

The effect of adult children's outmigration on the mental health of
older parents in Central and Eastern Europe

Ph.D. Thesis

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Pécs, 2024

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Abbreviations

ANCOVA: Analysis of covariance

CEE: Central and Eastern Europe

CELB: the Children and Elderly Left Behind dataset from the National Labor Force Survey in Moldova

CHARLS: the China Health and Retirement Longitudinal Study

EU: European Unions

HRS: the Health and Retirement Study in the United States

IFLS: the Indonesia Family Life Survey

LASI: the Longitudinal Ageing Study in India

LLD: Late-life depression

MHAS: the Mexican Health and Aging Study

MxFLS: the Mexican Family Life Survey

OECD: the Organization for Economic Cooperation and Development

PINZMS: the Pacific Island-New Zealand Migration Study in Tonga

SHARE: the Survey of Health, Ageing and Retirement in Europe

TILDA: the Irish Longitudinal Study on Ageing

Definitions

Left-behind parent: An older adult who had one or more adult children living at a distance from their household for at least the past two years.

Central and Eastern European countries: As per the OECD statistical definition, Central and Eastern European countries include Bulgaria, Czech Republic, Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia.

Abstract

Objective: To examine the association between adult children's migration and depression among older parents in Central and Eastern Europe (CEE) and explore the role of intergenerational support in contributing to their depression.

Methods: Data were from the eighth wave of the Survey of Health, Ageing and Retirement in Europe (SHARE), pooling a study sample of 11 CEE countries, with a cross-sectional design. Analysis of covariance (ANCOVA) and hierarchical linear regression were conducted using a study sample of 9133 respondents.

Results: Older adults whose children migrated over 500 km were more likely to experience depression compared to those with no migrant child or all children within 500 km. Among intergenerational support, frequent parent-child contact mitigated the effects of migration on depression in older parents with all their children who migrated over 500 km.

Conclusion: This study concluded that older parents with migrant children over 500km away should be considered a vulnerable population at risk for mental health in CEE countries. It is crucial for local governments and policymakers to address these challenges through improving integrated mental health and social programs for better mental health outcomes among older adults in CEE countries.

Keywords: depression; migration; older adults; intergenerational support; Central and Eastern Europe

1. Introduction

1.1. Depression in older adults

Depression in later life (LLD: late-life depression) is an increasingly pressing public health issue with aging population trends. Although prevalent, identifying depression in older adults has proved challenging because the symptoms are different from depression in younger group (Fiske et al., 2009; Blazer, 2003). Compared to a younger-aged group, suicide in the elderly is more closely related to depression and often 'suffer in silence' without seeking help (Royal College of Psychiatrists, 2018). Half or more elderly patients with major depression are newly depressed in older age (Bruce, 2002). Unlike depression in younger age groups, risk factors leading to the development of LLD include chronic diseases, disability, lower socio-economic status, weak social networks, disrupted family relations, and lack of intergenerational support (Blazer, 2003). LLD is strongly linked to adverse health outcomes, cognitive decline, suicidal tendencies, and heightened healthcare utilization. This, in turn, places a significant economic and caregiving burden on both individual family members and the wider community.

The prevalence of LLD in European older adults over 65 years ranged between 12.3% and 42% (Copeland et al., 2004; Horackova et al., 2019). Various studies have indicated notable disparities in the prevalence of LLD in different European regions (Andreas et al., 2017; Castro-Costa et al., 2007; Copeland et al., 2004; Horackova et al., 2019). Specifically, some investigations have proposed that Central and Eastern European (CEE) countries experience a more significant burden of LLD compared to Western European and Scandinavian countries (Hansen & Slagsvold, 2017). Among European countries, CEE countries have a higher prevalence of LLD, with a rate of 42 % compared to the average European rate of 39 %, as revealed by recent studies (Grundy et al., 2019; Hansen et al., 2017; Horackova et al., 2019; Naghavi, 2019; Nedev & Bogdanova, 2021).

The regional disparity between Western and Eastern European countries was linked to potential factors including poorer health, poorer living conditions, higher income inequalities, higher rates of bereavement in former socialist nations (Horackova et al., 2019; Kureková, 2011; Botev, 2011; Hansen & Slagsvold, 2017). It can be related to broader health and social care system factors including the accessibility of healthcare services, the policies governing depression treatment, the societal attitudes toward aging, mental health, health-seeking behaviours and less generous welfare programs (Van de Velde et al., 2010; Castro-Costa et al., 2007).

In particular, countries with more generous welfare programs at the national level tended to have lower rates of depression among older individuals (Kok et al., 2012). Based on the OECD report from 2023 regarding total long-term care spending as a percentage of GDP, most CEE countries, except for the Czech Republic (1.8%), allocate a lower percentage compared to the OECD average of 1.8%. Specifically, Poland, Romania, Bulgaria, and Croatia have rates lower than 0.5%, while Slovenia (1.4%), Lithuania (1.2%), Estonia (0.7%), Hungary (0.7%), Latvia (0.6%), Poland (0.5%), Romania (0.4%), Bulgaria (0.3%), and Croatia (0.2%) also fall below this average. These percentages are significantly lower than those of their Western and Nordic counterparts such as the Netherlands (4.4%), Norway (3.5%), Sweden (3.4%), and Denmark (3.2%). This discrepancy primarily reflects the formal care systems in the Western and Nordic countries contrasting with informal care arrangements that heavily rely on care provided by unpaid family members in CEE countries.

The variations in LLD prevalence across different European regions can be attributed to significant differences in intergenerational relationship and support patterns. In CEE countries, where filial care norms remain prevalent and community-based mental health care is less available (Gedvilaite-Kordušiene, 2015; Kureková, 2011), adult children are often a crucial source of instrumental and emotional support for older adults (Bengtson & Roberts, 1991; Guo et al., 2009). Despite the importance of these familial support structures, CEE countries

were included selectively or limited for the studies on LLD in Europe (Horackova et al., 2019). This selective inclusion may limit the comprehensive understanding of the impact of familial support dynamics within socio-cultural contexts on LLD in the broader European context. The limited representation of CEE countries in LLD literature results in a noticeable absence of empirical data.

1.2. Out-migration of adult children in CEE countries

The demographic landscape in CEE countries has undergone significant shifts, marked by an increase in life expectancy and a decline in fertility rates over the past two decades (Botev, 2012). This trend has resulted in an aging population with a rising proportion of older adults and a decrease in the number of younger adults. According to the World Bank's 2023 projections, the old-age dependency ratio in CEE countries is anticipated from 28-35% in 2022 to an average of 53% in 2030, posing a unique and unprecedented challenge in the history (Bijak et al., 2007; World bank, 2023).

As part of the EU's enlargement and accession process, several CEE countries, including the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic, and Slovenia, became EU members in 2004. Subsequently, Bulgaria and Romania joined in 2007, followed by Croatia in 2013. The free movement of workers within the EU has led to a notable rise in labor mobility in many CEE countries, especially in Poland, Romania and Bulgaria (European Commission, 2022).

The globalization coupled with the EU enlargement process has reshaped migration patterns, particularly in CEE regions. Outward migration, especially from countries like Romania, Bulgaria, and Poland, has become a noticeable trend, driven by factors such as seeking better economic prospects and educational opportunities in regions with more favourable conditions. The European Commission's 2022 report highlighted a steady increase in young adults' out-

migration from CEE countries. Of sending countries of origin, Poland and Romania are two largest individual groups, Romania, Poland, Italy, Portugal, and Bulgaria are composed of 58% of EU movers. In 2018, the annual outflow rate per 1,000 working-age citizens was 1.4% for Romania and 1.3% for Lithuania (European Commission, 2022).

Out-migration is influenced by various factors, including the social and economic conditions in both the sending and receiving regions. CEE countries with higher out-migration rates tend to have lower levels of social protection expenditure, and health access is affected by increased privatization and the burden of out-of-pocket payment (Botev, 2012). While free labor mobility within the EU can address labor market disparities, it presents challenges for both sending countries and the migrants themselves, including the loss of human capital, disruptions in family structures, and difficulties in providing and maintaining support over long distances (Kahanec et al., 2009).

One notable consequence of out-migration is the phenomenon of ‘left-behind parents’, referring to those residing in their country of origin with one or more children migrated away (Abas, 2009; Antman, 2013; Conkova & King, 2019; Démurger, 2015). The geographic separation of adult children from their aging parents raises concerns about increased loneliness, social isolation, and the loss of practical and emotional support for the older generation left behind. The limited social security and public health infrastructure in migrant-sending communities may fail to detect the mental health burden of left-behind older adults, resulting in unexpected challenges for the original communities.

Despite these challenges, migration from CEE countries also brings benefits, particularly through remittances. The financial support from migrant children can alleviate economic risks, contributing to improved living conditions, including better healthcare and access to more nutritious food and goods for the left-behind family members (Amuedo-Dorantes & Pozo, 2011; Böhme et al., 2015; Lu, 2013). Scholars have conceptualized this as a ‘new economics of labor

migration’, involving collective decision-making and care responsibilities for left-behind older parents (Gerber & Torosyan, 2013; Taylor et al., 2003). Coordinated care and support within the original community, often facilitated through extended family and social networks, become crucial, especially in regions with underdeveloped credit systems or inadequate insurance coverage for various circumstances affecting aging individuals (Lu, 2013; Yi et al., 2019).

Geographic proximity of adult children to their aging parents is generally believed to be beneficial for the physical and mental health of older parents. Living closer may allow for providing intergenerational support, such as frequent interaction, emotional closeness, and support exchange (Offer & Fischer, 2018; Ward et al., 2014). Emphasizing the importance of physical closeness, Offer and Fischer (2018) highlighted its crucial role in shaping social networks. Older parents are more likely to include their adult children in their social networks when at least one resides nearby. This geographical proximity contributes the dynamics of social interactions between older parents and their adult children, fostering the ability to receive support in both every day and emergency situations. The tangible benefits of physical closeness endure, even in the contemporary era marked by the widespread availability of digital communication technologies.

