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Financing retirement with real estate assets: an analysis of Mexico

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Abstract

Real estate assets represent a major form of savings for families when they reach retirement age. Reverse mortgages are a financial product developed as an alternative way of generating flows of liquid income during retirement in some countries. As income during old age must be diversified from different sources, in this work we assess the potential of reverse mortgages as an alternative income stream in retirement. Our work focuses on Mexico, using projections of the replacement rate that would be received by an old-aged pensioner, only considering the pension from the Instituto Mexicano del Seguro Social (IMSS), whilst incorporating annuity income from the reverse mortgage. Using a macroeconomic-actuarial model to generate projections, we found that these rates could be increased by 45 percentage points by incorporating annuity income from real estate assets. This result reinforces the concept of establishing not only policies focused on improving formal pension schemes, but also of making private financial mechanisms available to generate other adequate income flows for old age based on alternative assets.

Key words: reverse mortgage, pensions, defined contribution

JEL: G23, J32, G22, D14, G21.

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Introduction

The reverse mortgage is a financial product designed for elderly adults who own a property, allowing them to convert the equity value into money, without losing its ownership. This consists of a non-reimbursable loan, using a property as collateral, and allowing the homeowner to continue living in the dwelling until his/her death, at which point the heirs can choose either to pay off the loan and recover the property, or not to do so - in which case the creditor will execute the guarantee (award or sell the property) to pay off the debt, handing over any surplus to the heirs.

The capital lent may be provided in three different forms: a lump sum; a credit facility; or regular payments, either for a limited period of time life (term annuity) or for the rest of the borrower's (life annuity). The amount lent depends on the borrower's age, interest rates and housing prices. There are no income or credit rating requirements for Reverse Mortgages, as the payment is guaranteed using the value of the property which the pensioner already owns. According to Caplin (2002), reverse mortgages benefit the property owners, as many of them do not meet traditional requirements -demonstrable income, maximum age- for being granted a mortgage loan and do not have the funds needed to contract an annuity.

There are several reasons why reverse mortgages can be an interesting alternative for people who are entering retirement. Firstly, difficulties faced by the pension systems (public or private) in providing sufficient income on retirement. Second, the increase in life expectancy is gathering pace, and this is leading to adjustments (downwards) in the pension benefits of future generations. Third, a large percentage of people of working age in Mexico simply do not save in any pension scheme². As a result they depend financially on third-party assistance, above all their children or other family members. These situations may be offset if people of retirement age have access to a financial product based on real estate assets that enable them to diversify their income sources.

The above suggests a need to study the potential for the development of reverse mortgages and similar financial mechanisms in Mexico. This study is organized as follows: section one reviews international experience with reverse mortgages. Section two describes the current pension system in Mexico, using a macroeconomic and actuarial model to forecast the replacement rate that workers contributing to the IMSS will receive under current system parameters. In particular, it examines the need for additional income to the IMSS pension to provide sufficient resources during retirement. Section three assesses the impact of real estate savings on retirement income, calculating the replacement rate that would be obtained by incorporating a reverse mortgage structure, in addition to the IMSS pension. Finally, section four concludes that reverse mortgages could significantly increase the replacement rate for pensions, reflecting more widely on the financial risks of retirement, and the possibility of having a wide range of income streams to support this period of economic inactivity.

2: 60% of the Economically Active Population works informally, so that it does not make contributions to any pension scheme.

1. Some international experiences with reverse mortgages

Although the Reverse Mortgage is a new development in Mexico, it has existed for a long time in other countries around the world, especially in the UK, where it was introduced in 1965, and the United States of America, where it has been available since 1989. Other countries where Reverse Mortgages have been introduced include Australia, Canada, Denmark, Spain, France, Netherlands, Japan, Norway and Sweden.

1.1. The UK

Equity release products began to be used in 1965 in the UK, and have allowed people of over 55 to obtain income from their property assets while continuing to live there. There are two types of product: Lifetime Mortgage and Home Reversion Plans. In the UK, 1% of people over the age of 65 who own property use these products³.

a) Lifetime mortgages

The consumer retains the ownership of the property and obtains a loan using the aforesaid property as collateral. The loan can be received as a lump sum, life annuity, credit facility or a combination of all three. Although some lenders offer the option of making regular interest payments, in most cases the consumer makes no payment. Instead, the interest builds up and is repaid together with the capital until the property is sold after the death of the owner or a permanent move (for example, to a residential care). Suppliers are financial institutions, residential developers and non-deposit lenders. It is a very small market, approximately £1 billion and on average 22,000 plans are sold every year⁴.

b) Home reversion plans

The consumer sells his home to the lender. It can be total - if he completely sells the property - or partial, leaving a percentage of the value of the property available for an inheritance. In any event, the lender becomes the owner of the property. In exchange, the customer obtains a lump sum or a life annuity, or both, and the right to continue living in the property, until he or she dies or moves to an old people's home. Suppliers are financial services companies and specialized suppliers. The market is even smaller than the lifetime mortgage market, as fewer than 1,000 plans are sold a year.

Due to the high levels of real estate wealth of generations of elderly adults, *equity release* schemes play an important role in helping people to have retirement income. There are innovative flexible reverse mortgage plans which allow the customer to access small sums of capital at the outset, and giving him the opportunity to increase them in the future. This is a very useful possibility for people who presently have low liquidity needs, but who know that their needs will be greater in the future. Other innovations are products designed for special needs, such as customers with a low life expectancy (due to serious illness or disability), enabling them to obtain higher regular payments. Products which can be adapted to pensioners' needs will be critical for the future development of the *equity release* market.

1.2. United States

Reverse Mortgages began in 1989. From 2002 to 2009, the market registered favorable interest rates and increases in housing prices (Sánchez et al, 2007). From 2010 on, the market has shrunk due to the financial crisis. In 2011, only 2.1% of elderly homeowners had reverse mortgages⁵.

3: Orts (2012).

4: The Smith Institute (2012). "Making the most of equity release: perspectives from key players".

5: Nakajima and Telyukova (2012).

There are different kinds of these mortgages. They differ in the way the loan is received and who offers it (see Reyes Arzate, 2010):

- **Single-purpose mortgages:** are offered and backed only by some state and local governments, so they have a limited level of availability. Their acquisition and administration costs are low. No damage insurance has to be bought and the interest rate applied is lower, with either a fixed rate or simple interest. The funds from these mortgages can only be used for one specific purpose, such as to repair the home or pay the taxes on it. The money is paid in a single amount, and the loan is not returned provided the owner lives in the home.
- **Mortgages with federal insurance:** are backed by the US government through the Federal Housing Administration (FHA), which guarantees that financial institutions honor the established payments. The amount of the loan depends on the value of the property - subject to a federal limit of US\$625,500- and the age of the proprietor. The loan will be returned when the owner dies; the heirs have the option of paying off the loan and staying in the house, or selling the home and keeping any money left over, or handing over the property to the lender. If the value obtained from the sale of the home is higher than the total amount of the loan, the heirs will receive the remaining value. Otherwise, if the value of the home cannot cover the total value of the loan, the heirs are not responsible for the remainder. The lender does not bear the aforesaid loss either, given that it is covered through the governmental mortgage insurance - the insurance premium is included in the total cost of the loan.
- **Private mortgages:** Offered by authorized private financial institutions, but without associated FHA insurance. These are known as "Jumbo" mortgages because the loan is higher than the amount obtained through a mortgage with federal insurance, as they are not subject to the federal limit established by the FHA, although they are usually more expensive. The popularity of Jumbo mortgages has gradually waned as the FHA limit for mortgages with federal insurance has increased⁶. Only unencumbered homeowners can access them.

