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The War and the Future of Ukraine's Population

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Abstract

This study analyses the effect of Russia's invasion of Ukraine in 2022 on the future of Ukraine's population. We conduct a series of population projections with different assumptions on the number of casualties and refugees, and the refugees' likelihood of return by different political scenarios. Our projections show that if current demographic trends continue, Ukraine's population is projected to decline by 16% over the next two decades and to become older. These trends are largely driven by past and current demographic developments: continued very low fertility and large-scale emigration at the turn of the century. With war casualties and a large portion of the Ukrainian population seeking safety abroad from the conflict, the country's population is projected to decline by 33%. The decline would be even larger among the working-age population and children. Russia's invasion will not only lead to immense human and economic costs in Ukraine in the present, but also carries long-term demographic repercussions.

Keywords: Ukraine, demography, refugees, war

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Context

Russia's invasion of Ukraine in February 2022 has raised the question of how the war will impact Ukraine's population. All armed conflicts and wars lead to casualties and many people leave the affected countries as refugees. The number of deaths and refugees will depend on the magnitude of the conflict, i.e., whether the conflict involves mostly armed forces or also the wider civil population. However, focusing on the impact of the war on the total population only tells us part of the story. Certain population groups are more exposed to the consequences of the war than others. For example, most deaths occur among young men, i.e., those in their twenties who form the majority of soldiers. Refugees are also often young people with families. In the case of Ukraine, currently they mostly consist of young women with children (UNHCR, 2022a).

The aim of this study is to analyse the possible effect of the current war in Ukraine on the country's population size and structure in the short- and medium-term. To do so, we conduct a series of population projections. We assess the impact of Russia's invasion using different assumptions on the number of deaths and refugees, and the refugees' likelihood of staying abroad for a long period. The structure of the study is as follows. First, we review previous research on the impact of armed conflicts on the population. Next, we provide a short overview of Ukraine's demography. We then discuss the projection scenarios and conduct mid-term population projections. This is followed by the presentation and discussion of the results and their implications for the future of Ukraine's population.

War and demography

The population structure of a nation is vulnerable to external shocks such as famines, diseases, and wars. The shock of war, in particular, leads to both short- and long-term repercussions in mental and physical health (Bogic et al., 2015; Summerfield, 2000), mortality (Guha-Sapir et al., 2018), fertility (Castro Torres & Urdinola, 2019; Lindstrom & Berhanu, 1999), and out-migration (Iglicka, 2019) of the affected population. The demographic processes of births, deaths, and migration are highly interlinked. The impact of war, although felt by individuals across all age groups and gender, has the potential to warp population structure due to the differential mortality and migration risks among different population subgroups.

Mortality and fertility are heavily intertwined. In war time, deaths can be classified as deaths in combat, one-sided violence, criminal and unorganized violence, and non-violent mortality (Brunborg & Tabeau, 2005). The burden of deaths in combat, historically, has been borne by men of conscription age, leading to the loss of potential reproductive mates for women. In theory, other types of deaths should be less sex discriminating but in practice the population at risk largely depends on the nature of the war. Evidence from the Syrian civil war has shown heightened death rates among women and children due to the deliberate targeting of the civilian population through aerial bombing and shelling in urban areas (Guha-Sapir et al., 2018). Massive losses of life among women and children in combination with severe physical injury and psychological trauma are likely to reduce fertility on the population level with lasting effect. Those who survive the early days of war may choose to move internally to areas not yet plagued by violence, or elect to seek asylum abroad, leading to an exodus en masse.

Refugee migration differs vastly from economic migration in terms of what is at stake, but they share the similarity that the risks associated with the move are often managed and negotiated on a household level. Household members' vulnerabilities, expectations, and responsibilities often differ by age and sex. Migration decisions in family contexts are often conceived under the hope that

the right calculations will lead to a higher chance of the survival of the maximum number of its members, and an elevated probability that the family might reunite in the future (FitzGerald & Arar, 2018). In the case of Ukraine, the dire need for defence resulting in its president calling for general military mobilization, prohibiting men aged 18 to 60 from leaving the country (Qiblawi & Alvarado, 2022), skewing the demographic characteristics of those who leave Ukraine mainly towards women and children.

Among those who exit the country, individuals may settle permanently abroad or return shortly after the war. Voluntary return is not a homogenous phenomenon (Zakirova & Buzurukov, 2021). In the 1990s, many former Yugoslavians returned to their home country after the conflict ended, but many others chose to stay, particularly if they were able to integrate into the labour market (Dustmann et al., 2017). Refugee receiving countries often struggle to find a unified voice internally regarding the desired duration and permanence of stay for those who arrived from war-torn countries, leading to underdeveloped or hastily conceived integration policies. Under these challenges, refugees often struggle to integrate into the host society compared to other types of migrants (Dumont et al., 2016). It is generally true that migrants who struggle to integrate in the host society often ultimately return to their origin country (de Haas et al., 2015), but refugees face different constraints in realizing their return intentions.

Neoclassical economic theory alone is inadequate to address return migration of refugees, due to its assumptions of freedom of choice and perfect information which are largely inapplicable to involuntary migrants (Klinthäll, 2007). Unsurprisingly, economic success is important in predicting the return of migrants who left for economic reasons, while structural and political conditions in the origin country heavily influence refugees' return intention. Peace and security are not guaranteed after the initial conflict ends, and neither is the respect for human rights or political freedom (Zakirova & Buzurukov, 2021). Individuals are less likely to return if the erosion of democracy post-conflict is keenly felt. Moreover, even if economic factors do not loom quite as large compared to political factors, socio-economic reintegration concerns remain significant in the return decision-making process (Klinthäll, 2007; Zimmermann, 2012). The viability of a livelihood often depends on factors such as the speed at which infrastructures are rebuilt and the pace of economic recovery of the affected regions. Although highly developed countries may rise "like a phoenix" from war ashes, the least developed countries are likely to remain in a poverty trap for prolonged spells in the absence of foreign aid (Kugler et al., 2013), rendering return migration of displaced individuals less likely.

