



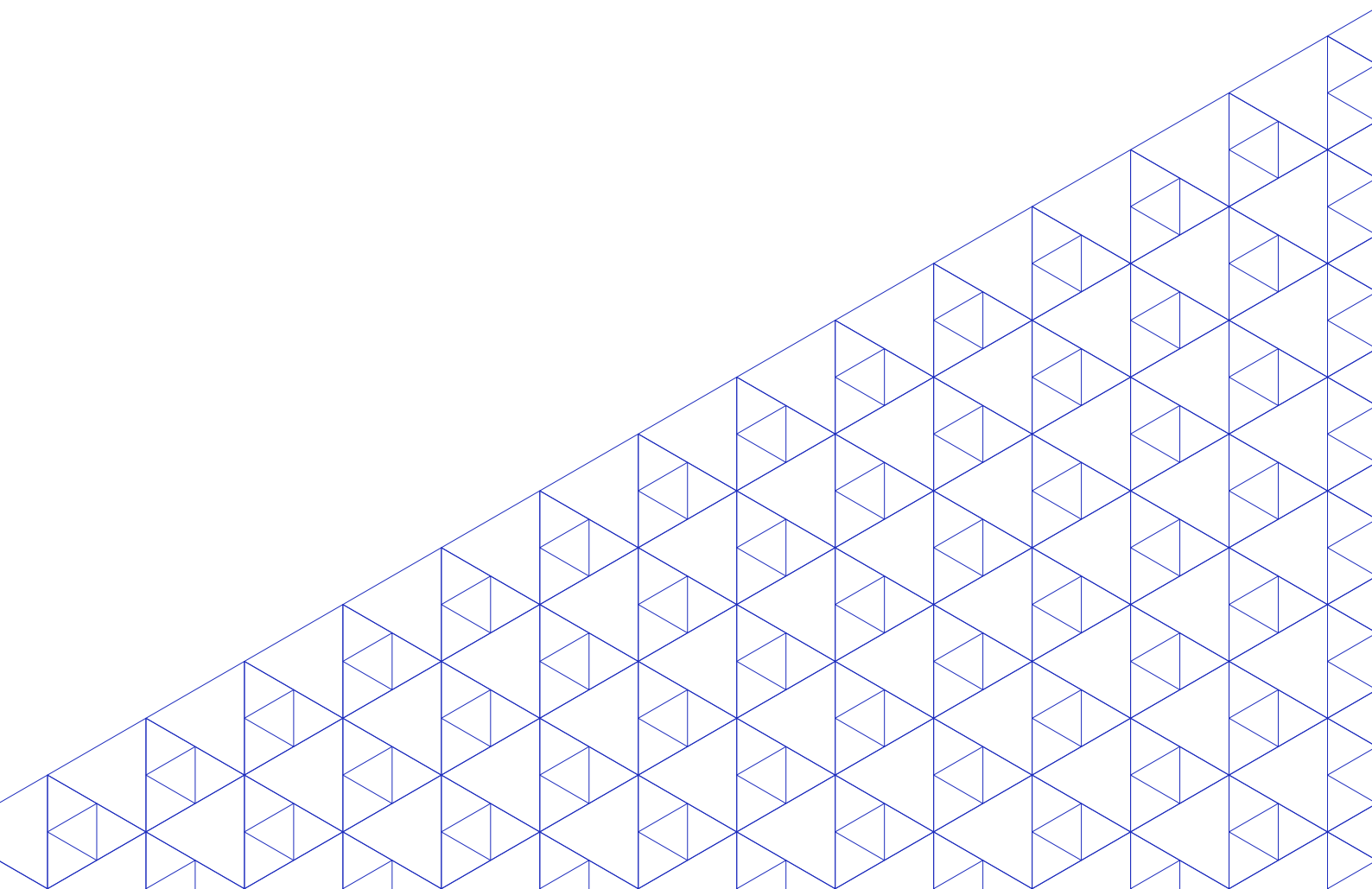
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► Old age work and income security in middle income countries: Comparing the cases

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Abstract

This paper considers the rapid demographic ageing trend experienced in many middle-income countries and examines how the dimensions of these demographic shifts can be combined with other dimensions related to employment, retirement and social protection in order to classify countries according to their level of preparedness to secure adequate income for their rapidly ageing population. This paper differs from other such studies as it deliberately incorporates employment measures and distributional aspects alongside economic and social protection measures in calculating a preparedness and vulnerability index.

Patterns of work and income security up to and during old age were incorporated into the index using data from 35 middle-income and upper-middle-income countries, all of which will face ageing populations over the next 10 to 30 years. The index presented in this paper differs from other indices as it incorporates current employment dimensions relevant to the delivery of old-age income security in the future. Drawing from a wide array of country-specific indicators, this study seeks to identify configurations of descriptive variables that can approximate underlying relative differences between countries in terms of economic and social preparedness, distributional vulnerability and gender inequality.

The results of the factor analysis suggest that, for social preparedness, the standard of living and strength of social protection in a country are two important underlying factors. For distributional vulnerability, the relative prevalence of low-quality employment and of poverty combined with inequality are the two dominant underlying factors which can be used to distinguish between countries. Finally, for gender inequality, the employment gender gap is the main factor, comprising gender differences in labour force participation and in youth preparedness for employment, both of which significantly influence life-long earnings and retirement income.

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Introduction

Income security has long been the hallmark of the aged. Nonetheless, along with health security, ensuring the quality and coverage of income security constitutes a major challenge for governments of countries with ageing populations, in which the proportion of the population aged 60 years and older is growing rapidly. The International Labour Organization (ILO) (2000) defines income security as relating to income level (absolute and relative to need), assurance of receipt, expectation of income adequacy now, and expectation of improvement or deterioration in the future, both during a person's working life and in old age or disability retirement. Social protection, pension, savings, work and health are the most important pillars for supporting the income security of older persons. Policies in these areas have a cumulative effect later in a person's life and are therefore critically important. This perspective may not be well imbedded within the priorities of policymakers, however, as they must simultaneously struggle with shorter-term policy needs.

This paper considers the rapid demographic ageing trend experienced in many middle-income countries and examines how the dimensions of these demographic shifts can be combined with other factors related to employment, retirement and social protection to classify countries according to their level of preparedness to secure adequate income for their rapidly ageing population. This paper differs from other such studies as it deliberately incorporates employment measures and distributional aspects alongside economic and social protection measures in calculating a preparedness and vulnerability index.

Patterns of work and income security up to and during old age were incorporated using data from 35 middle-income and upper-middle-income countries, all of which will face ageing populations over the next 10 to 30 years. The index presented in this paper differs from other indices as it incorporates current employment dimensions relevant to the delivery of old-age income security in the future. Drawing from a wide array of country-specific indicators, the study seeks to identify configurations of descriptive variables that can approximate underlying relative differences between countries in terms of economic and social preparedness, distributional vulnerability and gender inequality.

Factor analysis was used to simplify the task of comparing countries based on multiple variables, by identifying a handful of underlying factors. The results of the factor analysis suggest that, for social preparedness, the standard of living and strength of social protection in a country are two important underlying factors. For distributional vulnerability, the relative prevalence of low-quality employment and of poverty combined with inequality are the two dominant underlying factors that can be used to distinguish between countries. Finally, for gender inequality, the employment gender gap is the main factor of significance, comprising gender differences in labour force participation and in youth preparedness for employment, both of which heavily influence life-long earnings and retirement income.

This study is intended to encourage further consideration of how employment aspects can directly contribute to composite comparisons of income security in old age and to potential monitoring of national capabilities with a view to improving social preparedness, reducing vulnerabilities and narrowing gender gaps before the population ages considerably. Improving the measurement of such capabilities can shift policy towards a much-needed longer-term perspective.

► 1 Conceptual approach

The labour market plays a crucial role in all types of old-age income security systems, and patterns of labour market participation over an individual's life course influence the relative differences in income security between individuals later in life. Labour market differences between countries and between men and women within a country are therefore significant.

Income in old age may take various forms. It can come from wages or work-sourced income, support from family or the community, benefits from an enterprise where the individual currently works or previously worked, government support and transfers, and income from investments and savings. Differences in income security in old age largely stem from the economic inequalities that individuals experience during their working lives. Strong evidence already exists to support the importance of the accumulation of advantages and disadvantages throughout the life course (Mason and Lee 2013; Weller and Newman 2020). Unlike in most highly industrialized countries, contributory pensions in middle-income countries have a minimal impact on income security in old age, particularly in contexts of high informality and non-standard employment.

Labour market reforms and life course trajectories deviate from the prevailing aim of regular full-time employment until retirement. The Organisation for Economic Co-operation and Development (OECD) has flagged additional factors that account for ongoing change in prospects for old-age income security, such as higher life expectancy, increasing mobility and migration of the labour force, segmented working lives, higher female labour force participation and, in some cases, an expanding informal sector workforce. Pension reforms have also weakened coverage and benefits for individuals who fall outside of formal, regular employment records (ILO 2014a). Given that, in most countries, income insecurity is more pronounced among older women, gender gaps in work and in income security should be singled out for particular attention. Inequalities experienced in old age on the basis of gender and other factors, such as locality, are linked to labour gaps earlier in the individual's life course, both during prime working age and at earlier points during education (OECD 2017).

The OECD analysis further shows that differences in experiences of education, health, gender and employment interact with one another and compound inequality, and that earnings inequality is increasing in part because of the rising share of non-standard work, labour market difficulties for women and youth, and high unemployment in some countries over the past decade. In middle-income countries, earning inequalities are also prevalent (Vo et al. 2019).

The concept of preparedness draws on the idea of making something ready for use or consideration or to be dealt with. Preparedness partly reflects the extent to which national policies and programmes are in place to support old-age income security in the near- and medium-term future. It can also reflect the relative economic strength and security of the country. Preparedness can be thought of as the relative assets within a country available to support the delivery of old-age income.

Distributional vulnerability, which can take the form of disadvantages and inequalities among individuals within the same country, is also related to a country's level of preparedness. Vulnerability incorporates variables that reflect the characteristics of marginalized groups, and the extent to which they are marginalized, such as their dependency on old age work or family support during old age, which suggests that they likely do not benefit from the wealth and social protection policies and programmes available in their countries. Indicators of distributional vulnerability capture the depth and breadth of the population that falls outside of adequate old-age income support systems compared with the population that can reasonably expect to receive income support from pensions, social assistance, savings and assets.

