



Population Aging and Decline Will Happen Sooner Than We Think

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Abstract: The United Nations' 2022 World Population Prospects suggests the global population will reach 10 billion people in 2058 and will peak in 2086. Aggregated data do not account for regional and age-group realities, which draw a more pressing picture. We analyze the World Population Prospects 2022 data according to age groups and regions and show that population peaks are going to occur sooner in some regions of the world than others, and the working-age population will peak on average 10 to 20 years before the overall population peaks. Africa is the only world region expected to continue to experience significant population growth. The population will be increasingly made up of larger proportions of older ages than younger, thereby shifting the dependency ratio. Reflections on the implications of an aging and shrinking population on policy regarding fertility, aging, migration, urban planning and economic development are needed. The challenge is not to be left for future generations to face; it is happening tomorrow.

Keywords: aging; population decline; working age



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1. Introduction

Historical and projected demographic trends indicate that the global population will likely peak no later than 2086, thereafter initiating a marked decline (United Nations, Department of Economic and Social Affairs 2022a). In this study, we argue that such projections hide regional and age-group disparities. We show that current demographic trends regionally and by age group deliver a more complex and somewhat cognitively dissonant reality: adult population peak and decline are going to occur sooner than expected in key regions of the world. We argue that a focus on average trends in population aging has obscured the need to address (and thus delayed planning for) the onset of rapid population aging in most of the world. This phenomenon is caused by demographic momentum (Blue and Espenshade 2011; Dörflinger and Loichinger 2024), whereby changes such as fertility or mortality affect overall population numbers over longer periods. The arguments on aging and population decline are not new (Bricker and Ibbitson 2019). The rationale for this article is concern over insufficient awareness of these demographic forecasts in social policy fields such as planning (Coleman and Rowthorn 2011; Haartsen and Venhorst 2010).

World population demographics are oftentimes described as exponential. The global population totaled less than one billion for as far back as data estimates go, before the industrial revolution. Thereafter, the population increase was nothing short of remarkable: the human population totaled one billion around 1800, and has increased by nearly one billion per decade over the last 50 years. Current projections estimate that world population will peak in the later 21st century at slightly over 10 billion (United Nations, Department of Economic and Social Affairs 2022a). With ongoing challenges including

climate change and its implications, global health uncertainties and food security, debates around overpopulation remain widespread (Jargin 2021).

While much attention has been focused on the rising proportion of older adults in an aging world, we argue that the decline in the “working-age” population also merits close consideration due to its economic implications. After decades of enjoying the “demographic dividend”, in which improvements in productivity are associated with declines in fertility and mortality (Brown and Eloundou-Enyegue 2016), declines in productivity may be anticipated as a result of a shrinking and aging population. This demographic situation will force societies around the world to shift their approaches to managing their labor force, regional economic development, urban planning, and social policy. We encourage readers to consider if planners and policymakers are prepared for such profound transitions, or whether they are failing to plan due to the cognitive dissonance of imagining simultaneous population aging and shrinking.

Our analysis by region and by population age group reveals that the decline will occur earlier in many regions than generalized projections show. For too long, demographers and policymakers have focused on how to reduce fertility alongside concerns over overpopulation (De Silva and Tenreyro 2017). Our analysis suggests that the discourse needs to change. We need to focus on the implications of regional differences in population decline and aging for regional, national, and local policymakers. Although the literature often portrays this transition as a problem (Teitelbaum 2013), we will focus on providing a broader outlook on its implications.

There are positive aspects to global aging as well. Aging is the expression of the decline in mortality rates, especially among children, combined with the decline in fertility (Crist et al. 2022; Kinsella and Phillips 2005; Smeeding 2014). Thanks to improvements in hygiene, nutrition, human rights, and healthcare, including prevention, mortality has dropped, first among children and increasingly among all age groups. The decline in fertility is a complex phenomenon to explain. While global, it appears as multifactorial and diverse across regions (Colleran and Snopkowski 2018). The lengthening life span is not only a problem, but also an opportunity. Combined with projections of population decline, especially of working age, the challenge of aging forces us to rethink the way we perceive and project the future of our societies. We need to reconceptualize development beyond growth. This creates an opportunity to think about well-being in a broader framework and consider the implications for the economy, urbanization, environmental management, and public policy.