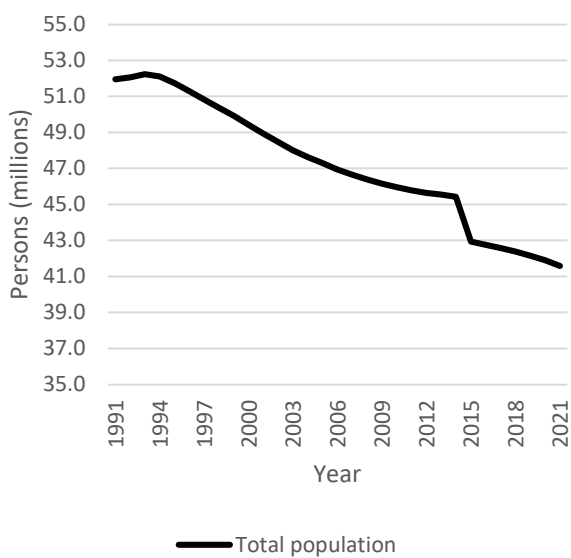
Push factors in the receiving country do not reliably predict migrants' (including refugees) return if the pull factors in the sending country prove insufficient (Alrababa'h et al., 2020). Refugees who are more educated have stronger return intentions, presumably due to their better prospects for successful reintegration. Those who fled to a nearby state are more likely to return than those who have migrated further (Al Husein & Wagner, 2020; Rendall & Ball, 2004). Similar to out-migration, the presence of children in the household increases the costs and hence, decreases the probability of (return) migration (Klinthäll, 2007). In the context of Ukraine, a lower-middle income country (United Nations, 2020), refugees might face difficulties to return as the country faces a longer road to full social and economic recovery post its invasion. With almost 2.7 million individuals now seeking asylum abroad (13/03/22), Ukraine faces substantial demographic challenges for years to come.

Short history of Ukraine's demography

Population change

Ukraine gained independence from the Soviet Union in 1991. Since then, its population has been continuously declining. In 1991, there were almost 52 million people in Ukraine but by 2021, the total population has decreased to 41.6 million (Figure 1). The decline has been gradual except for a sharp decrease in population size between 2014 and 2015 from 45.4 million to 42.9 million. This rapid population decline was related to the annexation of Crimea by Russia (a population of 2.3 million in 2014) and the War in Donbass (around 200,000 refugees and 10,000 deaths). Overall, the size of the Ukrainian population has declined by 20% since 1991.

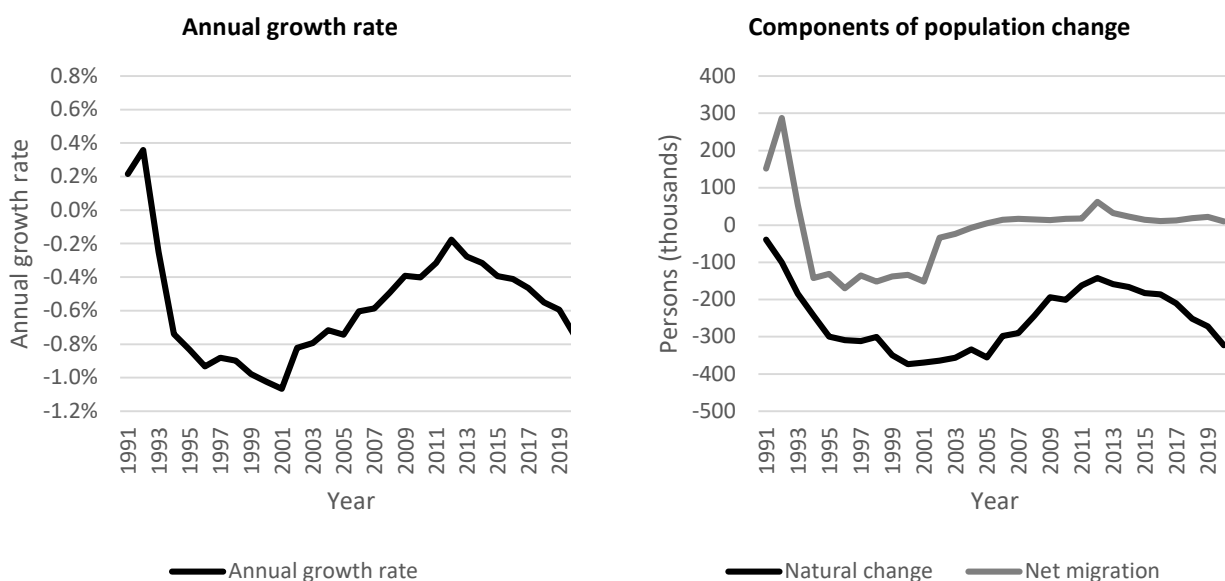
Figure 1. Ukraine's population, 1991-2021



Source: State Statistics Service of Ukraine, 2022.

In line with the continuous population decline, population growth has been negative starting from 1993 (Figure 2). The most rapid population decline took place in the 1990s; before gradually slowing between 2000 and 2012. However, since 2012, the annual rate of population decline has again started to accelerate. Natural population change has been the main driver of the decline in the population size. In other words, death rates have been higher than birth rates, leading to a negative annual population growth and overall population decline (Perelli-Harris, 2008). Although in the late 1990s and early 2000s emigration also contributed to the population decline, since 2005 Ukraine has experienced marginally positive net migration (i.e., more immigration than emigration). Nonetheless, this positive net migration did not compensate for the population lost due to low or very low fertility levels.