Insights from studies conducted in Poland, Lithuania, and Romania shed light on how left-behind parents address the challenges of geographic separation (Gedvilaite-Kordušiene, 2015; Krzyzowski & Mucha, 2014; Schröder-Butterfill & Schonheinz, 2019; Zimmer et al., 2014). While left-behind parents do not perceive themselves as ‘orphan pensioners’ or ‘being discarded’, the prolonged and accumulation of stresses over later life course may have a substantial mental health consequence (King & Vullnetari, 2006). They often employ coping strategies such as relying on financial support from remittances, enhancing their methods of communication, and seeking informal assistance from neighbours and close relatives to combat feelings of isolation and loneliness.

Although these findings are insightful and valuable, the majority of studies were qualitative, relying on small-scale, in-depth interviews without incorporating mental health outcomes. Consequently, there is a noticeable absence of empirical research aimed at comprehensively understanding the extent of the impact of adult children's outmigration on the mental health of older parents left behind.

1.3. Depression of left-behind older parents

The mental health ramifications of adult children's outmigration have garnered increased attention, particularly in low-and-middle income countries and those facing rapid socio-economic changes or crises (King et al., 2017; Tosi & Grundy, 2019). When older parents suffer from chronic disease or cognitive functional decline, their relationships with adult children may undergo transformations. The phenomenon of outmigration has given rise to concerns about the potential increase in loneliness, sadness, grief, a sense of loss, social isolation, and poorer mental health of older parents left behind (Démurger, 2015; Giles et al., 2010; Knodel et al., 2000, 2010; Kreager, 2006). Conversely, in regions where outmigration is prevalent, parents may experience a sense of pride and prestige (Abas et al., 2013; Krzyzowski & Mucha, 2014; Russell, 2019; Yahirun & Arenas, 2018). Beyond the immediate satisfaction of seeing their adult children venture into the wider world, parents often take pride in the resilience and adaptability their children demonstrated in navigating new environments. The achievements and successes of out-migrated children contribute to the family's reputation within the community, fostering a sense of prestige.

Research on the impact of adult children's outmigration on parental depression has yielded mixed results. Studies have either reported a negative effect (Antman, 2010, 2013, 2016 ; Guo et al., 2009; Li et al., 2020 ; Lu, 2012; Mosca & Barrett, 2016; Muhammad et al., 2022; Torres et al., 2018 ; Scheffel & Zhang, 2019), or a positive one (Abas et al., 2009, 2013 ; Yi et al., 2019), or no significant effect (Böhme et al., 2015; Ghimire et al., 2018; Gibson et al., 2011;

Waidler et al., 2017; Yahirun & Arenas, 2018). Antman (2010, 2013, 2016) reviewed the direct impact of adult children's outmigration operationalizing whether the parents had one or more migrant children or not. She used the Mexican Health and Aging Study (MHAS) dataset and studied the difference of depressive symptoms between parents with migrant children and those without migrant children. Her studies revealed that the detrimental mental health consequences of adult child outmigration in Mexico. Torres (2018) also conducted a study in Mexico and documented the results that the negative mental health effect of adult children's international migration to the U.S.A. On the other hand, Yahirun and Arenas (2018)'s study was conducted in Mexico but found no significant effect on parental depression among Mexican left behind parents using the population-based data of the Mexican Family Life Survey (MxFLS).

Widening the global perspective, studies conducted in diverse cultural contexts have consistently echoed these findings. Investigations in China (Li et al., 2020; Guo et al., 2009; Scheffel & Zhang, 2019), Indonesia (Lu, 2012), Ireland (Mosca & Barrett, 2016) and India (Muhammad et al., 2021) underscored the negative mental health impact associated with adult children's outmigration. Except one study in China conducted by Lu (2012), most of these studies draw upon extensive datasets such as the China Health and Retirement Longitudinal Study (CHARLS), the Indonesia Family Life Survey (IFLS), the Irish Longitudinal Study on Ageing (TILDA) and the Longitudinal Ageing Study in India (LASI) which were followed to the Survey of Health, Retirement and Ageing in Europe (SHARE) and the Health and Retirement Study (HRS) in the United States. These findings challenge the prevailing assumption that family members especially left behind older parents in original communities of sending countries would be benefitted from young adults' emigration. In China, the Family Education Law mandates that adult children living apart must regularly visit and attend to the needs of their parents (Lu, 2012). However, it is crucial to recognize that the effectiveness of this legal requirement, as well as the limitations imposed by mobility restrictions, may not offer a universally applicable solution to the complex dynamics of family relationships and support.

Contrary to common concerns about the well-being of older parents whose adult children have migrated away, studies conducted by Abas et al. (2009, 2013) and Yi et al. (2019) showed positive mental health effects for parents in rural Thailand and China because they had received financial support, which led to improved psychological outcomes through better living conditions. Abas et al. studies (2009 and 2013) used the nested study sample within the municipal demographic surveillance system in Thailand while Yi et al.'s study (2019) used the nationally representative survey of CHALS in China. Migration has been viewed as an opportunity to alleviate poverty in families, especially in low-resource household or less industrialized rural areas.

Lastly, studies in Moldova, Nepal and Tonga found no significant effect of adult children's outmigration on the mental health of left behind older parents (Böhme et al., 2015; Ghimire et al., 2018; Gibson et al., 2011; Waidler et al., 2017). Except the study in Nepal, conducted in a randomly selected municipality, other studies were based on population-based data using the Moldovan Labor Force Survey in Moldova, the Children and Elderly Left Behind (CELB) dataset from the National Labor Force Survey in Moldova, and the Pacific Island-New Zealand Migration Study (PINZMS) in Tonga. Some suggested explanations for no effect in results included legal mobility and freedom of traveling within the region (Böhme et al., 2015) as well as advancement of communication technologies, which enabled the frequent physical visits and contacts with their left behind parents. In the context of the low resource settings and lower income level, remittances and financial support from migrant children could be more valuable and important compared to other better off regions or communities (Ghimire et al., 2018). Besides, although formal care service for older adults or institutions were not enough equipped, the cultural norms and practices for taking care of aging family members were arranged at the extended family level, which support the notion of strategic decision of extended family for the younger adult children's outmigration in the limited resource settings (Waidler et al., 2017).

The global scope of research on adult child migration revealed both adverse and beneficial effects on the mental health of left behind older parents. Studies from Mexico, China, Indonesia, Ireland, and India underscore the negative impact on parental mental health, challenging assumptions about the benefits of emigration for families in sending communities (Antman, 2010). However, studies in rural Thailand and China demonstrated positive mental health effects linked to financial support from children, offering a counter-narrative of migration as an opportunity to alleviate poverty (Abas et al., 2013). Moreover, investigations in Moldova, Nepal and Tonga showed the absence of significant effects, emphasizing the role of legal mobility, communication technologies, and cultural norms in mitigating potential negative repercussions (Gibson et al., 2011).

While these studies provide valuable insights, there is a pressing need to extend the understanding of the impact of adult child migration on the mental health of left behind parents in other regions, particularly in CEE countries. The migration of adult children is viewed as a significant risk factor for depression among parents left behind in CEE countries. This perspective is supported by the studies documented negative mental health impact through the existence of an intergenerational support gap resulting from a combination of insufficient social/health care and the absence of familial support due to the increased outmigration of adult children, despite the enduring respect for filial piety (Botev, 2012; Kahanec et al., 2009; King & Vullnetari, 2006; Tosi & Grundy, 2019). Given the unique socio-economic and cultural dynamics in this region, examining the effects of outmigration on the mental health of older parents becomes crucial for shaping effective policies and interventions.

1.4. Intergenerational support influencing mental health outcomes in the context of adult children's outmigration

Intergenerational support emerges as a pivotal determinant of parental mental health, particularly in relation to depressive symptoms. Many studies have reviewed how specific types of adult child-parent support exchange relate to parental depression including contact frequency (Buber & Engelhardt, 2008; Tosi & Grundy, 2019), instrumental, financial, and emotional support provision (Amy et al., 2008; Djundeva et al., 2015; Silverstein et al., 1996, 2006; Wolff & Agree, 2004) and emotional closeness (Silverstein et al., 2006; Van Gaalen & Dykstra, 2006; Zhang & Silverstein, 2022). Older European and Chinese parents who had less often physical or virtual contact than once a week, lower support and weak emotional closeness with their adult children had higher levels of depression (Djundeva et al., 2015).

The spatial separation and migration of adult children bring about shift and challenges in the provision of care for older parents (Kreager, 2006; Mosca & Barrett, 2016). Geographic proximity plays a role, as adult children in close proximity are more likely to provide instrumental and emotional support, whereas those residing farther away or having migrated tend to contribute financially (Chen & Silverstein, 2000; Gedvilaite-kordusiene, 2015; Whyte & Qin, 2003; Zimmer, 2014). Financial support becomes more prevalent when adult children who migrated away frequently send remittances. Studies in Western Europe found that financial support is often given to adult children from older parents and was not associated with parental well-being (Fingerman et al., 2009; Merz et al., 2009). Conversely, in low-and-middle income countries such as Thailand and China, financial support from migrant children was able to compensate for negative mental health consequences of child outmigration (Abas, 2013; Yi et al., 2019). A qualitative study focusing on Polish migrant children revealed that economic remittances held both practical financial values and served as a symbolic expression of adult children's concern and care (Krzyzowski & Mucha, 2014).

Previous research suggested that the underlying mechanism linking intergenerational support to parental depression centers on parents who anticipate filial care, potentially experiencing elevated levels of depression compared to those without such expectations (Lee et al., 1995). Nevertheless, contrary to the common assumption that filial care norms lead to a rise in general informal caregiving, according to an empirical study, while prevailing familial norms and cultural expectations regarding family care were not linked to an increase in general informal caregiving, they were associated with an increase in intensive informal caregiving (Verbakel, 2017). Older adults who require long-term care often rely on family members such as spouses and adult children to provide unpaid caregiving. The declining rates of marriage and childbirth, coupled with the increasing outmigration of younger generations in CEE countries, have resulted in increased demand for alternative care arrangements as well as formal care systems.

