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A cross-country analysis of population aging and financial security

Angela C. Lyons^{a,*}, John E. Grable^b, So-Hyun Joo^c^a University of Illinois at Urbana-Champaign, Department of Agricultural and Consumer Economics, 440 Mumford Hall, 1301 W. Gregory Drive, Urbana, IL 61801, USA^b University of Georgia, Department of Financial Planning, Housing and Consumer Economics, Athens, GA, USA^c Ewha Womans University, Division of Consumer Studies, Seoul, South Korea

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ABSTRACT

Throughout the world, policy makers are concerned about the impact that population aging will have on households' financial security, especially those groups most likely to be vulnerable—women, the less educated, and the poor. We use data from the 2014 *World Bank Global Findex* and supplement it with macroeconomic indicators of old-age security to investigate the financial security of households across both developed (OECD) and developing (non-OECD) countries with various aging populations. Five fundamental indicators of financial security are examined. Results show an aging effect for all measures. The aging effects are largest for those who report saving for old age. Older age groups living in countries with larger aging populations are more likely to save, regardless of OECD status. Also, those who are female, have less education, and lower incomes are particularly vulnerable, especially those living in developing countries. Further, the financial security of those living in non-OECD countries is significantly more likely to be affected by public pension spending and other key indicators of old-age security. Financial inclusion and technological usage also have a significant and positive impact on financial security. These factors could play a key role in promoting savings and improving financial security in aging populations worldwide. The findings from this study have important policy implications given the pressures that some countries' social support and public transfer systems will face in the coming years.

Introduction

Population aging is occurring worldwide—both in terms of the number and proportion of older persons in the population (United Nations, 2013, 2015a, 2015b; He, Goodkind, & Kowal, 2016). Globally, the number of older persons (aged 60 years or over) is expected to more than double in size from 901 million in 2015 to more than 2.1 billion by 2050 (United Nations, 2015a). Further, the world's population of the oldest-old (aged 80 years or over) is anticipated to be primarily concentrated in five countries: China, the United States, India, Japan, and Germany. In 2015, these countries accounted for almost 50% of the world's population aged 80 years or over. High-income countries tend to have the largest aging populations. Currently, Japan has the world's most aged population (33% were aged 60 years or over in 2015), followed by Germany (28%), Italy (28%), and Finland (27%) (United Nations, 2015b). However, two thirds of the world's older persons live in less developed non-OECD countries. The older population in these

countries is growing faster than in more economically developed countries. By 2050, nearly 8 in 10 of the world's older population will live in less developed countries (United Nations, 2013, 2015a).

The issue of population aging, along with lengthening lifespan, has received a great deal of attention within the economic literature. Issues related to longevity risk, income distribution planning, uncertain health costs, and resource allocation decision-making are all impacted by access to resources across the lifespan. While it is generally known that country populations are aging, little is known about how this phenomenon is impacting OECD countries compared to non-OECD countries, particularly in relation to saving rates and the development of household emergency funds.

One area gaining attention—though perhaps not as well understood as others—is the impact that population aging will have on the financial markets and subsequent direct and indirect consequences on the financial security of the world's aging population. Important questions emerge from a research and policy perspective. Of particular

* Corresponding author.

E-mail addresses: anglyons@illinois.edu (A.C. Lyons), grable@uga.edu (J.E. Grable), sohyunjoo@ewha.ac.kr (S.-H. Joo).

importance is whether the aging, and soon to be aged populations, are adequately preparing for old age. Another important question is how does financial preparation vary for those groups most likely to be most vulnerable—women, the less educated, and the poor—especially those located in less developed regions of the world? The most vulnerable members of the population are the most likely to fall behind in terms of being prepared financially for old age, especially due to economic, informational, and institutional barriers to participation. This is true across non-OECD and OECD countries. Further, this will have serious global implications both economically and socially, not the least of which are reduced levels of global GDP growth and increased demands on already fragile social safety nets (e.g., Bloom & Eggleston, 2014; Čihák, Mare, & Melecký, 2016; Dabla-Norris, Ji, Townsend, & Unsal, 2015; Heller, 2016; International Monetary Fund, 2015; Sahay et al., 2015).

To address the financial challenges of population aging, nearly every country globally has already taken, or is beginning to take, a serious look at the sustainability of existing pension systems (e.g., Allianz, 2014; Allianz International Pensions, 2015; Bongaarts, 2004; Heller, 2016; Hsieh & Tung, 2016; Lee, Ogawa, Matsukura, 2016; Mitchell & Mukherjee, 2017). Policy makers in some countries have already begun the process of pension system reform by re-examining existing pay-as-you go or unfunded pension programs. However, the growing numbers and proportions of older persons will make it difficult for these programs to provide and maintain adequate income support into the future. Moreover, younger cohorts in many countries are not large enough to fund these programs far into the future. Globally, almost half of all people over pensionable age do not receive a pension (United Nations, 2015a). The general consensus is that existing pension systems in many developing countries are particularly vulnerable as they cover only a small fraction of older persons.

Further, almost all countries now have national campaigns and strategies to foster greater financial inclusion and encourage private savings and asset building, especially in the developing world (e.g., BCBS, 2015; Sahay et al., 2015; Lyons & Contreras, 2017; Lyons et al., 2017a, 2017b; Mehrotra & Yetman, 2015; Sahay et al., 2015). At present, China and India have perhaps the most progressive strategies, which aim to provide every household with a formal bank account.¹ Collectively, many national leaders advocate the notion that access to the formal financial system is a fundamental first step to improving not only individual financial security but long-run national economic and financial security (Sahay et al., 2015). Part of these discussions, not surprisingly, stem from concerns over population aging. The national argument is that having access to a formal bank account makes it easier for governments to encourage personal savings and to distribute social resources more efficiently and fairly.

The challenges policy makers face with regards to population aging and government transfer systems also highlight the growing importance and need for financial education (e.g., Lusardi & Mitchell, 2014; Lyons et al., 2017a; Lyons, Song, & Wu, 2018). Households are no longer relying solely on the social safety nets of the past. Households are instead taking on more personal responsibility in securing their financial futures. The result has been a rapid increase across the globe in demand for professional financial services related to how to personally plan for financial security in old age and best manage existing and future household resources. This transition is perhaps best evidenced by the rapid growth and expansion across the globe in self-regulated financial services sectors (Financial Planning Standards Board, Ltd., 2015) and the creation of an international standards board for the global financial planning profession (<http://www.fpsb.org/>).

To date, very little research has looked at the specific links between population aging and whether the aging, and soon to be aged

populations, are adequately preparing for old age. Even less is known about how financial preparation varies for those groups most likely to be vulnerable during this transition—women, the less educated, and the poor. In this study, we use data from the 2014 World Bank Global Findex and merge it with other international data sources to investigate these issues. We focus on five fundamental indicators of financial security (account ownership, general savings behavior, saving specifically for old age, saving for emergencies, and sources of emergency funds). We examine differences in financial security for vulnerable target populations in both developed (OECD) and developing (non-OECD) countries, accounting for differences across countries in old-age security.

The remainder of this paper is organized as follows. The next section briefly discusses the literature and the key contributions of this study. The third section describes the data and linkages to financial security for countries with various aging populations. The fourth section presents descriptive statistics for the key financial security indicators. Sections five and six present the empirical models and the results from the estimations. The final section summarizes the findings and highlights implications for both policy makers and the global financial community.

Literature review

Household financial security

Much of the existing research that looks at household economic and financial security focuses on general trends in savings rates, wealth accumulation, and retirement savings for U.S. households. This research is often presented within the context of households' ability to recover from a negative financial shock rather than within the contexts of financial security for aging populations. Also, many of these studies are primarily descriptive with little formal economic analyses (e.g., Schmeiser et al., 2014; Larrimore et al., 2015; Larrimore et al., 2016; The Pew Charitable Trusts, 2015). Yet, the work is helpful in providing general insight into what it means to be economically and financially secure and what some of the general trends have been. Not surprisingly, the findings from these studies generally indicate that households are not saving enough and they are ill-prepared financially for both unexpected emergencies and retirement.

Other studies on households' financial security use similar measures to show that households have inadequate safety nets, primarily due to lack of financial planning, savings options, and financial knowledge (e.g., The Pew Charitable Trusts, 2015; Bhargava & Lown, 2006; Dynan, 2009; Lee & Kim, 2016; Lusardi et al., 2011). These studies frequently show that households with lower levels of education, less income and wealth, and no financial education are particularly vulnerable. A few of these studies provide insights into households' coping strategies when a household is faced with unexpected negative financial shocks. For example, Lusardi et al. (2011) investigated the financial fragility of households from eight industrialized countries (Canada, France, Germany, Italy, Portugal, The Netherlands, United Kingdom, and United States) using data from the 2009 TNS Global Economic Crisis survey. They noted that households reported primarily relying on their personal savings to come up with the funds to cover an unexpected emergency or financial shock. This coping method was followed by reports of relying on family and friends, using formal and alternative credit, increasing work hours, and selling possessions. While there were some differences in households' coping strategies across countries, the order of the reported strategies tended to be consistent, with households primarily relying on personal savings.

Population aging and household financial security

Additional research has attempted to directly link financial security to the population aging crisis. These studies tend to focus on the public policy aspect of old-age security, assessing overall retirement

¹ For more information on national financial inclusion strategies from around the world, visit: <http://www.gpfi.org/>

preparedness, evaluating the sustainability and adequacy of existing pension systems, and proposing new policies to address the problem of population aging (e.g., Chomik, McDonald, & Piggott, 2016; Ellis, Munnell, & Eschtruth, 2014; Heller, 2016; Loayza, Schmidt-Hebbel, & Servén, 2000; Mitchell & Mukherjee, 2017). Heller (2016) considered the unique case of Japan, which is the first country to have both an aged and shrinking population. He highlighted several lessons that could be learned from Japan's unique case and considered the conditions under which Japan could be a model for other soon-to-be aged countries. Chomik et al. (2016) constructed a series of age dependency ratios and used them to quantify the various social, institutional, and policy impacts of population aging for nine Asia-Pacific countries. They extended standard dependency ratios to capture health, labor force and public economic factors. Chomik et al. found evidence to support the use of specialized dependency ratios for specific policy purposes and outcomes. For example, they concluded that health related dependency ratios may be more appropriate if a country is evaluating health policies related to population aging. In yet another recent study, Mitchell and Mukherjee (2017) used data from a field experiment in India to assess demand for micropensions among the poor. They considered various micropension schemes with different minimum withdrawal ages, government match rates, and options for lump sum withdrawal. They found evidence to suggest that micropensions could be an effective retirement savings device for the poor, especially if these schemes are linked to a government match rate and if participants are allowed to make smaller, more frequent contributions.

Financial inclusion and financial security

Due to the increased availability of country-level data, a growing number of researchers are now able to conduct more comprehensive analyses that look at financial inclusion and savings and retirement behaviors across countries (e.g., Allen, Demirgüç-Kunt, Klapper, & Peria, 2016; Demirgüç-Kunt et al., 2016; Heller, 2016; Hsieh & Tung, 2016; and Horioka, 2016). The work of Demirgüç-Kunt et al. (2016) is perhaps the most closely related to the present study. Demirgüç-Kunt et al. have been among the first to look at trends in saving for old age across regions of the world using microdata. Specifically, they pooled data for all countries from the 2014 *World Bank Global Findex* and looked at how the profile of those who were and were not saving for old age differed according to their financial inclusion status. They found that financial inclusion does in fact matter. Those with an account at a bank or formal financial institution were 53% to 63% more likely to save for old age. The models controlled for country-level macro-economic characteristics and pension-system characteristics. However, the study only considered one measure of financial security (saving for old age). Also, their work did not attempt to tease out the relationship of saving for old age across countries with larger aging populations and across both the developed and developing world.

Digital finance and financial security

Finally, we would be remiss if we did not acknowledge the growing body of international research that is now examining the role that digital finance, especially online and mobile technologies, plays in shaping access to and usage of financial services (e.g., Anderson, n.d.; Klapper & Singer, 2014; Lyons et al., 2017a, 2017b; Shrader & Duflos, 2014; Villasenor, West, & Lewis, 2015, 2016). However, much of this research is related to financial inclusion. To our knowledge, no study has looked at the role of technology within the context of improving financial security (i.e., savings and retirement behaviors) across aging populations.

The current study addresses many of the critical gaps mentioned above and contributes to the existing literature in five key respects. First, this study measures financial security using a number of dimensions, not just one. Second, it looks at financial security across aging

populations using micro-level data that is both pooled across countries and then estimated separately for several countries in both the developed and developing world. Third, the study pays particular attention to the financial security of those groups likely to be most vulnerable to population aging—women, the less educated, and the poor—and whether they are adequately preparing for old age compared to less vulnerable groups that may have greater access to the financial markets. Fourth, in examining differences in financial security across countries and for various target populations, this study also takes into consideration the impacts of financial inclusion and technology usage, primarily within a descriptive context. Finally, this analysis takes into consideration potential differences across countries in public pension systems and other related old-age security characteristics. In these respects, this is one of the first studies to take a comprehensive approach to describing, for several OECD and non-OECD countries, the current state of financial security as it relates specifically to the population aging crisis.

Data

In this study, we use the publicly available individual-level microdata from the 2014 *World Bank Global Findex* and merge it with other international data sources to investigate financial security across countries with various aging populations. The *Global Findex* database includes information on how individuals save, borrow, make payments, and manage risks for over 140 countries and almost 150,000 respondents.²

We use the *Global Findex* data to measure financial security and look at the impacts of aging on financial preparedness for 23 countries: 13 OECD countries (Australia, Austria, Canada, France, Germany, Ireland, Japan, Republic of Korea, The Netherlands, New Zealand, Switzerland, United Kingdom, and United States) and 10 non-OECD countries (Brazil, China, Colombia, Hong Kong, India, Indonesia, Malaysia, Singapore, South Africa, and Thailand).³ These countries are similar in having population aging challenges. Additionally, these countries are also member countries of the Financial Planning Standards Board (FPSB)—the international NGO that establishes, upholds, and promotes worldwide professional standards for the financial planning profession. The member countries have self-regulated financial services sectors that are subject, therefore, to similar international standards (<http://www.fpsb.org/about-financial-planning/find-a-planner/>). The FPSB standards are established and monitored to ensure that consumers in these countries have access to quality financial services and products and

² Data were collected in partnership with Gallup, Inc. from randomly selected, nationally representative samples of at least 1000 observations for each country. Samples were taken from each country's civilian, noninstitutionalized population aged 15 and older. For some larger countries such as China and India, larger sample sizes were collected. Data weights were also constructed for each country to ensure nationally representative samples. The weights include both a base sampling weight, which adjusts for unequal probability of selection according to household size, and a post-stratification weight, which adjusts for sampling and nonresponse error. The post-stratification weights are based on country-level population statistics for gender, age, education, and socioeconomic status. For more details on the 2014 data, see Demirgüç-Kunt et al. (2014) and The World Bank (2014, 2015).

³ In this paper, we separate the results for OECD and non-OECD countries to better identify differences in financial security and population aging for developed versus developing economies. However, there may be concerns that some high-income non-OECD countries such as Hong Kong and Singapore should not be grouped with lower-middle-income non-OECD countries such as India and Indonesia. As a robustness check, we combine all the OECD and non-OECD countries and test whether the findings for the OECD countries are significantly different from those for the non-OECD countries. We find that there is a significant "OECD" effect, supporting our decision to examine the results separately for the OECD and non-OECD countries. As a second check, we group the countries using the United Nations' classifications for high-income, upper-middle income and lower-middle income economies based on each country's per capita GNI (United Nations, 2014b, 2016). Based on this definition, Hong Kong and Singapore are grouped with the OECD countries in the high-income category. The results using income classifications are consistent with those found using the OECD country classification.

competent and ethical financial professionals. This base level of quality makes it easier to make comparisons across countries with regards to financial security and population aging.