Figure 2. Annual population growth and the components of population change in Ukraine, 1991-2020



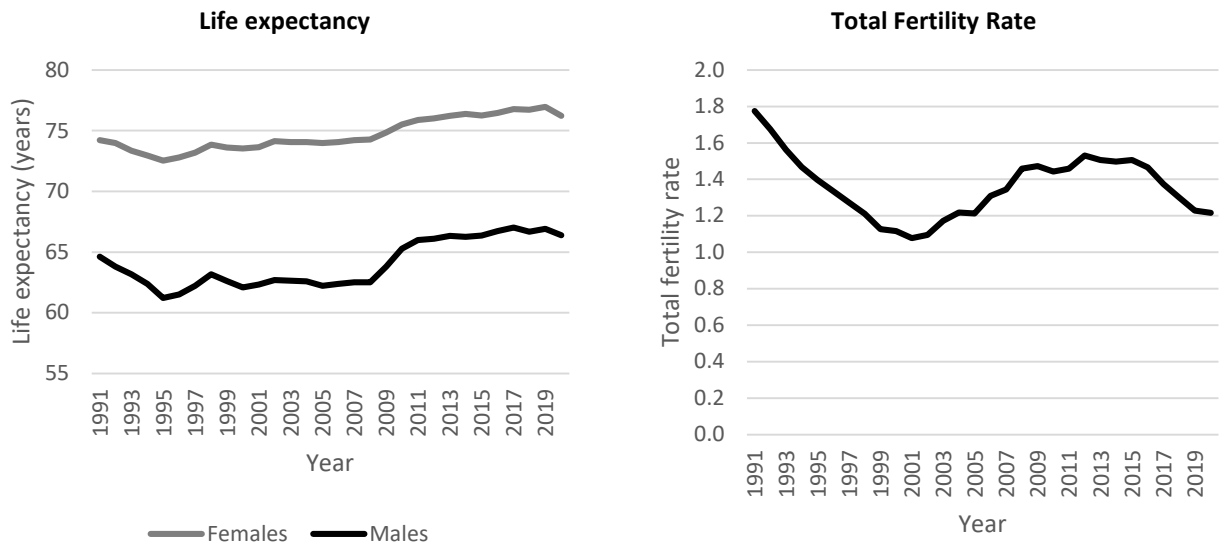
Source: see Figure 1.

Mortality and fertility

Overall, mortality slightly declined and life expectancy at birth increased somewhat between 1991 and 2020 in Ukraine (Figure 3). Life expectancy in 1991 was 69.6, whereas this figure was 71.4 in 2020. Men’s life expectancy is almost 10 years lower than women’s. The magnitude of this gender gap persisted over time. Around 15% of this gap is attributed to alcohol-related causes (Trias-Llimós & Janssen, 2018), 32% to smoking, and 13% to biological factors (Luy & Wegner-Siegmundt, 2014).

Dramatic changes have taken place in fertility levels since the country gained independence in 1991. The TFR declined from 1.8 in 1991 to 1.2 in 2020. The TFR was the lowest in 2000 at just 1.1. Between 2001 and 2011, the TFR increased to 1.5. Following a few years of stagnation, it declined again to 1.2. The increase in the TFR starting in 2001/2002 was possibly linked to (or supported by) the increase in the birth allowance, which has become much higher than anywhere else in the world. In 2014, it amounted to US\$ 3,259 for a first, US\$ 6,441 for a second, and US\$ 13,067 for a third child (Frejka & Gietel-Basten 2016).

Figure 3. Life expectancy at birth and Total Fertility Rate in Ukraine, 1991-2020

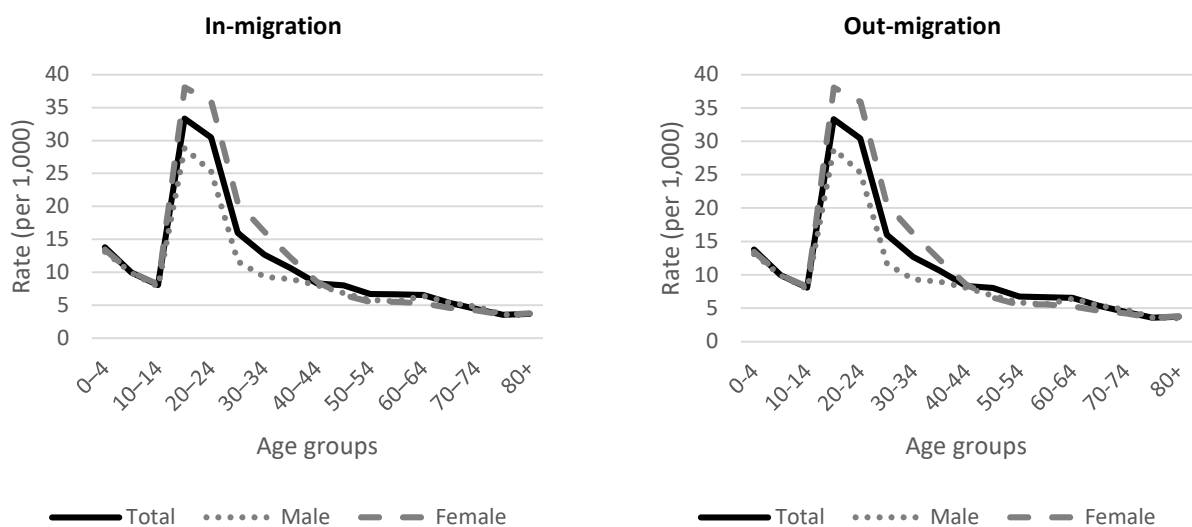


Source: see Figure 1.

International migration

Figure 2 showed that Ukraine’s net migration has been positive since the early 2000s. The age profiles of in- and out-migrants (Figure 4) are remarkably similar. Younger individuals (aged 15 to 35) are most likely to both immigrate to and emigrate from Ukraine and young children are also likely to both leave and arrive together with their parents. Between age 20 and 44, women have higher in- and out-migration rates than men.