Consequently, the significance of intergenerational support factors is amplified in the context of CEE countries, where filial care norms are deeply rooted in historical traditions and communal living practices (Gedvilaite-Kordušiene, 2015; Krzyzowski & Mucha, 2014). Despite the growing prevalence of individualistic values, adult children continue to be recognized as crucial sources of both instrumental and emotional support for aging parents in CEE countries (Gedvilaite-Kordušiene, 2015). However, very few studies have been examined the relationship between intergenerational support and depressive symptoms (Bó et al., 2020; Sun et al., 2022).

Qualitative studies carried out in Poland, Lithuania, and Romania offer valuable insights into how these left-behind parents address the challenges posed by the geographic separation (Gedvilaite-Kordušiene, 2015; Krzyzowski & Mucha, 2014; Schröder-Butterfill & Schonheinz, 2019; Zimmer et al., 2014). In contrast to general concerns about whether those who have their adult child migrate out may suffer from a lack of basic support, loneliness and isolation, the left-behind older parents often employ coping strategies such as relying on

financial support from remittances, enhancing their methods of communication, and seeking informal assistance from neighbours and close relatives to relieve feelings of isolation and loneliness (Conkova & King, 2019; Gedvilaite-Kordušiene, 2015; Krzyzowski & Mucha, 2014; Schröder-Butterfill & Schonheinz, 2019; Zimmer et al., 2014).

These available studies used in-depth interview or case studies covered only a part of CEE countries. Studies using quantitative measures with national-level data have reviewed the changes in intergenerational care practices, filial care norm expectation and non-kin support compensated for the absence of adult children, however, mental health consequences have not yet been reviewed.

1.5. Study significance

Contrary to the growing literature on left-behind children and spouses, very few studies have been concerned with the left-behind older adults' population in CEE countries. Often CEE countries are left out from migration and late-life depression studies in Europe. Despite relevant literature on CEE countries (Bó et al., 2020; Botev, 2012), most studies have not investigated mental health outcomes of left behind parents (Conkova & King, 2019). No quantitative study with mental health outcome measure is available so far as the previous study remarked in their discussion (Conkova & King, 2019).

Studies that have investigated the intergenerational care between out-migrated children and left behind parents focused on Poland, Lithuania, and Romania, thus creating a knowledge gap on the regional level (Bó et al., 2020; Gedvilaite-Kordušiene, 2015; Krzyzowski & Mucha, 2014; Schröder-Butterfill & Schonheinz, 2019; Zimmer et al., 2014).

Therefore, the aim of the current research was to explore whether adult children's migration significantly impacts mental health, operationalized as

depression, of left behind older parents in all CEE countries where data were available. This study was the first to investigate this issue in all CEE countries.

1.6. Conceptual framework of the dissertation

The conceptual model delineated in figure 1 addresses the relationship between depression in older adults and several key variables. Central to this framework is the primary independent variable, adult children's outmigration status, while the main dependent variable is the older parents' depression.

The risk factors contributing to late-life depression encompass several factors including sociodemographic attributes, psychosocial determinants, somatic comorbidities, functional disability, cognitive function, physical inactivity, and intergenerational support (Abas et al., 2013; Aichberger et al., 2010; Blazer, 2003; Bruce M., 2002; Fiske et al., 2009; Ghimire et al., 2018; Horackova et al., 2019; Lu, 2012; Thapa et al., 2018). Noteworthy among these are psychosocial factors such as feelings of loneliness (Wong et al., 2016) and exposure to traumatic events (Bruce, 2002; Lee et al., 2023), which have been identified as influential. However, these factors were not included due to a scarcity of studies exploring them within the context of child outmigration (Thapa et al., 2018). Therefore, various potential covariates identified through literature reviews were recognized as confounding factors and are considered for adjustment to enhance the accuracy and congruence of the study's findings.

Intergenerational support is constructed with three dimensions: instrumental, financial, and emotional factors (Chen & Silverstein, 2000; Guo et al., 2017; Sun et al., 2022). This study has framed intergenerational support within the context of adult children's outmigration, focusing particularly on financial and emotional dimensions, aligning with prior studies (Abas et al., 2009, 2013; Guo et al., 2017; Thapa et al., 2018). The assessment of intergenerational support involves evaluating the financial assistance exchanged between older parents and adult

children, as well as the frequency of contact and emotional closeness between them.

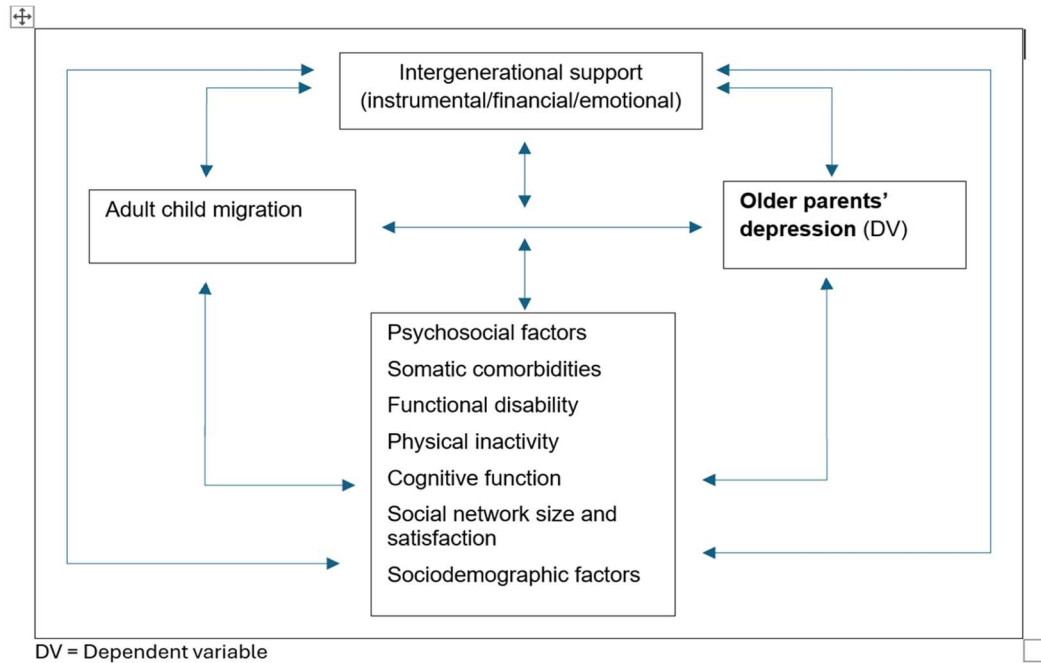


Figure 1. Conceptual framework

2. Purpose of the study

2.1. Research questions and hypotheses

The study seeks answers the following research questions and hypotheses:

Q1. Is the presence of migrant adult children among older parents associated with higher levels of depression compared to those without migrant children?

H1. Having all or some adult children out-migrated would increase depression among left-behind parents in CEE countries.

Q2. Is there a significant association between intergenerational support factors and the level of depression among older adults?

H2. Having more financial support, frequent contact, and emotional closeness with their adult children would be associated with a lower level of depression among left-behind older parents in CEE countries.

2.2. Research objectives

This study hypothesized that older adults with migrant adult children would experience greater depression than those with no migrant adult children. Secondly, this study assessed how intergenerational support, operationalized as financial support given and received, contact frequency, and emotional closeness impacted on older adults' depression. The research objectives are:

- To identify the association between adult children's migration and depression of older parents.
- To ascertain whether there exists a discernible intergenerational support impact such as financial support given to, received from the adult children, contact frequency and emotional closeness with adult children on the mental health of older adults with migrant adult children within the distinct categories of adult children's migration status.

By addressing these research questions and objectives, the study aimed to contribute valuable insights into the associations between adult children migration status, intergenerational support, and depression of older adults in CEE countries.

3. Methods

3.1. Data and materials

This study used data from the eighth wave of the Survey of Health, Ageing and Retirement in Europe (SHARE) conducted in 2019/2020 (Börsch-Supan, 2022; Börsch-Supan et al., 2013). SHARE is a multidisciplinary longitudinal panel survey of people aged 50 or over in 28 European countries and Israel, using nationally representative probability sampling from population registries or multistage sampling methods. Due to the Covid-19 pandemic, about 70% of all longitudinal interviews were conducted using the face-to-face computer-assisted personal interviewing (CAPI) technique, combined with computer-assisted personal interviewing (CAPI) technique, for the health protection of study participants (Scherpenzeel et al., 2020).

For Waves 1 to 4, the Ethics Committee of the University of Mannheim provided its review and approval. Subsequently, Wave 4 and the project's ongoing phases received review and approval from the Ethics Council of the Max Planck Society. This study was conducted as a secondary analysis. Access to the accredited SHARE Research Data Center was secured through an individual application and subsequent registration processes were successfully completed.

This study was conducted as a secondary analysis from the SHARE database. Although SHARE provides extensive information on ageing across EU countries. Studies on CEE countries have not gained much attention missing the valuable information to the present knowledge of aging.

3.2. Study sample

The target sample for this study consists of left-behind parents, defined as older adults with one or more adult children living away from their household for at least two years. This definition is in line with the biannual data collection schedule of the SHARE. Specifically, "left-behind parents" refers to individuals experiencing the phenomenon of adult children having relocated from the parental home for an extended period, thus requiring the incorporation of a temporal criterion. To mitigate potential biases, individuals who reported a change in their child's location during Wave 8 were excluded from the analysis. The subsequent paragraphs delineate the sampling process in a step-by-step manner.

As per the OECD statistical definition (OECD, n.d.), CEE countries include Bulgaria, Czech Republic, Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. The overall sample from the 8th wave comprised 46500 respondents. Because this study focused on 11 CEE countries, another 19 European countries, which were not part of the CEE cluster in the SHARE data, were excluded ($n=28893$). Out of the remaining 17607 respondents, those who were younger than 50 ($n=120$) were excluded because spouses of respondents aged 50 or more were interviewed and some of them were younger than 50. To address the research questions, those older adults who had no child ($n=5655$), i.e., those without at least one living biological, adopted, or stepchild were also excluded.