2. Methods

We present an analysis of the most recent demographic projections with a regional focus and an age-group perspective using data from World Population Prospects 2022 (United Nations, Department of Economic and Social Affairs 2022a). The World Population Prospects provide ten population projection scenarios based on different assumptions of fertility, mortality, and international migration (United Nations, Department of Economic and Social Affairs 2022b). We used the medium scenario, estimated from several thousand projected trajectories of the demographic components, as the baseline scenario (United Nations, Department of Economic and Social Affairs 2022b). We analyzed population trends for all world regions from 1950 to 2100, including Africa, Asia, Europe, Latin America and the Caribbean, North America, and Oceania.

The World Population Prospects uses the cohort-component method to project the population from 1950 to 2100, based on information about fertility by age of mother, and mortality and international migration by sex and age from 1950 to 2021 (United Nations, Department of Economic and Social Affairs 2022b). The Bayesian hierarchical model is used to account for the biases from various data sources, estimation methods, other system biases, and non-sampling errors (United Nations, Department of Economic and Social Affairs 2022b). The data on fertility are obtained from the system of civil registration for countries with national coverage, and from sample surveys when the registration of births

is lacking (United Nations, Department of Economic and Social Affairs 2022b). The data on mortality rates are obtained from vital registrations for countries with high-quality data and are modeled from life tables for countries with deficient mortality data (United Nations, Department of Economic and Social Affairs 2022b). The data on net migration are obtained from official estimates of net international migration, and refugee data are obtained from the Office of the United Nations High Commissioner for Refugees (United Nations, Department of Economic and Social Affairs 2022b).

Fertility is estimated for each country based on demographic transition theory, which assumes a rapid drop in the transition phase, followed by stability (replacement rate) in the post-transition phase (Coale 1989). As fertility declines differently across countries, the World Population Prospects used two separate processes to model fertility: (1) a double-logistic function to estimate the decline of fertility in the fertility-transition phases and (2) a first-order auto-regressive time series model to estimate low fertility in the post-transition phases (United Nations, Department of Economic and Social Affairs 2022b). The migration projection assumes that recent net-migration, if stable, will continue (United Nations, Department of Economic and Social Affairs 2022b). These relatively stable assumptions regarding fertility and migration may not hold, and future projections may make further adjustments. The World Population Prospects includes five fertility scenarios: medium, low, high, constant fertility projected for 2022, and instant-replacement fertility with a net reproduction rate of one (United Nations, Department of Economic and Social Affairs 2022b). The high fertility is projected to be 0.5 births above the fertility rate in the medium scenario, and the low fertility is projected to be 0.5 births below it (United Nations, Department of Economic and Social Affairs 2022b). In the high-fertility scenario, the world's population will keep growing by the end of the century, reaching 14.8 billion. In the low-fertility scenario, the world's population will peak in 2053 with about 9 billion people. In the constant-fertility scenario, the world's population will keep growing by the end of the century, reaching 19 billion; and in the instant-replacement fertility scenario, the world population will reach 10.6 billion by 2100.

We evaluate total population and working-age population (20–64 years) by region from 1950 to 2100. While youth employment can begin as early as 15, we select age 20 as our lower end to capture when most young people have finished secondary schooling. On the older end, we include through age 64. We recognize that in some countries, the retirement age may be higher (e.g., 67 in the US) but in others, it is lower (e.g., 50 for women in China). As older adults extend their working years, public policy regarding retirement may also lengthen.

The data used in our study depend on the assumption of medium fertility, mortality, and international migration. Although we used the most recent 2022 data to show that the global population will peak in 2086 with over 10 billion people, other studies show different results. For example, Gerland et al.'s (2014) projections based on the 2012 UN data predicted population will keep growing for the rest of the century, but Lutz and colleagues (Lutz et al. 2001) used data from UN 1998 World Population Projections and the US 2000 International Database and anticipated a 85% likelihood of population decline, and a 60% probability that the global population will not reach 10 billion by the end of this century. Falling fertility is a more powerful determinant of population aging than changes in mortality, as increased longevity does not age a population as dramatically as declining fertility (Manton 1991). Future study can use the low-fertility scenario from the UN World Population Prospects to develop a more conservative population estimate. This may lower projections even further, causing the events outlined in the paper to come about even sooner than current projections predict. Indeed, Bhattacharjee et al. (2024) used an even lower fertility estimate with mixed effects regression and spatiotemporal Gaussian process regression to predict that world population will peak at 8 billion.