We construct our sample using the *Global Findex* data and all the key variables described below. The initial sample includes 28,253 respondents (13,055 respondents from the OECD countries and 15,198 respondents from the non-OECD countries). Some observations are then dropped due to missing information. We further restrict the sample to respondents who are 18 years of age or older. The final sample consists of 25,703 respondents (12,176 respondents from the OECD countries and 13,527 respondents from the non-OECD countries).

Measuring financial security and population aging

The following questions from the *Global Findex* are used to create measures of financial security:

- 1) Do you have an account (by yourself or together with someone else) at a bank or another type of financial institution?⁴
- 2) Have you saved or set aside any money in the past year?
- 3) Have you saved or set aside any money in the past 12 months for old age?
- 4) How possible is it that you could come up with [1/20 of gross national income (GNI) per capita in local currency] within the next month? [1 = very possible, 2 = somewhat possible, 3 = not very possible, 4 = not at all possible].
- 5) If you are able to come up with emergency funds, what would be the main source of money that you would use to come up with [1/20 of GNI per capita in local currency] within the next month?

Questions such as these are widely used by other researchers as measures of financial security (e.g., Demirgüç-Kunt et al., 2014; Larrimore et al., 2015; Larrimore et al., 2016; Lusardi et al., 2011). The first question captures whether the individual is “financially included” in the mainstream financial system and has a formal account in which to potentially save. The second question captures general savings behavior and whether the individual has recently saved. These first two questions capture the most basic and fundamental means by which the majority of the world’s population has available to them to prepare financially for old age, especially those in developing countries. The third question looks at whether the individual has been saving specifically for “old age” and actively preparing for long-term financial security. The final questions capture the individual’s ability to access emergency funds if needed. If respondents indicated they were able to come up with emergency funds, they were then asked what the main source of those funds would be: (1) personal savings, (2) family and friends, (3) work or loan from an employer, (4) formal financial institution or credit card, or (5) informal lender or other source. These measures provide an indication of the individual’s immediate and short-term level of financial security.

Ideally, it would be preferable to have longitudinal data to track the financial security of respondents as they age and as their countries grow older as well. However, the questions related to saving for emergencies and old age are only included in the 2014 cross-sectional data of the *Global Findex*. As an alternative, we use respondents’ age to create “age groups” to compare cohorts across countries and make inferences as to how well the OECD and non-OECD countries are preparing for financial

⁴ Specifically, respondents were asked if they personally, or together with someone else, had an account at a bank or another type of financial institution, such as a credit union, microfinance institution, cooperative, or the post office. This might also include respondents who “had a debit card connected to an account at a financial institution with their name on it; received wages, government transfers, or payments for agricultural products directly into an account at a financial institution in the past year; or personally paid utility bills or school fees from an account at a financial institution in the past year” (The World Bank, 2015).

security, especially in terms of old age and emergencies. For countries such as Japan and Korea, a comparison of each cohorts’ current level of financial preparedness is particularly important since Japan and Korea are among the countries with the largest proportion of aging persons (United Nations, 2015b).

Individual-level control variables

The *Global Findex* database also includes information on respondents’ characteristics, including gender and education. Respondents are also asked whether they were engaged in the past 12 months in paid employment, worked in the public sector (employed by government, military, or public sector), and/or received government transfers.⁵ A measure of a respondent’s household income is also included based on quintiles that are constructed using household income per capita.⁶ The database also includes information on respondents’ usage of digital technologies and the relation to financial security. The measure that had the fewest missing values and is consistent across the countries is whether the respondent made payments in the past 12 months online using the Internet. We use this measure as a proxy for technological aptitude and usage. If respondents have an account, they are also asked if they made a transaction with money from their account using a mobile phone. This could include using their mobile phone to make payments, purchases, or to send or receive money. While this measure is conditional on having an account, it also provides some indication of technology usage across countries and its potential for improving global financial security.

Old-age security characteristics

There is wide variation across countries in terms of old-age security. For this reason, we include a set of country-level indicators to account for differences in public pension systems and other related macroeconomic characteristics. In particular, we focus on four pension characteristics: (1) public pension spending (as a percentage of GDP), (2) pension funds’ assets (as a percentage of GDP), (3) old-age dependency ratio, and (4) pension system sustainability and adequacy. The indicators for public pension spending (as a percentage of GDP), pension funds’ assets (as a percentage of GDP), and old-age dependency ratio are constructed using data from the OECD (2015), the The World Bank (n.d.), and the Allianz International Pensions (2015). According to the OECD, public pension spending includes all cash expenditures (including lump-sum payments) on old-age and survivors’ pensions. Pension funds’ assets include those assets purchased with pension plan contributions and used for the exclusive purpose of financing pension plan benefits. The old-age dependency ratio is defined as the ratio of the number of persons aged 65 and over (age when they are generally economically inactive) to the number of working-age persons between the ages of 15 and 64. These three measures are commonly used in the literature to account for pension differences across countries (e.g., Bongaarts, 2004; Demirgüç-Kunt et al., 2016). Further, information is available on these indicators for all the countries in the study.

Two international indices were used to measure overall pension system sustainability and adequacy: the Allianz Pension Sustainability Index (PSI) (Allianz, 2014) and the Melbourne Mercer Global Pension Index (MMGPI) (Mercer, 2014). The PSI was first introduced by Allianz in 2011. It is a multi-dimensional index used to measure the long-run sustainability of 50 countries’ public pension systems across several

⁵ Government transfers include payments for educational or medical expenses, unemployment benefits, subsidy payments, or any kind of social benefits. It does not include wages or any payments related to work.

⁶ Respondents were asked “What is your total MONTHLY household income in [your local currency], before taxes? Please include income from wages and salaries, remittances from family members living elsewhere, farming, and all other sources.” The income quintiles are constructed based on the survey responses.

institutional, technical, and legal parameters. Scores range from 1 to 10. Lower scores identify pension systems with low sustainability that require substantial reform, whereas higher scores reflect pension systems with high sustainability over the long run. The MMGPI was created in 2009. It compares the pension systems in 25 countries using three sub-indices that capture the systems' adequacy (40%), sustainability (35%), and integrity (25%). Overall index values represent a score between 0 and 100. The scores are then used to assign an overall index grade (A > 80; B+ 75–80; B 65–75; C+ 60–65; C 50–60; D 35–50; E < 35).

In addition to these measures, we also include four additional macroeconomic indicators that capture differences in old-age security across countries. These indicators include: (1) percentage of the population over age 60; (2) life expectancy at birth; (3) GDP per capita, PPP (in current international dollars); and (4) the human development index (HDI). These are standard country-level indicators reported by the United Nations (2014a, 2015a, 2015b) and the World Bank (n.d.). The HDI is an overall measure of quality of life. It is a composite statistic of human development across three key dimensions: a long and healthy life, being knowledgeable, and having a decent standard of living.

Descriptive statistics

The following question was asked at the outset of this paper: are the aging, and soon to be aged populations, adequately preparing for old age? The following discussion highlights key findings from this study that provide insight into the financial preparedness of those living in the selected OECD and non-OECD countries.⁷

Table 1 first presents a basic description of anticipated demographic trends in aging for all countries included in the sample and ranks them according to the number and percentage of their populations that are aged 60 or older.⁸ As shown in Table 1, every country examined in this study is and will continue to experience an average increase in the age of their population. The first three columns of the table show the actual and projected population of those aged 60 or older for each country. The numbers in parentheses indicate the rank of the country. For example, among the OECD countries, the United States has the highest number of those aged 60 or older as of 2015. The United States is also expected to have the largest number of older adults in 2030 and 2050. Columns four through six represent the percentage of each country's population that is aged 60 or older. Contrary to the actual numbers of older adults, the United States is currently ranked ninth out of the 13 OECD countries based on the percentage of those aged 60 or older. The last three columns show the median age of each country's population. As of 2015, the median age of those living in the United States was 38 years.

Several other trends are worth noting from Table 1. First, the median age of those living in OECD countries is greater than the median age of those living in non-OECD countries. However, by 2050 the gap in median age among OECD and non-OECD countries is expected to shrink, and in some cases, the median age of those living in non-OECD will be greater than the median age of those in OECD countries. Third, some countries that have a comparatively low percentage of those aged 60 or older today will find that their older population will be substantially larger in 2030 and 2050. Take for example, the Republic of Korea. As of 2015, Korea had the lowest percentage of those aged 60 or older among OECD countries. By 2030, Korea will have one of the largest populations of those over age 60. Interestingly, the percent of those aged 60 or older is expected to be more stable among non-OECD countries. This implies a continual trend of median age growth in these countries.

⁷ The OECD classifications were used to generally distinguish developed countries from those that were developing.

⁸ The data presented in Table 1 were adapted from the United Nations World Population Prospects: The 2015 Revision (United Nations, 2015a, 2015b).

Figs. 1a and 1b present graphical representations of the projected trends highlighted in Table 1. Specifically, the figures illustrate how the percentage of those aged 60 or older is expected to increase between 2015 and 2050 for both OECD and non-OECD countries, respectively.⁹ The dotted line highlights the average expected trend for each set of countries. The percentage of population aging for those countries above the dotted line is expected to be higher than the average. Similarly, the percentage of population aging for those countries below the dotted line is expected to be lower than the average.

Table 2 presents the country-level indicators for old-age security. In terms of pension system characteristics, the following observations are worth noting. First, there are large discrepancies between the OECD and non-OECD countries in terms of pension system spending and assets. In general, OECD countries have higher levels of public pension spending and pension assets than non-OECD countries; however, among the OECD and non-OECD countries, the levels of pension spending and assets vary widely. In 2015, public pension spending (as a percentage of GDP) was 7.1% on average for the OECD countries and only 2.5% for the non-OECD countries. France (13.8%), Germany (13.2%), and Japan (10.2%) had the highest levels of public pension spending compared to the lowest levels of 0% and 0.1% for Colombia, Indonesia, and Singapore. Similarly, pension assets (as a percentage of GDP) in 2015 were 62.7% for the OECD countries and 13.4% for the non-OECD countries. It is also interesting to note that the old-age dependency ratio is more highly correlated with public pension spending for the non-OECD countries ($corr(X, Y) = 0.93$) than the OECD countries ($corr(X, Y) = 0.76$). Little correlation is found between the old-age dependency ratio and pension assets.

Compared to the non-OECD countries, the OECD countries also score better in terms of the overall adequacy and sustainability of their existing pension systems. The scores for the Pension Sustainability Index (PSI) and the Melbourne Mercer Global Pension Index (MMGPI) in 2014 were considerably higher on average, for the OECD countries than for the non-OECD countries (OECD: PSI = 7.2, MMGPI = 62.6; non-OECD: PSI = 3.1, MMGPI = 49.5). However, these findings should be evaluated with caution because Table 2 also shows that the OECD countries, on average, have higher GDP per capita (45,823 international dollars compared to 21,467 international dollars), higher levels of human development (HDI of 0.903 compared to 0.726), and populations with longer life expectancies (age 81.4 compared to 73.4). These factors have likely contributed to the more rapid development and advancement of the public pension systems among the OECD countries.

We now consider the indicators for aging and financial security for the most recent survey year 2014. See Tables 3 and 4 for a summary of key statistics. The indicators for the OECD countries are presented in Table 3, whereas the indicators for the non-OECD countries are presented in Table 4. With regards to Table 3, the second column shows the basic demographic profiles of those living in OECD countries. As shown, approximately 28.0% of the population, across countries, is aged 60 or older. The median age is 48 years. This suggests that although not considered old, populations in these countries are in their prime saving years. Further, nearly 52.0% are women, with the majority (64.8%) holding a secondary level of education. Not surprisingly, over 98.0% of those in OECD countries have an account at a formal financial institution. Slightly more than three-quarters of OECD residents (77.3%) report saving money in the past 12 months, but less than 50.0% are saving specifically for retirement (only 45.2% report saving for old age). On a positive note, 77.9% indicate that they would be able to come up with emergency funds if needed. When asked what the main source would be to access money in case of an emergency, the majority (67.2%) state that they would use personal savings. Other important sources of

⁹ The data in Figs. 1a and 1b were taken from the following source: United Nations (2017). World Population Prospects: The 2017 Revision, DVD Edition (<https://esa.un.org/unpd/wpp/>).

Table 1
Comparison of aging populations for selected OECD and non-OECD countries.

Country	Population aged 60 or over (thousands)			Percentage aged 60 or over			Median age (years)		
	2015	2030	2050	2015	2030	2050	2015	2030	2050
World	900 906	1 402 405	2 091 966	12.3	16.5	21.5	29.6	33.1	36.1
<i>OECD Countries</i>									
Australia	4 887 (8)	7 014 (8)	9 483 (8)	20.4 (10)	24.6 (12)	28.3 (12)	37.5	39.8	41.4
Austria	2 064 (10)	2 864 (10)	3 282 (11)	24.2 (5)	32.4 (3)	37.1 (4)	43.2	46.5	49.7
Canada	8 021 (7)	11 858 (7)	14 320 (7)	22.3 (8)	29.4 (8)	32.4 (7)	40.6	43.5	45.5
France	16 249 (4)	20 321 (4)	22 592 (5)	25.2 (3)	29.9 (7)	31.8 (8)	41.2	43.0	43.9
Germany	22 269 (3)	28 644 (3)	29 275 (3)	27.6 (2)	36.1 (2)	39.3 (3)	46.2	48.6	51.4
Ireland	861 (13)	1 267 (13)	1 792 (12)	18.4 (13)	24.4 (13)	31.0 (9)	36.9	41.3	42.6
Japan	41 873 (2)	44 808 (2)	45 637 (2)	33.1 (1)	37.3 (1)	42.5 (1)	46.5	51.5	53.3
Republic of Korea	9 325 (6)	16 501 (6)	21 002 (6)	18.5 (12)	31.4 (5)	41.5 (2)	40.6	47.5	53.9
The Netherlands	4 148 (9)	5 633 (9)	5 852 (9)	24.5 (4)	32.0 (4)	33.2 (6)	42.7	44.7	46.2
New Zealand	921 (12)	1 378 (12)	1 650 (13)	20.3 (11)	27.0 (10)	29.4 (11)	38.0	40.0	43.0
Switzerland	1 955 (11)	2 825 (11)	3 461 (10)	23.6 (6)	30.6 (6)	34.5 (5)	42.3	45.1	46.9
United Kingdom	14 889 (5)	19 521 (5)	23 159 (4)	23.0 (7)	27.8 (9)	30.7 (10)	40.0	41.9	43.3
United States	66 545 (1)	92 906 (1)	108 326 (1)	20.7 (9)	26.1 (11)	27.9 (13)	38.0	40.0	41.7
<i>Non-OECD Countries</i>									
Brazil	24 392 (3)	42 879 (3)	69 882 (3)	11.7 (5)	18.8 (5)	29.3 (5)	31.3	37.4	44.8
China	209 240 (1)	358 146 (1)	491 533 (1)	15.2 (4)	25.3 (4)	36.5 (4)	37.0	43.2	49.6
Colombia	5 226 (6)	9 721 (6)	15 169 (6)	10.8 (6)	18.3 (6)	27.6 (6)	30.0	36.4	43.4
Hong Kong SAR, China	1 581 (9)	2 670 (9)	3 334 (9)	21.7 (1)	33.6 (1)	40.9 (1)	43.2	48.6	52.7
India	116 553 (2)	190 730 (2)	330 043 (2)	8.9 (8)	12.5 (9)	19.4 (8)	26.6	31.2	37.3
Indonesia	21 194 (4)	38 957 (4)	61 896 (4)	8.2 (9)	13.2 (8)	19.2 (9)	28.4	31.9	36.5
Malaysia	2 785 (8)	5 196 (8)	9 593 (8)	9.2 (7)	14.4 (7)	23.6 (7)	28.5	34.5	40.5
Singapore	1 001 (10)	1 969 (10)	2 700 (10)	17.9 (2)	30.7 (2)	40.4 (2)	40.0	47.0	53.0
South Africa	4 209 (7)	6 283 (7)	10 061 (7)	7.7 (10)	10.5 (10)	15.4 (10)	25.7	29.3	33.9
Thailand	10 731 (5)	18 355 (5)	23 153 (5)	15.8 (3)	26.9 (3)	37.1 (3)	38.0	44.8	50.6

Source: United Nations (2015). World Population Prospects: The 2015 Revision and World Population Ageing 2015. Rankings for each country per category are in parentheses.