By focusing on middle-income countries, this study was able to capture a wide range of country policies and conditions. It provides a comparative insight into how well such countries are coping with their ageing populations in the face of numerous economic and social constraints. The focus on middle-income countries also complements the more regular monitoring of ageing across OECD countries and within geographic regions.

Several indices already exist to capture relative differences across countries with aging populations in social protection, financing and economic growth. However, almost none of these indices incorporate employment-related factors in their consideration of future preparedness. Several indices focus on gauging the adequacy of national social protection systems, including financial sustainability elements. The Social Protection Floor Index, for example, compares national gaps in social protection financing,¹ particularly those related to adequate coverage for poor and vulnerable individuals throughout the life cycle (Bierbaum, Schildberg and Cichon 2017). Somewhat in contrast, the Global Aging Preparedness Index (Jackson, Howe and Peter 2013) combines two sub-indices, the first of which informs policy decisions based on the public burden, fiscal room and benefit dependence, and the second of which gauges living standards of the elderly relative to the non-elderly in each country. The two indices suggest that countries face a trade-off between fiscal sustainability and income adequacy. The third index worth mentioning is the Human Development Index (HDI) of the United Nations Development Programme (UNDP), which ranks countries based on three main dimensions: health, education and gross national income per capita. In this index, the scores for the three indices are aggregated into a composite index using a geometric mean.

1.1 Indicators of preparedness and vulnerability regarding old-age income security

1.1.1 Demographic factors indicating the characteristics of ageing populations

Life expectancies have been extending throughout much of the world, which has resulted in many older persons living for several decades after their retirement from work. Life expectancy differences can reflect differences in living standards between countries. Recognizing the diversity of life expectancies and retirement situations, this study uses the employment-based economic dependency ratio (EbDR)² (Loichinger et al. 2014) as it takes into account old-age work. In addition to capturing information similar to the more standard measures used in old-age dependency ratios, which calculate the proportion of the population over the age of 65 divided by the proportion of the employed population of working age (15 to 64 years), the EbDR also reflects the effects of varying levels of labour participation during prime working years and in old age.

1.1.2 Economic and human capital factors

The economic development situation of a country has a bearing on its capacity to deliver income security to its older population. Gross domestic product (GDP) per capita is frequently used as a proxy measurement for a country's standard of living. It captures the value added of production in a country during a designated period and divides this by the current population. Additional dimensions reflecting the relative development situation of a country are captured in life expectancy and levels of educational achievement.

Indicators can also capture the vulnerability of a given country by measuring distributional aspects of development. By measuring the proportion of the population with access to health facilities, safe drinking water and improved sanitation facilities, it is possible to create a comparison of the state of basic services available

¹ The minimum level of income and health security is based on requirements laid out in the ILO Social Protection Floors Recommendation, 2012 (No. 202).

² The EbDR is the ratio between the number of individuals of working age (15 years or above) who are unemployed or inactive and the size of the total employed population of working age.

to more marginalized segments of the population. The Gini coefficient is a common measure of income inequality that reflects how far a country's wealth or income distribution is skewed from an equal distribution.

Poverty and inequality affect older persons differently depending on the country. In some countries, inequality and poverty among older persons can decline where social security is effective in providing a social protection floor. However, in other countries, many prime-aged individuals (25 to 54 years) who experience poverty and inequality can expect to face similar hardships once they reach old age. National poverty rates, which capture the proportion of the population living below the national poverty line, point to the extent of the hardship faced by persons – both young and old – with low incomes in meeting their basic needs or in saving for the future.

1.1.3 Employment characteristics of populations of prime age, nearing old age and in old age

Employment is the most important source of income security for most individuals. Older workers transition out of employment in a variety of ways. While access to decent employment has accumulative benefits up to and throughout old age, labour force participation at all life stages can differ widely. In countries with a large proportion of rural and urban informal employment, relatively few individuals have access to a pension, and older persons in informal employment tend to remain in the labour force for longer than those working in formal employment. Individuals who achieve a number of years of formal employment frequently benefit from pensions after retirement; work during old age may, in this case, signify a preference for work, a need to complement an inadequate pension or a choice to postpone access to a pension scheme until terms become more favourable later in life (ILO 2014a).

Employment prospects for older persons are influenced by the type of jobs that they can attain and by their workplace environment. Compared to prime-age workers, older workers are somewhat over-represented in self-employment, part-time work and unpaid family work. This situation appears to continue post-retirement age for those in work. Likewise, the level of unemployment among persons nearing old age (55 to 64 years) can point to later vulnerability for those same groups in old age.

In addition to the quality of work accessed by older persons (65 years and over), lower quality work leading up to retirement age can also signal the relative vulnerability of an individual with regard to savings, pension eligibility and other forms of security during old age. The proportion of total employment represented by informal employment or agricultural employment aligns closely with the limited eligibility of workers to access contributory retirement schemes.

Another possible indicator of the over-reliance on work for security among very old persons is the proportion of the population over the age of 75 who are still in work.

1.1.4 Pensions, public assistance and medical coverage

Although pension systems are designed to provide income upon retirement, there are marked differences with regard to eligibility, coverage and benefits. The type of pension schemes available can lead to large differences between countries in terms of income security and labour supply at older ages. Nearly half (48 per cent) of all persons over pensionable age do not receive a pension (ILO 2018). For many of those who do receive a pension, it is not adequate. As a result, the majority of the world's older women and men have no guarantee of income security and may continue working for as long as they can, often in badly paid and precarious conditions. Large differences also exist between countries and regions; residents of European countries are more likely to rely on pension income in old age, while those in Latin American and Asian countries have tended to rely more on work, personal capital and family networks.

According to ILO research, long-term inequality, variable voluntary pension coverage and low pay-outs from old-age social assistance all contribute to old-age poverty. Pension entitlements dictate the level of poverty, as they are often the main source of income after retirement (Hinrichs and Jessoula 2012). The level of these pensions depends directly on workers' career paths during their working life and on the age at which they exit the labour market (ILO 2014b). The OECD (2017a) has shown that, in countries with large formal economies, the greater the share of older persons' incomes that comes from public pensions, the less old-age poverty there is. In countries with large informal economies, the greater the coverage of non-contributory pension schemes, the lower the rate of old-age poverty.

Key indicators of the adequacy of each country's pension schemes include estimates of the proportion of the population covered by an effective contributory pension scheme, the proportion covered by an effective non-contributory pension scheme, and the proportion of GDP represented by public social protection expenditure for older persons (excluding healthcare).

Additionally, access to affordable health services and healthcare coverage for medical treatment are major components of old-age income security. Old age brings a greater risk of chronic or acute health problems, and poor or deteriorating health is a frequent reason for early exit from the labour market. The relative health of older individuals and the relative quality of healthcare available to them are reflected in several indicators, such as life expectancy and healthy life expectancy.

1.1.5 Gender inequality

Disparities in old-age income security can reflect accumulated disadvantages based on the individual's location, gender, socio-economic status and other characteristics. Attitudes and practices towards older persons, and the lack or inadequacy of laws and policies (and their enforcement) that provide for equality and minimum standards of living, can widen the income security gap between population segments (OECD 2017b). Gender gaps can be found in many areas, including life expectancy, retirement age, pension eligibility and coverage, quality of work, family situation, care and housework, health coverage, wealth and savings, widowhood, divorce status, child situation and access to government transfer income.

Social policy configurations can influence the distribution of opportunities in diverse ways, including women's participation in economic life. This can take the form of differences in paid employment, the skills and education acquired and the quality of jobs accessible, as well as differences in access to, and adequacy of, social protection. Non-standard work – typically part-time or temporary work, self-employment and unpaid family work – are also more common among women and can widen gender-based inequality.

Gender inequality in old-age income security is also affected by lower levels of labour force participation and wages among women, the large number of women who work in informal jobs, and the fact that women often have shorter, interrupted careers due to child-bearing and care-giving for children and other family members in need. At the same time, women tend to live longer than men and so require income for longer periods of time (Jolly, n.d.).

Key measures linked to old-age gender inequality include the gender gaps in life expectancy, retirement age, contributory and non-contributory pension scheme coverage, labour force participation, informal and unpaid family work and education.

1.2 Methods for measurement

To summarize and reduce indicators in a more logical manner and to explore potential patterns across dimensions, this study makes use of factor analysis. This method can help to identify appropriate means of clustering and weighting various indicators. Factor analysis is a method of extracting underlying components from a set of information provided by indicators. The statistical model for factor analysis is:

$$\hat{\Sigma} = \hat{L}\hat{L}' + \hat{\psi}$$

where $\hat{L}$ is the loading matrix, $\hat{L}'$ is the loading matrix transposed and $\hat{\psi}$ is the uniqueness, all of which are estimated values. Through factor analysis, a series of weights (W) or scores distribute the indicators' degree of association of each indicator with each of the calculated dimensions for a given country:

$$\text{Social preparedness} = W_{v1} * Pre_{1i} + W_{v2} * Pre_{2i} + W_{v3} * Pre_{3i} + \dots + W_{vu} * U_{iv}$$

$$\text{Distributional vulnerability} = W_{v1} * Vul_{1i} + W_{v2} * Vul_{2i} + W_{v3} * Vul_{3i} + \dots + W_{vu} * U_{iv}$$

$$\text{Gender inequality} = W_{v1} * Ine_{1i} + W_{v2} * Ine_{2i} + W_{v3} * Ine_{3i} + \dots + W_{vu} * U_{iv}$$

Using a range of indicators assessed for their feasibility and appropriateness with regard to the analytical approach at hand, this study identifies and estimates underlying factors for preparedness, distributional vulnerability and gender inequality. Insufficient data were available for some countries for certain promising variables (e.g. employment data and old-age poverty rates). The set of measures compiled and tested for analysis are summarized in Table 1 below.