3. Analysis

3.1. Regional Differences in Dates of Population Peak

Globally, demographic projections suggest decades of increases in the population. However, regionally, population peaks are expected to occur according to different timetables. Regionally, populations are expected to peak or have peaked as follows: Europe in 2020, Asia in 2054, and Latin America in 2056. Africa, Oceania and North America are not currently projected to peak during the 21st century. See Table 1. Peaks are projected to be followed by immediate declines rather than stagnation.

Table 1. Year of reaching maximum population by world and regions, as of 2100.

	Year of Reaching Maximum Population (Million, as of 2100)		Maximum Population (Million, as of Year 2100)	
	Total population	Working age (20–64)	Total population	Working age (20–64)
World	2086	2074	10,431	5680
Africa	2100	2100	3924	2273
Asia	2055	2044	5305	3078
Europe	2020	2011	746	460
Latin America and the Caribbean	2056	2043	752	440
North America	2100	2053	448	234
Oceania	2100	2100	69	36
World without Africa	2054	2042	7233	4174

Source: Author analysis of World Population Prospects 2022 ([United Nations, Department of Economic and Social Affairs 2022a](#)).

3.2. Demographic Decline Projections by 2086

Some regions and subregions are projected to experience significant population declines. Compared to its population in 2022, by 2086, at the global peak, Asia will have lost 350 million (−6.5%), Europe 135 million (−18%), and Latin America, 56 million (−7%). National levels give a more specific perspective. In Eastern Asia, by 2086, compared to 2022, Japan’s population will fall to 80 million, representing a decline of 35%, South Korea will drop to 29 million (−44%), and China is expected to lose 541 million inhabitants (−38%). Southern and Eastern Europe will follow similar trends: Spain will lose 13.9 million inhabitants (−29%), Italy will lose 19 million (−32%), Germany will lose 12.6 million (−15%), Poland will lose 12.6 million (−33%), and Russia will lose 28.4 million (−19.6%) (excluding conflict casualties associated with the Russian invasion of Ukraine starting in 2022). By 2086, most Latin American countries will have initiated a descent. By 2086, Brazil is expected to have declined by 15.7 million (−7%) compared to 2022; this represents a decline of 30.4 million (−13%) from its peak, which is expected to occur forty years prior in 2046. While critical, such projections do not include analysis by age group, which reveals a more marked reality.

3.3. Declining Working-Age Demographics

The decline in the middle, working-age population (20–64 years) is especially striking because countries will lose the demographic dividend that resulted from earlier periods of high fertility ([Population Reference Bureau 2012](#)). Because the number of older adults is rapidly increasing, the proportion of working-age people does not strictly correlate with the total number of the population.

The working-age population (20–64 years) is expected to peak in 2074, 12 years prior to the all-age population peak. See Figure 1. The working-age population is expected to peak differently in various world regions: Europe in 2011, Asia in 2044, Latin America in 2043, and North America in 2053. Peaks are expected to be followed by declines. While, globally, the working-age population will stagnate, regional differences show different realities. By 2086, compared to its 2022 population, Europe may lose 158 million working-age people (−34%), Asia, 498 million (−16%), Latin America, 84 million (−19%) and North America,

7 million (−3%). At the national scale, projections by 2086 compared to 2022 show, China is expected to lose 520.9 million working-age people (−57%), the United Kingdom, 4.1 million (−10%), the United States, 7.6 million (−4%) and Brazil, 39.6 million (−28%). This calls for profoundly different policy responses in each country. For example, active labor market policies to encourage labor force participation may be even more important in China and Brazil than in countries where the working-age population is more stable. In 2022, among young adults (ages 15–24 years), unemployment was high in China (13.14%) and Brazil (21.36%), while youth unemployment was relatively low in the US (7.89%) and the UK (9.94%) (World Bank 2023).