At present the most popular reverse mortgage with federal insurance is administered by the FHA, and is called a home equity conversion mortgage (HECM); while the private market has decreased. HECM loans account for around 90% of total reverse mortgages on the North American market⁷. To be eligible for the HECM mortgage the owner has to be over 62 years old and permanently resident in the home⁸, and also receive independent advice. The loan is received as a lump sum, temporary income or life annuity, credit facility or a combination of all of these.

According to Orts (2012), the HECM has a specific insurance, provided by the FHA, guaranteeing that the applicant will receive the established payments while he is alive. When the accumulated debt reaches 98% of the maximum required amount⁹, the mortgage is assigned to the FHA, so that the government will continue making payments to the pensioner, and accepts complete responsibility for the mortgage (even if the debt exceeds the value of the property, the borrower lives for longer than expected or the value of the property decrease). This insurance offers ample protection, both for the homeowner -who is protected in the event that the financial entity becomes insolvent- and for the lending institution; the premium¹⁰ is financed with a percentage on the value of the home (initially 2% and then 1.25% of the loan balance).

6: The limit is equivalent to 95% of the average sales prices, for example in 2009 the limit was USD\$417,000, whilst in 2013 is US\$625,500.

7: Shan (2011), Nakajima (2012).

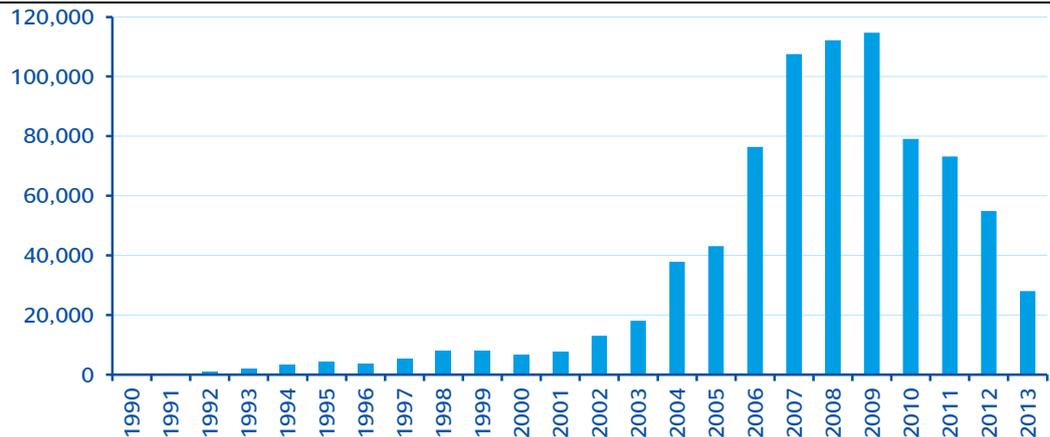
8: This requirement possibly relates to the possible existence of asymmetric information on the condition of the property, so as to decrease moral hazard in the transaction.

9: Minimum between the property value and the federal limit for HECM.

10: As it is a government program, the HECM insurance does not generate gains, but is used to continue insuring FHA mortgages.

From 2010 on,¹¹ a new more economic loan model called HECM SAVER, has been available. This model reduces the amount of the mortgage insurance premium to 0.01% of the home value, but also reduces the amount which the debtor can apply for, between 10 and 18%, while the interest rate is also higher. This product is designed for people who need a lower loan amount.

Chart 1
Number of HECM loans



Source: National Reverse Mortgage Lenders Association (NRMLA), 2013

1.3. Spain

Reverse mortgages began to be sold in Spain in 2006. They are regulated by the Mortgage Market Reform Act 41 of 2007 and do not have any type of state insurance (as in the U.S.). Reverse Mortgages are granted by credit or insurance institutions to adults aged over 65. The property has to be the normal home of the applicant, and has to be appraised by a property surveyor, as well as being insured against damages.

The amount of the loan will depend on the value of the property, the type of property to be mortgaged, the age of the person and the form of income (lump sum, temporary income, life annuity). Once the mortgage borrower has died, the heirs have the option of returning the capital plus the interest and keeping the property, or receiving the difference between the debt and the market value of the property. The mortgage deed allows the possibility of renting it or changing residence (if the person has to move to a home for the elderly, for example). The interest rate applicable tends to be fixed, and when the period of receiving the income payments through the reverse mortgage ends, the interest accrued is generally the mortgage EURIBOR plus 2% (see Sánchez (2007)). Lending institutions have to offer independent advice to individual customers, in order to guarantee the rights of customers and adapt the product to their financial needs.

There is a strong tradition of inheritance in Spain. As a result, the development of this product is more difficult, despite over 87% of people over the age of 65 being owners of their homes¹². Another reason for the slow development of this market in Spain is lack of knowledge of these products. In this regard, according to Sánchez et al. (2007), over 2,000 reverse mortgages have been sold in Spain. The customer profile is a person of around 80 years old, with a property worth around 300,000 euros, who receives income for some 15 years.

11: Mortgage Letter 2010-34 of October 21, 2010.

12: See Martínez (2012).

1.4. Other countries

The reverse mortgage market exists in other countries, with varying degrees of development in each case:

- France established its Life Annuity Mortgage (Prêt Viager Hypothécaire) in the Consumers Code of 2006, as a contract whereby a financial institution grants a natural person a loan backed by a real estate asset, whose repayable amount is not required until the debtor's death.
- Reverse mortgages have existed in Canada since 1986. They are offered by private institutions, without government insurance to people aged over 55, and the loan is for no more than 50% of the property's value. The received loan is not subject to taxes.
- In Australia, the market reached over 10,000 reverse mortgages in 2005. There is no specific regulation, but there is a voluntary code of conduct to which the lending institutions that offer these products subscribe.

The possibility of these contracts being added to the laws of certain countries raises questions which have not yet been resolved. One such case is Chile, where the question is still being considered, after the Securities and Insurance Supervisor (Superintendencia de Valores y Seguros) recently proposed that reverse mortgages be implemented as a supplementary solution to the low level of pensions.

It is important to note that reverse mortgages have come about as a response to the problem posed by longer life expectancy and the lack of resources in old age, when pensions do not suffice to provide ideal cover to adults, as shall be analyzed below.

2. Situation and forecasts for Mexico's pension system

Social security in Mexico is fragmented. There are several public contributory pension systems for workers in the formal labor sector run by different social security bodies. The pension system is therefore made up of various subsystems which on the whole do not operate in an integrated fashion. They include both pay-as-you-go systems and individual account systems.