► **Table 1. Indicator matrix**

Social preparedness	Distributional vulnerability	Gender inequality
GDP per capita	Gini index	Gender gap in life expectancy
Secondary education completion	Not in education, employment or training (NEET) rate	Gender gap in retirement age
Public healthcare expenditure	Poverty rate	Gender gap in (contributory) pension coverage
Labour force participation ages 55–64 and ages 65–74	Informal employment rate (as a proportion of total employment)	Gender gap in rates of informal employment and unpaid work
Old-age effective contributory pension coverage (per cent)	Labour force participation rate for persons aged 75+	Gender gap in NEET rate
Social protection non-health expenditure on persons aged 65+	Old-age effective non-contributory pension coverage (inverse relationship) (per cent)	Gender gap in secondary education completion
Social protection expenditure for all	Proportion of employment represented by agricultural work	Gender gap in labour force participation
Life expectancy	Proportion of persons engaged in unpaid family work	Gender gap in rate of unpaid family work
Economic dependency ratio (inverse relationship)		

1.3 Data and sampling

The analysis is based on a sample of 35 middle-income and upper-middle-income countries with labour force data, covering, for the most part, the period from 2000 to 2018. A total of 90 countries were identified for consideration in this study, based on predictions made by the United Nations Department of Economic and Social Affairs (UNDESA) that over 20 per cent of their respective populations would be aged 60 and above by 2050. Over half of the of the countries were subsequently dropped from the analysis due to labour force data limitations (such as China and Morocco) or social protection data limitations (such as Argentina and Bosnia and Herzegovina). Ultimately, 35 countries were included, covering a large number of sub-regions: Eastern and Central Europe; South and Central America; South, Southeast and East Asia; and North Africa. The countries included are profiled in Table 2 below.

► Table 2. Descriptive indicators of sampled countries

Country	Population over the age of 65 (2015)	Population over the age of 65 (2050)	GDP per capita (in thousands of United States dollars)	Informal employment
Albania	17.9%	33.4%	5.3	60.9%
Armenia	15.8%	29.7%	4.2	47.9%
Bangladesh	7.2%	21.9%	1.7	94.7%
Brazil	12.0%	29.4%	8.9	50.4%
Bulgaria	27.0%	36.4%	9.3	16.1%
Chile	15.3%	31.6%	15.9	40.7%
Colombia	11.5%	27.4%	6.7	60.9%
Costa Rica	12.6%	30.7%	12.0	36.9%
Croatia	26.3%	37.9%	14.9	13.5%
Czechia	24.9%	35.5%	23.0	9.2%
Dominican Republic	9.6%	21.4%	7.7	53.2%
Ecuador	9.8%	21.4%	6.3	62.4%
El Salvador	11.0%	28.5%	4.1	70.2%
Georgia	20.1%	21.7%	4.3	58.6%
India	8.9%	19.5%	2.0	91.5%
Indonesia	8.5%	21.1%	3.9	83.6%
Lithuania	24.5%	36.1%	19.1	12.7%
Mexico	10.0%	22.6%	9.7	54.7%
Nicaragua	7.4%	20.5%	2.0	78.7%
Panama	10.8%	23.0%	15.6	48.9%
Peru	10.7%	24.9%	6.9	67.9%
Poland	22.7%	38.8%	15.4	38.2%
Republic of Korea	18.3%	44.8%	31.4	34.4%
Republic of Moldova	16.5%	33.4%	3.2	32.1%
Russian Federation	20.0%	30.6%	11.3	35.5%
Serbia	24.3%	34.3%	7.2	19.8%
Slovakia	20.7%	36.4%	19.5	16.9%
Slovenia	25.1%	38.8%	26.2	5.7%
Sri Lanka	14.0%	28.1%	4.1	74.0%
Thailand	15.7%	35.8%	7.3	78.7%
Tunisia	11.8%	26.4%	3.4	58.8%
Turkey	11.5%	26.8%	9.3	35.0%
Uruguay	19.2%	27.6%	17.3	23.9%
Bolivarian Republic of Venezuela	9.6%	20.9%	16.1	39.7%
Viet Nam	10.2%	27.2%	2.6	73.4%

Note: All data on GDP per capita are from 2018, with the exception of the Bolivarian Republic of Venezuela (2014). For informal employment, the last years for which data were available were: 2018 for Chile, Costa Rica, Ecuador, Serbia and Uruguay; 2017 for Armenia, Bangladesh, El Salvador, Georgia, Indonesia, Panama, Peru, Turkey and Viet Nam; 2016 for Brazil, Dominican Republic, Sri Lanka and Thailand; 2015 for Colombia and Mexico; 2014 for Nicaragua, Republic of Korea, Russian Federation and Tunisia; 2013 for Albania; 2012 for Bulgaria, Croatia, Czechia, India, Lithuania, Poland, Slovakia, Slovenia and Bolivarian Republic of Venezuela; 2010 for Republic of Moldova.

► 2 Results

2.1 Descriptive analysis

Prior to submitting the indicators to a factor analysis, a descriptive analysis of country-level data was completed, with a focus on employment and social protection. The results show large disparities between countries with regard to the extent of labour force participation as individuals near and surpass national retirement age. Figure 1 shows the effect of these differences on the EbDR. Compared with 2007 (or the closest year for which data were available), by 2017, 20 of the 35 countries sampled had experienced a decrease in EbDR, with Turkey, Georgia and Poland showing the largest decline. Meanwhile, Nicaragua, Brazil and Peru underwent the highest increase in EbDR over the period of analysis.

All 35 countries are projected to see increases in EbDR by 2050, if employment rates and retirement trends remain unchanged, with Thailand, Slovakia and Slovenia at the top of the projected increases. The 2050 projections capture the purely demographic effect of these trends, using UN projections of country population growth and ageing (UNDESA 2015 and 2019), which suggest how population ageing will affect the need for economic support from the working population. Tunisia, for example, will need almost two active workers for each inactive or unemployed individual aged 15 years and over. As shown in Figure 2, major gender gaps exist in EbDR, particularly in India, Bangladesh and Tunisia, where the EbDR for females aged 15 years and above is, respectively, 11.6, 6.9 and 6.3 times that of men.

The examination of labour force participation, in contrast, uncovers a general trend over time of slightly increased labour participation among the population nearing old age (55 to 64 years), with a slightly larger per cent increase among women. Figure 3 sheds some light on the extent to which countries depend on older individuals staying active in the labour force. Georgia, the Republic of Korea and Ecuador have the highest proportion of persons aged 70 years and over who are working; for many of these individuals, this is likely a means of achieving income security in old age. At older ages, however, women exit the labour market relatively earlier and at a larger scale than men. One exception is Brazil, which, since 2007, has experienced a decline in labour force participation among persons aged 55 years and above. Over the past decade, major improvements in social pension coverage and healthcare, combined with strong economic growth, are widely credited with reducing poverty among millions of Brazilians, including older persons, which is linked to a reduction in old-age work (Guedes et al. 2019).

Five countries stand out for their high gender disparities in labour force participation. India, Tunisia, Bangladesh, Sri Lanka and Turkey have the highest proportions of women who remain outside the labour market for all age brackets. In Tunisia, there is also a sharp decrease in male labour participation after the age of 55; in combination with the low rate of labour force participation among women, this explains in great part why Tunisia ranks highest for EbDR. India presents one of the lowest labour force participation rates for women, combined with a gradual exit from the labour market among older men.

The speed with which older workers transition into effective retirement influences the EbDR in a country. Some countries with stronger pension systems, such as Slovakia, Croatia and the Russian Federation, register a sharp decline in labour force participation among persons aged 60 and over, while other countries, such as Indonesia, Georgia and El Salvador, experience slower transitions into retirement. A visual representation of the two types of countries is shown in Figure 4. Nearly all of the countries with a sharp fall in labour force participation after ages 55–59 (shown in blue) also have high levels of effective old-age social protection coverage. With the exception of Tunisia and Turkey, the rapid exit from the labour market coincides with a wider-reaching pension system.

However, several countries with a high level of effective old-age social security coverage also exhibit high levels of old-age labour force participation, such as Chile, Georgia, the Republic of Korea and Thailand. While cultural factors may be part of the reason for this, the inadequacy of pension benefits may also motivate older workers to remain in work longer. All of these countries spend less than 5 per cent of GDP on social protection.

With regard to employment quality, near-old and old-age workers are over-represented in informal employment. This reliance on informal work increases with age and is higher among older women as a proportion of total employment among older persons. Figures 5.a, b, c and d show the steady increase in the rate of informal employment as people reach and pass retirement age. While the average informal employment rate is 45 per cent for workers aged 35–54 years, it rises to 53 per cent for workers aged 55–64 years, jumping to 70 per cent for those aged 65 years and above. This shift to informal work is found even in the countries that have a relatively low reliance on informal employment among the working age population, which suggests that at least some older workers who remain in the labour market experience a deterioration in work quality. Even in countries such as Slovakia, Serbia and Uruguay, which have a rate of informal employment below 20 per cent for workers aged 35–54 years, the informal employment rate is higher than 50 per cent (up to 70 per cent, in the case of Slovakia) for workers aged 65 years and above. For Slovenia, the informal employment rate jumps from 5 per cent in the middle-age group to more than 30 per cent in the old-age group, and in the Republic of Korea it jumps from 26 per cent to 82 per cent.