3.4. Changing Population Composition

Population aging and shrinking has implications for demographic composition. For example, the population is increasingly made up of larger proportions of older ages than younger, thereby shifting the dependency ratio, as it is normally calculated as the proportion of children and older adults relative to the total working-age population. We show the shift in composition of the “dependent” population toward more older adults. Table 2 shows that from 2000 to 2021, the dependency ratio decreased in Africa, Asia, Latin America and the Caribbean, and Oceania, and slightly increased in Europe and North America. Across all the regions, the proportion of children to the working population decreased, especially in Latin America and the Caribbean (from 0.81 to 0.53) and Asia (from 0.74 to 0.52). The proportion of older adults to the working population increased, especially in Europe (from 0.24 to 0.32) and North America (from 0.21 to 0.29).

Table 2. Dependency ratio by region.

Region	Dependency Ratio—Overall		Dependency Ratio—Children		Dependency Ratio—Older Adults	
	Year 2000	Year 2021	Year 2000	Year 2021	Year 2000	Year 2021
Africa	1.33	1.18	1.26	1.11	0.07	0.08
Asia	0.84	0.68	0.74	0.52	0.11	0.16
Europe	0.65	0.68	0.40	0.35	0.24	0.32
Latin America and the Caribbean	0.92	0.69	0.81	0.53	0.11	0.15
North America	0.69	0.70	0.48	0.42	0.21	0.29
Oceania	0.77	0.75	0.60	0.53	0.17	0.22

Source: Author analysis based on data from World Population Prospects 2022 (United Nations, Department of Economic and Social Affairs 2022a). Note: dependency ratio = (population ages 0–19 + population ages 65 and over)/population ages 20–64.

3.5. African Demography Hides Regional Demographic Trends

African demography will have increasing weight on world demography, as it rises from 18% (n = 1.46 billion) of world population in 2023 to 35% (n = 3.66 billion) by 2086. If Africa is not included, world population is expected to peak 32 years sooner (in 2054), and working-age population also 32 years sooner (in 2042). (Figure 2). This can be explained by several factors: the asynchrony of the demographic transition compared to the rest of the world, a particularly strong population increase, and the sheer size of the African region. As a comparison, over the same duration of 63 years between 1960 and 2023, while the Asian population multiplied from 1.70 billion to 4.75 billion, its proportion of the world’s population remained rather stable (56% to 58%).