In 1997, Mexico began a structural transition of its pension system: the main public schemes have been obliged to migrate to individual capitalization systems¹³, with a private administration of funds and benefits linked to deposits in individual accounts. Currently, the main contributory pension systems cover around 39.9%¹⁴ of the economically active population (EAP), with the most important being the Mexican Social Security Institute (IMSS), to which formal workers in the private sector contribute, with a coverage of 32.9% of the EAP; and the Social Security Institute for Public-Sector Workers (ISSSTE) for federal government workers, which covers 5.6% of the EAP. Apart from this there are the state government pension systems, those of public universities and state-owned companies, all with a coverage of 2% of the EAP. It is important to note that informal workers (60% of the EAP)¹⁵ are not legally obliged to register and make contributions to a pension system.

The same is true in the case of coverage in old age (number of pensioners as a percentage of the population over the age of 65), which has remained practically constant at around 20%¹⁶. This situation is particularly worrying if we consider the change in the population structure (aging population) that will take place in the medium term.

13: The IMSS pension system was reformed in 1997 and the ISSSTE pension system in 2007.

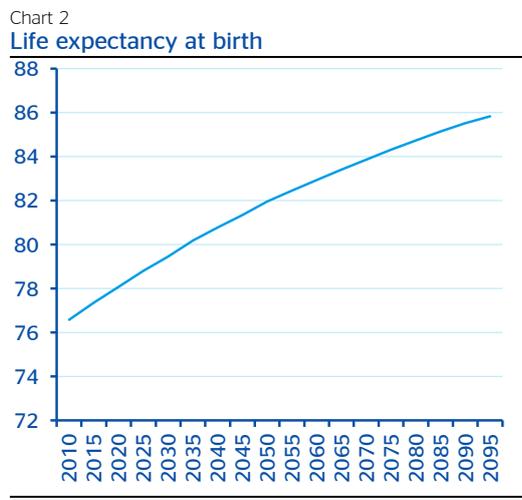
14: According to data from the 1st Government Report (2013) of President Enrique Peña Nieto and the National Institute of Statistics, Geography, and Information Technology (INEGI).

15: According to the 2012 National Occupation and Employment Survey, this group contains workers who are independent or do not have a contract.

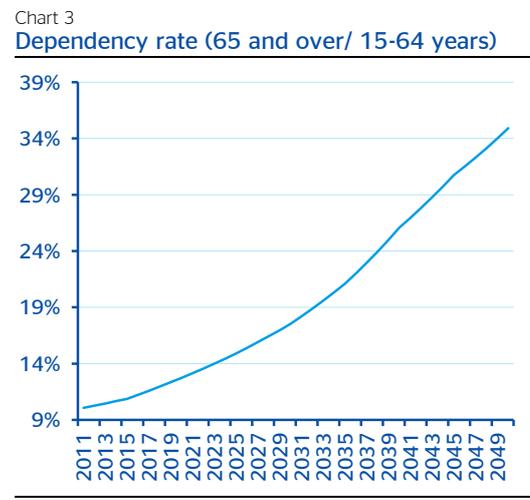
16: Source: 1st Government Report of President Enrique Peña Nieto and INEGI.

In the 1990s, when the reforms of the pension systems in Latin America began and individual capitalization systems were introduced in some countries in the region, it was expected that in the medium term the bulk of the labor force would be covered by these systems. Currently, the Retirement Savings System (SAR) administers USD 156 billion (12% of Gross Domestic Product) corresponding to the pension savings of 49.8 million in individual accounts. However, contributions have only been made to 21.2 million of these accounts over the last three years. However, the pension coverage levels are far from ideal, and most of the labor force is without any old-age protection. The high level of informality in the labor market, as well as people's limited pension culture, have not encouraged the increase of coverage significantly over recent years.

What is more, global demographic trends point to an aging of the population due to greater life expectancy and a reduction in birth rates. As a result, over the coming years financially viable pension systems will be a key element in the public finances of different countries, posing a financing challenge for retirement income. Most pension schemes are facing a variety of problems that make them inefficient in providing sufficient income for what is an increasingly prolonged period of retirement. According to estimates by the Latin American Demographics Center (Centro Latinoamericano de Demografía, CELADE), life expectancy at birth in Mexico will increase from 75.8 years in 2011 to 85.8 in 2050, while the dependency rate (over 65 / population aged 15 to 64 years) will increase from 10.1% in 2011 to 34.9% in 2050. Therefore, the population of elderly people will continue to increase, and if the observed trend of low pension coverage in old age continues, many members of this group will not have sufficient income.



Source: BBVA Research with CELADE data



Source: BBVA Research with CELADE data

According to the Organization for Economic Cooperation and Development (OECD 2011) pension policies must maintain an adequate balance between benefits (adequate income for retirement) and the financial sustainability of pension systems. Apart from the major challenge posed by an aging population, this balance has been made harder to achieve as a result of the recent economic and financial crisis, which has had a profound impact on the economy and public finances around the world.

All these problems require more detailed quantification, both in terms of depth and length. By depth we mean that it is important to make disaggregated estimates at the level of representative individuals, as the exposure of each of these to the pension system and the consequences of this are very different in each case, depending on individual socio-economic characteristics. With respect to the length of the estimates, we consider that the behavior of the system has to be observed not only in the current period but in terms of its development over the coming decades, given the interaction of various demographic and macroeconomic

factors. There are practically no projection models for Mexico's pension systems that take into account these two dimensions. We consider that this study may help fill the gap.

Therefore, in order to assess the current situation of the pension system, and in particular the need for additional retirement funding, we have developed a macroeconomic and actuarial model specifically for the IMSS pension system. We have called this the Pension Prediction Actuarial Model (MAPP2 for the Spanish acronym)¹⁷. It will enable us to produce long-term forecasts for the main IMSS pension system variables. Based on the information provided by the National Commission for Retirement Savings¹⁸, information from domestic socio-economic surveys¹⁹ and CELADE demographic forecasts²⁰, we have projected the coverage of pensions and the replacement rates of old-age pensions that workers contributing to the IMSS will receive in a baseline scenario, i.e. under the current parameters of the system, in real terms for 2013-2050.

The database of approximately 4 million workers contributing to the IMSS²¹ was classified into 60 types, for each age within the population pyramid. Specifically, we classified individuals by age, gender, educational level, income distribution decile and type of pension rights (Transition Generation or Afore Generation)²². The advantages of this degree of detail is that it enables us to forecast the specific situation for particular groups of the population.

The model is based on the CELADE population pyramids $P_{s,y}^t$ for each forecast year (t) between 2011 and 2050, for ages (y) between 0 and 100 years old, for men and women (s). The EAP pyramids $PEA_{s,y}^t$ have the same gender, age and forecast year dimensions.