Additionally, this study excluded those with their child younger than 18 years ($n=89$), and those reporting a change of child location in Wave 8 ($n=1270$) to avoid potential bias and error in measuring duration of exposure, as well as individuals with missing data in the key variable of adult children's migration status ($n=1340$). In this study, the target sample consists of left-behind parents, who were defined as older adults who had one or more adult children living at a distance from their household for at least the past two years, reflecting the biannual nature of data collection in the SHARE. Specifically, "left-behind

parents" refers to individuals experiencing the phenomenon of adult children having relocated from the parental home for an extended period, thus requiring the incorporation of a temporal criterion. To mitigate potential biases, individuals who reported a change in their child's location during Wave 8 were excluded from the analysis. The subsequent paragraphs delineate the sampling process in a step-by-step manner. The analytical sample size was 9133 respondents.

3.3. Measures

3.3.1. ***Depression***: To assess the mental health of older adults in CEE countries, this study used the EURO-D scale, which has been developed to compare the prevalence of major depressive symptoms in later life across different European countries. The instrument's internal validity and cross-cultural validity have been established in prior studies (Castro-Costa et al., 2008; Prince et al., 1999). Respondents were asked whether they experienced pessimism, depressive mood, suicidality, guilt, sleep difficulty, interest, irritability, fatigue, concentration, enjoyment, appetite, and tearfulness during the previous month in the local language. The answers of respondents were coded as 0= 'no' or 1= 'yes' and a sum score was calculated based on answers to each item. Depressive symptoms in older adults were measured using a composite score based on 12 items, with a total score ranging from 0 to 12. A higher score indicates a greater level of depression. Cronbach's alpha score in this study was 0.72.

3.3.2. ***Adult child out-migration status***: Adult child out-migration status was the main exposure variable of this study. To align with previous studies (Abas et al., 2013, 2009), this study recategorized the original responses into four new categories: 1) no migrant child (all children in the same household as the parents), 2) all children within 500 km of the parental residence, 3) some children over 500 km away from the

parental residence, 4) all children over 500 km away from parental residence. Using the furthest measured proximity, this study operationalized migration over 500 km as long-distance migration.

3.3.3. ***Intergenerational support:*** Several intergenerational support variables were used to examine the impact of adult child out-migration on older parents' depression, including contact frequency with children, emotional closeness with children, financial support received from children, and financial support is given to children adopted from previous studies (Abas et al., 2009; Aichberger et al., 2010; Lu, 2012; Thapa et al., 2018). Contact frequency with children was assessed with the categories of 0= 'never', 1= 'less than once a month', 2= 'once a month', 3= 'every 2 weeks', 4= 'once a week', 5= 'several times a week', and 6= 'daily contact'. A mean score of contact frequency with children was calculated based on answers to each item on each child. Emotional closeness with children was measured by answering the question about how close they feel to their children. Response categories were 1= 'don't know', 2= 'somewhat close', 3= 'very close', and 4= 'extremely close'. A mean score of emotional closeness with children was calculated based on answers to each item on each child. To assess financial support received from children and is given to children, respondents were asked whether they had received/given any financial or material gift or support amounting to €250 (e.g., receiving/giving money, covering specific types of costs such as those for medical care, insurance, or down payment for a home) from/to their children during the last 12 months. Response categories were 0= 'no' and 1= 'yes' and a mean score for the financial support received from children and given to children respectively were calculated based on answers to individual items.

3.3.4. ***Covariates:*** Sociodemographic, physical and cognitive health, functional disability, and social network variables were included as

covariates, as they were known to affect depressive symptoms in older adults (Abas et al., 2013; Aichberger et al., 2010; Ghimire et al., 2018; Lu, 2012; Thapa et al., 2018). These factors play a crucial role in understanding the complex and multifaceted nature of depression among older individuals.

- ***Sociodemographic variables:*** Sociodemographic variables included in this study were age, gender, education, relationship status, employment status, economic status, residence area, and number of children. The ages of both parents and children were recorded by subtracting their birth year from the year 2020. Each parent's gender was coded as 1= 'male' or 2= 'female'. Education level was classified into 1= 'lower' (levels 0-3) or 2= 'higher' (level 4-6), based on the International Standard Classification of Education (United Nations, 2006) (ISCED) version 97, which ranges from pre-primary education (level 0) to the second stage of tertiary education (level 6). Relationship status was categorized as either 1= 'no partner' or 2= 'with partner'. Employment status was self-reported and classified as either 1= 'not working' or 2 = 'working'. Economic status was assessed by a question related to the total monthly income of the household. Respondents were asked if their household was able to make ends meet, and responses were recoded as either 1= 'easy' or 2 = 'difficult'. These categories were reclassified from the original four options: 'easy – fairly easy – with some difficulty – with great difficulty'. Residence area was derived from the interviewer module and recategorized as 1= 'rural'(small town, rural area, or village) or 2='urban' (big city, suburbs, or outskirts of a big city and large town). Number of living children was recorded up to 20.
- ***Somatic comorbidities, functional disability, and physical inactivity:*** The number of chronic illnesses (e.g., heart disease, stroke, hypertension, diabetes, high blood sugar, cancer, and lung disease) was

recorded from 0 to 14. Functional disability was measured using the modified version of assessing limitations in activities of daily living (ADL: Steel et al., 2003) and the number of limitations in complex institutional activities of daily living (IADL: Nicholas et al., 2003). For the modified ADL, these assessments encompassed six daily activities – including tasks such as bathing, dressing, walking, eating, transitioning to/from bed, and using the toilet. These activities were coded from 0 to 6 as a continuous variable. Similarly, the modified IADL comprised nine institutional activities (Nicholas et al., 2003), such as taking medications, grocery shopping, preparing meals, using the telephone, using maps, household tasks, managing finances, leaving the house, and laundry. These activities were coded from 0 to 9 as a continuous variable. In both measures, higher scores corresponded to increased challenges with these activities (Mehrbrodt et al., 2022). Physical inactivity was assessed by asking respondents how often they engaged in activities that required moderate levels of energy, such as gardening, cleaning the car, or walking. Responses were coded as 0 for active (more than once a week, once a week, and one to three times a month) and 1 for inactive (hardly ever or never) (Malter et al., 2013).

- ***Cognitive function:*** The ten words recall test and the semantic verbal fluency tests were employed to assess objective cognitive performance. In the ten words list learning test, respondents were asked to recall any word from a list of 10 words that had been read out approximately 5 minutes earlier. The score ranged from 0 to 10. In the semantic verbal fluency test, respondents were given 60 seconds to generate as many animal names as possible. The total count of accurate words was recorded (Mehrbrodt et al., 2022).

- ***Social network size and satisfaction:*** Social network size was assessed based on respondents' report on the number of individuals in their network with a scale ranging from 0 to 7 (Malter et al., 2013). They

were also asked to rate their satisfaction with their network on a scale of 0 (completely dissatisfied) to 10 (completely satisfied).

3.4. Statistical analysis

Descriptive statistics including frequencies, proportions, and means (\pm SD) were done for main measures. To minimize the effect of selective nonresponse and panel attrition, this study applied calibrated, cross-sectional individual level weights provided by SHARE. Analysis of covariance (ANCOVA) was applied to assess differences in depression across all four child migration categories. Socio-demographic variables such as age, gender, education, relationship, employment, economic status, residence area as well as somatic comorbidities, functional disability, physical inactivity, social network size and satisfaction, were included as covariates. Post hoc differences across child migration categories were assessed by using the Least Significant Difference (LSD) post-hoc test to compare differences between pairs of groups in the child migration status variable. To predict depression, hierarchical linear regression was used. Outliers, by means of Studentized residuals, were removed from the regression analysis. Respondents falling outside of the < 2 and > -2 range were deselected. To understand and compare the unique contribution of non-sociodemographic predictors, this study also developed and compared four regression models separately for each child migration group. Normal distribution of the data was assessed by one sample Kolmogorov-Smirnov test. Statistical analyses were performed using SPSS Statistics, Windows version 25. Tests used for hypothesis testing were one-tailed, with a significance level of 0.05.

4. Results

4.1. Sample description

A total of 9133 older adults were eligible for the study, and their sample characteristics are displayed in Table 1. The average age of the participants was 71.00 years, with a standard deviation of 9.71. Among them, 68.37% identified as female, and 43.80% reported having no partner. Regarding education, 24.40% had attained a higher education level. In terms of employment status, only 26.25% were currently working, whereas the majority, accounting for 73.75%, were either not working or had retired. 53.38% of participants mentioned experiencing difficulty in making ends meet, and 63.08% resided in rural areas. On average, participants had 2.16 children ($SD=1.09$).

Participants had an average Euro-D score of 2.78 ($SD=2.42$), which measures depression symptoms. Out of 9133 parents in the study, 11.3% had no migrant child, i.e., all children live in the same household as parents, 72.0% had all out-migrated children within 500 km, 12.2% had some children over 500 km away, and 4.5% had all children living more than 500 km away.

Regarding their health status, participants suffered from an average of 2.09 chronic diseases ($SD=1.70$). In cognitive assessments, participants scored 19.48 ($SD=7.71$) in a test assessing verbal fluency, indicating their ability to generate words within a given time frame. The average score for delayed recall was 3.59 ($SD=2.11$), indicating their capacity to retrieve information after a delay. Participants reported a mean score of 0.32 ($SD=0.99$) in limited daily activities, which assesses difficulties in performing basic activities of daily living such as bathing, dressing, walking, and eating. The mean score for disability in instrumental daily activities was 0.69 ($SD=1.72$), indicating difficulties in more complex daily tasks like medication management, grocery shopping, meal preparation, and using the telephone. Approximately 15.56% of participants were

classified as inactive in terms of physical activity, indicating a lack of regular physical exercise or movement in their daily routines. Regarding their social dynamics, the average social network size reported by participants was 2.48 (SD=1.44), reflecting the number of individuals within their social circle. They expressed a mean satisfaction score of 9.03 (SD=1.42) concerning their social networks.