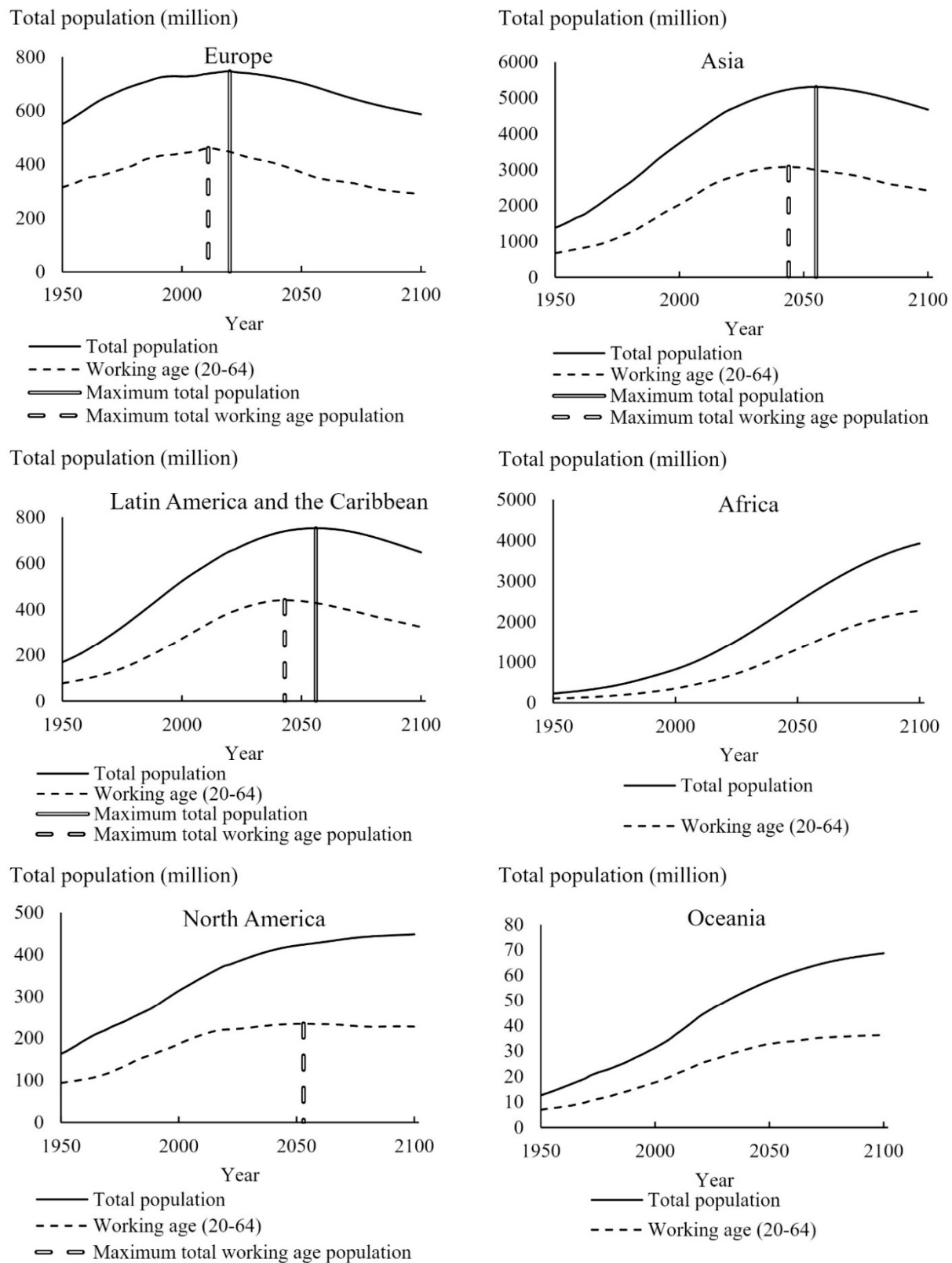


Figure 1. Regional population projections 1950–2100, total and working age. Source: Author analysis based on data from World Population Prospects 2022 (United Nations, Department of Economic and Social Affairs 2022a).