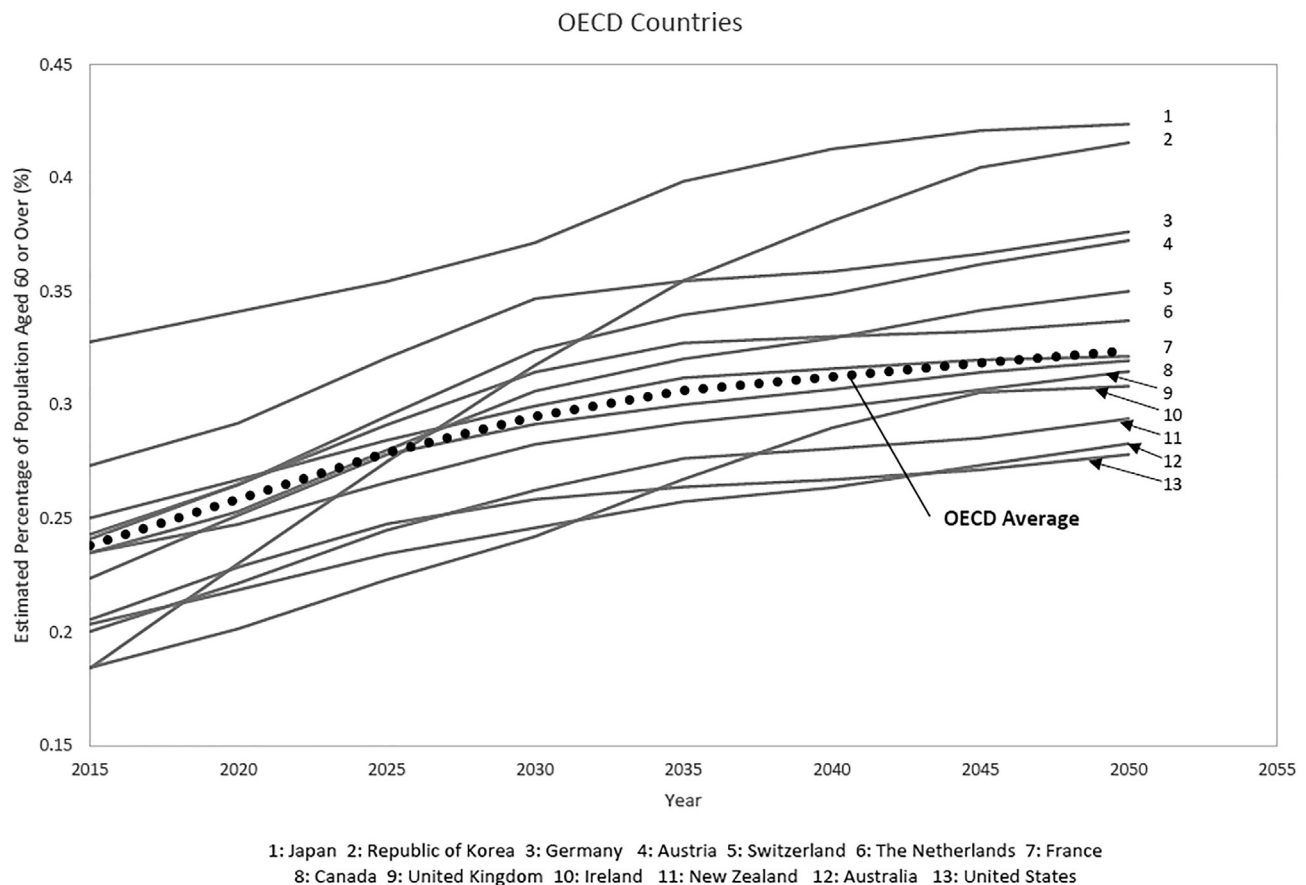
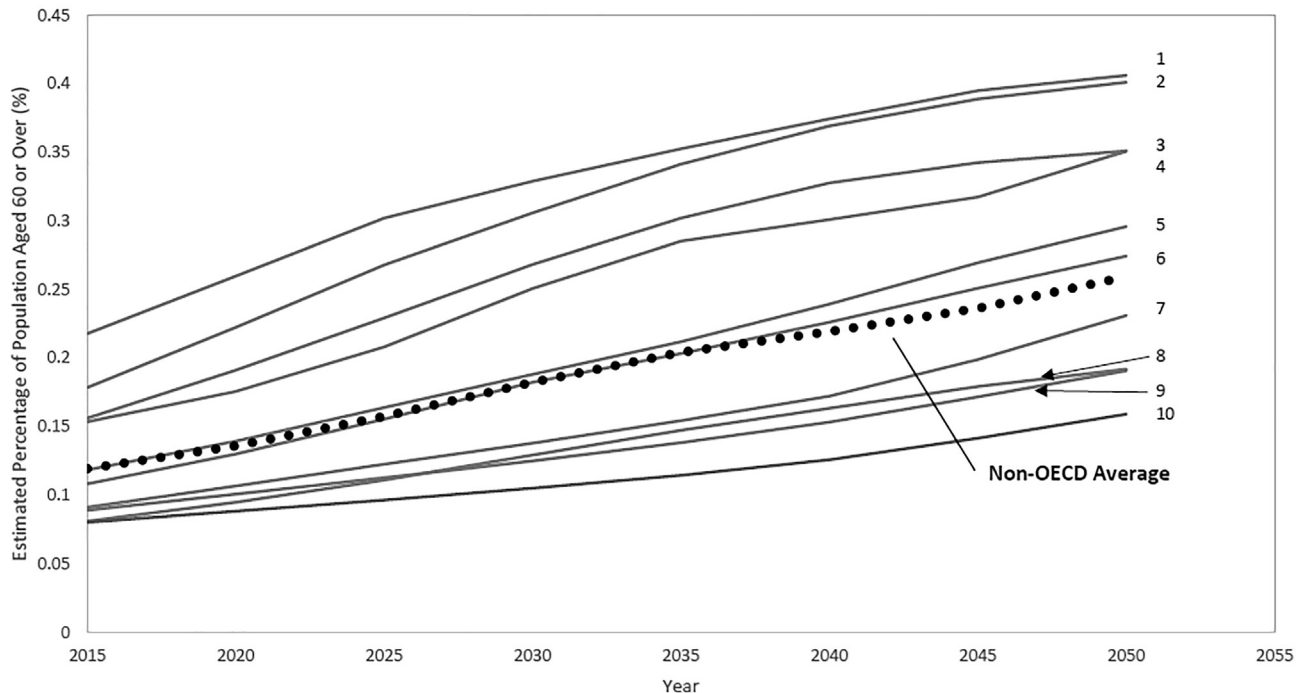


Fig. 1a. Estimated percentages of populations aged 60 or over for OECD countries (2015–2050). Source: United Nations (2017). World population prospects: The 2017 Revision, DVD Edition.

Non-OECD Countries



1: Hong Kong 2: Singapore 3: Thailand 4: China 5: Brazil 6: Colombia
7: Malaysia 8: Indonesia 9: India 10: South Africa

Fig. 1b. Estimated percentages of populations aged 60 or over for non-OECD countries (2015–2050). Source: United Nations (2017). World population prospects: The 2017 Revision, DVD Edition.

emergency funds include family or friends (11.9%), work or loan from an employer (10.9%), and financial institution or credit card (6.1%). Only 2.9% of those living in an OECD country indicate that they would use an informal lender or other source.

It is also particularly interesting to note that respondents in countries that are experiencing greater population aging (e.g., Japan, Republic of Korea, Austria, and Germany) tend to report greater saving and preparation for old age and emergencies. Further, respondents in countries such as Canada and New Zealand that have strong national strategies and educational programs to promote national savings behavior are also more likely to engage in positive behaviors (<http://www.cffc.org.nz/>).

When asked about technology usage, 59.8% report making payments online in the past 12 months. Of those who are account holders, 23.7% report using their mobile phone to make account transactions. However, these percentages vary widely across the OECD countries. Those living in Switzerland and the United Kingdom are the most likely to make online payments (74.5% and 74.0%, respectively), whereas those living in Japan are the least likely (only 36.0%). For account holders, those living in Korea and the United States are the most likely to use their mobile phones for account transactions (37.5% and 35.4%, respectively). This compares to only 6.0% of those living in Japan and 8.3% of those living in Switzerland.

Table 4 presents the same information for the non-OECD countries. Compared to those living in OECD countries, those in non-OECD countries tend to be younger and less educated. The data also show that there is a greater lack of financial inclusion within the non-OECD countries, suggesting that some in the population are likely being excluded from traditional financial services. For example, 72.1% of the non-OECD population report having a formal financial account compared to 98.4% for the OECD population. In some of the non-OECD countries, the percentage is even lower. For instance, only 44.7% of those living in Colombia have an account. In terms of savings, 63.2%

indicate that they have saved over the past 12 months, but the range in responses is quite large. Less than 30.0% of those living in Brazil indicate that they have saved, whereas over 80.0% of those living in Malaysia report saving money. Further, less than one-third of the non-OECD population report saving for old age; however, 61.9% report that they could come up with emergency funds if needed. Similar to those living in OECD countries, the majority (55.9%) would access emergency funds from personal savings; but unlike the OECD population, 27.0% would rely on family and friends to generate emergency funds. Fewer (1.9%) would use services or products offered by formal financial institutions or credit cards.

Similar to the OECD countries, the non-OECD countries with the largest growing aging populations also tend to exhibit more positive financial security behaviors (e.g., China, Hong Kong, Singapore, and Thailand). There may be some infrastructural or institutional barriers to accessing mainstream financial services in some of the other countries, especially in countries such as Colombia, India, and Indonesia. For these nations, account penetration is low; yet, they have some of the most progressive national financial inclusion strategies and agendas within the developing world. Usage of technology in the non-OECD countries is also particularly low. Only 14.0% report making online payments, and only 13.6% of account holders use their mobile phones to make account transactions. These percentages again vary widely across countries. In India, only 1.4% make online payments, whereas it is over 30% in Hong Kong and Singapore. Similarly, only 4.8% of account holders in India use their mobile phones for account transactions. The percentage is close to 26% in South Africa.

In summary, the descriptive statistics show, perhaps not surprisingly, that the non-OECD countries have considerably lower levels of financial security coupled with substantially lower levels of financial inclusion and technology usage than the OECD countries. These findings suggest that these factors are likely to be significantly associated, and more so, for the developing countries.

Table 2
Differences in old-age security across OECD and non-OECD countries.

Country	Public pension spending (as % of GDP) ^a	Pension funds' assets (as % of GDP)	Old-age dependency ratio	Pension sustainability index (PSI) ^b	Global pension index (MMGPI) ^c	% population over age 60	Life expectancy at birth	GDP per capita, PPP (current international \$)	Human development index
Data source	OECD (2015)	The World Bank (2014) & OECD (2015)	Allianz International Pensions (2015)	Allianz, 2014	Mercer Global Pension Index (2014)	United Nations (2015)	United Nations (2015)	The World Bank (n.d.)	United Nations (2014a)
<i>OECD countries</i>									
All OECD countries	7.1	62.7	26.6	7.2	62.6	23.2	81.4	45,822.7	0.903
Australia	3.5	102.3	22.7	6	79.9	20.4	82.1	46,298.7	0.933
Austria	13.2	5.8	27.9	8	52.8	24.2	81.1	48,659.0	0.881
Canada	4.3	76.2	23.7	4	69.1	22.3	81.8	45,126.5	0.902
France	13.8	0.4	29.6	6	57.5	25.2	81.9	40,151.8	0.884
Germany	10.6	16.4	32.7	7	62.2	27.6	80.7	47,099.7	0.911
Ireland	5.3	63.0	19.2	2	62.2	18.4	80.6	51,311.0	0.899
Japan	10.2	29.4	43.6	6	44.4	33.1	83.3	39,449.4	0.890
Republic of Korea	2.2	7.5	17.9	9	43.6	18.5	81.4	33,856.6	0.891
The Netherlands	5.5	184.1	27.8	10	79.2	24.5	81.3	49,055.4	0.915
New Zealand	4.9	17.9	22.5	9	n.a.	20.3	81.6	37,087.9	0.910
Switzerland	6.6	117.8	27.1	8	73.9	23.6	82.7	61,282.1	0.917
United Kingdom	5.6	104.9	28.1	9	67.6	23.0	80.5	40,745.2	0.892
United States	6.7	83.2	22.2	10	57.9	20.7	78.9	54,539.7	0.914
<i>Non-OECD Countries</i>									
All non-OECD countries	2.5	13.4	11.8	3.1	49.5	13.2	73.4	21,467.0	0.726
Brazil	7.4	14.0	11.6	2	52.4	11.7	74.1	16,045.2	0.744
China	3.4	0.9	13.1	n.a.	49	15.2	75.4	13,439.9	0.719
Colombia	0.1	20.4	10.0	7	n.a.	10.0	73.8	13,394.1	0.711
Hong Kong SAR, China	1.6 ^a	37.4	20.5	2	n.a.	21.7	83.7	55,463.7	0.891
India	2.2	0.3	8.3	4	43.5	8.9	67.5	5,663.7	0.586
Indonesia	0.0	1.7	8.2	6	45.3	8.2	68.6	10,567.0	0.684
Malaysia	3.8 ^a	57.9	8.3	7	n.a.	9.2	74.5	25,765.8	0.773
Singapore	0.0	25.6	15.2	3	65.9	17.9	82.6	83,798.6	0.901
South Africa	1.7	40.8	8.8	4	54.0	7.7	57.1	13,098.0	0.658
Thailand	2.2	6.9	14.5	1	n.a.	15.8	74.1	15,775.6	0.722

Notes: The data were adapted from multiple sources to construct country-level measures of old-age security.

^a Data on public pension spending (as% of GDP) was found for 21 of the 23 countries using the OECD publication *Pensions at a Glance 2015*. Data for Hong Kong SAR, China was found using 2006 data from the World Bank (2006) and for Malaysia using 2012 data from the World Bank.

^b The Pension Sustainability Index (PSI) is a multi-dimensional index used to measure the sustainability of 50 countries' public pension systems. Scores range from 1 to 10. Lower scores indicate pension systems which are inadequate and require substantial reform; higher scores indicate highly-developed pension systems that are more likely to be sustainable in the long run.