In terms of relationships with their children, the mean score of financial support received from children was 0.05 (SD=0.19) while participants provided a mean financial support of 0.09 (SD=0.26) to their children. The average contact frequency reported by participants was 1.73 (SD=0.90), indicating how often they communicated or interacted with their children. The mean emotional closeness score reported was 3.48 (SD=0.59), reflecting the perceived level of emotional closeness or intimacy in their relationships with their children.

Table 2 shows the distinctions in sample characteristics based on the migration status of adult children. Regarding depression score, individuals with some children living over 500 km and those with all children living over 500 km reported mean Euro-D scores of 3.0 (SD=2.4) and 3.0 (SD=2.5), while individuals without migrant children and those with all children living within 500 km reported mean Euro-D scores of 2.7 (SD=2.4) and 2.8 (SD=2.4), respectively.

Those with some or all adult children migrated over 500 km differed in several ways from those with all adult children living in the same household or within 500 km. Among these groups, individuals with adult children living all within 500 km were older (mean=72, SD=9.5) compared to those without migrant children (mean=68, SD=10.6) or with some/all children living over 500 km (mean=68, SD=9.2; mean=68, SD=8.7). Among individuals with all adult children living within 500 km and some children residing over 500 km, 70% and 69% were respectively identified as female. In comparison, those without migrant children and with all children living over 500 km comprised 66% and 67% female participants, respectively. Individuals with all their children living over 500 km

showed the highest percentage (32%) of higher education attainment. This was followed by those with some children living over 500 km (26%), while individuals without migrant children and those with all children living within 500 km both reported a lower proportion of higher education attainment at 24%.

Regarding employment status, 37% of participants without migrant children were currently working. This percentage was followed by those with some children living over 500 km away (35%), and those with all children living over 500 km (34%). A lower rate (23%) was observed among those with all children residing within 500 km who were currently employed.

Regarding relationships status, individuals with all their children living over 500 km (46%) had the highest percentage of individuals without partners, closely followed by those with children within 500 km (45%). Comparatively, individuals without migrant children and those with some children living over 500 km showed percentages of 38% and 37%, respectively, in this category.

Among individuals with all children living within 500 km, 51% reported facing difficulty in making ends meet. In contrast, individuals without migrant children, those with some children living over 500 km away, and those with all children living over 500 km expressed percentages of 58%, 61%, and 57%, respectively, experienced difficulty in making ends meet.

Regarding residence, among individuals with all children living over 500 km, 50% were found to reside in rural areas. Of individuals without migrant children, those with some children living over 500 km away, and those with all children living over 500 km, 67%, 63%, and 66% reported residing in rural areas.

In terms of health status, individuals with all children living within 500 km reported an average of 2.2 chronic diseases (SD=1.7), while individuals without migrant children, those with some children living over 500 km, and those with all

children living over 500 km reported an average of 1.9 (SD=1.7), 1.9 (SD=1.6), and 1.8 (SD=1.6) chronic diseases, respectively.

In cognitive assessments measuring verbal fluency, individuals with some children living over 500 km scored 18.7 (SD=7.3), while individuals without migrant children, those with all children living within 500 km, and those with all children living over 500 km scored 19.6 (SD=7.9), 19.6 (SD=7.7), and 19.9 (SD=8.9), respectively. Individuals with all children living over 500 km scored an average of 3.9 (SD=2.1) on the delayed recall test, while individuals without migrant children and those with all children living within 500 km scored 3.6 (SD=2.2), and 3.6 (SD=2.1) respectively. Individuals with some children living over 500 km had the lowest score on the delayed recall test, with a mean of 3.4 (SD=2.1).

There were no significant differences found in limited daily activities (ADL) scores among the different groups. Regarding disability in instrumental daily activities (IADL), individuals without migrant children and those with all children living within 500 km reported mean scores of 0.8 (SD=2.0) and 0.7 (SD=1.7), respectively. Meanwhile, individuals with some children living over 500 km and those with all children living over 500 km reported mean scores of 0.5 (SD=1.5) and 0.4 (SD=1.3), respectively. Regarding physical inactivity, there were no significant differences found among the different groups.

Regarding their social dynamics, individuals with all children living within 500 km reported an average social network size of 2.6 (SD=1.4), while individuals without migrant children, those with some children living over 500 km, and those with all children living over 500 km reported average sizes of 2.3 (SD=1.3), 2.3 (SD=1.5), and 2.2 (SD=1.4), respectively. Regarding satisfaction with their social networks, individuals with some children living over 500 km expressed a mean satisfaction score of 9.1 (SD=1.5), while those with all children living over 500 km expressed a mean satisfaction score of 8.9 (SD=1.6). Meanwhile, individuals without migrant children and those with all children

living within 500 km expressed mean satisfaction scores of 9.0 (SD=1.4) and 9.0 (SD=1.4), respectively. On average, individuals with some children living over 500 km had 2.9 children (SD=1.3) followed by those with all children living within 500 km (mean=2.1, SD=1.0). Meanwhile, individuals without migrant children had 1.8 children (SD=1.1) and those with all children living over 500 km had 1.7 children (SD=0.9).

Considering their relationships with children, the average amount of financial support received from children among individuals with all children living over 500 km was 0.14 (SD=0.33). Comparatively, for individuals with no migrant children, and those with all children living within 500 km, and those with some children living over 500 km, the average amounts of financial support received from children were 0.03 (SD=0.16), 0.04 (SD=0.19), and 0.05 (SD=0.17), respectively.

On the other hand, concerning the average amount of financial support given to children, individuals with all children living over 500 km provided an average of 0.10 (SD=0.29), while individuals without migrant children, those with all children living within 500 km, and those with some children living over 500 km gave average amounts of financial support of 0.07 (SD=0.24), 0.09 (SD=0.26), and 0.07 (SD=0.22), respectively.

As far as emotional closeness with children was concerned, the mean emotional closeness scores reported by individuals without migrant children and those with all children living within 500 km were 3.5 (SD=0.6) and 3.5 (SD=0.6), respectively. Meanwhile, the mean emotional closeness scores reported by individuals with some children living over 500 km and those with all children living over 500 km were 3.4 (SD=0.6) and 3.4 (SD=0.7), respectively.

Individuals with all children living over 500 km reported the highest average contact frequency (mean=2.5, SD=1.3), whereas individuals without migrant children reported the lowest average contact frequency (mean=1.0,

SD=0.2). Meanwhile, individuals with all children living within 500 km and those with some children living over 500 km reported average contact frequencies of 1.8 (SD=0.9), and 1.9 (SD=0.9), respectively.

4.2. Association between child migration status and depression

Results of the ANCOVA analysis (Table 3) revealed significant differences in parents' levels of depression across child migration categories ($F=8.80, p < 0.001$) after controlling for all covariates including age, gender, education, relationship, employment, economic hardship, residence, number of children, number of chronic diseases, ADLs, IADLs, verbal fluency, delayed recall words, physical inactivity, social network size, and satisfaction on social network quality.

The full model was significant ($F=8.802, p < 0.001$) and explained 29.4% of the variance in parental depression. When entered together in the last step, the unique contribution of migration status variables to explaining the variance in depression has been revealed. Migration variables accounted for 3% of the variance in depression.

Following the ANCOVA analysis, the post hoc pairwise comparisons using the Least Significant Difference (LSD) test were conducted to compare differences across child migration categories. The comparisons revealed that older parents with some children living over 500 km (mean=3.27, SD=0.08) and those with all children living over 500 km (mean=3.38, SD=0.16) had significantly higher depressive symptoms than those with no migrant child (mean=2.79, SD=0.08) ($p=0.004$) and those with all their children living within locality (mean=2.93, SD=0.04) ($p=0.003$). However, no significant differences in depression were observed between those with no migrant children and those with all children within locality. Additionally, there were no significant differences

observed between those with some children living over 500 km and those with all children living over 500 km.

4.3. Multivariate regression model for older adults' depression

Table 4 shows multivariate stepwise linear regression results for intergenerational support variables on depression among older parents using the entire sample of 9133 after adjusting for sociodemographic and other covariates.

The analysis involved sequential steps, with Step 1 accounting for sociodemographic and health-related variables. Factors such as age, gender, education, relationships status, employment, economic hardship, rural-urban residence, the number of children, number of chronic diseases, ADLs, IADLs, verbal fluency, delayed recall words, physical inactivity, social network size, and social network satisfaction were assessed. This step demonstrated significant associations of depression with gender ($b=0.73, p<0.001$), relationships ($b=-0.22, p=0.01$), employment ($b=0.27, p=0.01$), economic hardship ($b=0.57, p<0.001$), number of chronic diseases ($b=0.28, p<0.001$), ADLs ($b=0.13, p=0.01$), IADL ($b=0.33, p<0.001$), delayed recall words ($b=-0.22, p<0.001$), social network size ($b=-0.10, p<0.001$), and social network satisfaction ($b=-0.21, p<0.001$), among others.

In Step 2, additional variables related to intergenerational support were introduced. Financial support received from children did not show significant association ($b=0.28, p=0.19$), while financial support given to children ($b=0.30, p=0.04$), contact frequency ($b=-0.10, p=0.03$), and emotional closeness ($b=-0.17, p=0.01$) emerged as significant predictors of depression among older adults.

In the final step (3), migration status variables were included. Results indicated that having adult children living within 500 km did not significantly impact older adults' depression ($b=0.15, p=0.20$). However, having some children

living over 500 km ($b=0.48, p=0.00$) and having all children living over 500 km ($b=0.59, p=0.01$) were significantly associated with increased levels of depression among older adults. The R-square values were 0.289 for Step 1, 0.292 for Step 2, and 0.294 for Step 3.