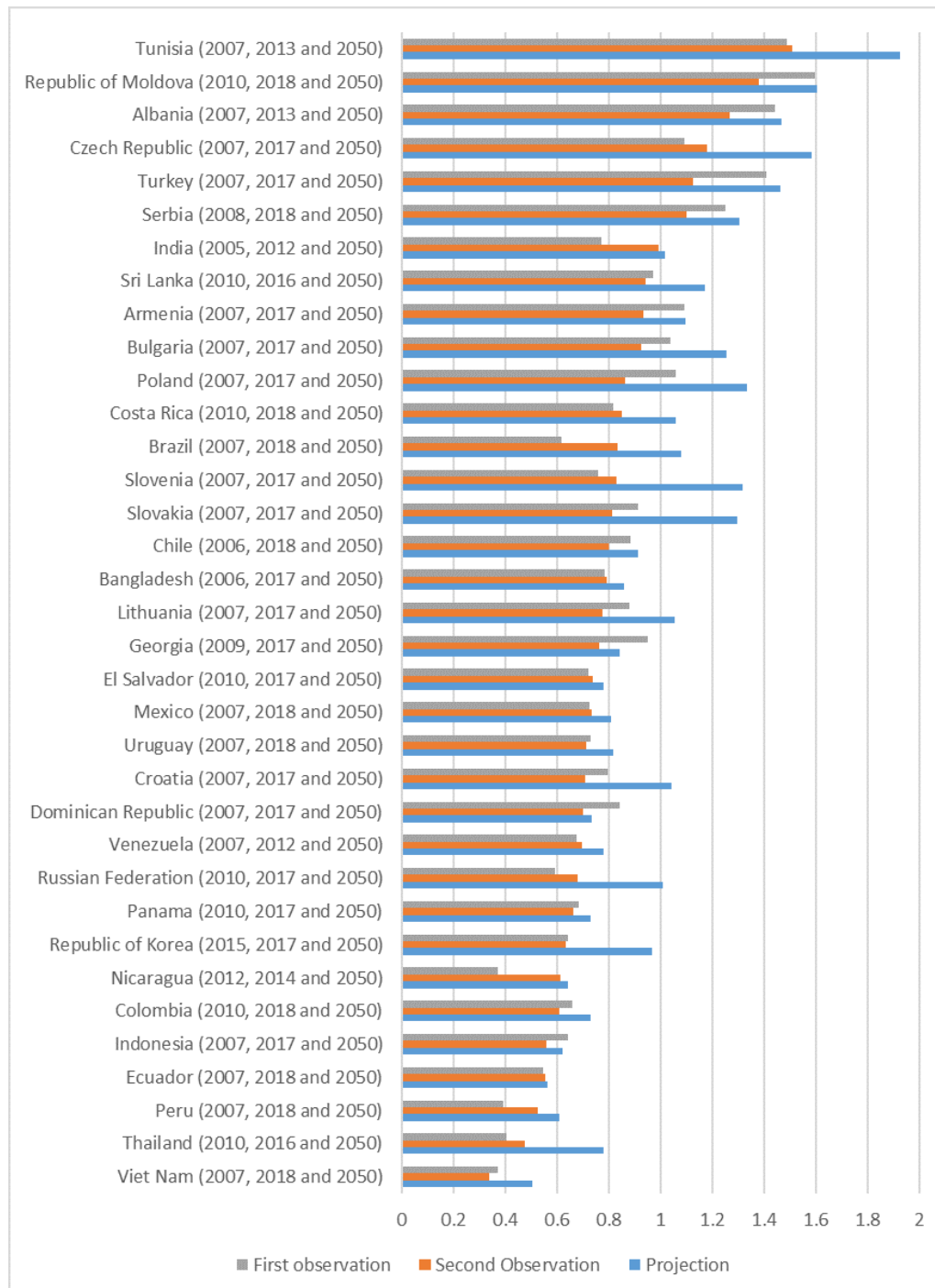
The shift to informal employment during older age also is more pronounced for women who remain in work. On average, the informal employment rate is 4 percentage points higher among older women than older men. While there are wide disparities between countries, in 26 of the 35 countries studied the rate of informal employment is higher among older women than older men.

Policies differ between the countries studied with regard to retirement and pensions. Most maintain an official retirement age, which differs for men and women in half the countries, with official retirement for women set at a younger age. Twelve countries have a retirement age of below 60 years for women; only three countries (Bangladesh, Indonesia and Sri Lanka) have a retirement age below 60 years for men. (See Table 3.) When it comes to effective retirement, the labour force participation rate among men aged 60 years and above is 58 per cent in Bangladesh, 65 per cent in Indonesia and 48 per cent in Sri Lanka, placing them in the upper rankings in terms of old-age active labour participation.

With regard to the rate of effective old-age coverage through pension schemes (namely, the proportion of the population of at least statutory retirement age that benefits from a pension scheme), 14 of the 35 countries have achieved effective coverage for less than half of their old-age population, with the Dominican Republic, El Salvador, Indonesia and Peru providing effective coverage to less than 20 per cent. In contrast, 15 of the 35 countries provide effective coverage to more than 75 per cent of the old-age population. When comparing public expenditure on old-age social protection (excluding healthcare), countries' expenditure as a proportion of GDP ranges from as low as 0.1 per cent in Bangladesh to as high as 12.7 per cent in Serbia.

There is, as expected, an important association between old-age social protection expenditure, effective social protection coverage and labour force participation. The countries with effective coverage rates of more than 75 per cent of their population have a lower rate of old-age labour force participation. Eleven countries present a sharp decrease in old-age labour force participation rates after retirement age. (See Figure 4.)

► Figure 1. Employment-based economic dependency (EbDR) by country

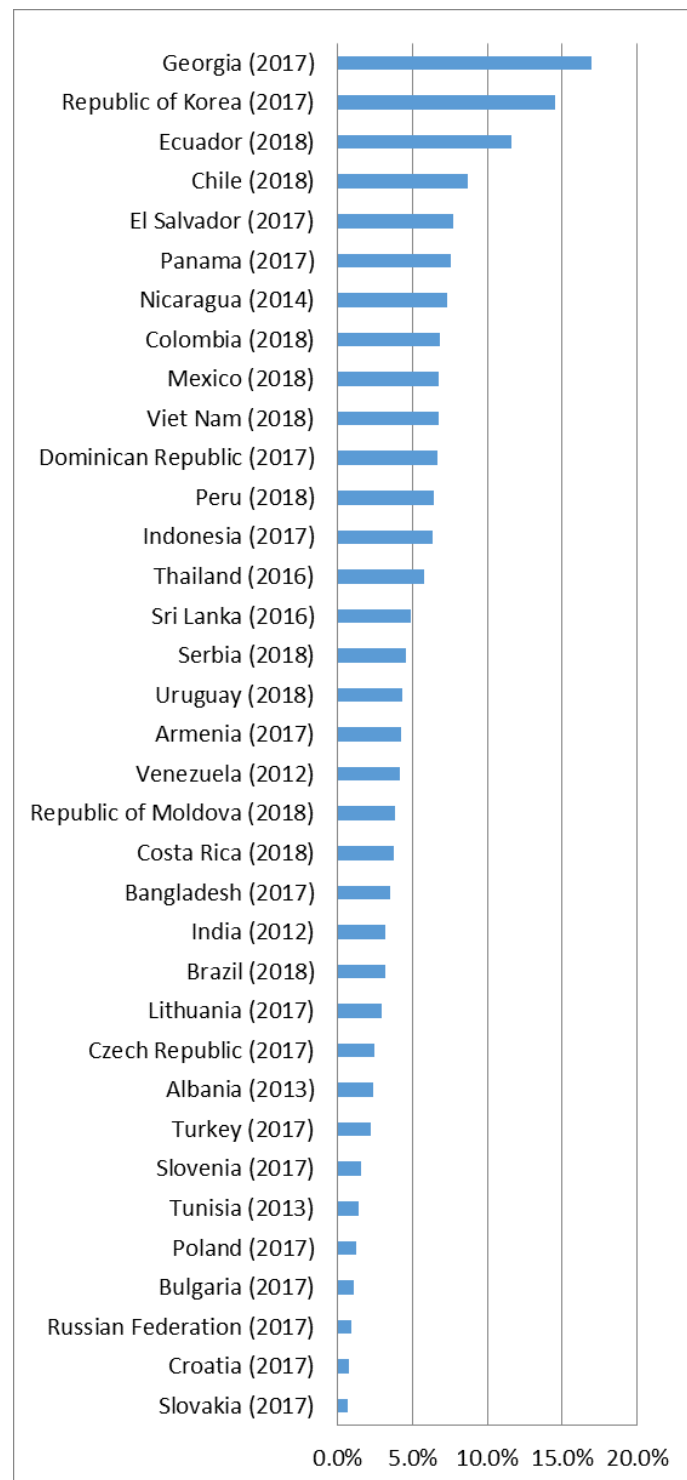


Source: Own elaboration based on ILO (n.d.).