Figure 4. In- and out-migration rate in Ukraine by age (5-year groups) and sex, average rates for 2016-2020

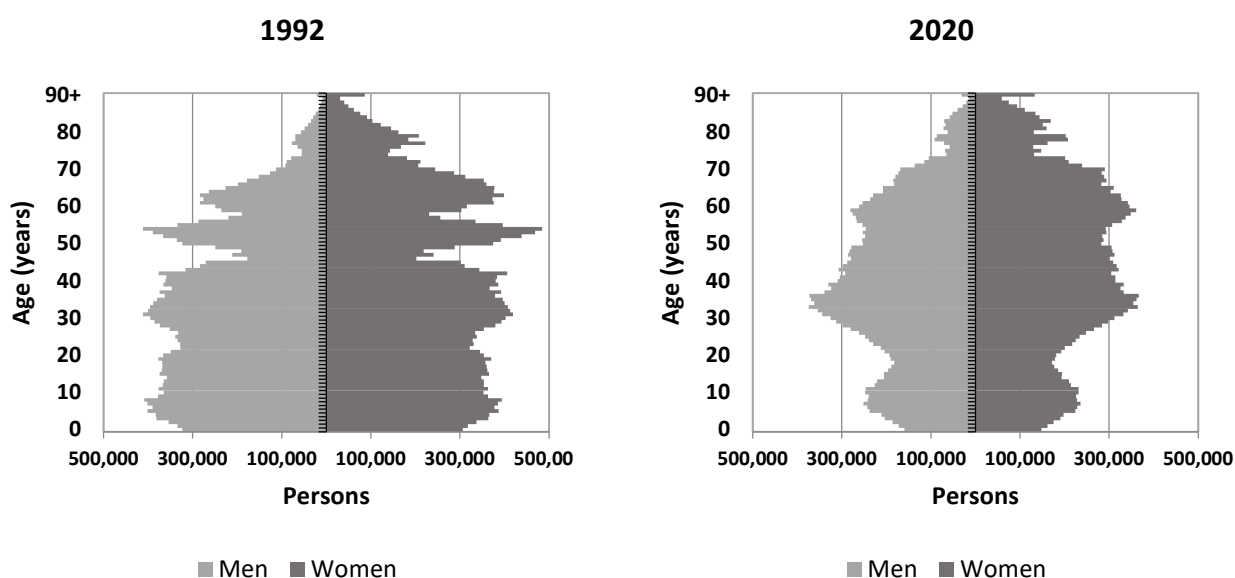


Source: see Figure 1.

Population composition

As a result of these population processes, the structure of Ukraine's population has also changed remarkably between the early 1990s and 2020 (Figure 5). In 1992, those born in the 1930s formed the largest cohort, and the population structure was young with large groups of individuals aged 5-45. However, by then a decline was already visible in the number of children in the 0-4 age group. In 2020, the population structure by age and sex looks remarkably different. The pyramid shows an ageing population and a gender imbalance. The group of 0-20-year-olds is relatively small and women outnumber men in middle and older ages. Overall, past population trends in Ukraine, especially significant emigration in the second half of the 1990s and early 2000s and low fertility since the mid-1990s, have led to ageing and declining population, making it vulnerable to any external shock.

Figure 5. Ukraine's population by age and sex in 1992 and 2020



Source: see Figure 1.

Projection methods and assumptions

To estimate the effect of the war on population change, we conduct population projections using the cohort component method with the POPGROUP projection software (Edge Analytics 2020). We adopt the deterministic approach but conduct a series of projections with different assumptions on war casualties, the number of refugees, and the proportion of refugees that may return to Ukraine. Our aim is not to predict the future, but rather to project changes in population size and structure conditional on different assumptions about the number of casualties and refugees fleeing to and returning from neighbouring countries. This allows us to measure the effect of the war on Ukraine's population.

We use information on Ukraine's population by age and sex in 2020 using the latest population statistics recorded by the Ukrainian government. Our baseline projection assumes that fertility and mortality rates will stay at their current levels for the next two decades. To remove any annual variation, we calculate average rates over a five-year period (2016-2020). We also assume that

overseas migration flows will remain the same as they have been on average in the past five years. However, they differ in 2022: we assume that only refugees leave Ukraine and that they may return. We develop 5 projection variants including the baseline. Our first two variants are based on the current statistics (11/03/22) about the casualties and refugees: a) 1,500 deaths among the Ukrainian army (Wikipedia 2022); 500 civilian deaths (UNHCR 2022a) and 2.5 million refugees (UNHCR 2022b). For the sake of simplicity, we assume that all deaths among soldiers have occurred among men in ages 20 to 29 and that civilian casualties are uniformly spread over all age groups (proportionally to their relative size in the total population). We have no information on the age structure of refugees, only their total number. We assume that refugees have the same age structure as people who left Ukraine between 2016 and 2020, i.e., most of them are young people and many have children. It is unclear what will happen to refugees, i.e., whether they will return to Ukraine or not. We develop two assumptions: a) 90% of refugees will return during 2022; and b) only 10% of refugees will return in 2022. The former assumption could be true, e.g., if Ukraine remains an independent democratic country, whereas the latter could occur if, e.g., the country becomes occupied by Russia and potentially annexed, a condition which many refugees may not find acceptable. For the latter case we assume that many young men who survive the conflict will join their (refugee) families abroad and thus the total number of refugees will significantly increase.