^c The 2014 Melbourne Mercer Global Pension Index ranks the pension systems in 25 countries using 3 sub-indices of the system's adequacy (40%), sustainability (35%), and integrity (25%). Overall index values represent a score between 0 and 100. The scores are then used to assign an overall index grade (A > 80; B + 75–80; B 65–75; C + 60–65; C 50–60; D 35–50; E < 35).

Empirical models

To better understand some of the driving factors behind financial security for aging populations, we estimate a series of probit models using the five indicators of financial security (i.e., having an account at a financial institution, saving in the last 12 months, saving for old age, ability to come up with emergency funds, and source of emergency funds). Each model is estimated separately for the OECD and non-OECD countries using the sample weights. First, we examine the “age group” effects on the probability that the household has an account at a financial institution. We then compare the results across the different “aging cohorts” for OECD and non-OECD countries. The relationship is assumed to be as follows:

$$\begin{aligned}
 Acct_{ij}^* &= \beta_0 + AgeGroups_{ij}'\beta_1 + X_{ij}'\beta_2 + CountryDummies_{ij}'\beta_3 \\
 &+ \varepsilon_{ij}, \text{ where } Acct_{ij} = 1 \text{ iff } Acct_{ij}^* > 0 \text{ and } 0 \text{ otherwise for } i = 1, \dots, I \\
 &\text{ and } j = 1, \dots, J.
 \end{aligned} \tag{1}$$

In this model, $Acct_{ij}$ is the discrete dependent variable that is equal to one if the i th respondent in the j th country has an account at a formal

financial institution and zero otherwise. $Acct_{ij}^*$ is determined by the continuous, latent variable $Acct_{ij}^*$, the actual amount held in the account. The error terms, ε_{ij} , are assumed to be distributed standard normally with mean zero and variance equal to one.

The factors that determine $Acct_{ij}^*$, and thus $Acct_{ij}$, are represented by the vector for the age groups and the vector for the country dummy variables. Note that the reference group for the age categories is *Age: 18–24*. The reference group for the country dummies is the *United States* for the OECD countries and *China* for the non-OECD countries. As [Table 1](#) shows, the United States is a young country that in large part does not face the problem of an aging population like many of the other OECD countries. China is the largest non-OECD country, and unlike the other non-OECD countries, China will experience an aging problem in the future, especially in terms of actual numbers. The vector X_{ij} includes the individual-level control variables described in the data section: gender, education, income, employment status, and government assistance.¹⁰

¹⁰ Additional demographic controls for marital status, family structure, urban/rural, and employment were collected by Gallup, Inc. However, these variables are not included in the publicly available *Global Findex* database and so were not included in the models.

Table 3
Financial security profile of households in the selected OECD countries.

	Selected OECD countries N = 12,176	Australia n = 934	Austria n = 952	Canada n = 930	France n = 933	Germany n = 947	Ireland n = 946	Japan n = 937	Republic of Korea n = 928	The Netherlands n = 948	New Zealand n = 913	Switzerland n = 944	United Kingdom n = 947	United States n = 917
Percentages														
Aged 60 or older (%)	28.0	26.8	28.2	26.3	27.9	32.4	22.7	42.3	21.8	26.2	27.9	29.9	26.7	25.6
Median age (yrs)	48.0	47.0	45.0	47.0	50.0	49.0	45.0	54.0	44.0	48.0	48.0	49.0	47.0	47.0
Female	51.7	52.5	52.3	52.9	50.9	51.0	50.0	54.0	51.0	51.0	54.3	51.3	50.9	51.0
Educ: Primary or less	7.9	4.9	4.1	7.8	4.4	4.3	7.7	11.0	18.7	6.0	8.0	19.3	4.7	2.4
Educ: Secondary	64.8	70.5	83.3	62.9	76.7	68.9	63.4	66.7	41.5	64.7	68.5	47.0	62.3	65.9
Educ: Tertiary	27.3	24.6	12.6	29.3	19.0	26.9	28.9	22.3	39.8	29.3	23.5	33.7	33.0	31.7
<i>Financial security measures</i>														
Has an account at fin institution	98.4	99.6	97.6	99.7	99.0	99.1	96.0	99.2	97.2	99.6	99.6	98.9	98.8	94.5
Saved in past 12 months	77.3	82.8	80.5	84.2	67.6	81.0	70.3	75.0	75.8	74.2	86.9	75.3	73.7	77.1
Saved for old age	45.2	42.2	49.8	54.3	32.0	58.2	32.6	46.3	45.2	32.3	54.5	49.6	43.1	47.5
Able come up w/ emergency funds	77.9	79.5	76.2	79.8	69.2	85.1	74.1	83.8	75.7	77.5	83.6	81.6	78.9	66.7
<i>Main source of emergency funds</i>														
Savings	67.2	65.3	67.7	60.7	66.1	65.7	56.8	88.6	52.8	73.1	67.7	84.2	59.2	61.6
Family or friends	11.9	10.3	15.9	9.0	16.3	9.9	19.8	5.5	18.7	9.6	7.4	8.8	15.7	10.4
Work or loan from employer	10.9	9.0	11.3	11.9	7.8	14.2	10.9	3.7	21.2	11.3	12.2	2.5	12.3	14.5
Fin institution or credit card	6.1	10.5	4.0	12.9	5.2	6.1	8.1	1.2	5.0	1.7	8.9	2.2	6.7	7.5
Informal lender or other source	2.9	3.7	0.4	5.0	2.2	3.3	2.9	0.0	1.6	3.8	3.3	1.8	5.4	4.4
Didn't know or refused to answer	1.0	1.2	0.7	0.6	2.4	0.9	1.5	1.1	0.6	0.5	0.5	0.5	0.7	1.6
<i>Technology usage</i>														
Made payments online	59.8	69.9	50.6	67.3	47.1	59.0	56.1	36.0	53.9	68.6	74.5	54.8	74.0	65.5
If an acct, made transactions using mobile phone	23.7	34.5	21.1	28.5	12.3	13.2	25.7	6.0	37.5	30.2	25.7	8.3	30.4	35.4

Notes: All summary statistics are weighted using the base sampling and post-stratification weights provided in the WB Global Findex database (Deming-Kunt et al., 2014). Responses to the “main source of emergency funds” was conditional on being able to come up with emergency funds. Similarly, making transactions using a mobile phone was conditional on having a financial account.
Source: The World Bank (2014).

Table 4
Financial security profile of households in the selected non-OECD countries.

Percentages	Selected non-OECD countries N = 13,527	Brazil n = 946	China n = 3788	Colombia n = 930	Hong Kong SAR, China n = 932	India n = 2511	Indonesia n = 839	Malaysia n = 904	Singapore n = 831	South Africa n = 895	Thailand n = 951
Aged 60 or older (%)	15.9	16.4	15.8	17.5	26.5	13.0	11.8	11.4	21.7	12.4	17.6
Median age (yrs)	40.0	39.0	41.0	39.0	46.0	35.0	38.0	36.0	45.0	35.0	43.0
Female	50.5	52.4	49.1	52.2	54.5	48.1	53.5	47.7	51.1	53.1	53.1
Educ: Primary or less	46.2	45.5	63.9	26.8	18.5	54.5	46.6	13.9	21.4	27.0	60.2
Educ: Secondary	44.3	49.9	29.5	57.4	55.0	40.8	47.5	66.3	59.6	67.6	34.2
Educ: Tertiary	9.5	4.6	6.6	15.8	26.4	4.7	5.9	19.8	19.0	5.4	5.6
<i>Financial security measures</i>											
Has an account at financial institution	72.1	72.2	80.6	41.2	97.2	54.9	39.9	83.0	97.6	72.5	79.3
Saved in past 12 months	63.2	28.6	73.9	44.7	68.0	38.8	74.2	82.0	78.5	68.5	81.4
Saved for old age	32.1	3.9	39.8	13.7	41.6	10.1	31.2	55.8	56.8	17.3	61.6
Able come up w/ emergency funds	61.9	36.6	78.4	54.3	76.8	48.9	48.0	53.7	78.9	43.4	61.9
<i>Main source of emergency funds</i>											
Savings	55.9	23.3	66.8	20.7	76.8	41.2	40.8	51.7	76.0	49.7	37.2
Family or friends	27.0	55.9	17.2	41.4	13.7	36.5	37.2	22.7	19.3	33.9	51.2
Work or loan from employer	12.3	5.0	12.5	26.9	6.8	14.8	17.0	19.7	2.6	7.0	8.5
Financial institution or credit card	1.9	12.1	0.9	4.8	0.8	1.1	0.9	1.4	1.2	2.4	2.9
Informal lender or other source	2.9	2.8	2.4	5.7	1.5	5.3	2.9	3.4	0.0	7.0	0.2
Didn't know or refused to answer	0.1	1.1	0.2	0.4	0.4	1.2	1.3	1.1	0.9	0.0	0.0
<i>Technology usage</i>											
Made payments online	14.0	9.1	19.5	6.2	37.2	1.4	4.7	20.0	31.4	8.3	4.1
If an acct, made transactions using mobile phone	13.6	5.0	18.3	6.5	17.8	4.8	4.7	10.6	19.2	25.8	5.0

Notes: All summary statistics are weighted using the base sampling and post-stratification weights provided in the WB Global Findex database (Demirgüç-Kunt et al., 2014). Responses to the “main source of emergency funds” was conditional on being able to come up with emergency funds. Similarly, making transactions using a mobile phone was conditional on having a financial account.

Source: The World Bank (2014).

Similar probit models are estimated for the other measures: (1) the probability the respondent saved in the past 12 months; (2) the probability the respondent saved specifically for old age in the past 12 months; and (3) the probability the respondent was able to come up with emergency funds within the next month if needed.¹¹ The only difference in these models is that the equations for savings and saving specifically for retirement include an additional control variable for whether the respondent had, at the time of the survey, a formal financial account. This serves as a proxy for financial inclusion and an indicator for whether the respondent is already “financially included” in the mainstream financial system. The emergency fund equation includes an additional control for whether the respondent has already been saving over the past 12 months.

An additional set of probit models are estimated to examine potential differences across countries in old-age security:

$$\begin{aligned}
 Acct_{ij}^* &= \beta_0 + AgeGroups_{ij}'\beta_1 + X_{ij}'\beta_2 + Old\ Age\ Security_{ij}'\beta_3 \\
 &+ \varepsilon_{ij}, \text{ where } Acct_{ij} = 1 \text{ iff } Acct_{ij}^* > 0 \text{ and } 0 \text{ otherwise for } i = 1, \dots, J \\
 &J \text{ and } j = 1, \dots, J.
 \end{aligned}
 \tag{2}$$

These models differ from those presented in Equation (1) in that they include a vector of country-level indicators to control for potential differences in public pension systems and other related old-age security characteristics. Specifically, the following are included in these regression models: public pension spending (as a percentage of GDP),

¹¹ Individuals are identified as being able to come up with emergency funds if they responded that it was “very possible” or “somewhat possible” to come up with the funds in the next month (77.9% for the OECD countries and 61.9% for the non-OECD countries). To test the robustness of the findings, additional models are estimated using various groupings for this categorical variable. Results are similar regardless of the groupings.

percentage of population over age 60, life expectancy at birth (in years), and GDP per capita, PPP (current international dollars). Note that we are unable to include all the old-age security indicators presented in Table 2 because several are highly correlated.¹²

A final series of probit models are estimated to better understand the determinants of the sources for emergency funds and how these sources vary across countries. Recall that conditional on having an emergency fund, respondents are asked what the main source of those funds would be: (1) personal savings, (2) family and friends, (3) work or loan from an employer, (4) formal financial institution or credit card, or (5) informal lender or other source. Respondents can only choose one source (their *main* source). Individual probit models are estimated for each of the five sources.¹³ The models are defined such that:

¹² For example, *public pension spending (as a percentage of GDP)* is highly correlated with *pension funds' assets (as a percentage of GDP)*. Similarly, the *percentage of population over age 60* and *life expectancy at birth* is also highly correlated with the *old-age dependency ratio* and the *human development index (HDI)*. Also, there is missing information for the pension indices for some of the countries. For this reason, we exclude the *PSI* and *MMGPI* as well. However, additional models are estimated using various combinations of the old-age security indicators. The specifications presented in this paper reflect the general findings of the other specifications that include different combinations of the old-age security variables.

¹³ To check the robustness of our findings, a multinomial logit was also estimated. We were able to estimate this model because respondents were only allowed to choose one source (their main source) such that the dependent variable ranged from 1 to 5 depending on which source was selected. The results for the multinomial logit were consistent to those found for the individual probit models. However, for some countries, only a small percentage of respondents reported that they used as their main source of emergency funds either “formal financial institution or credit card” or “informal lender or other source.” This made it difficult to generate and interpret some of the multinomial results, especially with regards to the country dummies. For this reason, we chose to report the results for the probit models.

$$\begin{aligned} \text{Source}_{ijk}^* &= \beta_0 + \text{AgeGroups}'_{ijk}\beta_1 + X'_{ijk}\beta_2 + \text{CountryDummies}'_{ijk}\beta_3 \\ &+ \varepsilon_{ijk}, \text{ where } \text{Source}_{ijk} = 1 \text{ iff } \text{Source}_{ijk}^* > 0 \text{ and } 0 \text{ otherwise for } i \\ &= 1, \dots, I, j = 1, \dots, J, \text{ and } k = 1, \dots, K. \end{aligned} \quad (3)$$

In this model, Source_{ijk} is the discrete dependent variable that is equal to one if the i th respondent in the j th country reported that their main source for emergency funds was the k th source and zero otherwise.¹⁴ Source_{ijk} is determined by the continuous, latent variable Source_{ijk}^* , the actual amount of funds the respondent could obtain from that source in an emergency. The error terms, ε_{ijk} , are again assumed to be distributed standard normally with mean zero and variance equal to one. The factors that determine Source_{ijk} are represented by the same factors included in the previous probit models for financial security.

Results

Probit results for financial security measures for OECD countries

Table 5 presents the marginal effects for the probits for households' financial security decisions according to their OECD status. Several significant associations were found for the key independent variables and the first four measures of financial security (i.e., having an account at a formal financial institution, saving in the last 12 months, saving for old age, and the ability to come up with emergency funds). We first discuss the findings for the OECD countries, and then we compare those findings with those for the non-OECD countries.

With regards to the OECD countries, positive and significant age effects are the norm for all the models except the second model for “saved in the past 12 months.” For the other three models, the marginal effects are most significant and largest for saving for old age. Not surprisingly, the findings follow the life-cycle theory such that the older age groups are more likely to be saving for old age up until the point of retirement. Savings then decreases for those aged 65 or older. The magnitudes of the aging effects also tend to be larger for the older age groups. For example, those living in OECD countries aged 65 or older are 5.3 percentage points more likely to have an account than those aged 24 or younger and 25.4 percentage points more likely to be saving for old age. Second, the marginal effects are, in general, largest for the third model (saving for old age). Those living in the OECD countries aged 35–44 are 29.1 percentage points more likely to be saving for old age than the youngest age group (aged 18 to 24). Third, saving specifically for old age is significantly more likely to be related to age than saving in general. In fact, a negative relationship exists between general savings behavior and age for those living in the OECD countries. Those aged 25–34 are significantly less likely than those aged 18–24 to have saved in the past 12 months (7.3 percentage points less likely). A plausible explanation for this negative finding might be that the older age groups, compared to the youngest age group, may be in life-cycle stages that require higher levels of spending and thus lower levels of saving. They may, for example, be paying down debts, starting families, or allocating income for other purposes.