For the base year (2011), we distribute each population cohort of $PEA_{s,y}^{2011}$ according to the probability²³ of having reached a determined level of studies (primary, secondary, tertiary) ($Pm_{s,y,e}^{2011}$) and obtain the population pyramid by level of studies reached (e) in the base year $PEACU_{s,y,e}^{2011}$

$$PEACU_{s,y,e}^{2011} = P_{s,y,e}^{2011} \times Pm_{s,y,e}^{2011}$$

Starting at the $PEACU_{s,y,e}^t$ of each projection year t , we establish a probability of being a pension saver²⁴ and having an individual IMSS account administered by an Afore $Tafil_{s,y,e}^t$:

$$AFIL_{s,y,e}^t = PEACU_{s,y,e}^t \times Tafil_{s,y,e}^t$$

In this study, we only consider workers who made their most recent contributions in 2009-2011, who we term *regular contributors*²⁵ $COT_{s,y,e}^t$. This population is obtained as follows:

$$COT_{s,y,e}^t = AFIL_{s,y,e}^t \times Tcotiz_{s,y,e}^t$$

Where $Tcotiz_{s,y,e}^t$ is the probability of being a regular contributor²⁶ by gender, age and educational level.

It is important to classify contributors according to their pension rights, as the Transition Generation (GT), formed by all those workers who joined the IMSS before 1997, has a pension benefit right defined at the moment of retiring²⁷. However, the Afore Generation (GA) includes

17: For further details, see Alonso, Hoyo and Tuesta (2013). Appendix 2 provides a summary of the MAPP2 model methodology.
18: A random sample of 4 millions anonymous records with socio-economic information on IMSS contributors to December 2011.
19: National Occupation and Employment Survey (ENOE), Encuesta Nacional de Seguridad Social (ENESS).
20: Population and EAP projections for 2013-2050.
21: Information provided by the Comisión Nacional del Sistema de Ahorro para el Retiro (CON SAR).
22: See Appendix : 1.
23: Taken from INEGI's 2010 National Occupation and Employment Survey (ENOE).
24: Workers with individual IMSS/EAP account.
25: Alonso, Hoyo and Tuesta (2013) carried out detailed analysis of the situation for other groups of the population, such as non contributors and irregular contributors.
26: Regular contributors/EAP.
27: They may choose between Act 97 or Act 73 pensions. However, as Act 73 provides a better replacement rate, most of this population is expected to receive pensions under Act 73.

all workers who joined the IMSS after 1997 and therefore can only retire through the individual accounts system.

We obtain the regular AG contributors $CotGA_{s,y,e}^t$ by deducting from the total contributor group ($COT_{s,y,e}^t$) the TG regular contributors ($CotGT_{s,y,e}^t$) by age, gender and educational level.

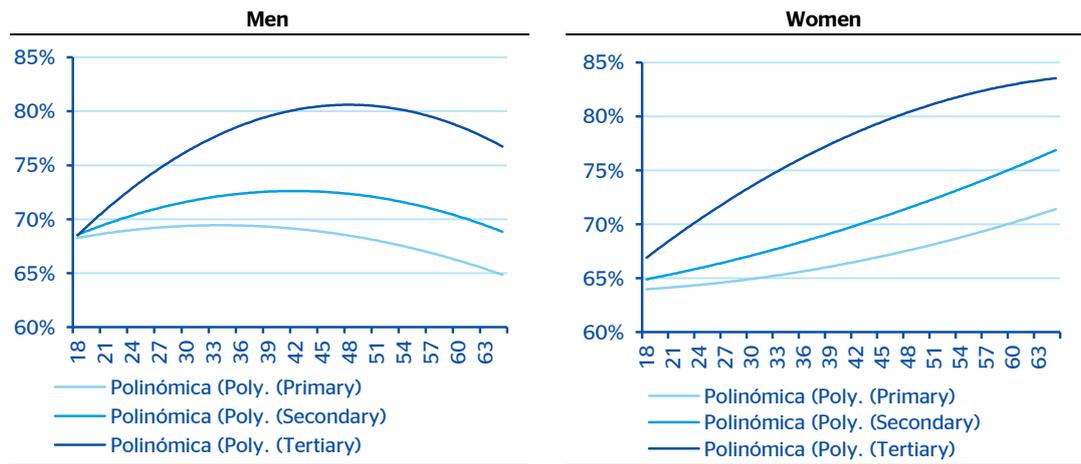
$$CotGA_{s,y,e}^t = COT_{s,y,e}^t - CotGT_{s,y,e}^t$$

Subsequently, we classify contributors by their income decile (r)²⁸ by age, gender and educational level.

Contributions are defined by four main elements: potential income (W), contribution density ($DCot$), the contribution rate (ta) and the social contribution. Potential income and contribution density depend on gender, age, educational level and income decile, whilst the social contribution depends solely on income.²⁹

Contribution density is greater among men with a higher level of studies and greater income level (top distribution deciles); while young women with a low level of studies and low income levels have a low contribution density.

Chart 4
Contribution density, by age and educational level (regular contributors)



Source: BBVA Research with CONSAR data

Source: BBVA Research with CONSAR data

The total contributions of each type of individual (there are 60 types in each population cohort) are determined as follows:

$$APCotGT_{s,y,e,l,r}^t = CotGT_{s,y,e,l,r}^t \times DCotGT_{s,y,e,l,r}^t \times (ta \times WCotGT_{s,y,e,l,r}^t + CS_r)$$

$$APCotGA_{s,y,e,l,r}^t = CotGA_{s,y,e,l,r}^t \times DCotGA_{s,y,e,l,r}^t \times (ta \times WCotGA_{s,y,e,l,r}^t + CS_r)$$

Where:

$APCot_{s,y,e,r}^t$ = contributions from regular contributors, by gender, age, education level and income decile

$DCot_{s,y,e,r}^t$ = contribution density of regular contributors, by gender, age, education level and income decile

$WCot_{s,y,e,r}^t$ = potential salary of regular contributors, by gender, age, education level and income decile. Each projection year, the salary increases in accordance with the rate of salary increase assumed in the model.

28: An income decile is 10% of the reference population group with income delimited by the richest and poorest individuals in that group.

29: Only workers with income of under 15 times the minimum wage receive the Social Contribution, with the amount being greater the lower the income.

CS_r =Social Contribution corresponding to the worker's income

ta = contribution rate, equivalent to 6.5% of the contribution base salary

Each type of individual by age, gender, educational level and income decile capitalizes the accumulated salaries until this time and totals the contributions made in each year. Capitalization is at a real interest rate of 4%.

