016
Salaj	-0.184	-0.188	-0.138	-0.231	-0.392	-0.323	-0.302	-0.152	-0.002	0.012
Satu Mare	-0.273	-0.264	-0.210	-0.301	-0.462	-0.420	-0.403	-0.271	-1.094	-1.032
Centre										
Alba	-0.192	-0.209	-0.147	-0.242	-0.404	-0.337	-0.298	-0.147	-0.224	-0.207
Brasov	-0.183	-0.210	-0.140	-0.229	-0.379	-0.321	-0.255	-0.114	0.069	0.072
Covasna	-0.219	-0.223	-0.167	-0.264	-0.427	-0.369	-0.339	-0.187	-0.021	-0.014
Harghita	-0.187	-0.190	-0.140	-0.242	-0.408	-0.338	-0.310	-0.146	-0.115	-0.101
Mures	-0.213	-0.220	-0.161	-0.260	-0.424	-0.363	-0.328	-0.173	-0.091	-0.076
Sibiu	-0.204	-0.222	-0.155	-0.243	-0.391	-0.341	-0.286	-0.150	-1.014	-1.109
North-East										
Bacau	-0.229	-0.227	-0.175	-0.259	-0.404	-0.360	-0.341	-0.214	0.256	0.176
Botosani	-0.321	-0.309	-0.247	-0.337	-0.498	-0.471	-0.458	-0.332	1.284	0.998
Iasi	-0.212	-0.211	-0.156	-0.240	-0.382	-0.329	-0.301	-0.168	0.933	1.142
Neamt	-0.193	-0.188	-0.145	-0.231	-0.381	-0.318	-0.314	-0.177	0.133	0.216
Suceava	-0.242	-0.236	-0.182	-0.268	-0.419	-0.368	-0.354	-0.223	1.026	0.469
Vaslui	-0.281	-0.270	-0.212	-0.294	-0.441	-0.403	-0.388	-0.265	1.874	1.986
South-East										
Braila	-0.301	-0.313	-0.235	-0.325	-0.487	-0.458	-0.418	-0.295	-0.048	-0.058
Buzau	-0.299	-0.289	-0.231	-0.326	-0.498	-0.457	-0.444	-0.307	-0.140	-0.147
Constanta	-0.096	-0.130	-0.068	-0.167	-0.329	-0.232	-0.183	-0.014	-0.080	-0.089
Galati	-0.220	-0.227	-0.166	-0.253	-0.405	-0.353	-0.322	-0.188	0.719	1.091
Tulcea	-0.175	-0.183	-0.133	-0.228	-0.392	-0.320	-0.303	-0.148	-0.121	-0.111
Vrancea	-0.275	-0.264	-0.210	-0.301	-0.458	-0.417	-0.409	-0.279	-0.575	-0.567
South-Muntenia										
Arges	-0.240	-0.239	-0.185	-0.280	-0.444	-0.393	-0.358	-0.213	-0.012	-0.013
Calarasi	-0.308	-0.294	-0.236	-0.337	-0.511	-0.469	-0.462	-0.318	-0.117	-0.118
Dambovita	-0.296	-0.274	-0.227	-0.326	-0.496	-0.457	-0.447	-0.303	0.129	0.126
Giurgiu	-0.372	-0.347	-0.284	-0.388	-0.573	-0.542	-0.544	-0.402	-0.058	-0.037
Ialomita	-0.226	-0.228	-0.171	-0.272	-0.444	-0.378	-0.365	-0.207	-0.201	-0.169
Prahova	-0.245	-0.248	-0.188	-0.285	-0.452	-0.400	-0.365	-0.218	-0.025	-0.019
Teleorman	-0.322	-0.309	-0.250	-0.352	-0.535	-0.495	-0.497	-0.354	-1.035	-1.041
Bucuresti-Ilfov										
Ilfov	-0.226	-0.219	-0.158	-0.263	-0.427	-0.339	-0.297	-0.137	-0.788	-0.731
Bucuresti	-0.306	-0.341	-0.241	-0.326	-0.467	-0.465	-0.345	-0.237	1.147	0.821
South-West Oltenia										
Dolj	-0.167	-0.181	-0.124	-0.224	-0.397	-0.314	-0.284	-0.119	0.003	0.007
Gorj	-0.142	-0.151	-0.106	-0.205	-0.374	-0.287	-0.264	-0.095	-0.032	-0.037
Mehedinti	-0.217	-0.222	-0.165	-0.262	-0.433	-0.366	-0.347	-0.193	-0.094	-0.062
Olt	-0.232	-0.230	-0.177	-0.279	-0.460	-0.393	-0.381	-0.220	-0.025	-0.031
Valcea	-0.271	-0.267	-0.209	-0.301	-0.467	-0.423	-0.396	-0.259	-0.750	-0.675
West										
Arad	-0.251	-0.259	-0.192	-0.285	-0.446	-0.400	-0.359	-0.220	-0.097	-0.072
Caras-Severin	-0.185	-0.200	-0.140	-0.238	-0.406	-0.332	-0.305	-0.146	-0.137	-0.108
Hunedoara	-0.260	-0.285	-0.203	-0.293	-0.451	-0.415	-0.351	-0.222	-0.257	-0.233
Timis	-0.192	-0.209	-0.142	-0.238	-0.395	-0.334	-0.279	-0.127	-0.360	-0.345

Source: INSSE (2022)