With regards to the other control variables, gender is negative and highly significant for the third and fourth models. Women are significantly less likely to save for retirement than men and less able to come up with emergency funds: 3.3 percentage points for both models. When considering the aging problems facing women, this gender gap has potentially significant retirement planning implications. The effects for education, income, and employment tend to be positive and significant across the models. Specifically, those living in the OECD countries with more education and income are more likely to have an account, be saving, saving for retirement, and able to come up with emergency funds, as are those with paid employment and those who

were working in the public sector. Those receiving government transfers are also significantly more likely to have an account, but less likely to be saving for retirement and to be able to come up with emergency funds. This is perhaps not surprising since social safety nets may decrease individuals' perceived need to save for retirement.

It is worth noting that some of the largest and most significant positive effects are found for the factors related to financial inclusion. Those who have an account with a formal financial institution are 22.2 percentage points more likely to be saving in general and 18.4 percentage points to be saving for retirement. Not surprisingly, those who have already been saving money during the past 12 months have a higher likelihood of being able to come up with emergency funds if needed (26.3 percentage points more likely).¹⁵

In terms of country effects, a few findings are also worth noting. First, those living in other OECD countries, compared to the United States, are more likely to have an account with a financial institution. The marginal effects, however, are relatively small, suggesting little difference across OECD countries in terms of account ownership. This is most likely due to the fact that nearly everyone across the OECD countries has an account with a formal financial institution. For this reason, readers need to be somewhat cautious in interpreting the results for account ownership for the OECD countries. The results from the limited variation in the dependent variable could simply be driven by observations in those countries where there is more variation. Still, it is useful to run this model for the OECD countries to compare the findings for the non-OECD countries, where there is considerably more variation in account ownership.

Another key difference is that those living in other countries also have a higher probability of being able to come up with emergency funds. These marginal effects are relatively large, especially for countries with greater population aging such as Japan and Germany. Those living in Japan and Germany are 12.7 and 12.3 percentage points more likely, respectively, to be able to come up with emergency funds compared to those living in the United States. The remaining country-specific effects do not follow a clear pattern; however, country-specific effects do significantly matter. With regards to general savings, those living in Australia, Austria, Canada, Germany, and New Zealand are significantly more likely to have saved in the past 12 months, while those living in France and Ireland are significantly less likely. Finally, those living in Austria, Canada, Germany, and New Zealand are significantly more likely to be saving for old age, whereas those living in France, Ireland, the Netherlands, and United Kingdom are less likely than those in the United States. Some of these country-specific effects are likely reflecting differences across countries in national pension systems and other institutional social safety nets that we will examine in our next set of models.

Comparison of probit results for financial security measures for non-OECD countries

In comparing the results for the OECD and non-OECD countries, the findings presented in Table 5 are fairly similar. In general, financial security is again found to be significantly and positively related to age, education, income, employment, government transfers, and financial inclusion. There are, however, a few notable differences for the non-OECD countries. One difference is that the marginal effects are considerably larger for the non-OECD countries, especially for the models

¹⁴ Please note that no Japanese respondents reported using “informal lenders or other sources” as their main source of emergency funds.

¹⁵ Other models, not presented in this paper, accounted for technological usage by including a control for “made online payments.” The results showed a positive and significant relationship between financial security and making online payments. In particular, those making online payments were significantly more likely to have saved in the past 12 months and to be saving for old age. However, the direction of the effect was uncertain since it could be the case that those with an account may also be more likely to make digital payments. Given the potential for reverse causality, the results were not included in the paper, but are available from the authors upon request.

Table 5
 Probit results for households' financial security decisions for OECD and non-OECD countries.

VARIABLES	(1) Has an account at fin institution		(2) Saved in past 12 months	
	OECD	Non-OECD	OECD	Non-OECD
Age: 25–34	0.0020** (0.0010)	0.0873*** (0.0148)	−0.0728*** (0.0258)	0.0737*** (0.0199)
Age: 35–44	0.0036*** (0.0011)	0.0967*** (0.0149)	−0.0339 (0.0232)	0.0864*** (0.0199)
Age: 45–54	0.0037*** (0.0011)	0.0685*** (0.0153)	−0.0712*** (0.0233)	0.0471** (0.0204)
Age: 55–64	0.0039*** (0.0011)	0.0298* (0.0179)	−0.0851*** (0.0243)	0.0115 (0.0221)
Age: ≥ 65	0.0053*** (0.0013)	0.0180 (0.0212)	−0.0936*** (0.0248)	−0.0679** (0.0265)
Female	0.0018* (0.0010)	−0.0492*** (0.0099)	−0.0041 (0.0093)	−0.0145 (0.0120)
Education: Secondary	0.0089*** (0.0035)	0.1375*** (0.0115)	0.1001*** (0.0199)	0.0585*** (0.0146)
Education: Tertiary	0.0063*** (0.0017)	0.1862*** (0.0117)	0.1570*** (0.0152)	0.1189*** (0.0217)
Household income per capita: Second 20%	0.0010 (0.0010)	0.0471*** (0.0137)	0.0360*** (0.0137)	0.0306* (0.0175)
Household income per capita: Third 20%	0.0033*** (0.0010)	0.0748*** (0.0130)	0.0919*** (0.0121)	0.1241*** (0.0164)
Household income per capita: Fourth 20%	0.0036*** (0.0011)	0.1139*** (0.0126)	0.1084*** (0.0117)	0.1526*** (0.0165)
Household income per capita: Top 20%	0.0028*** (0.0010)	0.1575*** (0.0120)	0.1446*** (0.0109)	0.2029*** (0.0159)
Paid employment	0.0109*** (0.0028)	0.1015*** (0.0109)	0.1142*** (0.0118)	0.0898*** (0.0141)
Works in public sector	0.0029** (0.0013)	0.0869*** (0.0225)	0.0689*** (0.0136)	−0.0233 (0.0265)
Received government transfer	0.0044*** (0.0010)	0.1250*** (0.0105)	−0.0098 (0.0109)	0.0311** (0.0154)
Has account at fin institution	.	.	0.2216*** (0.0580)	0.2272*** (0.0149)
Saved in past 12 months
Australia [Brazil]	0.0041*** (0.0010)	−0.1188*** (0.0216)	0.0555** (0.0219)	−0.4800*** (0.0187)
Austria [Colombia]	0.0028*** (0.0008)	−0.5112*** (0.0230)	0.0514** (0.0216)	−0.2573*** (0.0258)
Canada [Hong Kong]	0.0041*** (0.0010)	0.1776*** (0.0133)	0.0673*** (0.0210)	−0.1534*** (0.0247)
France [India]	0.0036*** (0.0009)	−0.2599*** (0.0190)	−0.0845*** (0.0291)	−0.3237*** (0.0193)
Germany [Indonesia]	0.0038*** (0.0009)	−0.4918*** (0.0230)	0.0466** (0.0212)	0.0924*** (0.0224)
Ireland [Malaysia]	0.0017* (0.0009)	−0.0991*** (0.0277)	−0.0499* (0.0272)	0.0482* (0.0264)
Japan [Singapore]	0.0038*** (0.0009)	0.1747*** (0.0134)	0.0020 (0.0245)	−0.0147 (0.0267)
Republic of Korea [South Africa]	0.0031*** (0.0008)	−0.1940*** (0.0255)	0.0123 (0.0250)	−0.0652** (0.0260)
The Netherlands [Thailand]	0.0038*** (0.0008)	−0.0127 (0.0207)	−0.0374 (0.0255)	0.1126*** (0.0219)
New Zealand	0.0041*** (0.0010)	.	0.0938*** (0.0190)	.
Switzerland	0.0036*** (0.0009)	.	−0.0044 (0.0245)	.
United Kingdom	0.0037*** (0.0009)	.	−0.0380 (0.0273)	.
Observations	12,176	13,527	12,176	13,527
Pseudo R2	0.2540	0.2320	0.1080	0.1960

VARIABLES	(3) Saved for old age		(4) Able to come up w/ emergency funds	
	OECD	Non-OECD	OECD	Non-OECD
Age: 25–34	0.1631*** (0.0277)	0.1800*** (0.0228)	0.0207 (0.0186)	0.0483** (0.0202)
Age: 35–44	0.2906*** (0.0243)	0.2970*** (0.0230)	0.0635*** (0.0156)	0.0724*** (0.0201)
Age: 45–54	0.2732***	0.3325***	0.0955***	0.0785***

(continued on next page)

Table 5 (continued)

VARIABLES	(3) Saved for old age		(4) Able to come up w/ emergency funds	
	OECD	Non-OECD	OECD	Non-OECD
Age: 55–64	(0.0242) 0.2985***	(0.0233) 0.3586***	(0.0143) 0.1041***	(0.0201) 0.0485**
Age: ≥ 65	(0.0238) 0.2538***	(0.0250) 0.3423***	(0.0138) 0.1489***	(0.0224) 0.0366
Female	(0.0261) −0.0329***	(0.0286) 0.0071	(0.0128) −0.0327***	(0.0247) −0.0426***
Education: Secondary	(0.0115) 0.0795***	(0.0109) 0.0328**	(0.0093) 0.1384***	(0.0119) 0.1348***
Education: Tertiary	(0.0258) 0.1437***	(0.0139) 0.0487**	(0.0206) 0.1882***	(0.0141) 0.2336***
Household income per capita: Second 20%	(0.0268) 0.0436**	(0.0221) 0.0315*	(0.0135) 0.0470***	(0.0158) 0.0979***
Household income per capita: Third 20%	(0.0206) 0.0902***	(0.0185) 0.1043***	(0.0128) 0.0983***	(0.0166) 0.1757***
Household income per capita: Fourth 20%	(0.0197) 0.1332***	(0.0195) 0.1431***	(0.0114) 0.1313***	(0.0155) 0.2444***
Household income per capita: Top 20%	(0.0194) 0.1946***	(0.0200) 0.1452***	(0.0104) 0.1403***	(0.0145) 0.2981***
Paid employment	(0.0190) 0.0941***	(0.0208) 0.0218*	(0.0105) 0.0510***	(0.0130) 0.0399***
Works in public sector	(0.0142) 0.0849***	(0.0127) 0.0300	(0.0118) −0.0025	(0.0139) 0.0025
Received government transfer	(0.0181) −0.0727***	(0.0227) 0.0004	(0.0152) −0.0677***	(0.0238) −0.0280*
Has account at fin institution	(0.0134) 0.1835***	(0.0144) 0.1538***	(0.0115) .	(0.0159) .
Saved in past 12 months	(0.0535) .	(0.0125) .	0.2633*** (0.0139)	0.2438*** (0.0131)
Australia [Brazil]	−0.0472 (0.0295)	−0.2833*** (0.0074)	0.1068*** (0.0146)	−0.4112*** (0.0211)
Austria [Colombia]	0.0562* (0.0292)	−0.1837*** (0.0142)	0.0873*** (0.0157)	−0.3002*** (0.0248)
Canada [Hong Kong]	0.0696** (0.0294)	−0.0437** (0.0182)	0.1020*** (0.0148)	−0.0920*** (0.0270)
France [India]	−0.1684*** (0.0268)	−0.2390*** (0.0110)	0.0430** (0.0189)	−0.2867*** (0.0205)
Germany [Indonesia]	0.1034*** (0.0295)	−0.0042 (0.0212)	0.1234*** (0.0126)	−0.3971*** (0.0210)
Ireland [Malaysia]	−0.1340*** (0.0277)	0.1589*** (0.0255)	0.0906*** (0.0151)	−0.4234*** (0.0228)
Japan [Singapore]	−0.0219 (0.0289)	0.1009*** (0.0242)	0.1268*** (0.0126)	−0.0860*** (0.0272)
Republic of Korea [South Africa]	−0.0004 (0.0301)	−0.1780*** (0.0136)	0.0938*** (0.0154)	−0.4463*** (0.0207)
The Netherlands [Thailand]	−0.1629*** (0.0256)	0.2200*** (0.0241)	0.0972*** (0.0141)	−0.2683*** (0.0252)
New Zealand	0.0696** (0.0290)	.	0.1269*** (0.0122)	.
Switzerland	0.0055 (0.0288)	.	0.1243*** (0.0129)	.
United Kingdom	−0.0578** (0.0292)	.	0.0981*** (0.0157)	.
Observations	12,176	13,527	12,176	13,527
Pseudo R2	0.0893	0.1950	0.1860	0.2220

Notes: All probits are weighted using the base sampling and post-stratification weights provided in the WB Global Findex database (Demirgüç-Kunt et al., 2014). Marginal effects are reported for each model, and robust standard errors are in parentheses. Omitted categories include: Age: 18–24; Education: Primary or less; Household income per capita: Bottom 20%; Country: United States (OECD) and China (non-OECD). For each measure, the country dummies not in parentheses are included in the OECD models, while the country dummies in parentheses are included in the non-OECD models. ***p < .01, **p < .05, *p < .10.

related to having an account and being able to come up with emergency funds. This suggests that differences in socio-economic status and financial access are likely to matter even more for those living in the non-OECD countries, such that financially vulnerable populations in the developing world are at even greater risk for financial insecurity. It may be particularly difficult for vulnerable populations to gain access to the formal financial markets and build long-run financial security.

Among the OECD countries, gender is only a marginally significant predictor of having a formal bank account. However, for the non-OECD

countries, gender is significant and negative, with women being 4.9 percentage points less likely to have a financial account than men. Women are also 4.3 percentage points less likely to be able to access emergency funds. These findings are consistent with studies that examine account ownership and find evidence of a gender gap for developing countries, with less of a gap for developed countries, especially highly-developed economies (e.g., Demirgüç-Kunt et al., 2013, 2014; Swamy, 2014). The research often points to women having less access to financial markets and lower levels of financial inclusion

within developing areas. Evidence suggests this gap may also be partially related to a marital effect, where married women in developing countries may be more likely to be saving via their spouses or other family members' financial accounts. They may also be more reliant on their spouse or other family members for financial support during retirement and in the case of emergencies. However, even after controlling for marital status, research still finds a considerable gender gap (e.g., Demirgüç-Kunt et al., 2013). Unfortunately, we are unable to control for marital status to check for this possibility. Sociocultural and gender norms, legal barriers, gender discrimination, and lack of financial knowledge and experience have also been found to prevent some women from accessing important financial resources (e.g., Demirgüç-Kunt et al., 2013; Lyons & Contreras, 2017).

Also, note that compared to the OECD countries, the marginal effects for the non-OECD countries for aging and income are larger and more significant in general across the models. The older age groups are significantly more likely than the youngest age group (aged 18–24) to have an account (between 3.6 and 10.6 percentage points) and to have saved in the past 12 months (between 6.4 and 10.0 percentage points). Again, these effects are not surprising as they reflect the life-cycle pattern of savings behavior. However, the magnitudes of the effects are noteworthy as they are considerably larger than for the OECD countries. A notable difference is also apparent when comparing the results for saving in general to those for saving for old age. The marginal effects for the age groups are at least twice as large in size for the non-OECD countries. For example, compared to the youngest age group (aged 18–24), those who are older than 25 years of age are between 18.0 and 35.9 percentage points more likely to report saving for retirement compared to only 4.7 and 8.6 percentage points for saving in general. This is excluding the oldest age group (aged 65 or older). Also for the non-OECD countries, those in the top 20% of their country's income distribution are 20.3 percentage points more likely than those in the bottom 20% to be saving and 29.8 percentage points more likely to have an emergency fund (compared to only 14.5 and 14.0 percentage points, respectively, for the OECD countries).