The balance of the individual account for each forecast year (t) is calculated as:

$$BalanceCotGT_{s,y,e,l,r}^t = BalanceCotGT_{s,y,e,l,r}^{t-1} \times 1 + i + APCotGT_{s,y,e,l,r}^t * (1 - f)$$

$$BalanceCotGA_{s,y,e,l,r}^t = BalanceCotGA_{s,y,e,l,r}^{t-1} \times 1 + i + APCotGA_{s,y,e,l,r}^t * (1 - f)$$

Where

$BalanceCotGT_{s,y,e,l,r}^t$ =Balance of regular contributors, TG, by gender, age, education, employment situation and income decile

$BalanceCotGA_{s,y,e,l,r}^t$ =Balance of regular contributors, AG, by gender, age, education, employment situation and income decile

i = interest rate

f = commission on Afore balance

The defined benefit pension under Act 73 ($Pen73$) depends on salary level³⁰ and the weeks of contributions³¹, and is calculated using the algorithm described in article 167 of the 1973 Social Security Act.³² Pensions under Act 97 ($Pen97_x$) are obtained by dividing the balance accumulated in the affiliates individual account (CI) at the moment of retirement, having discounted the survivor's insurance premium³³ ($MCSS_{x,y}$), by the current actuarial value of the pensioner's life annuity (a_x), calculated based on current mortality tables,³⁴ and a 3% actuarial discount rate.³⁵ The assumptions and algorithms for the life annuity are as follows:

Table 1
MAPP2 calculation assumptions

Assumption	Value	Reference	Source
Commission on balance (Afore)	1%	Mortality table	EMSSAH 2009
Individual account real return	4%	Real increase in salaries (annual)	2%
Contribution to individual account	6.5% salary	Life annuity fee	2%

Source: BBVA Research

$$Pen97_x = \text{Min} \left[\text{PMG}, \frac{CI - MCSS_{x,y}}{\ddot{a}_x * (1 + \alpha)} \right]$$

$$\ddot{a}_x = \sum_{K=0}^{\omega-x} v^k * {}_kP_x - \frac{m-1}{2m}$$

$$MCSS_{x,y} = [0.9 CB_{iv} * (m+1) * \sum_{K=0}^{\omega-y} (1 - {}_kP_x) * {}_kP_y * v^k] * (1 + \alpha)$$

30: The average salary for the last 250 weeks of contributions, expressed as a multiple of minimum wages in the Federal District (SMDF).

31: According to the contribution density of each individual, the months of contributions are aggregated to the initial length worked by each type of worker. This will determine the retirement age if the pension saver has contributed for sufficient weeks to be eligible for an RCV pension.

32: See Appendix 3.

33: The survivor's insurance pays the widow a pension on the death of the retiree.

34: Mortality tables regulating the calculation of life annuities under the Social Security system, known as the Mexican Social Security Experience of the Active Population (EMSSA). These are dynamic tables that take into account improvements in future life expectancy.

35: The average of reference rates in 2011 and 2012 for calculation of Pension Insurance derived from the Social Security, published by the Comisión Nacional de Seguros y Fianzas (National Insurance and Guarantees Commission) in the Official Gazette of the Federation.

Where:

$Pen97_x$ is the amount of life annuity for a pensioner aged x

CI is the balance of the individual account

PMG is the minimum guaranteed pension, equivalent in 2013 to 2,501 pesos per month

$MCSS_{x,y}$ is the present actuarial value (constitutive amount) of the survivors' insurance for the spouse aged y of the pensioner aged x .

CB_{iv} is the amount of basic invalidity and life, defined as the maximum of the Guaranteed Minimum Pension (PMG for the Spanish acronym) and 35% of pensionable salary³⁶

a_x is the present actuarial value of the life annuity of the pensioner aged x

α is the fee charged by the pension insurer, equal to 2%

$$v^k = \frac{1}{1+i}$$

i is the actuarial discount rate

m is the number of payments per year, equal to 12

ω is the last age of the mortality table, equal to 110 years

${}_kP_x$ is the probability of an individual aged x reaching the age of $x + k$, calculated as

$${}_kP_x = \prod_{j=0}^{k-1} P_{x+j}$$

P_x is the probability of survival of an individual aged x to $x + 1$, obtained from the EMSSA 2009 dynamic mortality tables

Finally, the replacement rate for TG and AG workers is obtained by dividing the old-age pension amount by the last salary received by the worker. TG workers receive the higher of the benefits under Act 73 and Act 97 pensions:

$$TRGT_x = \text{Max} \frac{Pen73_x}{WCotGT_{s,y,e,l,r}^t}, \frac{Pen97_x}{WCotGT_{s,y,e,l,r}^t}$$

$$TRGA_x = \frac{Pen97_x}{WCotGA_{s,y,e,l,r}^t}$$

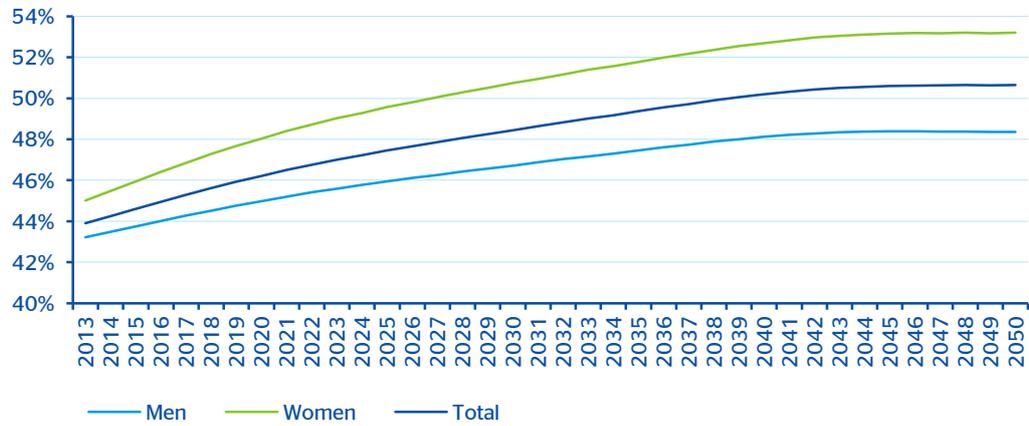
The projections obtained from the model show the unpromising prospects that the pension system has and will continue to have in the long term, with limited improvements to coverage rates. The possibility of obtaining adequate pensions will be restricted to those whose socio-economic conditions permit them a long working life, who can thus make contributions to their individual accounts.

These forecasts show a slight increase in the coverage rate for regular contributors³⁷ in the coming years, but this will be slight (chart 4). This is due to the improvement in the education level of the population in general -resulting in higher earnings and increased contribution density- and women in particular. Nevertheless, this improvement is not sufficient to significantly increase the coverage rate of the pension system, and this is storing up major socio-economic problems for the future.

36: The pensionable salary is defined as the average of the last 250 weeks of contributions by the worker, updated for inflation. For the purposes of simplification, the model considers the pensionable salary as equal to the worker's potential salary.

37: Regular contributors are considered to be workers who have made contributions to their individual accounts over the last three years.