Our third and fourth scenarios assume that the war will continue for a month or longer so that further casualties and refugees are expected. We assume the following casualties: 5,000 deaths among soldiers and 1,500 civilian deaths based on the current trends. There will be 5 million refugees, which is an estimate by UNHCR (UNHCR 2022a). Again, it is unclear what will happen to refugees. We assume that either 90% or only 10% of the refugees will return depending on the outcome of the war. For the latter case the number of refugees will significantly increase as men will also join their families abroad. To summarise, our scenarios are as follows:

0. Baseline: Current trends in fertility, mortality, and migration continue
1. Short war, Ukraine remains independent: 1,500 deaths among men in their 20s, 800 civilian deaths; 2.5 million refugees, 90% return
2. Short war, Russian occupation: 1,500 deaths among men in their 20s, 800 civilian deaths; 2.5 million refugees, 10% return
3. Long(er) war, Ukraine remains independent: 5,000 deaths among men in their 20s; 1,500 civilian deaths; 5 million refugees, 90% return
4. Long(er) war, Russian occupation: 5,000 deaths among men in their 20s; 1,500 civilian deaths 5 million refugees, 10% return

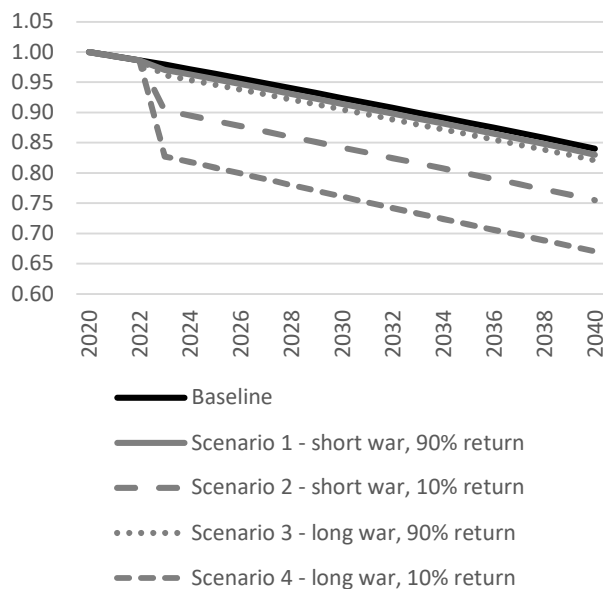
For scenarios 1 to 4 we also assume that young men currently in Ukraine will join their (refugee) families later so that families will stay together. For example, if 10% of refugees will stay abroad for a long-time period, each woman will be joined by a man of the same age group.

Projection results

Our baseline projection (or variant 0) shows that if the current demographic trends (or the average of the trends over the past five years) continue, Ukraine's population will decline by 16% in the next two decades from 41.7 million in 2020 to 35.1 million in 2040 (Figure 6). This would be a significant decline driven by population processes in the past: large-scale emigration of young adults in the late 1990s and early 2000s and continuously low fertility levels since the 1990s. All variants considering the impact of the war project an even larger decline in Ukraine's population. With fewer war casualties

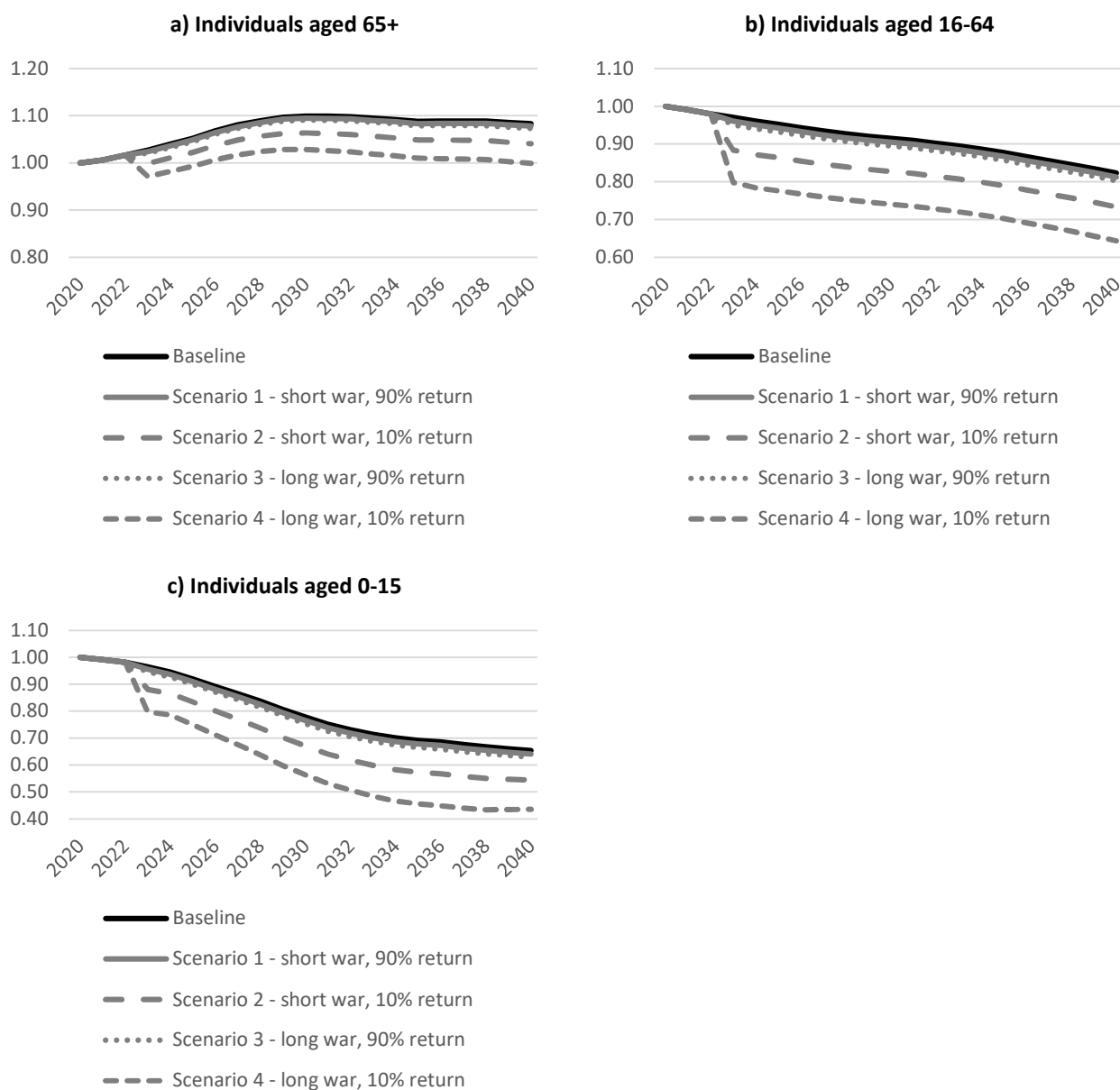
and most refugees returning to the country, Ukraine’s population is projected to decline by 17% (variant 1) and 18% (variant 3) to 34.7 and 34.3 million, accordingly. With more casualties and most refugees unable or unwilling to return, Ukraine’s population is projected to decline by 24% (2) and 33% (4) to 31.5 and 28.0 million, accordingly. Clearly, the future size of Ukraine’s population will depend very much on the number of current refugees and on whether they can return to their homeland or not (assuming no large-scale civil casualties).