Similar to the OECD countries, financial inclusion is a significant predictor of financial security. The magnitudes of the effects are also similar. Those living in non-OECD countries who report having a formal financial account are 22.7 percentage points more likely to be saving in general and 15.4 percentage points more likely to be saving for old age. This is compared to 22.2 and 18.4, respectively, for the OECD countries. Policies designed to prompt participation in the mainstream financial system may help to promote savings behavior and lead to overall improvements in financial security, especially in the developing world.¹⁶

Finally, with regards to country-specific effects, those living in Colombia and Indonesia are the least likely, compared to those living in China, to have a formal financial account, while those living in Hong Kong and Singapore are more likely to have an account. Those living in Brazil and India are the least likely to be saving, with the marginal effects being especially large (48.0 and 32.4 percentage points, respectively). Brazil and India are also the least likely to be saving for old age (28.3 and 23.9 percentage points, respectively). Those living in the Southeast Asian countries of Indonesia, Malaysia, Singapore, and Thailand tend to be more likely to be engaging in savings behaviors compared to those living in China. The ability to obtain emergency funds for those living in all the non-OECD countries (Brazil, Colombia, Hong Kong, India, Indonesia, Malaysia, Singapore, South Africa, and

Thailand) is significantly lower than for those living in China. The marginal effects are also quite large for all the countries. For instance, Brazilians, Malaysians, and South Africans are at least 40.0 percentage points less likely than the Chinese to be able to come up with emergency funds. These large differences across the non-OECD countries again emphasize how important it is to have a deeper understanding of the individual countries, their institutional systems and infrastructures, as well as social and cultural norms. These are factors not accounted for in the models. Yet, they are likely being captured in the country-specific effects.

Country-level macroeconomic indicators and old-age security characteristics

Table 6 presents the findings from the models that include country-level indicators to control for potential differences in public pension systems and other related old-age security characteristics. The most notable finding is that the macroeconomic indicators appear to have a larger and more significant effect on the financial security of the non-OECD countries than the OECD countries. Specifically, those living in non-OECD countries with higher levels of public pension spending (as a percentage of GDP) are significantly more likely to have a financial account, while they are significantly less likely to have saved and to be able to come up with emergency funds. As previously mentioned, improvements in public pension systems and other social safety nets, especially in developing countries, may decrease individuals' perceived need to save for old age. Further, those living in non-OECD countries with higher percentages of the population over age 60 are also significantly more likely to have a financial account, to be saving, and to be able to come up with emergency funds. However, those living in non-OECD countries with higher life expectancy rates are less likely to have an account and to have saved in the past 12 months, but they are significantly more likely to be saving for old age and to have access to emergency funds if needed.¹⁷ These findings are perhaps not surprising since the developing countries have more inadequate pension systems. Households are aware that they will need to rely on themselves or family and friends for old-age security.¹⁸ Higher levels of GDP per capita increase the probability of having a financial account and savings in general and for old age, but decrease the probability of being able to come up with emergency funds. This could be because those living in the non-OECD countries tend to be more reliant on family and friends as their main source for emergency funds.

For those living in the OECD countries, the macroeconomic

¹⁷ One could argue that those living in non-OECD countries may not have an account and may be saving less because accounts may not be accessible in the area where they are living. Thus, the “percentage of the population aged 60 and over” and “life expectancy at birth” could be proxying for a lack of financial institution development rather than aging. While this is possible since we see “life expectancy at birth” is negatively associated with account ownership and savings behavior, we also see that the “percentage of the population aged 60 and over” is positively related. Moreover, the marginal effects are larger, outweighing the negative effects associated with “life expectancy at birth.” Further, evidence suggests that this is unlikely due to the rapid expansion of digital finance which has made it possible now to access numerous financial services and products in remote areas, especially in developing countries (G20 Global Partnership for Financial Inclusion (GPII), 2017a,b; Lewis et al., 2017; UNSGSA, 2017; The Better Than Cash Alliance, 2017; Visa, 2017).

¹⁸ Readers should be somewhat cautious when evaluating this argument. It could be that households living in less developed countries depend more on informal elderly care (family and spouse care for the elderly) and that this reliance in the non-OECD countries could therefore dampen the gap between the OECD and non-OECD countries in retirement preparedness. Research, however, does not find significant and outstanding differences among the selected OECD and non-OECD countries in general (e.g., Colombo et al., 2011; United Nations, 2017; Yoo et al., 2004). In fact, almost all countries in the coming years will experience a severe dependency ratio decrease (ratio of population aged 20–64 per population 65 and over), except for India, Indonesia, and South Africa. The potential availability of spousal caregiving is also expected to decrease in almost all countries, except South Africa and Thailand. Therefore, the evidence suggests that society's burden of elder care (formal and informal) will be increased both in the OECD and the non-OECD countries.

¹⁶ Additional models were estimated for the non-OECD countries that accounted for technology usage. Similar to the OECD countries, those living in non-OECD countries who had experience making online payments were also more likely to be saving in general and specifically for retirement. While these findings suggest that digital finance, especially related to online and mobile technologies, could play a key role in improving financial security, readers again need to be cautious in interpretation because of the potential for reverse causality. While not included in the paper, these results also are available upon request.

Table 6
 Probit results for households' financial security decisions related to country-level differences in old-age security.

VARIABLES	(1) Has an account at fin institution		(2) Saved in past 12 months		(3) Saved for old age		(4) Able to come up w/ emergency funds	
	OECD	Non-OECD	OECD	Non-OECD	OECD	Non-OECD	OECD	Non-OECD
Age: 25–34	0.0023** (0.0011)	0.0869*** (0.0151)	−0.0728*** (0.0258)	0.0797*** (0.0185)	0.1581*** (0.0272)	0.1703*** (0.0217)	0.0220 (0.0186)	0.0484** (0.0200)
Age: 35–44	0.0042*** (0.0012)	0.0960*** (0.0153)	−0.0365 (0.0233)	0.0901*** (0.0189)	0.2821*** (0.0239)	0.2736*** (0.0218)	0.0631*** (0.0157)	0.0719*** (0.0199)
Age: 45–54	0.0043*** (0.0012)	0.0663*** (0.0157)	−0.0745*** (0.0233)	0.0443** (0.0196)	0.2637*** (0.0237)	0.2990*** (0.0221)	0.0959*** (0.0143)	0.0724*** (0.0199)
Age: 55–64	0.0046*** (0.0012)	0.0282 (0.0183)	−0.0850*** (0.0243)	0.0040 (0.0215)	0.2883*** (0.0233)	0.3163*** (0.0240)	0.1034*** (0.0139)	0.0401* (0.0223)
Age: ≥65	0.0062*** (0.0015)	0.0141 (0.0214)	−0.0917*** (0.0246)	−0.1100*** (0.0263)	0.2476*** (0.0254)	0.2585*** (0.0278)	0.1496*** (0.0129)	0.0271 (0.0245)
<i>Country-level indicators</i>								
Public pension spending (as % of GDP)	−0.0004* (0.0002)	0.0260*** (0.0026)	−0.0028 (0.0019)	−0.0297*** (0.0029)	−0.0028 (0.0022)	−0.0178*** (0.0026)	−0.0064*** (0.0018)	−0.0112*** (0.0029)
% population over age 60	0.0006** (0.0003)	0.0451*** (0.0022)	−0.0000 (0.0019)	0.0194*** (0.0026)	0.0046** (0.0023)	0.0064*** (0.0025)	0.0047** (0.0019)	0.0394*** (0.0026)
Life expectancy at birth (in years)	0.0021*** (0.0007)	−0.0128*** (0.0014)	0.0052 (0.0055)	−0.0090*** (0.0017)	−0.0101 (0.0065)	0.0059*** (0.0016)	0.0243*** (0.0054)	0.0061*** (0.0016)
GDP per capita, PPP (current international \$)	−0.0051 (0.0038)	0.0805*** (0.0113)	−0.0236 (0.0305)	0.0647*** (0.0135)	−0.0202 (0.0365)	0.0557*** (0.0120)	0.0070 (0.0312)	−0.1395*** (0.0129)
Observations	12,176	13,527	12,176	13,527	12,176	13,527	12,176	13,527
Pseudo R2	0.2370	0.2150	0.0944	0.1320	0.0685	0.1190	0.1800	0.2020

Notes: All probits are weighted using the base sampling and post-stratification weights provided in the WB Global Findex database (Demirgüç-Kunt et al., 2014). Marginal effects are reported for each model, and robust standard errors are in parentheses. The other control variables are included in each model, and the omitted categories are consistent with the previous estimations.

***p < .01, **p < .05, *p < .10.

indicators are considerably less significant, except with regards to the fourth model related to emergency funds. Those living in OECD countries with higher levels of public pension spending are significantly less likely to be able to come up with emergency funds, while those living in countries with larger aging populations and/or with higher life expectancy rates are significantly more likely. For the other models, the results are somewhat mixed. Those living in OECD countries with larger aging populations are more likely to have a financial account and to be saving for old age. However, the magnitude of the effect for having an account is negligible (only 0.06 percentage points), while the effect on saving in general is insignificant. Those living in countries with higher life expectancy rates are significantly more likely to have a financial account, but the effect for saving in general was insignificant as was the effect for saving for old age.

Probit results for main source of emergency funds

Table 7 presents the probit results for the main source of emergency funds. Again, we first discuss the results for the OECD countries and then compare those findings to those for the non-OECD countries. Recall that those who report being able to come up with emergency funds are then asked to report the main source of how they would come up with those funds. The majority of respondents report that the main source would be personal savings or family and friends. Recall also that the OECD countries are more likely than the non-OECD countries to report personal savings as the main source, whereas the non-OECD are more likely to report family or friends. For these reasons, particular emphasis is placed on reporting the findings related to the first two sources.

The key findings for the OECD countries suggest that the profile of respondents who use personal savings as their main source of emergency funds is significantly different from the profile of those who would use family or friends as the main source. As shown in Table 7, those who are likely to use personal savings as their main source are relatively older, more educated, and have higher incomes. They are also more likely to have saved in the past 12 months. Those who use family

or friends as their main source of emergency funds are younger, less educated, with lower incomes. They are less likely to have paid employment, and they are less likely to be savers. They are more likely, however, to be women. These results have important implications for public policy related old-age security. Those who are more likely to rely on family or friends in an emergency may not be able to rely on them in the future as populations age and family and friends must also consider more carefully their own financial security.

Further, it is interesting to note that women may be particularly at risk. They are the one group that is significantly more likely to use family or friends as their main source by 2.8 percentage points. Women are significantly less likely to rely on work or a loan from an employer. They are also less likely to turn to formal financial institutions or their credit cards and to use an informal lender or other source. However, these marginal effects are relatively smaller, ranging from 1.5 to 1.0 percentage points.

A few country-specific effects are also worth noting. First, those living in Austria, France, Japan, the Netherlands, and Switzerland are significantly more likely to use personal savings as their main source for emergency funds compared to those living in the United States. Further, the country-specific effects are largest for personal savings compared to the other sources. The largest marginal effects are found for Japan and Switzerland, as they are 25.8 and 22.2 percentage points more likely to use personal savings than those residing in the United States. Given these large effects, it should not be surprising that Japan and Switzerland are also significantly less likely to use all other sources as their main means for obtaining emergency funds. In fact, none of the respondents in Japan even report using an informal lender or other source.

With regards to the non-OECD countries, the results for the control variables are quite similar to those for the OECD countries, and the factors related to using personal savings and family or friends are again found to be moving in opposite directions. For example, age effects are positive and significant for personal savings, while they are negative for family or friends. Gender effects are also similar to those for the OECD countries; the magnitude of the effects, however, are larger. Females

Table 7
 Probit results for main source of emergency funds for OECD and non-OECD countries.

VARIABLES	(1) Personal savings		(2) Family or friends		(3) Work or loan from employer	
	OECD	Non-OECD	OECD	Non-OECD	OECD	Non-OECD
	Age: 25–34	0.1100*** (0.0237)	0.1343*** (0.0259)	−0.0514*** (0.0101)	−0.1404*** (0.0178)	−0.0208 (0.0129)
Age: 35–44	0.1265*** (0.0221)	0.1766*** (0.0259)	−0.0890*** (0.0079)	−0.1858*** (0.0167)	−0.0105 (0.0130)	0.0303* (0.0179)
Age: 45–54	0.1514*** (0.0211)	0.1586*** (0.0261)	−0.1027*** (0.0077)	−0.1568*** (0.0171)	−0.0152 (0.0125)	0.0119 (0.0170)
Age: 55–64	0.2165*** (0.0181)	0.1780*** (0.0277)	−0.1108*** (0.0067)	−0.1590*** (0.0167)	−0.0493*** (0.0101)	0.0202 (0.0206)
Age: ≥ 65	0.2693*** (0.0180)	0.1071*** (0.0333)	−0.1281*** (0.0074)	−0.1055*** (0.0218)	−0.0906*** (0.0094)	0.0242 (0.0240)
Female	0.0109 (0.0121)	0.0052 (0.0160)	0.0283*** (0.0077)	0.0494*** (0.0133)	−0.0150** (0.0070)	−0.0353*** (0.0090)
Education: Secondary	0.0493 (0.0309)	0.0625*** (0.0204)	−0.0423** (0.0191)	−0.0471*** (0.0165)	0.0092 (0.0215)	0.0121 (0.0121)
Education: Tertiary	0.0755** (0.0298)	0.1404*** (0.0265)	−0.0479*** (0.0160)	−0.0952*** (0.0202)	0.0050 (0.0227)	−0.0182 (0.0145)
Household income per capita: Second 20%	0.0271 (0.0217)	0.0668* (0.0293)	−0.0052 (0.0128)	−0.0628*** (0.0217)	−0.0222* (0.0115)	0.0321 (0.0200)
Household income per capita: Third 20%	0.0589*** (0.0202)	0.0667** (0.0283)	−0.0205* (0.0118)	−0.0633*** (0.0216)	−0.0248** (0.0111)	0.0285 (0.0182)
Household income per capita: Fourth 20%	0.0757*** (0.0199)	0.0776*** (0.0279)	−0.0395*** (0.0107)	−0.0687*** (0.0215)	−0.0177 (0.0112)	0.0385** (0.0184)
Household income per capita: Top 20%	0.0831*** (0.0196)	0.0838*** (0.0281)	−0.0448*** (0.0106)	−0.0732*** (0.0221)	−0.0070 (0.0119)	0.0159 (0.0168)
Paid employment	−0.0081 (0.0155)	−0.0538*** (0.0184)	−0.0263*** (0.0100)	−0.0576*** (0.0152)	0.0447*** (0.0084)	0.1020*** (0.0114)
Works in public sector	−0.0394** (0.0183)	0.0120 (0.0305)	−0.0064 (0.0119)	−0.0125 (0.0267)	0.0206* (0.0105)	−0.0075 (0.0156)
Received government transfer	0.0042 (0.0146)	−0.0404* (0.0223)	0.0137 (0.0094)	−0.0803*** (0.0204)	−0.0345*** (0.0076)	−0.0304*** (0.0116)
Saved in past 12 months	0.2666*** (0.0183)	0.2035*** (0.0188)	−0.1440*** (0.0154)	−0.1468*** (0.0173)	−0.0430*** (0.0127)	−0.0500*** (0.0118)
Australia [Brazil]	0.0463 (0.0302)	−0.3940*** (0.0278)	−0.0130 (0.0207)	0.4005*** (0.0356)	−0.0360*** (0.0134)	−0.0743*** (0.0110)
Austria [Colombia]	0.0690** (0.0279)	−0.4461*** (0.0212)	0.0371 (0.0257)	0.2788*** (0.0336)	−0.0192 (0.0143)	0.1156*** (0.0249)
Canada [Hong Kong]	−0.0068 (0.0312)	0.0917*** (0.0284)	−0.0205 (0.0186)	−0.0202 (0.0257)	−0.0174 (0.0151)	−0.0577*** (0.0114)
France [India]	0.0721** (0.0288)	−0.2173*** (0.0253)	0.0509* (0.0280)	0.1681*** (0.0267)	−0.0458*** (0.0108)	0.0280* (0.0160)
Germany [Indonesia]	0.0415 (0.0293)	−0.2986*** (0.0275)	−0.0091 (0.0209)	0.2664*** (0.0329)	0.0026 (0.0168)	0.0565** (0.0229)
Ireland [Malaysia]	0.0015 (0.0317)	−0.1997*** (0.0324)	0.0504* (0.0274)	0.1056*** (0.0354)	−0.0238* (0.0143)	0.0691*** (0.0239)
Japan [Singapore]	0.2583*** (0.0167)	0.0864*** (0.0296)	−0.0504*** (0.0149)	0.0501* (0.0286)	−0.0721*** (0.0094)	−0.0905*** (0.0090)
Republic of Korea [South Africa]	−0.0494 (0.0337)	−0.1952*** (0.0333)	0.0452* (0.0265)	0.2109*** (0.0367)	0.0385* (0.0212)	−0.0525*** (0.0133)
The Netherlands [Thailand]	0.1319*** (0.0240)	−0.3132*** (0.0256)	−0.0241 (0.0179)	0.3667*** (0.0296)	−0.0241* (0.0136)	−0.0141 (0.0164)
New Zealand	0.0498* (0.0281)	.	−0.0300* (0.0175)	.	−0.0116 (0.0155)	.
Switzerland	0.2220*** (0.0186)	.	−0.0251 (0.0181)	.	−0.0836*** (0.0067)	.
United Kingdom	0.0037 (0.0313)	.	0.0301 (0.0260)	.	−0.0171 (0.0153)	.
Observations	9847	8041	9847	8041	9847	8041
# obs if source = 1	7001	4429	960	2130	991	1078
Pseudo R2	0.1020	0.1280	0.1360	0.1330	0.0929	0.0905