4.4. Intergenerational support predicting parent depression in each adult children migration categories

Individual multivariate linear regression models (Table 5) developed for each child migration status showed the unique impact of intergenerational support within each group. All models were significant and explained 29, 33, 34 and 54 per cent of the variance in parental depression respectively, after adjusted for age, gender, education, relationship status, economic difficulties, employment status, number of children, rural-urban residence, physical inactivity, chronic disease number, adl, iadl, verbal fluency, delayed word recall, social network size, satisfaction of social network.

For older parents with no migrant children, greater levels of emotional closeness with their children decreased depressive symptoms by about half a point ($b=-0.44, p< 0.05$). However, receiving more financial support from their children increased parents' depression by over one and a half points ($b=1.64, p< 0.05$). Increased contact frequency, another significant predictor of depression, decreased parental depression when all children lived locally ($b=-0.14, p< 0.05$) or were all more than 500 km away ($b=-0.46, p< 0.05$). In contrast, greater contact frequency increased depression in older parents with some children living over 500 km away ($b=0.36, p< 0.01$).

5. Discussion

This study aimed to examine the effects of adult children's out-migration on the mental health of older adults in CEE countries and sought to explore what role intergenerational support has in promoting positive mental health outcomes. The main findings of this study and their implications are outlined below.

Primarily, this study revealed that older parents whose adult children migrated over 500 km from their households were at a higher risk for depression, compared to those without a migrant child. This finding corroborates the first hypothesis, suggesting that the absence of adult children due to migration exacerbates depression among left-behind parents in CEE countries. There was no significant difference in depression levels between those with all children within 500 km and those with no migrant child, suggesting that short-distance migration may not negatively affect the mental health of older parents. This could be due to the ease of maintaining regular physical contacts and providing timely support for adult children living within 500 km. Despite the free mobility policy enforced within the EU, irregular physical contacts between children and parents increased the negative impact of long-distance migration (beyond 500km) on depression and mental health of older adults.

These findings underscore the importance of targeted interventions and support systems to address the mental health challenges faced by left-behind parents in this region. To improve the mental health outcomes of left-behind parents in CEE countries, public health services may be advised to incorporate assessments that focus on the impact of adult children migration (Kureková, 2011). Migrant-sending countries and communities should allocate more resources towards these programs to meet the mental health needs of left-behind parents.

Secondly, as for intergenerational support, this study revealed that parent-child contact frequency and emotional closeness both had a significant impact on

reducing depression among older adults. These findings provided partial support for the second hypothesis. On the other hand, providing financial support to adult children was found to significantly increase depression, while receiving financial support from adult children had no significant effect on their parents' depression. This pattern aligns with prior studies highlighting the greater impact of psychological support in improving the mental health of older adults when compared to material or instrumental support (Gur-Yaish et al., 2013; Merz & Huxhold, 2010).

Thirdly, out of the four regression models predicting depression by child migration status, this study identified two distinct effects of financial support received from children and emotional closeness for the parents without migrant children. Among this group, emotional closeness with their children significantly reduced the risk of depression by bolstering parents' feelings of self-efficacy, fostering a sense of intimacy and trust with their adult children (Lin & Chen, 2018). Conversely, financial support received from their children increased the risk of depression for parents without migrant children. Although the causal link between financial support received and depression cannot be ascertained in this research, some studies have reported that receiving financial support from adult children can evoke feelings of burden, leading to excessive guilt and shame among older parents (Shiraz et al., 2020; Silverstein, et al., 2013).

Additionally, for individuals whose children have migrated more than 500 km away, the frequency of parent-child contact emerges as a key predictor of depression. Interestingly, factors such as financial exchanges with children and emotional closeness with them show no significant association with parental depression within this group. These findings resonate with prior studies emphasizing the positive effects of maintaining close contact with adult children (Buber & Engelhardt, 2008; Lawton et al., 1994). Tosi and Grundy (2019) assert that sustained close contact with adult children can bolster the psychological security of older parents, particularly in societies undergoing rapid

transformations and lacking robust public support systems, as evidenced in their research in Bulgaria, Georgia, and Russia.

Furthermore, in CEE countries where filial piety is a prevailing social norm, parents and children may feel obligated to uphold frequent contacts, irrespective of the quality of their relationship (Van Gaalen & Dykstra, 2006). In essence, the frequency of contact between parent and child reflects a normative or foundational aspect of intergenerational solidarity within the cultural context of CEE countries. This discovery not only highlights the cultural aspect at play but also presents a practical intervention avenue. In an era with diverse communication modes such as telephone calls, emails, and social media, this becomes especially relevant, particularly during travel restrictions imposed by pandemics like Covid-19, providing valuable measures to enhance the mental health outcomes of older parents.

However, contact frequency when *some* children resided more than 500 km away had an opposite effect. Parents who maintained more frequent contact with their children in this category displayed higher levels of depressive symptoms. This finding has not been observed elsewhere in the literature. Future research is recommended to identify underlying explanations for this outcome. This study has been looking at different variables and their influence on contact frequency in the study sample, but a deeper analysis would be out of scope for this paper. Future studies may improve the child outmigration categories because the category of ‘some children over 500km’ seems to compress a significant volume of information.

Fourthly, the results of this study revealed significant associations between depression and several socio-demographic and health-related factors. Specifically, gender played a significant role in predicting depression levels, with female exhibiting higher levels of depression compared to male. And having economic difficulties contributed to higher levels of depressive symptoms. Moreover, having more numbers of chronic diseases and of functional disabilities, lower

level of cognitive functions, smaller social network size and lower level of satisfaction in social network also associated with higher level of depression. Future studies may categorize child outmigration using merged factors in conjunction with female, poorer economic conditions, weak social networks and declining physical health indicators to identify clear target group.

Lastly, those with some or all adult children migrated over 500 km differed in many ways from those with all adult children living in the same household or within 500 km. The left-behind parents with some or all adult children migrated over 500 km were more likely to have higher educational attainment, fewer chronic diseases, better cognitive function, and were less disabled in instrumental daily activities. They tended to be healthier overall but experienced higher levels of depressive symptoms compared to parents whose adult children lived nearby. They also reported more frequent contact with their children and received more financial support.

These findings suggest that the impact of adult children's migration may be underestimated. Their decision to move away may be influenced by their parents' health status and adult children are less inclined to live far from their parents if they have health issues. Additionally, there is a strong association between depression and physical health; hence, the absence of pre-existing physical health conditions could amplify the effects of long-distance adult-child migration. Among the left-behind parents with some or all of their children over 500 km, those experiencing lower levels of physical activity, poorer physical health, lower satisfaction with their social network, and weaker emotional closeness with their children were found to be more vulnerable compared to others who were not.

During the COVID-19 pandemic, significant attention was drawn to the potential increase in mental health issues, particularly depression and anxiety, among older adults, who are viewed as a vulnerable population (Ettman et al., 2020; Iob et al., 2020). However, despite the limited available literature, studies

conducted during and after the COVID-19 pandemic have yielded inconsistent results. Some studies found no significant difference in the level of depression among older adults (Röhr & Riedel-Heller, 2020), while others reported fewer depressive symptoms in this population (Litwin & Levinsky, 2022). One potential explanation for the decreased reporting of depression among older adults is the shift from direct personal interview methods to indirect interviews using telephone or online survey for data collection during the pandemic. Another explanation is that individuals may focus more on external difficulties during severe national crises, such as the COVID-19 pandemic (Reibling et al., 2017).

While some of recent studies have shown that the crisis prevented migrant children from providing necessary support to their parents, other studies have found that during the pandemic period migrant children became more attentive to their left-behind parents, leading to an increased frequency of virtual contacts and a higher level of support compared to usual circumstances. Additionally, the pandemic facilitated the return of some migrants to their countries of origin. Parents with returned migrants were not included in the present study, potentially resulting in an underestimation of this study model predicting depression outcomes for parents. It is unknown whether the unexpected return of migrant children may reduce the depression of older parents or not. Therefore, it is plausible that the Covid-19 pandemic could have influenced the reported prevalence of depression and the frequency of parent-child contacts. This could also potentially lead to an underestimation of the magnitude of the association between contact frequency and depression in older parents.

In sum, this study sheds light on the complex dynamics of adult child outmigration and its impact on the mental health of older parents in CEE countries. By identifying key factors influencing depression levels among left-behind parents, our findings provide valuable insights for policymakers, healthcare practitioners, and researchers working to develop effective interventions and support systems to address the mental health needs of older adults in this region. However, further research is warranted to explore the

underlying mechanisms driving the observed associations and to develop targeted interventions tailored to the specific needs of left-behind parents in CEE countries, particularly in the context of the recurring pandemic and its implications for parent-child relationships and mental health outcomes.

6. Limitations

Despite the valuable insights gained from this study, there are several limitations that warrant consideration. First, the findings of this study were based on cross-sectional data and as such, causation between adult child migration and depressive symptoms in older adults cannot be discerned. Adult children may be likely to live at a long distance if their older parents are mentally ill, and there may be unobserved variables affecting both adult children's migration and parental mental health. Using longitudinal panel data like SHARE yields some limitations including the fact that older adults with a poor health status are at high risk for dropping out, leading to a disproportional loss of respondents. Future studies are needed to assess a causal relationship between adult child migration and older adults' depression and to explore other relevant individual and contextual factors determining its long-term impact on older adults' mental health.

Secondly, the study's scope was constrained by the inability to comprehensively examine the spectrum of adult children's migration and its association with older adults' depression. While SHARE provided intergenerational information, crucial details such as the voluntariness, causes, duration, and nature (international, interregional, or internal) of migration were not delineated. Moreover, factors like gender and education among adult children could potentially moderate the migration's role, necessitating more specific measures in future studies to capture recent trends, especially in CEE countries characterized by seasonal or short-term circular migration.

Thirdly, the reliance on self-reported measures and information from older adults may have introduced potential biases owing to factors such as cognitive impairment, disability, or respondents' lack of awareness regarding medication use. These limitations may have introduced distortions in either underestimating or overestimating the associations between adult child migration and older adults' depression.

Fourthly, it is recognized that older adults constitute a diverse population with varying characteristics including age, gender, education, income, and number of children, all of which can potentially influence the impact of adult child migration on depression. While covariates have been employed to control for heterogeneity, these statistical approaches provided only secondary techniques over appropriate sample selection.