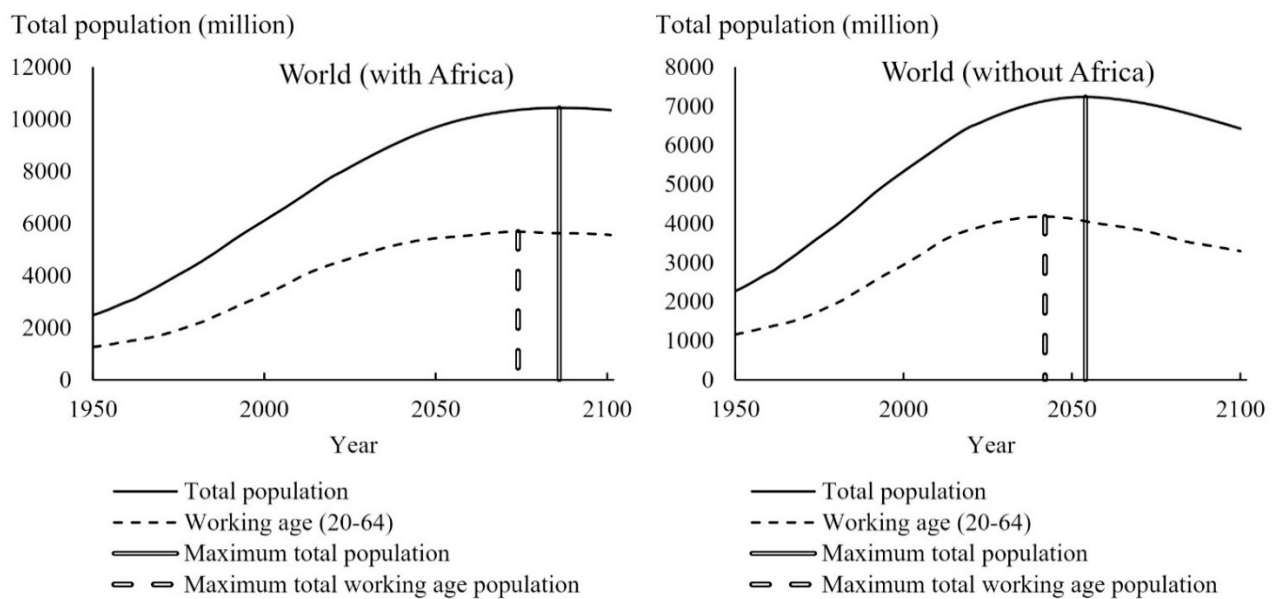


Figure 2. Global population projections 1950–2100 (total, total working age, with and without Africa). Source: Author analysis based on data from World Population Prospects 2022 (United Nations, Department of Economic and Social Affairs 2022a).

4. Discussion and Implications

4.1. Policy Implications and Adaptation Strategies

The shift in demographic composition has implications for policy, as social support for the dependent population may shift from the young (schooling) toward older adults (health and retirement). In the US, for example, a much larger percentage of public spending is directed toward older adults than toward children, and this will increase as the population ages (Edwards 2010; Issacs 2009). As the child population declines, schools may be repurposed to serve older adults and the broader community, rather than shut down (Warner et al. 2024). In younger societies, especially those with underdeveloped social security systems, expenditures on older adults are expected to grow (Jakovljevic et al. 2021), but greater attention must also be given to the needs of the youngest children (ages 0–3) and their parents (parental leave, childcare) to reduce the cost burden of raising children (Richardson et al. 2023).

4.2. Cultural and Economic Perspectives on Population Dynamics

Population matters, but the impacts of population change are socially, politically, and economically mediated. The outcomes of population dynamics in one area do not necessarily predict the same outcomes elsewhere with similar population dynamics. Society presents choices of how to respond to aging populations, or to the demographic dividend, especially in societies where the working-age population is disproportionately great, as is currently the case in Africa. Those choices provide a broader range of policy alternatives as we look around the world.

For example, Africa still needs to give primary attention to the needs of a younger population—such as education and employment—in order to capture the demographic dividend (Brown and Eloundou-Enyegue 2016), especially given concerns over rising inequality in the region (Eloundou-Enyegue et al. 2017). International strategies can be important, as migration can help address unemployment in the sending nations and labor shortages in the receiving ones. The European Union points to immigration as one important element to address labor shortage and slow population aging in the short term, but notes that it will not solve the aging problem in the long term (Commission of the European Communities 2009). Immigration policy must focus on integration in the labor force and broader society to ensure human rights, quality of life, and labor force

upgrading (Castles 2000; Golini 2001). While migration may play a significant role in the transition to an older society and the evening out of age groups globally, it must be planned and executed within a humane long-term framework, including policies to combat discriminatory policies and racist behaviors (Tsfahune 1998). As Africa starts aging, large-scale migration may prevent Africa from taking advantage of its own demographic dividend and delay the necessary adaptation of Europe to a low working-age demography.

Scholars from Italy point to the need to explore a range of new policy options. Migrants should be better incorporated into the labor force, but migration will not be enough (Golini 2001). Public policy also will need to support families, especially mothers, to make the burden of child rearing less heavy, and promote part-time work for older adults who may wish to extend their participation in the labor force (Reynaud and Miccoli 2019). Aging can have significant outcomes for health and well-being, as it provides an opportunity to reconceptualize labor, welfare, and social policy.

In much of the world, impending demographic stagnation and decline is still the subject of denial. This situation may find its roots in cultural history (Kopnina and Washington 2016), including economic foundations, where population stagnation and decline are perceived as economic disasters (Lianos et al. 2023). Socialization around the necessity of economic and human demographic growth may have generated a form of cognitive dissonance, leading to denial of the unfolding phenomenon. Centuries of population growth challenge the paradigm of global aging and regional population decline. For example, the Chinese, South Korean, and Japanese cases are often introduced as non-generalizable exceptions, but we argue the trends are more generalizable. It could be that the shift in thinking is so profound that embracing the changing reality is rejected. We argue that scholars, planners, environmentalists and policymakers must integrate this fundamental insight regarding population aging and decline in their analysis of policy options.