Chart 5
IMSS Coverage Rate Projections (contributors/EAP)



Source: MAPP2, BBVA Research

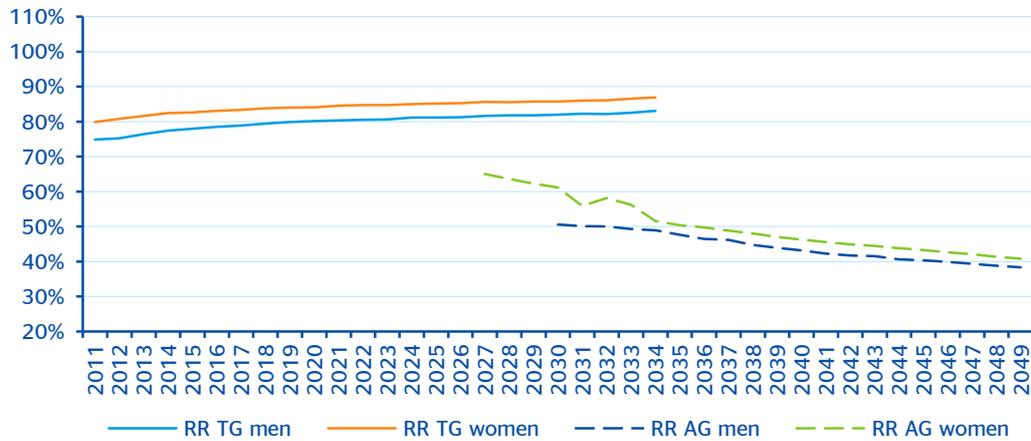
Moreover, the average replacement rate (RR)³⁸ projected to 2050 shows varied behavior: from 2012 to 2035 workers in the transition generation are expected to choose the defined-benefit pension under Act 73, because the RR is more generous and only requires 500 weeks of contributions to be eligible for a pension. From 2035, the first workers in the Afore generation³⁹ begin to receive pensions from the funds in their individual accounts. The replacement rates they will obtain are considerably lower than under Act 73 (see Chart 5), due mainly to low contribution rate, low contribution density and future increases in life expectancy increasing the cost of life annuities.

Act 73 pensions (defined benefits) give an average replacement rate of 75%, with an upward trend, as generations with higher educational levels retire having contributed over longer working lives, they would be expected to receive better pensions. Moreover, the average RR under Act 97 will be 37%, with a downward trend as the majority of the pensions generated will be under the Minimum Guaranteed Pension (PMG), which is constant in real terms.⁴⁰

38: Weighted average of replacement rates for each type of individual.
39: Workers who make contributions for 1,250 weeks giving a right to a pension.
40: As, in real terms, salaries increase and the Guaranteed Minimum Pension is constant.

Chart 6

Forecast replacement rates (weighted average) by generation type and gender



Source: MAPP2, BBVA Research

3. Assessing the impact of pensions on real estate savings

Our model's predictions for the future of the IMSS pension system are not very encouraging in terms of coverage and replacement rates. Therefore, it may be interesting to capitalize other types of less liquid savings, such as real estate assets, through reverse mortgage structures. The social housing policy implemented in Mexico in recent years has brought about a considerable increase in the supply of housing for the middle classes and salaried employees. Consequently, the number of homeowners is increasingly significant, as indicated in the 2012 National Survey of Income and Expenditure for Mexican Households (ENIGH)⁴¹, which found that at national level 82.4% of people over the age of 60 own their home, with an average value nationally of MXP\$636,163, according to figures from the SHF (Federal Mortgage Society)⁴². This demonstrates the strong preference of Mexicans for placing their savings in real estate assets.

In May 2013, amendments to the Civil Code and the Financial Code of the State of Mexico allow the concept of Reverse Mortgages in that territory. However, banking and/or insurance regulations need to be amended so that these products can be offered.

It is worth noting that the aforesaid regulation establishes that institutions which grant reverse mortgages can be private, social or public institutions, as well as natural persons. Another important consideration is that there is no mention of compulsory insurances (against damages or against the risk of negative equity) for these schemes. Appendix 4 sets out the main aspects of the new regulation.

By way of an exercise, and taking into account the information provided by the SHF regarding the average property value nationwide⁴³, a calculation of the life annuity ($RVHipInv_x$) that an individual aged 65 could obtain from a reverse mortgage has been incorporated into the pension model:

$$RVHipInv_x = \frac{ValueOfProperty_t}{a_x}$$

41: There are over 20 million privately owned homes, representing the potential market for reverse mortgages.

42: US \$51,000.

43: As there is no more detailed breakdown of the value of housing (e.g. by age range or decile of revenue), the average value is considered.

Where:

$ValueOfProperty_t$ = the average value of housing nationwide, for each forecast year t , including an annual increase in the real value of the property of **1%**

The replacement rate obtained with the life annuity from the reverse mortgage is calculated as:

$$TRHipInv_x = \frac{RVHipInv_x}{WCotProm_x^t}$$

Where:

$WCotProm_x^t$ = Average contribution salary by age x in each forecast year t

Subsequently, we calculated the old age pension of the IMSS ($TRGT_x$ ó $TRGA_x$) and compared it to the figure which would be obtained if a reverse mortgage were contracted, receiving the loan in the form of a life annuity ($TRGT_x + TRHipInv_x$) ó ($TRGA_x + TRHipInv_x$). We performed this for 2013-2050, so as to measure the potential impact of incorporating reverse mortgages into the pension income of individuals retiring with different pension rights at different moments in time, whilst also reflecting the impact of increases in life expectancy.

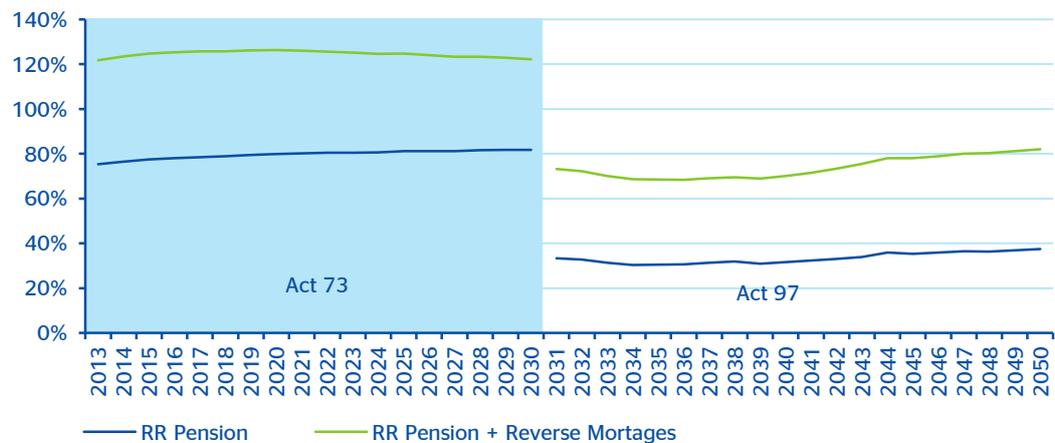
According to these projections, by contracting a reverse mortgage, the replacement rate for this individual could increase from 75% to 122% in 2013, while in 2050, the replacement rate increases from 37% to 82%, as shown in the table 2 and chart 7:

Table 2
Replacement rates with and without reverse mortgage, in 2013 and 2050

	2013	2050
Salary	5,534	7,947
Property value	636,163	919,304
Pension replacement rate	75%	37%
Pension replacement rate + reverse mortgage	122%	82%

Source: MAPP2, BBVA Research

Chart 7
Projected replacement rates with and without reverse mortgage



Source: MAPP2, BBVA Research

4. Conclusions

We carried out a projection exercise to assess the potential for reverse mortgages to complement pensions in Mexico, using available information on the average value of housing nationwide calculated by the SHF, information from household surveys and the socio-demographic characteristics of IMSS contributors. The results show that reverse mortgages could be a way of partly offsetting longevity risk in Mexico over the coming decades.