Figure 6. Projected relative population change in Ukraine, 2020-2040



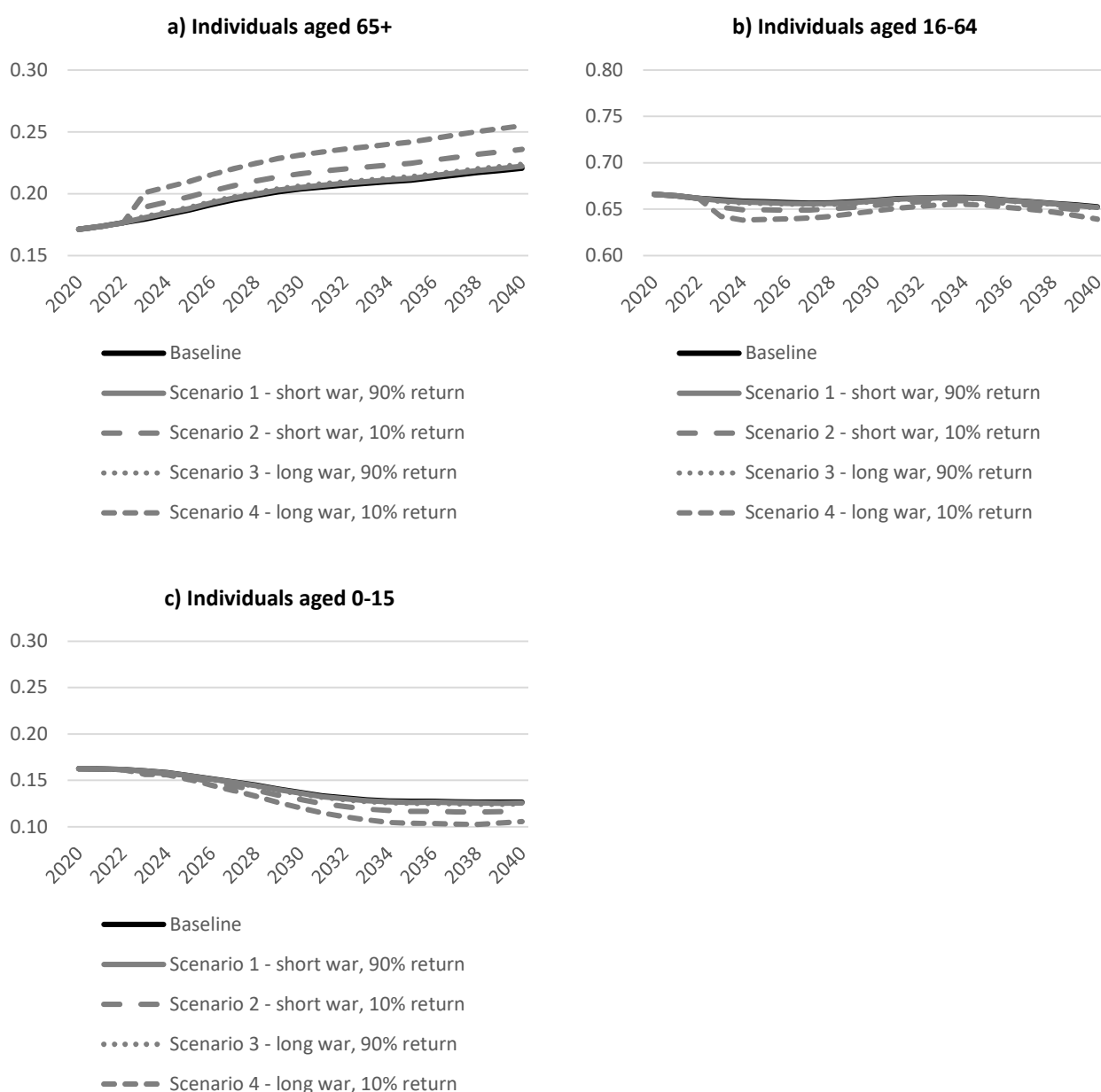
The differences in the projected changes across age groups are remarkable. With current population trends continuing, the number of people 65 and older would slightly increase over the next two decades (Figure 7). In contrast, the number of working age population (16-64) and children (0-15) would decline by 18% and 35%, accordingly. All scenarios considering the effect of the war show further decline in the size of the working age population and that of children. Depending on the number of casualties and refugees returning to Ukraine, the decline of the country’s working age population is projected to be 19% (scenario 1) and 36% (scenario 4) and that of children 36% and 56%, accordingly.