► Figure 2. Gender gap in EbDR

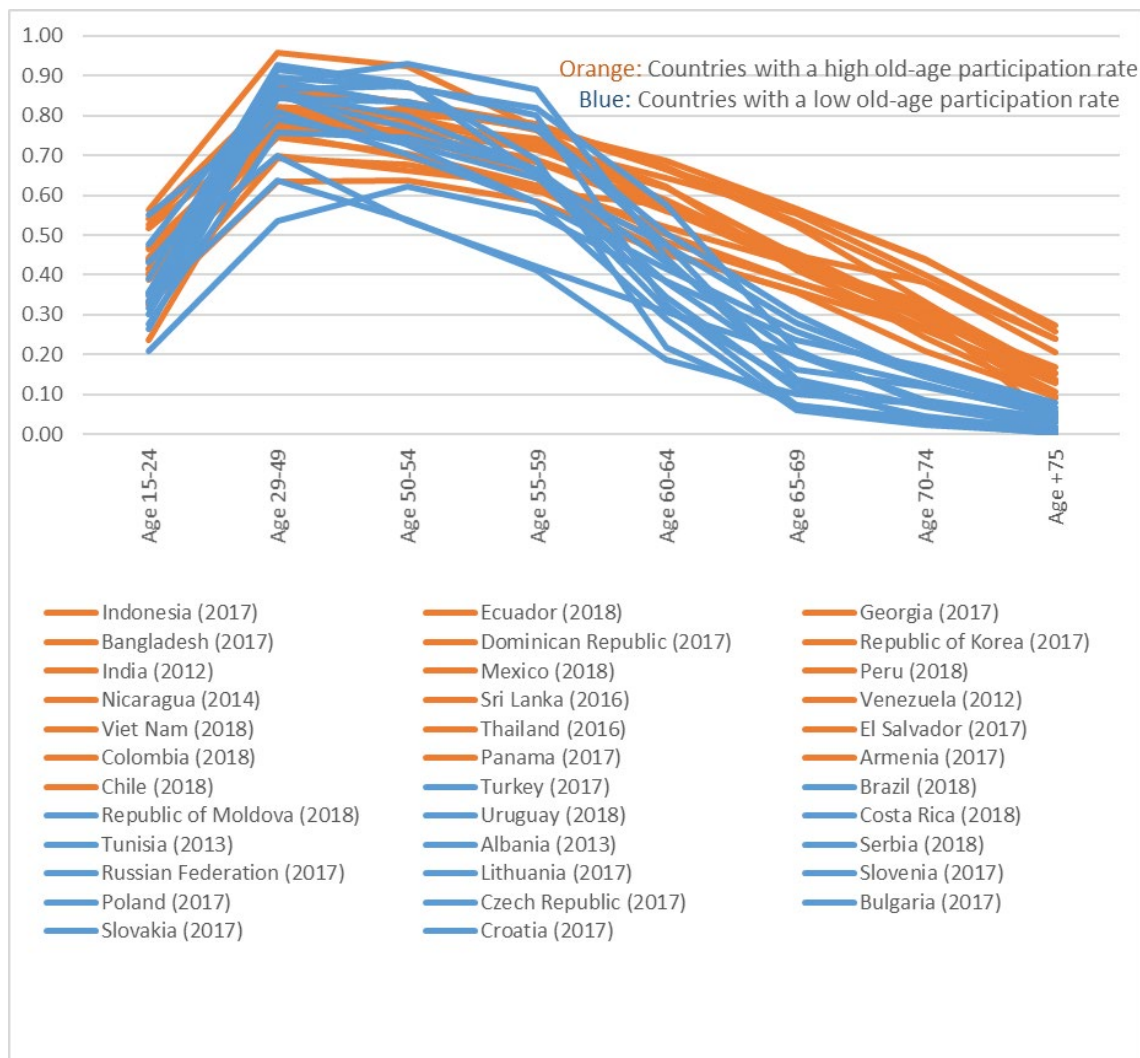


► Figure 3. Change in EbDR if persons aged 70+ cease working



Source: Own elaboration based on ILO (n.d.).

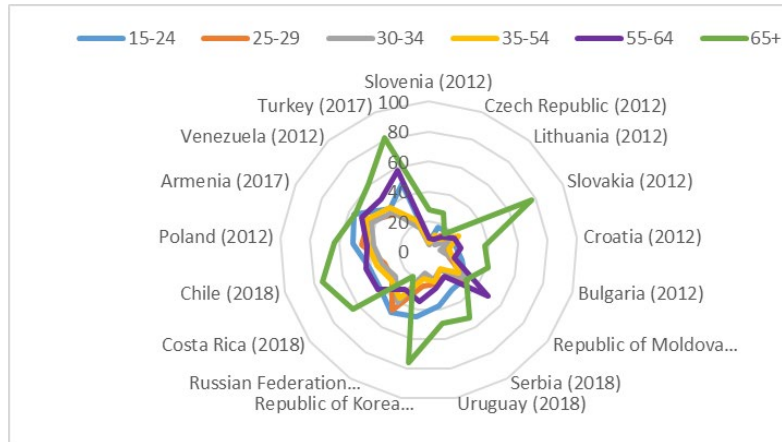
► Figure 4. Labour force participation rate by age group



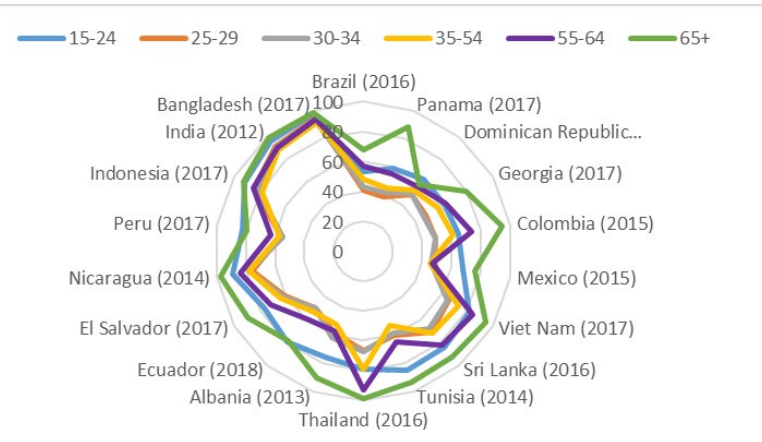
Source: Own elaboration based on ILO (n.d.).

► **Figure 5. Informal employment rate by age group (most recent data)**

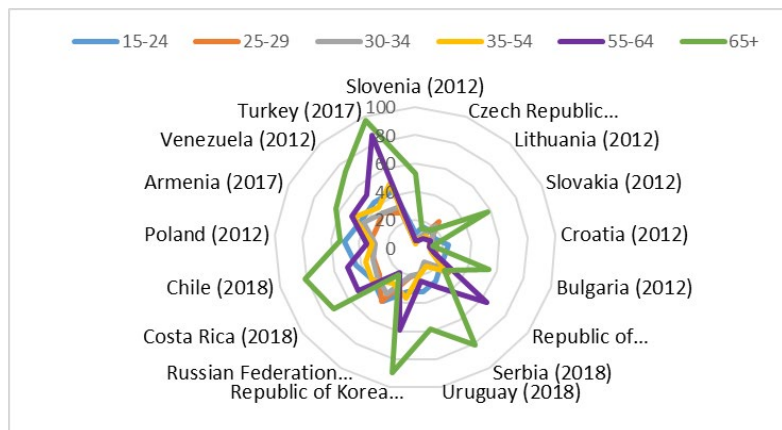
► **5.a. Men: Countries with a low rate of informal employment**



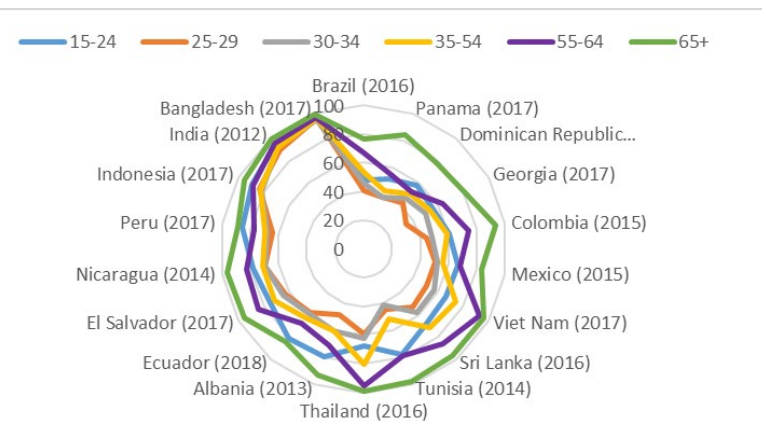
► **5.b. Men: Countries with a high rate of informal employment**



► **5.c. Women: Countries with a low rate of informal employment**



► **5.d. Women: Countries with a high rate of informal employment**



Source: Own elaboration based on ILO (n.d.).

► Table 3. Key demographic and social protection indicators

Country	Retirement age		Effective old-age coverage (%)	Social protection expenditure as a proportion of GDP		Life expectancy at birth (2010–2015)
	M	F		Including healthcare	Older persons, excluding healthcare	
Albania	65	60	77.0	11.9%	7.5%	77.49
Armenia	63	63	68.5	7.6%	5.6%	73.99
Bangladesh	59	59	33.4	1.7%	0.1%	70.79
Brazil	65	60	78.3	18.3%	9.6%	74.34
Bulgaria	64	61	100.0	18.5%	8.9%	74.25
Chile	65	60	78.6	15.3%	3.0%	79.29
Colombia	62	57	51.7	14.1%	3.8%	75.99
Costa Rica	65	65	68.8	13.6%	5.7%	79.16
Croatia	65	61	57.6	21.6%	9.3%	77.45
Czechia	63	58	100.0	19.5%	8.9%	78.16
Dominican Republic	60	60	11.1	6.4%	0.9%	72.62
Ecuador	60	60	52.0	7.8%	0.2%	75.59
El Salvador	60	55	18.1	11.6%	1.1%	71.82
Georgia	65	60	91.9	10.6%	4.4%	72.31
India	60	60	24.1	2.7%	4.3%	67.77
Indonesia	58	58	14.0	1.1%	1.0%	70.01
Lithuania	63	61	100.0	14.7%	6.6%	73.99
Mexico	65	65	25.2	12.0%	1.7%	74.94
Nicaragua	60	60	23.7	6.3%	1.6%	73.10
Panama	62	57	37.3	9.8%	2.7%	77.29
Peru	60	60	19.3	5.5%	2.5%	75.11
Poland	65	60	100.0	19.4%	10.4%	77.15
Republic of Korea	61	61	77.6	10.1%	2.7%	81.27
Republic of Moldova	62	57	75.2	18.1%	7.5%	70.97
Russian Federation	61	56	91.2	15.6%	8.7%	70.27
Serbia	65	60	46.1	23.4%	12.7%	74.75
Slovakia	62	62	100.0	19.4%	7.5%	76.23
Slovenia	64	64	100.0	22.4%	12.0%	80.14
Sri Lanka	55	55	25.2	6.5%	1.4%	75.89
Thailand	60	60	83.0	3.7%	2.2%	75.18
Tunisia	62	62	33.8	10.4%	5.2%	75.45
Turkey	60	58	20.0	13.5%	8.3%	75.59
Uruguay	60	60	76.5	17.0%	8.9%	77.05
Bolivarian Republic of Venezuela	60	55	59.4	8.8%	7.4%	73.07
Viet Nam	60	55	39.9	6.3%	5.5%	74.96

Note: For effective old-age coverage, the most recent year for which data were available was 2015, with the exception of: Thailand (2016); Czechia, Lithuania, Poland, Slovakia, Slovenia and Turkey (2014); Bolivarian Republic of Venezuela (2012); Albania, India, Nicaragua and Uruguay (2011); Croatia, Republic of Korea and Serbia (2010); Dominican Republic, El Salvador and Mexico (2009); and Panama (2008). For social protection expenditure including healthcare expenditure, the most recent year for which data were available was 2015, with the exception of: Bangladesh, Bulgaria, Croatia, Dominican Republic, Ecuador, India, Lithuania, Serbia and Turkey (2014); Tunisia (2011); and Nicaragua (2005). For social protection expenditure for older people, the most recent year for which data were available was 2015, with the exception of: Republic of Korea, Bulgaria, Croatia and Lithuania (2014); Czechia, Slovakia, Slovenia, Sri Lanka and Turkey (2013); Poland and Ecuador (2012); India (2011); Peru (2010); and Nicaragua (2009).