BBVA Research's MAPP2 model forecasts that the coverage rate for the IMSS pension system as a percentage of the EAP will increase only marginally to just over 50%, whilst the replacement rate for defined contribution pensions under Act 97 will average 37%. The low coverage rate and low replacement rates are due to the high levels of informal employment - around 60% - and the low contribution rate to Mexico's pension system, 6.5% of salary.

Under current parameters, the situation points to the need to diversify sources of retirement income through voluntary savings mechanisms or through the conversion of other forms of wealth, such as real estate, into liquid flows. Here, reverse mortgages can help to improve liquidity up to what is an increasingly long retirement age, by turning illiquid assets into liquid flows. With the inclusion of a flow of life annuities from real estate assets, the forecast replacement rates in the pension system for a 65-year old pensioner would increase from 75% to 122% in 2013, and from 37% to 82% in 2050.

Although the inherent potential in a reverse mortgage scheme is of interest for tackling the problem of future risks in old age, a number of elements have to be taken into account. Firstly, there has to be a change of mentality among the population so that people consider their home as savings they have available for use when necessary, which is difficult in Mexico given the deep-rooted tradition of inheritance. Moreover, reverse mortgages are still not well known as a financial product among the population. It is also clear that mortgage companies and financial and insurance institutions are not prepared for the management of massive housing portfolios. Moreover, marketing such products requires experience of both mortgages and life annuities: most of the institutions that grant mortgages in Mexico have no knowledge of the annuities market, and vice versa. Another important issue is how the financial institution will make the property liquid. The property repossession process is costly due both to the legal processes involved and also the fact that selling property is not part of the bank's business and this impact strongly on the price of the asset. Last, but not least, there are the implications of financial crises and the normal volatility of the real-estate markets. These create risks for both lenders and borrowers. Strategies have therefore to be put in place to mitigate these risks and regulate them adequately.

Reverse mortgages have the potential to substantially increase pension replacement rates. In general, these results lead us to a broader reflection on the financial risks of retirement and the possibility of a wider range of sources of income to support this period of inactivity. Governments should not only focus on the design of pension systems per se, but on generating financial structures that make it easier to convert illiquid assets into a flow of liquid income that will be increasingly necessary in a scenario where life expectancy continues to increase.

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Appendix 1

Reform of the IMSS pension system

The IMSS pension system was reformed in 1997, introducing an individual capitalization structure for Retirement, Advanced and Old-Age Inactivity (RCV for the Spanish acronym) insurance. The contributions for these are channeled through individual accounts managed by Afores (Administradoras de Fondos para el Retiro - Pension Fund Managers). The following rules were applied in the transition from the defined benefit scheme to the new one:

1. Pensions granted under the previous scheme (Act 73) are financed by the Federal Government.
2. Since 1997, all IMSS contributors have had an individual Afore account that capitalizes their RCV contributions, at a rate of 6.5% of the contribution salary (capped at 25 times the minimum wage⁴⁴).
3. Workers who were contributing to the IMSS when the reform took place (the Transition Generation) have the choice at the time of retirement of choosing between receiving a pension under the previous scheme (a defined benefit according to the contribution period and wage level) and the pension granted under the new scheme (Act 97).
4. Workers who began to make contributions after 1997 (the Afore Generation) can only receive a pension under the individual accounts scheme, so during their active lives they do not know precisely the level of pension they will receive, as this depends on accumulated contributions and returns.

According to Albo et al. (2007), the transition rules involve maintaining at the same time two different pension schemes for a long transition period: the defined-benefit under Act 73 and the defined-contribution under Act 97. All current and future pensions granted under Act 73 represent a liability for the federal government, while the pensions under Act 97 are financed from the individual accounts⁴⁵. In addition, Act 97 establishes the right to a minimum guaranteed pension (PMG), equivalent in 2012 to 2,415 pesos (1.29 times the minimum wage)⁴⁶ for workers who meet the requirements for receiving an old-age pension, but whose balance in the individual account is not sufficient to finance a pension that is greater than the PMG. When the balance of the individual account of the person receiving a PMG pension is used up⁴⁷, the pension will be financed by the Federal Government.

The three-way contribution to the RCV from workers, employers and the Federal Government, is equivalent to 6.5% of the base contribution salary (SBC) of workers, with a ceiling of 25 times the minimum wage. In addition, the Federal Government contributes a Social Contribution⁴⁸ on a sliding scale for workers with a salary under 15 times the minimum wage. This is updated every quarter in line with inflation. The amounts of the Social Contribution are as follows:

44: Equivalent to MXN\$46,720 per month (USD 3,600).

45: Despite the fact that the contributions of the invalidity and life and occupational risk insurance are administered by the IMSS, the pensions associated with this insurance are also financed from the individual account funds, and only if these funds are not sufficient does the IMSS contribute the amount required, with funds from the corresponding technical reserves.

46: The amount of the minimum guaranteed pension is defined as 1 times the minimum wage of 1997, updated annually by inflation. However, from 1997 to date the cumulative increase in the minimum wage has been below inflation.

47: If a minimum guaranteed pension is granted, the balance of the individual account remains administered by the Afore.

48: In 2009 the Social Contribution scheme was reformed on a sliding scale, as previously the Federal Government had contributed a fixed Social Contribution to all eligible workers, regardless of their salary level.

Table 3
Social contribution

Salary multiple of MW	Daily Social Contribution*		% of 1 MW
1	\$	4.35	7.0%
1.01-4	\$	4.16	6.7%
4.01-7	\$	3.98	6.4%
7.01-10	\$	3.80	6.1%
10.01-15	\$	3.62	5.8%
>15	\$	-	0%

* Amount current as of April 2012
Source: BBVA Research with CONSAR data

As can be seen, the Social Contribution is a very important component for contributing to the individual account of low-income workers. For example, workers who earn the minimum wage, receive a contribution of 13.5% of the salary (6.5% of the obligatory contribution plus 7% of the Social Contribution).

Appendix 2

The Pension Predictive Analysis Model (MAPP2)

This model is based on information on the socio-economic profiles of a random sample of 4 million workers contributing to the IMSS, organized as a matrix and processed using GAUSS software.

The databases have been used to separate by pension rights (transition or Afore generation, gender and educational level - primary, secondary and tertiary), broken down into a matrix by age and income decile. All the relevant variables in the model are generated as matrices of this type; in other words, there are matrices for the total number of pension savers, regular contributors, irregular contributors, potential salary, balance of the individual account, pension received, contribution density, etc. For example, there are 12 different matrices for the contribution density variable (corresponding to the TG and AG and men with primary education, men with secondary education, men with tertiary education, women with primary education, women with secondary education and women with tertiary education). Each matrix would have a size of [101 x 10], where position [35.6] would correspond to the contribution density of an individual (man or women and with a different educational level according to the matrix) of 35 years of age belonging to income decile 6.