Fifthly, the study's utilization of secondary data analysis meant that the researcher had no control over the data collection process and its quality. Additionally, the cross-sectional design hindered the establishment of a causal relationship between adult child migration and depressive symptoms in older adults. Therefore, a recommendation is made for future studies to adopt a longitudinal design to better understand the impact of adult child migration on older adults' depression and discern contextual factors with enduring effects.

Furthermore, caution needs to be exercised when interpreting results, considering that SHARE wave 8 was conducted during the Covid-19 pandemic. Due to the Covid-19 outbreak and subsequent lockdown, the mode of data collection was changed from the face-to-face interview (CAPI) to the telephone-administered interview (CATI). The altered mode of data collection could lead to the interpretation challenges, which might pose challenges to report sensitive information such as mental health as noted by Holbrook, Green, and Krosnick (2003).

Lastly, the limitation of the current study includes its inability to account for between-country variations in CEE countries. These variations encompass diverse factors such as GDP levels, cultural contexts, aging policies, social welfare regimes, pension systems, public expenditure on social care for older individuals, and payment methods (Botev, 2012; Hansen & Slagsvold, 2017). Additionally, the study could not address the various COVID-19-related restrictions and fatality rates imposed across CEE countries (Litwin & Levinsky, 2022). Future studies are needed to consider these factors.

In addition, a broader range of psychosocial factors, including isolation, stressful life events, coping mechanisms, and spirituality, may be incorporated to better understand the depression of older adults (Fiske et al., 2009; Blazer, 2003). Previous studies have explored different aspects of psychological wellbeing within the context of adult children's migration, examining indicators such as loneliness, life satisfaction, happiness, and sadness, often alongside measures of depression (Antman, 2010; Guo et al., 2009; Mosca & Barrett, 2016; Scheffel & Zhang, 2019; Yahirun & Arenas, 2018; Waidler et al., 2017). However, there is inconsistency in the measures of psychological wellbeing across the literature on adult children's outmigration. Therefore, a more comprehensive approach to studying these factors could provide deeper insights into their relationship with depression among older parents left behind.

To sum up, while the SHARE dataset enriched our understanding of intergenerational dynamics, the study's limitations emphasized the need for more specific and expansive research methodologies to be employed to untangle the intricate relationships between migration patterns and older adults' mental health in diverse populations.

7. Conclusion

This study has unveiled a noteworthy association between the migration of adult children and the mental health of older adults in CEE countries. Notably, findings indicated that older adults with children who migrated over 500 km away were more susceptible to experiencing depressive symptoms compared to those without such migratory distances. Additionally, the research brought to light effects of intergenerational support linked to the migration status of adult children. These results emphasize the pivotal role that socioeconomic variables play in shaping the mental well-being of older adults, highlighting the need for comprehensive investigations into the intricate dynamics at play.

In light of some compelling results, it is imperative for future research to delve deeper into the mental health challenges faced by older adults left behind due to the migration of their adult children. This path of research could uncover specific stressors and coping mechanisms unique to this population, shedding light on potential interventions to support the mental health of older individuals in migrant-sending communities. Moreover, there is a pressing need to unravel the mechanisms that underlie the potentially protective effects of intergenerational support, offering valuable insights into how familial connections influence mental health outcomes among the older parents.

As migration continues to be a prevailing trend in an increasingly globalized world, it stands out as a significant explanatory variable in understanding the complexities of mental health in older populations. Therefore, future research endeavors should include measures specifically designed to evaluate the influence and distinctive impact of adult child migration on the mental health of parents within migrant-sending communities. By doing so, researchers can gain more specific understanding of the multifaceted factors influencing depression among older adults, contributing to the development of targeted interventions and policy recommendations.

Furthermore, this study prompts a re-evaluation of the broader implications of adult child migration on the mental health landscape in CEE countries. The observed association between migratory distances and depressive symptoms underscores the far-reaching consequences of family dispersion on the well-being of older individuals. As such, there is a critical need for policies and support systems that acknowledge and address the mental health vulnerabilities of the older adults left behind concerning adult children's migration. Collaborative efforts between healthcare providers, community organizations, and policymakers should be fostered to design interventions tailored to the unique challenges faced by this population, ensuring child migration is accounted for.

Additionally, this research advocates for a proactive stance in understanding the evolving nature of migration patterns. With migration poised to continue its upward trajectory, efforts to mitigate the potential negative effects on the mental health of older adults must be informed by comprehensive and up-to-date data. Future studies should explore the changing dynamics of intergenerational relationships in the context of migration, examining factors such as voluntariness, causes, and the nature of migration (international, interregional, or internal). This research agenda will enable a more detailed understanding of the diverse experiences of older adults in migrant-sending communities and inform targeted interventions that align with the evolving needs of these older adults groups.

For future studies, it is crucial to pay attention when comparing data collected during the COVID-19 pandemic with subsequent datasets. Researchers must carefully consider the unique circumstances surrounding each data collection period to ensure meaningful comparisons. This involves conducting longitudinal analyses, examining pre-pandemic baseline data trends, and staying abreast of the effects of the COVID-19 pandemic on data collection methods, participant behaviour, and outcomes to minimize potential biases or influences on data interpretation. Additionally, the impact of the COVID-19 pandemic may vary due to different policy measures implemented across countries. Considering this

complexity within the scope of this study may be beyond its intended focus. Therefore, future studies on the impact of adult children migration on the mental health of older adults need to pay meticulous attention to compare the data collected in different contexts.

This study stands as the first empirical investigation utilizing a large sample size and recruitment across many CEE countries, which providing insights applicable to a broad spectrum of older adults. Few considerations have been given to the migration of adult children away from their older adult parents and its potential implications for health and mental health. The findings from the current study can add important evidence to the literature, which can inform relevant policy formulation and improve integrated mental health and social programs. This study underscores the importance of implementing targeted interventions aimed at enhancing mental health outcomes among older adults, particularly those affected by adult child migration. Policies promoting frequent parent-child contact could be instrumental in mitigating the negative effects of migration on the mental health of older parents.

In conclusion, this study contributed valuable insights into the relationship between adult child migration and the mental health of older adults in CEE countries. The implications extend beyond the realms of academia, calling for concerted efforts to address the mental health challenges faced by older adults left behind due to migration. As we navigate an era of increased global mobility, understanding and mitigating the impact of migration on the mental health of older adults emerges not only a scholarly pursuit but also a societal imperative.

8. Summary of novel findings

1. This study introduces a novel finding revealing a significant association between the migratory distances of adult children and the manifestation of depressive symptoms in older adults within CEE countries. Specifically, older adults having adult children who migrated more than 500 km away exhibited a higher susceptibility to depressive symptoms compared to those without such extensive migratory distances. This sheds light on the nuanced impact of geographical separation on the mental health of older parents, emphasizing the need for targeted interventions and support systems. This is the first study contributes to the knowledge whether depression of older adults left behind is associated with adult children migration in CEE region.
2. An innovative aspect of this research lies in uncovering the effects of intergenerational support associated with the migration status of adult children on the mental health of older adults. This study found that emotional closeness was a key predictor of depression regardless of migration status.
3. The frequency of parent-child contact was significantly contributed to reducing depression among older adults. In the analysis of parent with migrant children, the parent-child contact frequency emerged as a pivotal predictor of depression. Frequent parent-child contact is strongly associated with a substantial reduction in parental depression, particularly for those with all children migrated over 500 km.
4. The impact of contact frequency on depression among older parents whose children have migrated varies significantly depending on the status of migration. Surprisingly, for those whose children have migrated more than 500 km away, increased contact frequency significantly reduced

depression levels. However, a contrasting effect was observed for individuals with some of their children migrated the same distance; increased contact frequency was associated with higher levels of depression. This paradoxical finding underscores the complexity of the relationship between contact frequency and depression in the context of adult children's migration. Future research is imperative to investigate deeper into this contradiction, examining the underlying mechanisms and potential moderating factors that may elucidate these divergent outcomes.

5. These study results underscore a crucial policy implication—promoting intergenerational contacts could notably benefit left-behind parents, especially those with children living far away. These findings provide valuable insights into the complex dynamics of intergenerational support, particularly in the context of adult children migration in CEE countries. The implications extend to the development of targeted strategies that consider the unique needs of older adults in the face of evolving family structures in the region.
6. This study contributes a distinctive perspective by positioning global migration trends as a significant explanatory variable in understanding the mental health complexities of older adults in CEE countries. Given the increasing globalization and mobility, the migration of adult children emerges as a pivotal factor influencing the mental health landscape of the older adults. For future research, it is important to explicitly incorporate measures that assess the influence and unique contribution of adult child migration, recognizing its significance in shaping the mental health outcomes of older adults in migrant-sending communities. This novel perspective calls for comprehensive investigations into the evolving nature of migration and its implications for the mental health of older populations.

9. List of publications: Articles, abstracts, and presentations

Lee, H., Kim, J., & Zrínyi, M. (2024). Mental health effects of adult children's outmigration on older parents in Central and Eastern Europe, *Aging & Mental Health*, 28(2), 353–359. DOI: 10.1080/13607863.2023.2260327 (IF: 3.52)

Lee, H., Kim, J., & Zrínyi, M. (2023). Mental health of older parents with migrant adult-children in Europe, *European Journal of Public Health*, 33(2), October 2023, ckad160.143, <https://doi.org/10.1093/eurpub/ckad160.143>

Lee, H. (2021). Mental health impact of adult children's out-migration to elderly parents in Central and Eastern Europe. 10th Jubilee Interdisciplinary Doctoral Conference, Pecs, Hungary. Book of abstracts, p. 278, 1p.

Lee, H. (2020). Effects of socioeconomic position on depression of the elderly in rural Thailand, X. Scientific forum, Doctoral School of Health Sciences, Pecs, Hungary.