4.3. Systemic Implications and Regional Variations

A shrinking and aging population has systemic implications, from housing stock, transportation, and energy consumption to other resource needs such as food and water (Brauner-Otto 2023; Hummel and Lux 2007). While the housing stock adapted to later life is of concern to planners (Golant 2002), the idea of housing over-development is rarely addressed, and if it is, it is interpreted as an investment bubble rather than dissonance between demographic growth and housing development (Williams and Redmond 2014). Regarding environmental consequences, aging and population decline could have positive implications for reductions in greenhouse gases and climate change (Lee et al. 2014). A shrinking working-age population will have implications for the labor force in both export sectors as well as the care sector, where demand will increase due to an aging population (Browne and Braun 2008). The structural shift to an older-age population will have important implications for the financing of social welfare and pension systems, as well (Blackberry and Morris 2023; McCann 2017).

Global and all-age demography blurs fundamental elements of interpretation. While migration is often presented as a straightforward solution, the future may be increasingly challenged by diminishing “stocks” of migrants (Czaika and De Haas 2014). The scale of emigration from Africa and, to far lesser extents, Latin America, would need to reach arguably unrealistic levels to compensate for demographic realities. As Latin America ages, there will be less pressure to migrate out, as local economies will be better able to absorb labor. For example, the net-outmigration rate of Latin America and the Caribbean decreased from 0.18% in 2000 to 0.04% in 2021 (United Nations, Department of Economic and Social Affairs 2022a). Similar reductions may be expected in Southeast and South Asia in the future. Thus, we need to begin to imagine a world in which the population shrinks and becomes older at the same time. Migration is a short-term solution, which can help countries adapt to the new paradigms, although it could also delay recognition of the profound societal transitions implied by an aging and shrinking world. Similarly, policies

providing support for raising children could have a softening effect on the transition (Reynaud and Miccoli 2019).

In addition to global regional differences, there will be important subnational regional differences, as rural areas often age faster than urban ones. Rural areas typically lose their younger population to outmigration to cities, causing rural communities to have even older age profiles than urban ones. This creates challenges for social inclusion and for economic development and service provision in rural communities (Cattaneo et al. 2022; Davoudi et al. 2010; Warner et al. 2017). In many cases, rural communities are the harbinger of what the broader society may become over time as the population ages and shrinks.

New approaches to regional planning and economic development are urgently needed. This aging and shrinking world population challenges us to engage in new thinking about public policy, the economy, and notions of aging itself. We need to engage new economic paradigms based on quality of life, rather than growth (Jacobs 2020), and notions of work and productivity that extend beyond the traditionally conceived “working age” years (Lain and Vickerstaff 2014). We also must reimagine social welfare systems to support all forms of care—family, community and nation—rather than the narrower conception of nationally financed pension schemes (Bloom et al. 2011), which currently do not cover the majority of the population in most countries (International Labour Organization 2021). Additionally, automatization and robotization will increasingly find their place as the working-age group shrinks and the number of older adults grows (Acemoglu and Restrepo 2022). A multi-level framework is needed that looks across micro, meso, and macro scales (Guillemot and Warner 2023). Currently, families, at the micro scale, bear most of the burden of adjustment. However, there is a critical role at the meso community scale and at the macro policy scale to help society adjust to this new aging reality.

Demographic aging and population decline, illustrated by the diamond-shaped age pyramid, is coming sooner than we think, not just in the Global North, but in the entire world. We are about to enter a new global demographic era, and it does not have to be interpreted negatively, but it does need to be managed (Davoudi et al. 2010). As we exit a society marked by demographic growth and a positive demographic dividend, we should not ignore the impending transformation. When we do acknowledge the upcoming change, we must move beyond the most common policies of increasing retirement age, compensating declining workforce with immigration, and promoting fertility. It is time to rethink societal and economic paradigms, redraw our definition of societal success and find new outcomes to define our progress. We must turn towards all-age, inclusive planning (Warner and Zhang 2022) to promote and maximize lifelong individual, societal, and economic contribution.

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