Table A.24: B. Net migration rate (temporary migrants) males, NUTS-3

NUTS-3	2012	2013	2014	2015	2016	2017	2018	2019	2018	2019
North-West										
Bihor	0.224	0.186	-0.156	-0.292	-0.199	-0.207	-0.199	-0.089	-0.037	-0.027
Bistrita-Nasaud	0.204	0.177	-0.141	-0.265	-0.182	-0.181	-0.204	-0.103	-0.144	-0.166
Cluj	0.239	0.186	-0.166	-0.310	-0.210	-0.221	-0.181	-0.065	0.024	0.021
Maramures	0.220	0.177	-0.153	-0.289	-0.202	-0.198	-0.196	-0.086	-0.012	-0.016
Salaj	0.216	0.182	-0.150	-0.282	-0.196	-0.197	-0.203	-0.097	-0.002	0.012
Satu Mare	0.212	0.182	-0.145	-0.274	-0.190	-0.192	-0.205	-0.100	-1.094	-1.032
Centre										
Alba	0.215	0.172	-0.151	-0.283	-0.196	-0.197	-0.184	-0.076	-0.224	-0.207
Brasov	0.214	0.163	-0.152	-0.282	-0.191	-0.202	-0.158	-0.054	0.069	0.072
Covasna	0.225	0.188	-0.156	-0.294	-0.198	-0.205	-0.206	-0.098	-0.021	-0.014
Harghita	0.230	0.195	-0.161	-0.302	-0.204	-0.212	-0.213	-0.104	-0.115	-0.101
Mures	0.227	0.188	-0.159	-0.298	-0.202	-0.209	-0.204	-0.093	-0.091	-0.076
Sibiu	0.209	0.163	-0.146	-0.272	-0.184	-0.194	-0.163	-0.061	-1.014	-1.109
North-East										
Bacau	0.193	0.164	-0.134	-0.252	-0.172	-0.176	-0.184	-0.089	0.256	0.176
Botosani	0.206	0.178	-0.139	-0.266	-0.181	-0.186	-0.203	-0.100	1.284	0.998
Iasi	0.209	0.173	-0.139	-0.256	-0.171	-0.177	-0.176	-0.082	0.933	1.142
Neamt	0.196	0.170	-0.136	-0.257	-0.180	-0.174	-0.198	-0.100	0.133	0.216
Suceava	0.202	0.172	-0.137	-0.258	-0.176	-0.175	-0.190	-0.093	1.026	0.469
Vaslui	0.197	0.169	-0.131	-0.244	-0.165	-0.166	-0.182	-0.091	1.874	1.986
South-East										
Braila	0.209	0.166	-0.145	-0.276	-0.192	-0.196	-0.182	-0.073	-0.048	-0.058
Buzau	0.222	0.192	-0.153	-0.291	-0.201	-0.204	-0.223	-0.111	-0.140	-0.147
Constanta	0.226	0.174	-0.161	-0.300	-0.209	-0.206	-0.180	-0.068	-0.080	-0.089
Galati	0.200	0.163	-0.138	-0.261	-0.181	-0.182	-0.178	-0.077	0.719	1.091
Tulcea	0.207	0.173	-0.145	-0.274	-0.191	-0.189	-0.199	-0.095	-0.121	-0.111
Vrancea	0.210	0.183	-0.143	-0.271	-0.185	-0.187	-0.209	-0.107	-0.575	-0.567
South-Muntenia										
Arges	0.221	0.187	-0.155	-0.292	-0.203	-0.209	-0.202	-0.090	-0.012	-0.013
Calarasi	0.233	0.202	-0.159	-0.303	-0.204	-0.211	-0.236	-0.122	-0.117	-0.118
Dambovita	0.231	0.207	-0.159	-0.301	-0.204	-0.213	-0.237	-0.124	0.129	0.126
Giurgiu	0.246	0.219	-0.165	-0.315	-0.213	-0.217	-0.257	-0.139	-0.058	-0.037
Ialomita	0.229	0.193	-0.160	-0.303	-0.207	-0.208	-0.225	-0.113	-0.201	-0.169
Prahova	0.226	0.189	-0.159	-0.299	-0.206	-0.212	-0.205	-0.091	-0.025	-0.019
Teleorman	0.227	0.201	-0.156	-0.300	-0.209	-0.208	-0.243	-0.127	-1.035	-1.041
Bucuresti-Ilfov										
Ilfov	0.284	0.233	-0.185	-0.336	-0.219	-0.218	-0.208	-0.096	-0.788	-0.731
Bucuresti	0.212	0.147	-0.151	-0.286	-0.187	-0.220	-0.112	-0.004	1.147	0.821
South-West Oltenia										
Dolj	0.232	0.191	-0.162	-0.307	-0.214	-0.211	-0.208	-0.091	0.003	0.007
Gorj	0.217	0.183	-0.153	-0.288	-0.203	-0.198	-0.204	-0.093	-0.032	-0.037
Mehedinti	0.217	0.183	-0.152	-0.289	-0.201	-0.198	-0.208	-0.096	-0.094	-0.062
Olt	0.226	0.195	-0.158	-0.300	-0.210	-0.208	-0.228	-0.112	-0.025	-0.031
Valcea	0.215	0.183	-0.149	-0.282	-0.197	-0.200	-0.202	-0.092	-0.750	-0.675
West										
Arad	0.224	0.181	-0.154	-0.291	-0.198	-0.205	-0.193	-0.083	-0.097	-0.072
Caras-Severin	0.220	0.179	-0.154	-0.292	-0.205	-0.203	-0.202	-0.091	-0.137	-0.108
Hunedoara	0.206	0.156	-0.145	-0.274	-0.189	-0.198	-0.159	-0.051	-0.257	-0.233
Timis	0.234	0.186	-0.161	-0.301	-0.202	-0.213	-0.183	-0.073	-0.360	-0.345

Source: INSSE (2022)