Source: ILO (2017: 75–99); UNDESA (2019).

2.2 Multivariate results

A descriptive analysis of selected indicators points to the complexity of the issues that influence old-age income security. For the purpose of simplicity, factor analysis was applied to all three sets of indicators to identify correlating dimensions for social preparedness, distributional vulnerability and gender inequality in countries with ageing populations. The results identified underlying factors which might have remained hidden if only observable or single indicators were considered, or if all indicators were combined into a single factor analysis. Factor analysis is a means of modelling the correlation matrix using a lower number of variables, known as “factors”.

As a first step, the correlations between variables were checked to include only variables with at least one correlation coefficient of an absolute value of at least 0.3 (Kinnear and Gray 1994). Using normalized data, the correlated variables were initially used to perform a principal component analysis in order to identify, through the eigenvalues, the number of factors of significance that captured the related underlying relationships (eigenvalues of at least 1). This was followed by a bounded factor analysis based on initial results, in addition to orthogonal factor rotation. The overall Kaiser-Meyer-Olkin value was used to measure the sampling adequacy of the factors retained, with 0.5 as the designated threshold. The results and their interpretation are presented below.

2.2.1 Social preparedness for old-age income security

Nine socio-economic indicators were used as input variables for factor analysis with the aim of identifying underlying dimensions of preparedness in the provision of old-age income security. Table 4 shows the correlation matrix between these variables, and Table 5 summarizes the two significant factors and the associated factor loadings assigned to each factor based on these correlations. Only two factors registered eigenvalues of at least 1: the first factor accounts for 55 per cent of variance and the second for 41 per cent.

The interpretation of factors is essentially a qualitative process, based on identifying which variables load strongly on each factor. The first factor is positively related to the proportion of the population that is effectively covered by contributory or non-contributory pensions and to the proportion of the population that contributes to pension coverage, as well as to life expectancy and GDP per capita. This could be interpreted as capturing diverse aspects associated with the relative standard of living in a country, including the extent of formality in employment and of pension eligibility and coverage. Indeed, almost all the countries with higher factor values are identified in Figure 4 as having a more rapid reduction in the labour participation rate after the age of 55.

Differences in GDP per capita and life expectancy are also associated with differences in relative standards of living. The first factor also considers the level of social protection expenditure as a proportion of GDP, the labour force participation rate among individuals ages 65 and above and the level of public expenditure on the population aged 65 and above. It therefore includes a broader perspective of living conditions that goes beyond economic wealth. In this study, this factor is therefore referred to as the “social standard of living”.

The second factor has a high positive factor loading for the EbDR indicator, denoting that it is associated with having a relatively high proportion of the population that is not in work. This could suggest that adequate forms of social protection are in place to make not working feasible for individuals. This factor's positive relationship with the level of social protection expenditure as a proportion of GDP and with the level of public expenditure on the population aged 65 and above further points to the adequacy of social protection. This factor negatively correlates with labour force participation among near-old (55 to 64 years) and old-age (65 to 74 years) groups. It appears to capture relative differences in the effectiveness of social protection for older persons who tend to work less at advanced ages, and it is negatively associated with work at older ages. For the purposes of this study, this factor is therefore referred to as "old-age social protection".

By plotting the two factor scores for the countries in the study (Figure 6), it is possible to identify four quadrants of relative social preparedness. The countries that are mapped onto the two right-hand quadrants register a higher level of relative wealth and investment in social standards of living, and those in the top two quadrants register relatively high scores with regard to social protection in old age. Those in the top right quadrant are considered to be the most well prepared with regard to old-age income security, while those in the lower left quadrant are the least prepared.

► **Table 4. Correlation matrix of social preparedness indicators**

	EbDR	Life exp	Effective coverage	Active contributors	Tot socpro expenditure	Old socpro expenditure	LFP 55-64	LFP 64-74	GDPpc
EbDR	1.000	-	-	-	-	-	-	-	-
Life exp	-0.002	1.000	-	-	-	-	-	-	-
Effective coverage	0.055	0.378	1.000	-	-	-	-	-	-
Active contributors	0.169	0.619	0.775	1.000	-	-	-	-	-
Tot socpro expenditure	0.382	0.446	0.615	0.756	1.000	-	-	-	-
Old socpro expenditure	0.416	0.250	0.597	0.636	0.821	1.000	-	-	-
LFP 55-64	-0.749	0.033	0.066	-0.171	-0.399	-0.497	1.000	-	-
LFP 64-74	-0.573	-0.256	-0.496	-0.697	-0.756	-0.804	0.691	1.000	-
GDPpc	-0.193	0.679	0.572	0.758	0.522	0.390	0.061	-0.354	1.000

Variable	Description
EbDR	Employment-based economic dependency ratio
Life exp	Life expectancy at birth
Effective coverage	Old-age effective pension system coverage
Active contributors	Active contributors to a pension scheme among the working-age population
Tot socpro expenditure	Total social protection expenditure including healthcare (percentage of GDP)
Old socpro expenditure	Public social protection expenditure on older persons (percentage of GDP, without healthcare)
LFP 55-64	Labour force participation among persons aged 55-64 years
LFP 64-74	Labour force participation among persons aged 65-74 years
GDPpc	GDP per capita

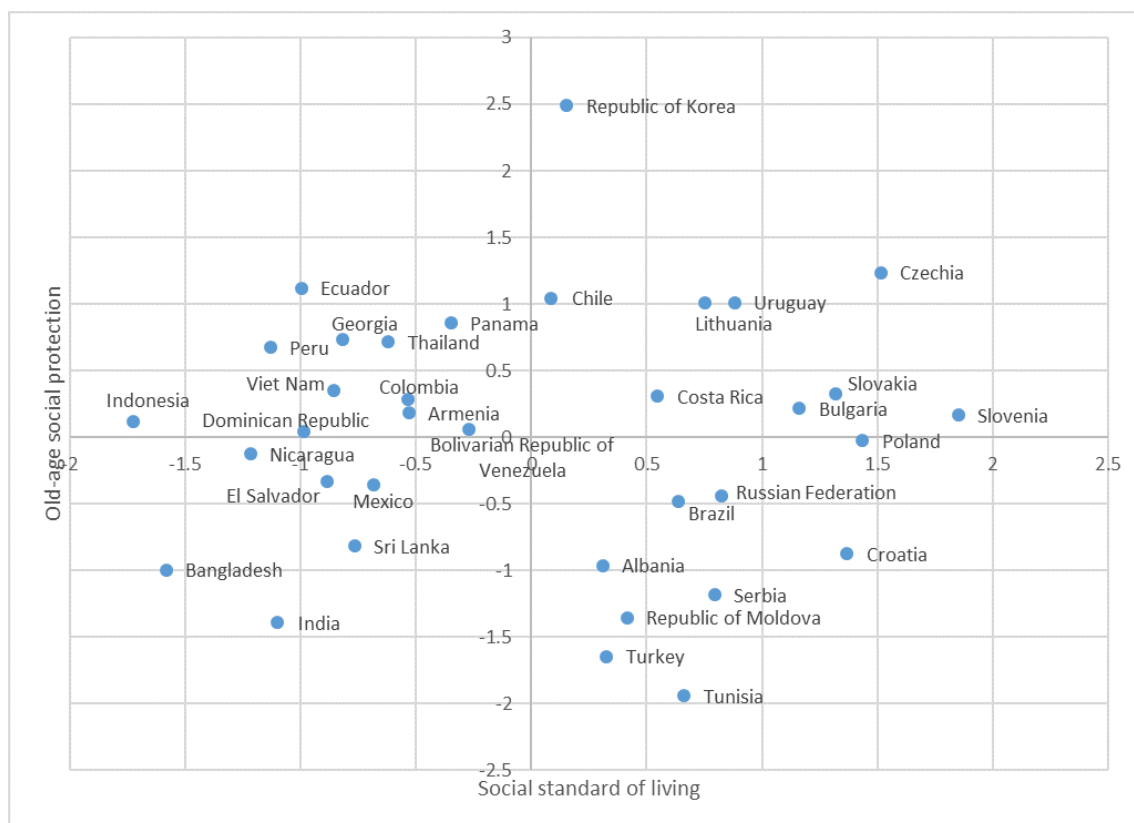
► **Table 5. Orthogonal varimax rotation factor matrix for preparedness**

Factor analysis/correlation			Method: principal factors	
Rotation: orthogonal varimax				
Factor	Variance	Difference	Proportion	Cumulative
Factor 1	3.72691	0.94277	0.5502	0.5502
Factor 2	2.78414	-	0.411	0.9612
LR test: independent vs saturated: chi2(36) = 261.47 Prob>chi2 = 0.000				

Rotated factor loadings (pattern matrix) and unique variances

Variable	Factor 1	Factor 2	Uniqueness
EbDR	-	0.7846	0.3828
Life exp	0.6653	-	0.5533
Effective coverage	0.7916	-	0.3638
Active contributors	0.9195	-	0.0971
Tot socpro expenditure	0.7107	0.5239	0.2204
Old socpro expenditure	0.5747	0.6344	0.2556
LFP 55-64	-	-0.8917	0.2014
LFP 64-74	-0.5159	-0.7847	0.1181
GDPpc	0.8331	-	0.2964

► Figure 6. Scoreplot for social preparedness



2.2.2 Distributional vulnerability to old-age income insecurity

Seven indicators were used as inputs in the factor analysis to capture the relative distributional vulnerabilities of countries to old-age income security. Correlations between variables are shown in Table 6. A high correlation is noted between agricultural work and unpaid family work. Factor analysis was applied, which resulted in two factors with an eigenvalue greater than 1. A rotated factor solution, shown below (Table 7), associates the first factor with 67.2 per cent of the variable error and the second factor with 36.2 per cent.