VARIABLES	(4) Fin institution or credit card		(5) Informal lender or other source	
	OECD	Non-OECD	OECD	Non-OECD
	Age: 25–34	0.0370* (0.0222)	0.0026 (0.0050)	0.0000 (0.0089)
Age: 35–44	0.0979*** (0.0273)	0.0077 (0.0054)	−0.0012 (0.0080)	0.0129 (0.0082)
Age: 45–54	0.0925*** (0.0253)	0.0112* (0.0067)	−0.0022 (0.0075)	0.0121 (0.0083)

(continued on next page)

Table 7 (continued)

VARIABLES	(4) Fin institution or credit card		(5) Informal lender or other source	
	OECD	Non-OECD	OECD	Non-OECD
Age: 55–64	0.0817*** (0.0249)	0.0075 (0.0064)	0.0011 (0.0079)	0.0057 (0.0081)
Age: ≥ 65	0.0727*** (0.0241)	0.0106 (0.0081)	0.0047 (0.0091)	–0.0063 (0.0057)
Female	–0.0125** (0.0052)	–0.0046* (0.0024)	–0.0096*** (0.0037)	–0.0047 (0.0033)
Education: Secondary	–0.0005 (0.0131)	0.0040 (0.0029)	–0.0035 (0.0087)	–0.0180*** (0.0042)
Education: Tertiary	–0.0051 (0.0133)	0.0162* (0.0086)	–0.0090 (0.0078)	–0.0126*** (0.0030)
Household income per capita: Second 20%	0.0031 (0.0102)	0.0000 (0.0044)	–0.0010 (0.0060)	–0.0098** (0.0041)
Household income per capita: Third 20%	0.0027 (0.0099)	–0.0060* (0.0034)	–0.0070 (0.0051)	–0.0047 (0.0048)
Household income per capita: Fourth 20%	0.0037 (0.0098)	–0.0072* (0.0033)	–0.0117** (0.0046)	–0.0147*** (0.0038)
Household income per capita: Top 20%	–0.0127 (0.0085)	–0.0030 (0.0037)	–0.0117** (0.0046)	–0.0056 (0.0052)
Paid employment	0.0057 (0.0065)	0.0004 (0.0028)	–0.0187*** (0.0055)	–0.0099*** (0.0036)
Works in public sector	0.0079 (0.0078)	0.0215** (0.0103)	0.0090 (0.0068)	–0.0034 (0.0052)
Received government transfer	0.0067 (0.0066)	–0.0006 (0.0033)	0.0111** (0.0049)	–0.0039 (0.0041)
Saved in past 12 months	–0.0315*** (0.0089)	0.0015 (0.0025)	–0.0129** (0.0060)	0.0067** (0.0031)
Australia [Brazil]	0.0180 (0.0156)	0.1293*** (0.0277)	–0.0081 (0.0063)	0.0203 (0.0138)
Austria [Colombia]	–0.0262*** (0.0090)	0.0363** (0.0148)	–0.0272*** (0.0026)	0.0578*** (0.0165)
Canada [Hong Kong]	0.0323* (0.0171)	–0.0058 (0.0038)	0.0019 (0.0080)	0.0069 (0.0080)
France [India]	–0.0210** (0.0096)	0.0041 (0.0054)	–0.0154*** (0.0048)	0.0294*** (0.0100)
Germany [Indonesia]	–0.0122 (0.0105)	–0.0004 (0.0068)	–0.0085 (0.0059)	0.0135 (0.0092)
Ireland [Malaysia]	0.0011 (0.0131)	0.0009 (0.0062)	–0.0133*** (0.0051)	0.0319** (0.0151)
Japan [Singapore]	–0.0498*** (0.0048)	–0.0022 (0.0054)	. (0.0024)	–0.0185*** (0.0024)
Republic of Korea [South Africa]	–0.0192* (0.0106)	0.0117 (0.0105)	–0.0184*** (0.0039)	0.0768*** (0.0227)
The Netherlands [Thailand]	–0.0455*** (0.0054)	0.0228** (0.0104)	–0.0065 (0.0061)	–0.0173*** (0.0024)
New Zealand	0.0050 (0.0129)	. (0.0054)	–0.0096* (0.0054)	. (0.0054)
Switzerland	–0.0416*** (0.0059)	. (0.0059)	–0.0179*** (0.0043)	. (0.0043)
United Kingdom	–0.0088 (0.0118)	. (0.0118)	0.0020 (0.0085)	. (0.0085)
Observations	9847	8041	9048	8041
# obs if source = 1	599	168	296	236
Pseudo R2	0.0732	0.1290	0.0675	0.1030

Notes: All probits are weighted using the base sampling and post-stratification weights provided in the WB Global Findex database (Demirgüç – Kunt et al., 2014). Marginal effects are reported for each model, and robust standard errors are in parentheses. Omitted categories include: Age: 18–24; Education: Primary or less; Household income per capita: Bottom 20%; Country: United States (OECD) and China (non-OECD). For each measure, the country dummies not in parentheses are included in the OECD models, while the country dummies in parentheses are included in the non-OECD models.

***p < .01, **p < .05, *p < .10.

are 4.9 percentage points more likely to use family or friends, while they are 3.5 percentage points less likely to rely on work or a loan from an employer. These findings support some of the arguments made earlier that women may be relying on savings and old-age support from the financial accounts of spouses and/or other family members, especially if they face more barriers to financial access. In addition, significant and positive effects for education and income are found for personal savings, while negative education and income effects are found for family or friends. Being a saver is positively related with using

personal savings and with using an informal lender or other source, but negatively related with family or friends and relying on work or a loan from an employer.

Finally, the non-OECD country-specific effects are considerably larger and more significant than those for the OECD countries. In fact, the country effects are very large (or largest) for personal savings and family or friends when compared to the other control variables. Compared to China, those living in Brazil, Colombia, India, Indonesia, Malaysia, South Africa, and Thailand indicate they would be less likely

Table 8
 Probit results for aging effects for individual countries.

Percentages	OECD countries N = 12,176	Australia n = 934	Austria n = 952	Canada n = 930	France n = 933	Germany n = 947	Ireland n = 946	Japan n = 937	Republic of Korea n = 928	The Netherlands n = 948	New Zealand n = 913	Switzerland n = 944	United Kingdom n = 947	United States n = 917
<i>Saved in past 12 months</i>														
Ages: 25–34	-0.0728 ^{***}	-0.0916	-0.0325	-0.2506 ^{**}	-0.1495	0.0251	-0.4080 ^{***}	0.2534 ^{***}	0.0633	-0.0859	0.0467	-0.4501 ^{***}	-0.1271	-0.1570
Ages: 35–44	-0.0339 ^{***}	0.0989	0.0330	-0.1576	-0.0327	0.0061	-0.3681 ^{***}	0.2082 ^{***}	0.1024 ^{**}	-0.2925 ^{***}	0.0363	-0.3380 ^{**}	-0.0149	-0.0733
Ages: 45–54	-0.0712 ^{***}	0.1019	0.0003	-0.2581 ^{***}	-0.0977 ^{***}	0.0478	-0.3938 ^{***}	0.1573 ^{***}	0.1862 ^{**}	-0.2486 ^{***}	-0.0267	-0.3375 ^{***}	-0.1433	-0.1952 [*]
Ages: 55–64	-0.0851 ^{***}	0.1134	0.0326	-0.1419	-0.1704 ^{***}	0.2134 ^{**}	-0.3333 ^{***}	0.1232	0.1294 ^{**}	-0.2431 ^{***}	-0.0562	-0.4758 ^{***}	-0.0169	-0.1548
Ages: ≥ 65	-0.0936 ^{***}	0.0153	0.0409	-0.1530	-0.1137 ^{***}	0.2227 ^{**}	-0.2356 ^{**}	0.1617 [*]	0.0975 [*]	-0.3407 ^{***}	0.0165	-0.5043 ^{***}	-0.0864	-0.2524 ^{**}
<i>Saved for old age</i>														
Ages: 25–34	0.1631 ^{***}	0.1031	0.0010	0.3932 ^{***}	0.0460	0.1139	0.0989	0.2483	0.2035 ^{**}	0.1938 [*]	0.1501	0.4019 ^{***}	0.0690	0.2414 ^{***}
Ages: 35–44	0.2906 ^{***}	0.1761 [*]	0.0467	0.4544 ^{***}	0.2489 ^{***}	0.3302 ^{***}	0.1251	0.2384 [*]	0.4283 ^{***}	0.3795 ^{***}	0.2407 ^{***}	0.4904 ^{***}	0.0878	0.4067 ^{***}
Ages: 45–54	0.2732 ^{***}	0.2043 ^{**}	0.0600	0.4415 ^{***}	0.2007 ^{***}	0.2210 ^{***}	0.1811	0.2692 ^{**}	0.4429 ^{***}	0.2839 ^{***}	0.1926 ^{**}	0.5360 ^{***}	0.0241	0.3231 ^{***}
Ages: 55–64	0.2985 ^{***}	0.3001 ^{***}	0.0468	0.4370 ^{***}	0.1420	0.1434 [*]	0.3071 ^{***}	0.3030 ^{**}	0.4125 ^{***}	0.4485 ^{***}	0.2924 ^{***}	0.4574 ^{***}	0.1907 [*]	0.3958 ^{***}
Ages: ≥ 65	0.2538 ^{***}	0.4285 ^{***}	-0.0921	0.4142 ^{***}	0.1801	0.0372	0.3527 ^{***}	0.3731 ^{***}	0.4799 ^{***}	0.1988 ^{**}	0.3155 ^{***}	0.3221 ^{***}	0.0668	0.3111 ^{***}
<i>Able to come up w/ emergency funds</i>														
Ages: 25–34	0.0207 ^{***}	0.0574	0.0229	0.0958 ^{**}	-0.0983	0.0564	-0.1136	0.0174	-0.0037	0.0363	0.0366	-0.2449 ^{**}	0.0738	0.1519 ^{**}
Ages: 35–44	0.0635 ^{***}	0.0017	0.1094 ^{**}	0.1140 ^{***}	-0.0188	0.0554	-0.0994	0.0946 ^{**}	0.1503 ^{***}	0.0934 ^{**}	0.0665 ^{***}	-0.1939 [*]	0.0747	0.1201 [*]
Ages: 45–54	0.0955 ^{***}	0.0337	0.1067 [*]	0.1431 ^{***}	0.1124	0.0524	0.0272	0.1284 ^{***}	0.0980 ^{**}	0.0757 [*]	0.0785 ^{***}	-0.1426	0.1568 ^{***}	0.1421 ^{**}
Ages: 55–64	0.1041 ^{***}	0.0172	0.1135 ^{**}	0.1634 ^{***}	0.0278	0.0602	0.1098 ^{**}	0.1140 ^{***}	0.1357 ^{***}	0.1469 ^{***}	0.0880 ^{***}	-0.1020	0.0784	0.2094 ^{***}
Ages: ≥ 65	0.1489 ^{***}	0.1419	0.1212	0.1940 ^{***}	0.1134	0.0665	0.1103 ^{**}	0.1430 ^{***}	0.1294 ^{**}	0.1454 ^{***}	0.1499 ^{***}	0.0101	0.1651	0.2397 ^{***}
<i>Non-OECD countries</i>														
N = 13,527														
<i>Saved in past 12 months</i>														
Ages: 25–34	0.0737 ^{***}	0.0962	0.0920 ^{***}	-0.1375 ^{**}	-0.1091	0.1595 ^{***}	0.0124	-0.0259	0.0860 [*]	0.0835 [*]	0.0257			
Ages: 35–44	0.0864 ^{***}	0.0249	0.1617 ^{***}	-0.1448 ^{**}	-0.1252	0.1368 ^{***}	0.0585	-0.0972	0.0662	0.1199 ^{**}	-0.0188			
Ages: 45–54	0.0471 ^{***}	0.0914 [*]	0.0690 ^{**}	-0.1928 ^{***}	-0.2313 ^{***}	0.1441 ^{***}	0.0340	0.0426	0.0280	0.2280 ^{***}	0.0139			
Ages: 55–64	0.0115 ^{***}	0.0362	0.0795 ^{**}	-0.1953 ^{***}	-0.2654 ^{***}	0.0826	-0.0223	-0.0871	0.0596	0.0618	-0.0541			
Ages: ≥ 65	-0.0679 ^{***}	0.0861	0.0301	-0.2504 ^{***}	-0.4297 ^{***}	0.0277	0.0011	-0.2612 ^{**}	-0.0686	0.1243 [*]	-0.0798			
<i>Saved for old age</i>														
Ages: 25–34	0.1800 ^{***}	0.6778 ^{***}	0.2486 ^{***}	0.0544 ^{***}	0.2438 ^{***}	0.1393 ^{***}	0.1892 ^{***}	0.0654 ^{**}	0.2681 ^{***}	0.0721	0.1908 ^{***}			
Ages: 35–44	0.2970 ^{***}	0.7926 ^{***}	0.4401 ^{***}	0.0938 ^{***}	0.4453 ^{***}	0.1692 ^{***}	0.2378 ^{***}	0.1216 ^{***}	0.2880 ^{***}	0.1824 ^{***}	0.1764 ^{***}			
Ages: 45–54	0.3325 ^{***}	0.8231 ^{***}	0.4701 ^{***}	0.0841 ^{***}	0.4338 ^{***}	0.2343 ^{***}	0.2221 ^{***}	0.1259 ^{***}	0.3425 ^{***}	0.2253 ^{***}	0.2340 ^{***}			
Ages: 55–64	0.3586 ^{***}	0.8190 ^{***}	0.5415 ^{***}	0.1208 ^{***}	0.3965 ^{***}	0.2048 ^{***}	0.2936 ^{***}	0.1234	0.3342 ^{***}	0.2423 ^{***}	0.2224 ^{***}			
Ages: ≥ 65	0.3423 ^{***}	0.9282 ^{***}	0.5254 ^{***}	0.1266 ^{***}	0.2950 ^{***}	0.2212 ^{***}	0.4102 ^{***}	-0.0593	0.3271 ^{***}	0.3796 ^{***}	0.1560 ^{***}			
<i>Able to come up w/ emergency funds</i>														
Ages: 25–34	0.0483 ^{***}	0.0370	0.0932 ^{***}	0.0371 ^{***}	0.0426 ^{***}	0.0595	-0.0647	-0.0046	0.0451	0.1685 ^{**}	0.2047 ^{***}			
Ages: 35–44	0.0724 ^{***}	0.0160	0.0801 ^{**}	0.2289 ^{***}	0.1341 ^{***}	0.0078	-0.1008	0.0974	-0.0317	0.1796 ^{***}	0.0837			
Ages: 45–54	0.0785 ^{***}	0.0678	0.0568 ^{**}	0.1130 ^{***}	0.0930 ^{***}	0.0781	-0.0776	0.0633	0.0941 ^{**}	0.1962 ^{***}	0.1814 ^{***}			
Ages: 55–64	0.0485 ^{***}	0.0079	0.0052	0.0588 ^{***}	0.1281 ^{***}	0.0370	-0.0593	0.1959 ^{***}	0.1289 ^{***}	0.1988 ^{***}	0.1533 ^{***}			
Ages: ≥ 65	0.0366 ^{***}	0.0108	-0.0143	0.1142 ^{***}	0.0651 ^{***}	0.0179	-0.0407	-0.0320	0.1340 ^{***}	0.2807 ^{***}	0.2037 ^{***}			