10. Acknowledgements

This paper uses data from SHARE Waves 8 (DOI: 10.6103/SHARE.w8.800) see Börsch-Supan et al. (2013) for methodological details. The SHARE data collection has been funded by the European Commission, DG RTD through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982, DASISH: GA N°283646) and Horizon 2020 (SHARE-DEV3: GA N°676536, SHARE-COHESION: GA N°870628, SERISS: GA N°654221, SSHOC: GA N°823782, SHARE-COVID19: GA N°101015924) and by DG Employment, Social Affairs & Inclusion through VS 2015/0195, VS 2016/0135, VS 2018/0285, VS 2019/0332, and VS 2020/0313. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, HHSN271201300071C, RAG052527A) and from various national funding sources is gratefully acknowledged (see www.share-project.org).

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12. List of Tables

Table 1. Unweighted total sample characteristics

Variable	Total sample ($n=9133$)
Age, mean (<i>SD</i>)	71.00 (9.71)
Gender, female, %	69.37
Education, higher, %	24.40
Employment, working, %	26.25
Relationship, no partner, %	43.80
Ability to make ends meet, with difficulty, %	53.38
Residence, rural, %	63.08
Number of children, mean (<i>SD</i>)	2.16 (1.09)
Number of chronic diseases, mean (<i>SD</i>)	2.09 (1.70)
Verbal fluency, mean (<i>SD</i>)	19.48 (7.71)
Delayed recall, mean (<i>SD</i>)	3.59 (2.11)
Limited daily activities (ADL), mean (<i>SD</i>)	0.32 (0.99)
Disability in instrumental daily activities (iADL), mean (<i>SD</i>)	0.69 (1.72)
Physical inactivity, inactive, %	15.56
Social network size, mean (<i>SD</i>)	2.48 (1.44)
Social network satisfaction, mean (<i>SD</i>)	9.03 (1.42)
Financial support received from children, mean (<i>SD</i>)	0.05 (0.19)
Financial support given to children, mean (<i>SD</i>)	0.09 (0.26)
Contact frequency, mean (<i>SD</i>)	1.73 (0.90)
Emotional closeness, mean (<i>SD</i>)	3.48 (0.59)
Euro-D, mean (<i>SD</i>)	2.78 (2.42)
Child migration status, No migrant child, %	11.30
All in locality, %	71.98
Some children over 500km away, %	12.20
All children over 500km away, %	4.52

Table 2. Unweighted sample characteristics by adult children migration status

Variable	No migrant child (n=1,032)	All within 500 km (n=6,574)	Some over 500 km (n=1,114)	All over 500 km (n=413)	F/χ^2	p value
Age, mean (<i>SD</i>)	68 (10.6)	72 (9.5)	68 (9.2)	68 (8.7)	82.876	<0.001
Gender, female, %	66	70	69	67	10.963	0.002
Education, higher, %	24	24	26	32	15.297	0.002
Employment status, working, %	37	23	35	34	158.304	<0.001
Relationship status, no partner, %	38	45	37	46	39.930	<0.001
Ability to make ends meet, with difficulty, %	58	51	61	57	44.814	<0.001
Residence, rural, %	67	63	66	50	37.008	<0.001
Number of Chronic illnesses, mean (<i>SD</i>)	1.9 (1.7)	2.2 (1.7)	1.9 (1.6)	1.8 (1.6)	15.978	<0.001
Verbal fluency, mean (<i>SD</i>)	19.6 (7.9)	19.6 (7.7)	18.7 (7.3)	19.9 (8.9)	4.830	0.002
Delayed recall, mean (<i>SD</i>)	3.6 (2.2)	3.6 (2.1)	3.4 (2.1)	3.9 (2.1)	5.476	0.001
Limited daily activities (ADL), mean (<i>SD</i>)	0.3 (1.1)	0.3 (1.0)	0.3 (1.0)	0.3 (1.0)	0.209	0.890
Disability in instrumental daily activities (iADL), mean (<i>SD</i>)	0.8 (2.0)	0.7(1.7)	0.5 (1.5)	0.4 (1.3)	8.908	<0.001

Physical inactivity, inactive, %	16	15	14	14	13	0.116
Social network size, mean (<i>SD</i>)	2.3 (1.3)	2.6 (1.4)	2.3 (1.5)	2.2 (1.4)	22.899	<0.001
Social network satisfaction, mean (<i>SD</i>)	9.0 (1.4)	9.0 (1.4)	9.1 (1.5)	8.9 (1.6)	2.899	0.034
Number of children, mean (<i>SD</i>)	1.8 (1.1)	2.1 (1.0)	2.9 (1.3)	1.7 (0.9)	239.817	<0.001
Financial support received from children, mean (<i>SD</i>)	0.03 (0.16)	0.04 (0.19)	0.05 (0.17)	0.14 (0.33)	33.539	<0.001
Financial support given to children, mean (<i>SD</i>)	0.07 (0.24)	0.09 (0.26)	0.07 (0.22)	0.10 (0.29)	3.801	0.010
Emotional closeness with children, mean (<i>SD</i>)	3.5 (0.6)	3.5 (0.6)	3.4 (0.6)	3.4 (0.7)	8.500	<0.001
Child contact frequency, mean (<i>SD</i>)	1.0 (0.2)	1.8 (0.9)	1.9 (0.9)	2.5 (1.3)	275.459	<0.001
Euro-D, mean (<i>SD</i>)	2.7 (2.4)	2.8 (2.4)	3.0 (2.4)	3.0 (2.5)	4.665	0.003

Table 3. Association between child migration status and depression ($n=9133$)

Child migration status	Mean \pm SD	Depression F test	Pairwise comparisons
No migrant child (1)	2.79 \pm 0.08		1<3***, 1<4***
All in locality (2)	2.93 \pm 0.04		2<3***, 2<4**
Some over 500km (3)	3.27 \pm 0.08	8.802***	3>1***, 3>2***
All over 500km (4)	3.38 \pm 0.16		4>1***, 4>2**

Notes: age, gender, education, relationship, employment, economic hardship, residence, number of children, number of chronic diseases, ADLs, iADLs, verbal fluency, delayed recall words, physical inactivity, social network size, and satisfaction on social network quality are used as covariates. LSD post-hoc test was conducted for pairwise comparisons. Data weighted. * $p<0.05$ ** $p<0.01$ *** $p<0.001$.

Table 4. Multivariate, stepwise hierarchical regression for older adults' depression

Variable	b (unstandardized) weight	<i>p</i> value
Step 1		
Intercept	3.82	< 0.001
Age	-0.01	0.32
Gender	0.73	< 0.001
Education	-0.15	0.17
Relationship	-0.22	0.01
Employment	0.27	0.01
Economic hardship	0.57	< 0.001
Rural-urban residence	-0.02	0.82
Number of children	0.04	0.24
Number of chronic diseases	0.28	< 0.001
ADLs ^a	0.13	0.01
IADLs ^b	0.33	< 0.001
Verbal fluency	-0.01	0.12
Delayed recall words	-0.22	< 0.001
Physical inactivity	0.11	0.26
Social network size	-0.10	< 0.001
Social network satisfaction	-0.21	< 0.001
Step 2		
Financial support received from children	0.28	0.19
Financial support given to children	0.30	0.04
Contact frequency	-0.10	0.03
Emotional closeness	-0.17	0.01
Step 3		
All in household (ref.)		
All within 500km	0.15	0.20
Some over 500km	0.48	0.00
All over 500km	0.59	0.01

Note: Dependent variable: older parent's depression. Data weighted. a = Activities of Daily Living, b = Institutional Activities of Daily Living. Adjusted R square: 0.289 for Step 1, 0.292 for Step 2, 0.294 for Step 3

Table 5. Individual regression models for child migration categories predicting parent depression.

Category	No migrant child		All within 500 km		Some over 500 km		All over 500 km	
Model	$R^2 = 0.34, p < 0.001$		$R^2 = 0.29, p < 0.001$		$R^2 = 0.33, p < 0.001$		$R^2 = 0.54, p < 0.001$	
Variables	b weight*	<i>p</i>	b weight	<i>p</i>	b weight	<i>p</i>	b weight	<i>p</i>
Financial support received from children	1.64	0.03	0.53	0.06	0.26	0.62	-0.14	0.80
Financial support given to children	0.83	0.06	0.10	0.58	0.72	0.09	0.01	1.00
Contact frequency	-0.55	0.80	-0.14	0.01	0.36	0.00	-0.46	0.02
Emotional closeness	-0.44	0.02	-0.12	0.16	-0.20	0.23	-0.61	0.10

Note: Dependent variable: older parent depression. Adjusted for age, gender, education, relationship status, economic difficulties, employment status, number of children, rural-urban residence, physical inactivity, chronic disease number, adl, iadl, verbal fluency, delayed word recall, social network size, satisfaction of social network

Data weighted. * Unstandardized regression coefficient.

Appendix 7

**SUBMISSION OF THE DOCTORAL DISSERTATION AND
DECLARATION OF THE ORIGINALITY OF THE DISSERTATION**

The undersigned,

Name: Hayoung Lee.....

Maiden name: Hayoung Lee.....

Mother's maiden name: Jungae Jung

Place and time of birth: Pohang, 10/07/1975.....

on this day submitted my doctoral dissertation entitled

The effect of adult children's outmigration on the mental health of older parents in
Central and Eastern Europe

to the

PR-73604464507. Frontier of Public Health Programme.....

of the Doctoral School of Health Sciences, Faculty of Health Sciences, University of Pécs.

Names of the consultant(s): Dr. Miklós Zrínyi.....

At the same time, I declare that

- I have not submitted my doctoral dissertation to any other Doctoral School (neither in this country nor abroad),
- my application for degree earning has not been rejected in the past two years,
- in the past two years I have not had unsuccessful doctoral procedures,
- my doctoral degree has not been withdrawn in the past five years,
- my dissertation is independent work, I have not presented others' intellectual work as mine, the references are definite and full, on preparation of the dissertation I have not used false or falsified data.

Dated: 2024/04/20

Hayoung Lee

.....
signed by candidate

.....
supervisor

.....
co-supervisor