Figure 7. Projected relative change of individuals in different age groups in Ukraine, 2020-2040



Projected changes in the relative size of different age groups provide further information on the future of Ukraine's population. With current trends continuing, the share of people 65 and older is projected to increase from 17% in 2020 to 22% in 2040 (Figure 8). In contrast, the share of the working age population will decline from 66% to 65% and that of children from 17% to 13%. Again, the war will lead to further decline in the share of the working age population and that of children. With a large Ukrainian refugee population staying abroad, the share of elderly is projected to increase to 26%, whereas the proportion of the working age population will decline to 64% and that of children to 11%.

Figure 8. Projected share of individuals in different age groups in Ukraine, 2020-2040



We have also calculated the dependency ratio and the old age dependency ratio. The former measures the ratio of individuals aged 0-15 and 65+ to that of 16-64 year-olds, the latter is the ratio of individuals aged 65+ to that of 16-64 year-olds (Hinde 1998). The dependency ratio is projected to change relatively little over the next two decades (Figure 9). This is largely because the increasing number of elderly will be offset by the decreasing number of children. In contrast, the old age dependency ratio will increase from 26 to 34 supporting that Ukraine's population is expected to experience significant ageing. The working age population is also projected to age. The analysis shows that the ratio of younger working age population (16-44) to older working population (45-64) would decrease from 1.42 to 1.03 (Figure 10). With a large Ukrainian refugee population staying abroad the ratio would decline to 0.87.

Figure 9. Projected dependency ratio and old age dependency ratio in Ukraine, 2020-2040

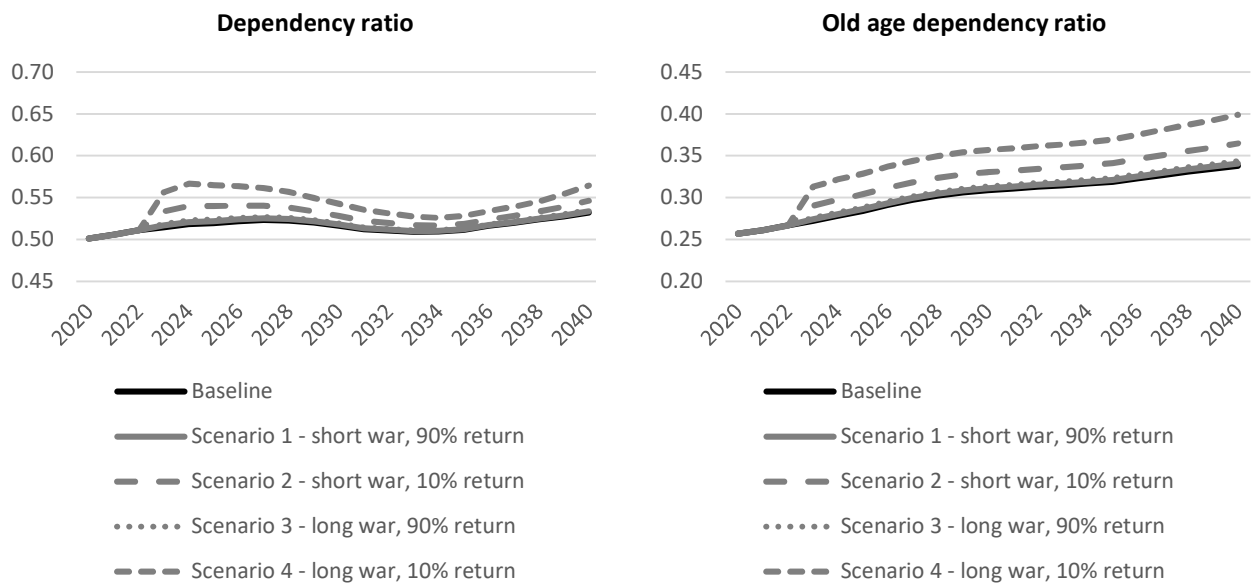
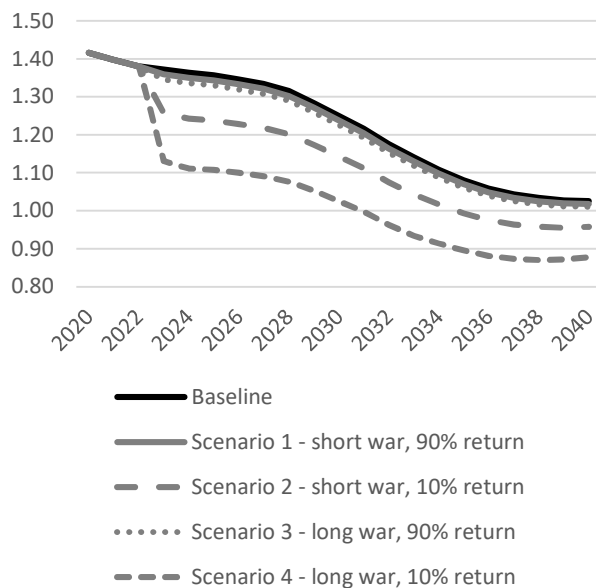
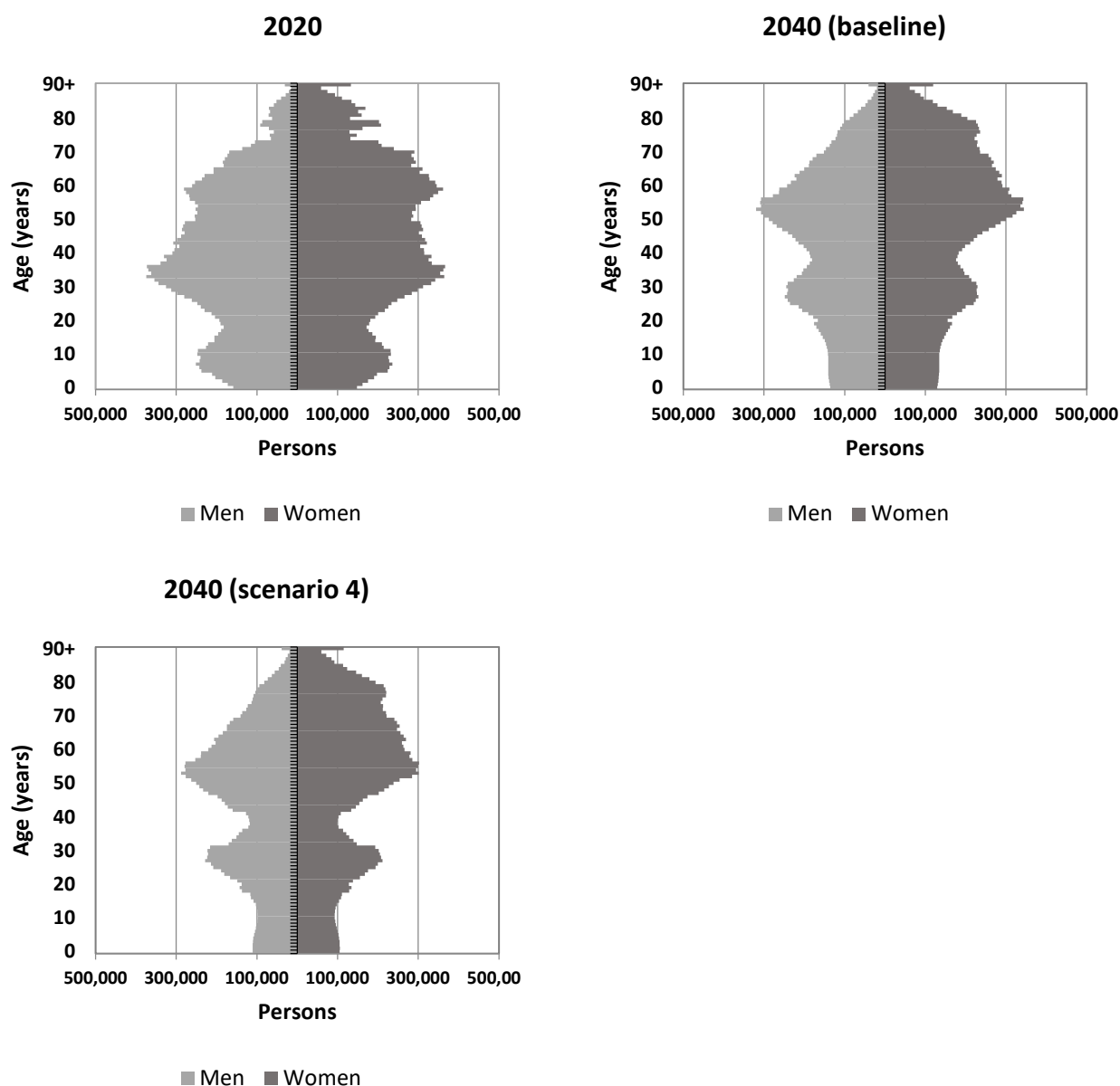