Notes: All probits have been weighted using the base sampling and post-stratification weights provided in the WB Global Findex database (Demirgüç-Kunt et al., 2014). The marginal effects for the aging variables are reported above for each model. The reference category is Age: 18–24. The other control variables also were included in each model, and the omitted categories are consistent with the previous estimations. *** p < .01, ** p < .05, * p < .10.

to use personal savings (ranging from 19.5 percentage points for South Africa to 44.6 percentage points for Colombia), while they are significantly more likely to use family or friends (from 10.6 percentage points for Malaysia to 40.1 percentage points for Brazil). Those living in Hong Kong and Singapore are more likely than those living in China to use personal savings and less likely to rely on work or a loan from an employer. The marginal effects for these two countries, however, are considerably smaller. In terms of magnitude, two other findings are noteworthy. Brazilians are found to be 12.9 percentage points more likely to use a formal financial institution or credit card than the Chinese, and Colombians are 11.6 percentage points more likely to rely on work or a loan from an employer.

Aging effects for the individual countries

The top panel of Table 8 presents the probit results for the aging effects for the OECD countries, and the bottom panel presents the results for the non-OECD countries. These were the results that were generated when the probit models were estimated separately for each country, as follows: (1) saved in the past 12 months, (2) saved for old age, and (3) able to come up with emergency funds. For the OECD countries, interesting differences are found when comparing the general savings behavior of the western OECD countries (Canada, Ireland, the Netherlands, and Switzerland) to that of the eastern OECD countries (Japan and Korea). Specifically, the marginal effects for the age groups are found to be negative for the western countries and positive for the eastern countries. Compared to the youngest age group (aged 18–24), older households are less likely to have saved in the past 12 months in western countries and more likely to have saved in the past 12 months in eastern countries. The largest positive marginal effects are found for Japan, where values range from 15.7 to 25.3 percentage points across the statistically significant age groups. These findings are perhaps not surprising since Japan has the largest aging population of the OECD countries and Korea will have one of the largest populations over age 60 in the near future.

With regards to saving for retirement, those living in Canada, Japan, Korea, the Netherlands, New Zealand, Switzerland, and the United States exhibit strong retirement savings behavior across almost all the age groups. Also, the marginal effects for Japan and Korea are largest for the oldest age group (aged 65 or older). In Japan, those who are aged 65 or older are 37.3 percentage points more likely to save for retirement than those who were aged 18–24. Whereas in Korea, people in the oldest age group are 48.0 percentage points more likely to save for retirement. As previously mentioned, these two countries will continue to experience rapid aging, which means that longevity risks are likely to be more severe for those living in these countries. Positive age effects are also noted for the other OECD countries, but the marginal effects tend to decrease a bit for the oldest age group, which is consistent with the life-cycle pattern. In terms of having an emergency fund, the most significant and positive age effects are found for Austria, Canada, Japan, Korea, the Netherlands, New Zealand, and the United States. The marginal effects tend to be largest for the older age groups.

For the non-OECD countries, the most significant age effects for savings behavior are found for China, Colombia, Hong Kong, and India. However, the effects are opposite in sign. Those living in China and India are more likely to be saving, especially the younger age groups. Those living in Colombia and Hong Kong are less likely to be saving, with the marginal effects being quite large for the older age groups. Significant and positive age effects are also found for retirement savings for almost all the non-OECD countries. For Brazil, the marginal effects are very large. Compared to the youngest age group, those who are over age 65 in Brazil are almost always likely to report saving for retirement (92.8 percentage points). The marginal effects for retirement savings for China, Indonesia, Singapore, and South Africa are relatively large for the older age groups as well. In terms of ability to come up with emergency funds, significant and positive effects are found for the older

age groups for Singapore, South Africa, and Thailand. The marginal effects are most significant and largest for those living in South Africa.

Conclusions

This study uses data from the 2014 World Bank Global Findex, supplemented with macroeconomic indicators of old-age security, to investigate the financial security of households for selected OECD and non-OECD countries with various aging populations. Countries represent OECD and non-OECD countries with self-regulated financial planning sectors that are FPSB members. This sample delimitation is used to create a standard benchmark within the financial markets to make more meaningful comparisons across countries. We then look at whether the aging, and soon to be aged populations, are adequately preparing for old age. We focus on those groups most likely to be financially vulnerable during this transition—women, those with less education, and the poor. These groups have traditionally been excluded from the financial markets especially in developing countries.

To measure financial security, we consider the following factors: (1) account ownership, (2) general savings behavior, (3) saving specifically for old age, (4) saving for unexpected emergencies, and (5) the source of the emergency funds. We find aging effects for each of these measures. The aging effects are largest for those who report saving for old age. Older age groups, not surprisingly, are more likely to save, especially those living in countries with larger aging populations regardless of OECD status (e.g., Japan, Korea, China, and the United States). Further, when looking at socioeconomic status, we find that those respondents who are female, have less education, and lower incomes are particularly vulnerable, especially those living in developing countries. This finding suggests it may not be easy to improve people's socioeconomic status with one policy effort alone. Governments may need to adopt different strategies for distinctive socioeconomic groups. It may be necessary for some countries to pay more attention to the financial behaviors of vulnerable populations and implement policies that help them gain better access to the financial markets, as well as financial products and services that are better tailored to meet their needs. One of the first steps that can be taken to promote financial security among vulnerable groups is to ensure that they have access to basic mainstream financial accounts and programs that encourage savings and enhance household level long-term financial security. Another way to address this issue is through the development of more robust financial planning interventions and retirement planning options.

In addition to the socioeconomic findings, we also find that the OECD countries have particularly high levels of financial inclusion; over 98.0% of respondents report having an account at a formal financial institution. However, for the non-OECD countries, almost 30.0% of respondents report having no account. Further, the percentage of respondents who are able to come up with an emergency fund is about 78.0% for those living in the OECD countries but only 62.0% for those living in the non-OECD countries. Yet, even with these stark differences between the OECD and non-OECD countries, financial inclusion is a significant and positive factor associated with financial security, as measured by general savings, saving specifically for old age, and saving for an emergency. These results provide support for the recent global push for financial inclusion as a means to promote general savings behavior and improve financial security both within and among countries, perhaps reducing gaps in financial security between the developed and developing world.

Along these same lines, there is descriptive evidence of a positive relationship between technological usage and financial security. Online and mobile technologies may be viable mechanisms in which to first increase financial inclusion, and then in turn, improve household financial security. However, it must be acknowledged that the direction of the relationship is unclear given the possibility of reverse causality. Further, the main measures for technological usage/aptitude in this study were proxied for according to whether the respondent made

payments online and/or made a financial transaction using their mobile phone. These may be too narrow of measures to capture the true effects of technology. Also, it is uncertain what these measures may be really capturing. Are these measures capturing respondents' access to the technology or their aptitude and ability to use the technology? Also, a respondent may have access and aptitude but may be unwilling to use the technology for various reasons related to trust, preferences, or cultural norms. Regardless, the results from this study support the need for future analyses to better take into consideration the role of digital finance (especially online and mobile technologies) in improving financial security for aging populations.

Finally, the findings from this study show that there are considerable differences between the OECD and non-OECD countries in terms of the adequacy and sustainability of their public pension systems and other key macroeconomics indicators of old-age security. These differences are likely contributing to the economic and financial difficulties non-OECD countries are facing when attempting to provide a basic level of income security in old age for all citizens. The most notable result is that the macroeconomic indicators for old-age security had larger and more significant effects on the financial security of households living in the non-OECD countries than the OECD countries. In particular, those households living in non-OECD countries with higher levels of public pension spending (as a percentage of GDP) are significantly more likely to have a financial account, but significantly less likely to be engaged in savings behaviors and to be able to come up with emergency funds. A plausible explanation is that improvements in public pension systems and other social safety nets, especially in these developing countries, may further decrease individuals' perceived need to save for old age, as they already tend to rely more on family and friends for old-age security than their own private savings.

Implications for policy makers and the financial industry

The findings from this study have important policy implications given the pressures that some countries' social support and public transfer systems will face in the coming years. As country populations continue to grow older, it is becoming more imperative that policies be designed and implemented to specifically target the needs of older persons. These policies should include programs for aging populations that address issues related to employment, health care, housing, social protections, and intergenerational support, as well as financial security and long-term economic well-being. Because of coming demographic shifts described in this and other studies, and the known timeframes associated with general population aging, policy makers working in OECD and non-OECD countries still have time to plan for and be proactive in securing the financial well-being of their populations, but the window of opportunity is closing. Governments need to take action to align their policies to the evolving economic and financial needs of their aging populations.

When viewed holistically, financial inclusion appears to influence savings behavior for those living in both OECD and non-OECD countries. As such, financial inclusion needs to be a part of any national strategy to improve financial security for aging populations. One of the key lessons learned from this analysis is that policy makers ought to think about financial security and preparedness within the contexts of different target groups based on socioeconomic status. Three income groups stand out. First, there are those at the lower-end of the income and wealth distribution who may not have access to a formal bank account. Even those in the lower-end of the distribution who do have an account may find it difficult to engage in private saving. Second, there are those with moderate incomes, for whom expanding access to retirement saving vehicles and encouraging saving through those vehicles could raise retirement preparedness. Third, there are those at the highest income levels, for whom private sector defined contribution structures provide a range of opportunities for saving.

Also, the results from this study call attention to the potential need

for more gender and age-specific retirement planning services and educational programming. In general, women tend to be socially and economically disadvantaged and they tend to live longer than men, which leads to later life financial insecurity (Demirgüç-Kunt et al., 2013; Lyons & Contreras, 2017; Swamy, 2014). For some countries, the aging problem is closely aligned with gender inequality. Rather than develop and promote a "one size fits all" type of financial product or financial service intervention, a better path towards financial inclusion may be one that is based on meeting the needs of aging women as a unique socioeconomic group, especially those who may be relying primarily on spouses or other family members for their long-run financial security. For instance, results from this study indicate that financial inclusion and technological usage/aptitude are related. Further, other findings not presented in this paper suggest that a gender gap may exist in relation to technological savviness. Developing a program that helps women gain access to both a bank account and to technology to manage the account may be a step towards promoting broader use of financial products and services in this digital age.

Also, an opportunity exists for financial service professionals, researchers, and educators to unite globally to promote financial readiness, the importance of old-age security, and the need for greater financial inclusion, especially among vulnerable populations. This, of course, will require acknowledging that the needs and environment of each affiliated country varies in the types of problems faced and the level of preparedness needed to meet those problems. Nonetheless, steps can be taken to find commonalities between and among countries in creating a global initiative of old-age security, perhaps in combination with existing financial inclusion efforts being led by such international organizations as the United Nations, OECD, and G20 (<http://www.gpfi.org/about-gpfi>).

Limitations and implications for future research

While the results of this study are noteworthy, a few limitations must be acknowledged. For example, since an existing dataset is used, the analysis is limited to the types of questions asked and the response categories available. It is not possible to specify more elaborate models based on the variables available in the dataset. Additionally, while we find country-specific effects for many of the models, it is difficult to know exactly why the households in these countries are more or less financially secure. Many country-level factors could be driving these results, such as differences in national pension systems, social safety nets, infrastructures, social and economic inequalities, et cetera. We attempt to control for some of the macroeconomic differences across countries in terms of old-age security and find that these factors do matter, especially for the non-OECD countries.

On a related note, it is important to acknowledge that individual observations may be independent across countries but correlated within specific countries. More specifically, individuals within certain countries may have attributes that uniquely affect the financial security of the individuals in that particular country. We may not be adequately controlling for these unique characteristics in our models. Moreover, some of our country-level variables may be picking up the effects of these factors. For this reason, there may be concern we are overstating the significance of some of our findings. As a robustness check, we estimated the models using clustered standard errors. The significance of the results did not vary considerably from those using robust standard errors. This could be because we are combining only one year of individual-level data for a limited number of countries. We then merge that data with country-level attributes that do not vary across the individual observations within a country. This lack of within country variation in our data makes it difficult to capture if observations are truly independent across countries but correlated within countries.

Also, respondents from different countries may have interpreted and responded differently to the questions, especially those related to financial security, inclusion, emergency funds, and the main source of

emergency funds. These differences in responses could be due to variations across countries in cultural, social, political, and religious norms. For example, it is more common in some countries than others to rely on one's familial and social networks as a primary source of care and financial support in old age. Therefore, someone may not feel that they need to be saving for old age because their children and extended family will provide for them later in life.

There may also be concerns associated with endogeneity and reverse causality within the models, especially between the measures for financial security and financial inclusion. For example, having an account may be the catalyst needed for a respondent to start saving. However, it could also be that starting to save could be the behavior that leads one to decide to open an account. Given the limited number of control variables in the dataset, it is not possible to address these concerns. Yet, it is still valuable to know that these relationships exist and are perhaps more important than originally thought. Additional future research is needed to better understand the direction of these effects using a more comprehensive set of control variables. Longitudinal data would be ideal to identify these relationships and see how financial security is changing as populations get older. The *Global Findex* database includes only cross-sectional data. In addition, only the 2014 survey asked respondents about saving for old age and emergencies; the 2011 survey did not. However, the survey was scheduled to be administered again in 2017. There may be an opportunity to update this analysis if the same questions related to financial security are asked again.

Regardless of these limitations and future opportunities, the current research provides unique and significant insights into the similarities and differences between and among selected OECD and non-OECD countries with regards to financial security, the role of financial inclusion, and population aging. It also provides insight into where there may be key opportunities to assist specific target populations in becoming adequately prepared and financially secure as they grow older, especially in countries where the public pension systems may be less robust than others. Those countries with aging populations that are more financially prepared for the future are likely to see improvements in their populations' overall health and well-being, as well as reductions in poverty and other social and economic inequalities.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.jeoa.2018.03.001>.

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