Based on positive loadings associated with five explanatory variables, the first factor appears to capture aspects of vulnerable employment associated with informality, agricultural work and unpaid family work, as well as the relative proportion of the workforce under the age of 25 that is neither working nor in school. This factor is therefore referred to as “vulnerable employment”.

The second factor registers a positive association with measures of poverty, income inequality, a population aged 75 and above that is still in work, and informal employment, thereby capturing these dimensions of vulnerability. This factor is therefore referred to as “inequality/poverty”. As shown in Table 7, the Gini coefficient and the rate of labour force participation among persons aged 75 and over are the two main weighted variables, followed by the poverty rate.

Figure 6 plots the relative factor scores for vulnerability. The countries that are mapped onto the lower two quadrants register relatively higher levels of inequality and have greater segments of the population living in poverty, and those in the left two quadrants register higher vulnerable employment or low-quality work. Countries that fall into the lower left quadrant face the highest distributional vulnerability to old-age income insecurity, while those in the top right quadrant face the lowest.

► Table 6. Correlation matrix of old-age distributional vulnerability indicators

	Poverty	Gini	NEET	Family work	LFP >75	Agri work	Informal emp
Poverty	1.000	-	-	-	-	-	-
Gini	0.406	1.000	-	-	-	-	-
NEET	0.222	0.167	1.000	-	-	-	-
Family work	-0.104	-0.137	0.465	1.000	-	-	-
LFP >75	0.316	0.424	0.239	0.329	1.000	-	-
Agri work	-0.073	-0.089	0.580	0.847	0.425	1.000	-
Informal emp	0.113	0.320	0.521	0.590	0.619	0.740	1.000

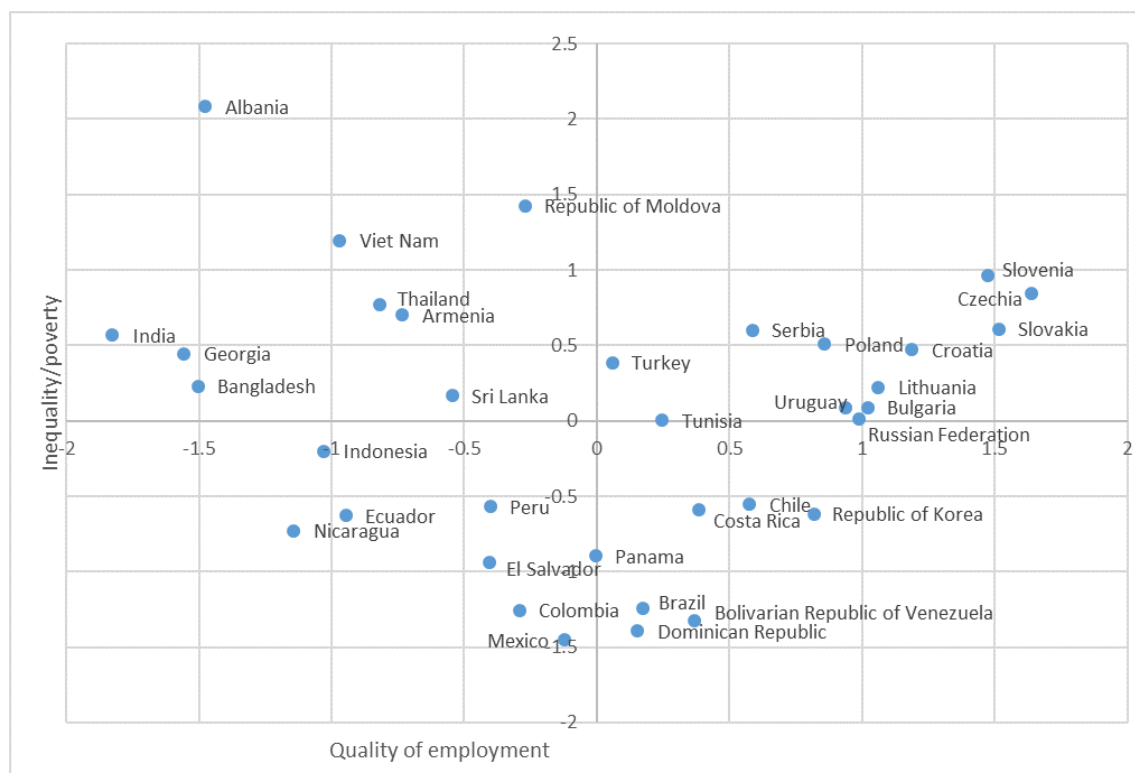
Variable	Description
Poverty	Poverty headcount ratio at national poverty lines (percentage of population)
Gini	Gini coefficient
NEET	Proportion of young persons not in employment or education
Family work	Proportion of persons engaged in unpaid contributory family work
LFP >75	Labour force participation among persons aged over 75
Agri work	Proportion of workers in the agricultural sector
Informal emp	Informal employment

► Table 7. Orthogonal varimax rotation factor matrix for old-age distributional vulnerability

Factor analysis/correlation		Method: principal factors		
Rotation: orthogonal varimax				
Factor	Variance	Difference	Proportion	Cumulative
Factor 1	2.70203	1.24733	0.672	0.6723
Factor 2	1.4547	-	0.362	1.0343

LR test: independent vs saturated: $\chi^2(21) = 125.14$ Prob> $\chi^2 = 0.000$

Rotated factor loadings (pattern matrix) and unique variances			
Variable	Factor 1	Factor 2	Uniqueness
Poverty	-	0.546	0.6969
Gini	-	0.7187	0.4789
NEET	0.5615	-	0.6146
Family work	0.862	-	0.2504
LFP >75	0.4036	0.5987	0.4787
Agri work	0.9593	-	0.0795
Informal emp	0.7423	0.4525	0.2442

► Figure 7. Scoreplot for distributional vulnerability³

2.3 Gender gap in old-age income security

The final dimension of income security in old age that must be considered is the divergence between men and women. To construct the gender inequality dimension, all gender gap variables were initially considered. Some were eliminated due to their low correlation coefficients with the rest (<0.3). For this reason, variables such as gender gaps in secondary education enrolment, life expectancy, retirement age and unpaid family work were excluded from the factor analysis. Based on an assessment of the overall sampling adequacy (Kaiser-Meyer-Olkin test), only one set of factors reach the acceptable threshold of 0.5. (See Table 8.)

The gender inequality factor was calculated based on the correlation between two variables: the gender gap among individuals who are in neither education nor employment (NEET) and the gender gap in labour force participation. The NEET rate is a strong predictor of labour force participation later in life, as well as quality of work. Gender differences in labour force participation during working age are in turn carried through the life cycle to perpetuate gender gaps in income security later in life. The gender factor correlates negatively with the two preparedness factors, and it correlates positively with the two distributional vulnerability factors.

Figure 8 shows the factor values calculated for each country. India, Bangladesh and El Salvador were found to have a relatively large employment-related gender gap, while Moldova, Lithuania and Slovenia showed relatively smaller gaps.

³ To improve the presentation of this scoreplot, the predicted scores of the components were multiplied by -1. Accordingly, the countries with a higher quality of employment are located on the right-hand side of the chart, while countries with a lower level of equality are located at the bottom of the chart.

► **Table 8. Factor analysis results for gender inequality**

Factor analysis/correlation	Method: principal factors
Rotation: orthogonal varimax	

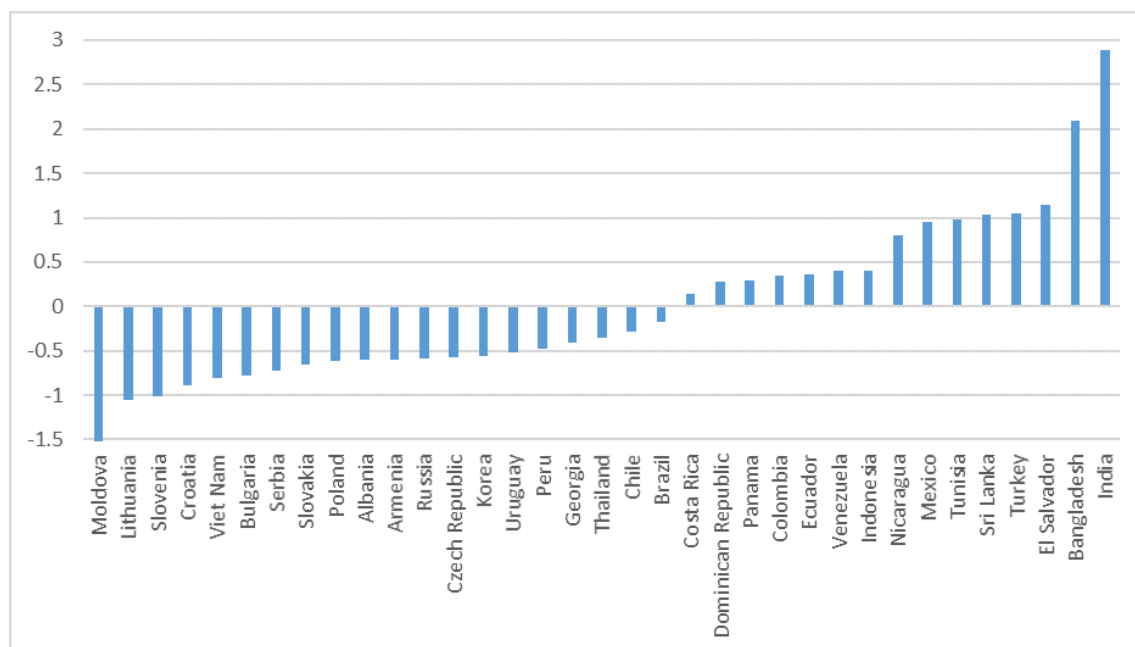
Factor	Variance	Difference	Proportion	Cumulative
Factor 1	1.661	-	1.0667	1.0667

LR test: independent vs saturated: $\chi^2(21) = 50.48$ Prob> $\chi^2 = 0.000$

Rotated factor loadings (pattern matrix) and unique variances		
Variable	Factor 1	Uniqueness
NEET GG	0.911	0.1697
LFP GG	0.911	0.1697

Variable	Description
NEET GG	Gender gap for among young persons not in employment or education
LFP GG	Gender gap in labour force participation