Figure 10. Projected ratio of population aged 16-44 to aged 45-64, in Ukraine, 2020-2040



Finally, the comparison of population pyramids illustrates and summarises the main changes in Ukraine's population. We see a clearly declining and ageing population (Figure 11). Most importantly, the decline and ageing of Ukraine's population will be pronounced with war casualties and a large refugee population staying abroad.

Figure 11. Ukraine’s population by age and sex in 2020 and 2040 (baseline and scenario 4).



Discussion

The aim of this study was to analyse the effect of Russia’s invasion on the future of Ukraine’s population. We conducted a series of population projections with different hypothetical scenarios on the number of casualties and refugees, and the refugees’ likelihood to return to Ukraine post-conflict. First, our analysis shows that if past demographic trends continue, Ukraine’s population will decline by 16% in the next two decades. Second, with war casualties and a large refugee population staying abroad, the decline is projected to be even larger, or by one-third. Third, we project significant differences by age groups. The size and especially the share of children is projected to decline, whereas those of the older population will increase suggesting significant population ageing, which will be exacerbated by the growing numbers of refugees as the war continues. Although the share of the working age population is projected to only slightly decline, it will become significantly older.

Our results also highlight the importance of the share of refugees returning to Ukraine for its population size and structure. If 90% of refugees return to Ukraine, population decline and ageing would largely be similar to those of our baseline projection (the counterfactual, or in the absence of the war) regardless of the size of the refugee population. However, if only 10% of refugees return to Ukraine (scenarios 2 and 4), the population would decline by 24-33% by 2040 depending on the final number of refugees by the end of the war. Even more striking is the decline in the size of the working-age population (by 27-36%) and especially the number of children (by 46-56%) by 2040. These findings highlight the importance of re-building Ukraine following the war in such a way as to enable and attract refugees to return.

Our demographic accounting only considers the direct effects of past demographic trends and the war on the future of Ukraine's population. There are also indirect effects such as possible long-term health crisis among the civil population due to injuries, infectious diseases (such as COVID-19), and psychological trauma. Future migration streams are likely to depend on the country's political and economic developments. Return migration is difficult to predict (Dustmann & Weiss, 2007). Migrants may also move on to a third country through resettlement schemes (Garnier et al., 2018) or independently in search of family or better living conditions. With long-term political and economic instability, refugees are not only unlikely to return, but young adults and families still in Ukraine may also decide to leave the country eventually. Fertility may stay depressed in the context of prolonged uncertainty. To conclude, our analysis shows that Ukraine's population has been declining and ageing and these processes are projected to continue in the next two decades. Russia's invasion will not only lead to tremendous human and economic costs in Ukraine in the present, but will also have long-term demographic consequences.

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