The data are calibrated by multiplying by a factor that equates the numbers in the random sample to the total reported by CONSAR (public information). For example, suppose that the random sample contains 2 million regular contributors and the official data register 21.3 million regular contributors; in this case the factor that would calibrate the base would be 10.65.

In all the cases, the base year for data is December 2011. The databases have information on gender, age, balance in the individual account, year of entry into the IMSS and contribution base⁴⁹ of each pension saver in 2011. The education variable is the only one not in the original database, but given that it is an important factor for developing the model, we have developed a methodology of imputing the educational level for each individual based on the characteristics of each group in the 2011 National Occupation and Employment Survey (ENOE). In other words, using the data of the survey, we have calculated the probabilities of having primary, secondary or tertiary education, given age, gender and wage level, for pension savers in each system; these probabilities are then applied to the CONSAR and Afore databases to assign the corresponding educational level.

The information on pensioners is obtained from the 2009 National Employment and Social Security Survey (ENESS) for 2.6 million RCV pensioners in the IMSS system. It contains data on gender, age, educational level, date of retirement and pension amount. This information is calibrated with the statistics published by the IMSS, as well as the results of the actuarial valuation of the IMSS.

The baseline scenario is the projection obtained based on current conditions and on agents behaving the same way in the future as in the present, with information as of 2011. The profiles of each individual representing the rate of pension savers and the labor market remain constant. The methodology does not explicitly model the behavior of informality or make explicit assumptions regarding the future, but the mathematical functions included in the model suggest that this is adjusted endogenously, through the trend in education level in the methodology employed and its impact on future coverage and pension levels.

49: Capped at 25 times minimum wage.

Appendix 3

Calculation of IMSS pensions under Act 73

The pension under Act 73 consists of a basic amount that depends on the wage level⁵⁰ and increments by weeks of contributions in addition to the required minimum of 500 weeks, in accordance with the Table in Article 167 of the Social Security Act, as shown below:

Tabla 4
Factors for calculating the RCV pension under Act 73

Salary Group corresponding to number of times SMDF			Percentage of salaries	
			Basic amount	Basic amount
0.00	a	1.00	80.00	0.563
1.01	a	1.25	77.11	0.814
1.26	a	1.50	58.18	1.178
1.51	a	1.75	49.23	1.430
1.76	a	2.00	42.67	1.615
2.01	a	2.25	37.65	1.756
2.26	a	2.50	33.68	1.868
2.51	a	2.75	30.48	1.958
2.76	a	3.00	27.83	2.033
3.01	a	3.25	25.60	2.096
3.26	a	3.50	23.70	2.149
3.51	a	3.75	22.07	2.195
3.76	a	4.00	20.65	2.235
4.01	a	4.25	19.39	2.271
4.26	a	4.50	18.29	2.302
4.51	a	4.75	17.30	2.330
4.76	a	5.00	16.41	2.355
5.01	a	5.25	15.61	2.377
5.26	a	5.50	14.88	2.398
5.51	a	5.75	14.22	2.416
5.76	a	6.00	13.62	2.433
6.01		and higher	13.00	2.450

Source: Article 167 of the 1973 Social Security act

As can be seen in the above Table, the lower the wage level, the higher the replacement rate. The minimum pension under Act 73 is equivalent to the minimum wage. For early retirement (before 65) a reduction in the amount of the pension is applied, in accordance with the following table.

Tabla 5
Reduction in old-age pensions for early retirement

Age	% old-age pension
60	75%
61	80%
62	85%
63	90%
64	95%

Source: Article 167 of the 1973 Social Security act

⁵⁰: The average salary for the last 250 weeks of contributions, expressed as a multiple of minimum wages in the Federal District (SMDF).

Once the amount of pension has been calculated, it will be increased by 11%⁵¹ (thus the replacement rate of Act 73 may be up to 111% of the salary). The financing of these pensions is the responsibility of the federal government, which therefore recovers the accumulated balance in the individual account of the pensioned worker.

Table 6

Example of replacement rates under Act 73

Salary multiple of MW	Weeks contributed	
	500	1250
1	111%	111%
2	56%	73%
3	37%	64%
4	28%	59%
5	22%	56%
6	19%	54%
over 6 times	16%	54%

Source: BBVA Research, based on the 1973 Social Security Act

At the death of the pensioner, a widow's pension (*PenViu*) is granted, equivalent to 90% of the holder's pension.

$$PenVIU_{s,y,g}^t = .9 * Pen73_{s,y,g}^{t-1}$$

⁵¹: In accordance with Transitional Article Four of the Social Security Act 2002, which granted an 11% increase to the pension of all pensioners over the age of 60, orphans, widows and parents or grandparents.

Appendix 4

Reverse Mortgage Regulation in the State of Mexico

Pursuant to the Civil Code of the State of Mexico, by virtue of the Reverse Mortgage or Mortgage Pension product, the pension scheme (institution which grants the loan) is obliged to pay a life annuity to the pensioner or their beneficiary, using the real estate asset which is the normal residence and property of the pensioner as collateral.

Pension schemes can be private or social institutions, natural persons and public institutions authorized for that purpose.

The reverse mortgage contract has to comply with the following characteristics:

- i. The amount agreed between the pension scheme and pensioner has to be sufficient for the latter to be able to cover his/her basic necessities;
- ii. The applicant or his/her beneficiary (spouse or common law wife/husband) will have to be aged 60 or over;
- iii. The debt will only be payable and the collateral enforceable upon death of the pensioner and the beneficiary;
- iv. The pensioner will be able to make a total or partial advance payment without any form of penalty whatsoever;
- v. The pensioner will inhabit the mortgaged property for life. However, he or she shall be entitled to partially or wholly lease the mortgaged property, provided he/she has the express authorization of the pension scheme and the terms and conditions of the lease are established in the corresponding agreement;
- vi. The interest on the capital will only accrue on the amounts drawn by the pensioner;
- vii. The contract will specify the annual increase in the pension, in accordance with market conditions and the value of the property.

The reverse mortgage shall be determined by means of an appraisal to determine the market value of the property. The pension scheme shall cover the cost of this valuation, which is to be updated every 2 years in order to adjust for appreciation of the property over the course of time.

When the pensioner and his/her beneficiary die, their heirs will be able to pay the pension scheme all the existing debt due. However, if no payment has been made six months after the death, the pension scheme will collect the debt up to the level of the value of the mortgaged asset, and may request that it be auctioned or sold.

Were the pension scheme to fail to comply with the agreed steps, the pensioner shall be entitled to request the cancellation of the agreement and demand payment of damages. Furthermore, the debt shall be considered to be settled and shall not earn more interest, and the pension scheme must release the corresponding encumbrance at its own cost.

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