► Figure 8. Factor scores for gender inequality



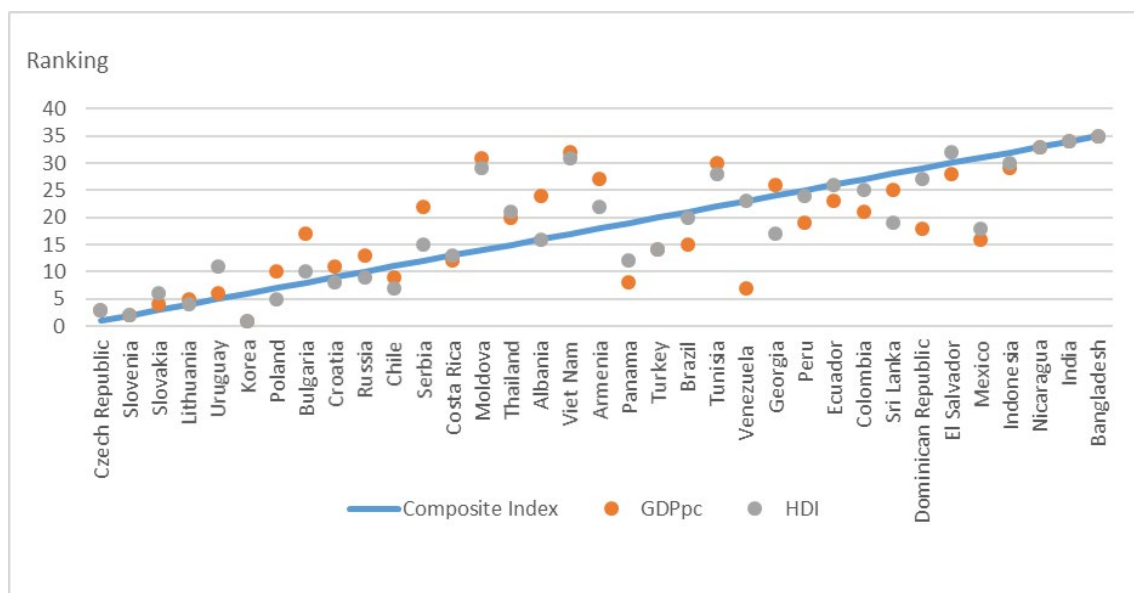
2.4 A composite index

As a final step, a composite index of country preparedness and vulnerability in relation to old-age income security was drawn up, which combined the country rankings based on the four factors created in this analysis, excluding the gender gap factor. For each country, the four predicted score values were averaged using equal weighting, after inverting the signs of the calculated scores for the two vulnerability factors. Czechia, Slovenia and Slovakia scored the highest for old-age income security among the 35 countries assessed. (See Figure 9.) They have strong pension systems that ensure full effective coverage, in addition to high-quality employment that ensures decent standards of living for their populations. At the other end, Bangladesh, India and Nicaragua scored lowest. These three countries have relatively low social protection coverage rates, as well as high male labour force participation rates among the population over the age of 60. In India, nearly half of all young women are not involved either in productive work or in training experiences.

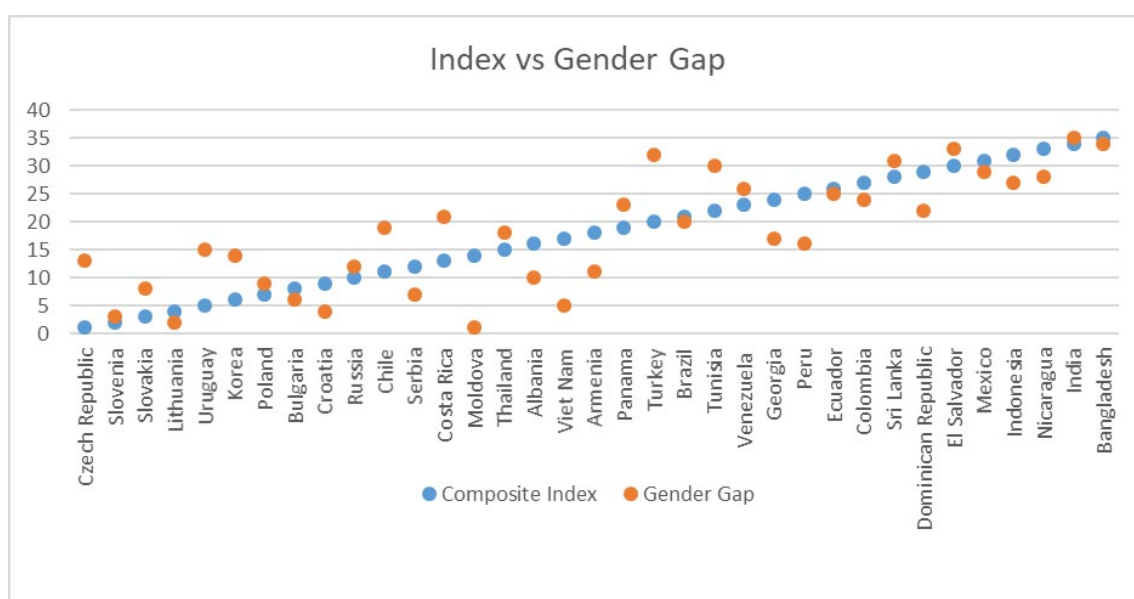
The ranking of countries within the composite index can be compared to the GDP and HDI rankings for the 35 countries, with the lowest ranking representing the greatest level of preparedness with regard to old-age income security and the highest ranking the weakest. As shown in Figure 9, the HDI and the composite index rankings for roughly half of the countries are close to converging. Several countries fare better under the composite index (such as the Republic of Moldova and Viet Nam), while others fare worse (such as Mexico and Sri Lanka). When compared to GDP, a lower degree of convergence is found. It is worth noting that the scaling for all the indices is based on the rankings among the set of 35 countries, rather than on the underlying scale of measures used to create the indices.

The composite index can also be compared to the gender gap index calculated for the 35 countries. As Figure 10 shows, the consideration of gender inequalities in the labour market could improve the ranking of some countries (such as the Republic of Moldova, Viet Nam and Peru), but it would push down the ranking of others (such as Czechia, Uruguay, the Republic of Korea, Turkey, Tunisia, Chile and Costa Rica). However, given its weak correlation with the social preparedness and distributional vulnerability indices, the gender gap index has not been included in the composite index.

► Figure 9. Composite index compared to GDP and HDI rankings



► Figure 10. Composite index compared to gender gap country rankings

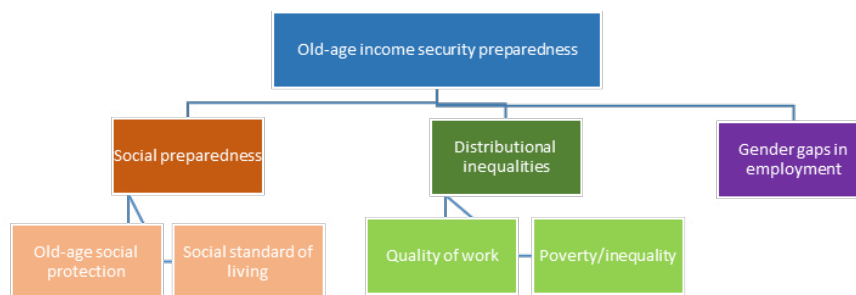


► 3 Discussion

This study works from the conceptual model that the income security of older persons in a country is strongly influenced by the relative preparedness of that country's society and economy to deliver health and income security to an ageing population. This, in turn, depends to a large extent on the economy's robustness, the opportunities for formal employment and the social security schemes accessible during a person's working years. However, even within countries, inequalities create distributional vulnerabilities for some groups, which tend to be cumulative over a life course. Gender differences come sharply into focus as women age, and women are more likely than men to face income insecurity in old age.

There is no single measure for old-age income security or for a country's preparedness to deliver such security. This study sought to consider a wide range of indicators to describe these qualities. Through factor analysis, the authors identified a reduced number of dimensions that contribute to old-age income security preparedness. The findings strongly suggest that old-age income security preparedness needs to be considered from multiple dimensions, which can point to the relative strengths and weaknesses of a country's level of preparedness. The study was explicitly designed to capture three dimensions (social preparedness, distributional inequality, and gender gaps in employment) but, within these, the analysis further suggested additional underlying factors, all of which incorporate employment dimensions. (See Figure 11.)

► **Figure 11. Dimensions of old-age income security preparedness**



The results strongly suggest that employment performance is a critical component in identifying each country's level of preparedness to deliver old-age income security. They also suggest that countries need to consider employment policies and performance as an integral part of efforts to build capacities for future delivery of income security to older populations, such as through ensuring widespread participation in pension schemes linked to formal employment. Employment policies should also aim to increase labour market participation over the entire life course. The disadvantages experienced at different stages of life have a cumulative impact by the time that an individual reaches pensionable age. At the beginning of a person's employment activity, such policies should focus on facilitating the school-to-work transition. Policies that promote voluntary extended time in the labour market are also relevant in the context of an ageing workforce.

Similar differentiations were found in distributional vulnerability related to variation in the quality of work (higher rates of informal, low-wage or self-employed work), inequality and poverty, in addition to gender gaps in education, early employment and labour force participation during working age. Policies to expand and deepen social security schemes for informal workers should go hand in hand with the prioritization of adequate public expenditure on such groups. Policy approaches aimed at closing the gender gap in old-age poverty must begin early in the life course, including during the school-to-work transition. They must also address the adverse effects of gender stereotypes that limit women's career options and level of labour force participation.

Although factor analysis is useful for reducing many variables into a far smaller number of underlying factors, it has been criticized for the potentially arbitrary demarcation and misinterpretation of results. In this study, the authors used a socio-economic and descriptive data analysis to argue that the underlying factors identified are indeed associated with known dimensions that affect old-age income security in each country. The associated factor loadings and country factor scores can therefore be used to make comparisons between countries with regard to multiple dimensions, including many linked to employment.

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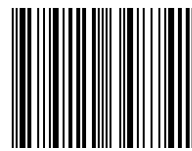
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