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Labor Force Participation by the Elderly in Mexico

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Labor Force Participation by the Elderly in Mexico[†,‡]

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Abstract

A brief review of the aging of the Mexican population, the high labor force participation of elderly, and the lack of retirement pensions, is followed by a causal empirical analysis using a panel data set (*Mexican Health and Aging Study*, *MHAS*) of Mexicans aged 50 and more. We find that the labor force participation of elderly men is affected by their economic situation; in particular the availability of a retirement pension (after contributions to a pension plan earlier in their life) reduces participation. A better health raises male participation rates, while the health effect is absent for women. The opposite effect, from labor force participation on health status, is negligible for both genders. Access to health services, which is obtained if the partner or a child is working, reduces participation rates. Additional analysis indicates that the same variables influence the choice for a job in the formal or the informal sector, and whether a job is held in addition to a pension. The results suggest that a redesign of the social security including retirement pensions and health care services has implications for the individuals' participation decisions, and therefore for future contributions to the insurance and pension plans.

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1. Introduction

For the long-run economic development in Mexico it is important to be aware of and account for the economic consequences of foreseeable demographic changes in discussions about the redesign of the social security system. As is well-documented, Mexico has, similar to many other OECD countries, an aging population (Burniaux *et al*., 2004; Wong, 2001; Zúñiga Herrera, 2004). One of the consequences of an aging population is an increased pressure on pension plans. On the one hand there are more people who have the right to claim from the plan, while on the other hand the number of people who contribute to the plans is likely to decrease due to a decreasing labor force. The latter however can be compensated if the low participation rates in pension plans would increase. Currently the income situation of elderly in Mexico is not very good (*e.g*. Pedrero Nieto, 1999; Parker and Wong, 2001; Wong and Espinoza, 2003; Rodriguez-Flores and DeVaney, 2006), partly due to a lack of access to a retirement pension. Another consequence of an aging population is that the costs for health care services can be expected to increase, because in general elderly people have more health problems. The larger number of elderly is therefore likely to increase the pressure on health expenses (*e.g*. Ham Chande, 1999), which are paid from social security plans that are filled by working people and increasingly through tax-financed social protection (*Seguro Popular*). It implies that the younger generations (whose size will decrease in the long run) have to contribute more to the social security or protection plans in order to cover the health expenses for the older generations. This may create additional incentives for informality, avoiding taxes and contributions to social security (Levy, 2008).

Reforms in social security, *e.g*. those proposed in Aguilera (2010a,b) should on the one hand increase both the access to health care services and retirement pensions while on the other hand setting incentives such that jobs in the formal sector (that pay contributions to the social security system and payroll taxes) remain attractive in comparison to informal sector jobs (that do not pay for the social security system). A careful redesign may reinforce itself due to potentially beneficiary relation between labor force participation and health; a better health care affects not only public health but also may help people to remain more productive for a longer time.

Labor force participation, retirement issues and health are closely related. However, not a lot is known about the mechanisms that govern labor force participation, retirement decisions, and health. Parker and Wong (2001) analyze the determinants of health care coverage and of pension receipt, but explain neither health status nor participation. Aguila (2007, 2008) shows that financial considerations are important in the decision to retire or continue working. Van Gameren (2008) analyzes the relation between participation and health and concludes that better health increases participation, and that there are no clear indications of a causality running in the opposite direction. Elderly who contributed to a retirement plan are more likely to withdraw from the labor market. Barros (2008) concludes that the introduction of *Seguro Popular* has positive but small effects on health status, and does not affect the labor decisions.

In this chapter we document population aging and labor force participation in Mexico, and in particular we analyze the relation between health, labor force participation and retirement. The next section presents numbers on the population distribution, from which it is clear that also in Mexico aging is a relevant phenomenon. Labor force participation statistics show that Mexico's labor market is atypical in the OECD, with high participation rates among the elderly, and a large informal sector. Data for the descriptive analysis is borrowed from

various sources. The empirical analysis is based on the *Mexican Health and Aging Study* (*MHAS*; in Spanish: *Estudio Nacional sobre Salud y Envejecimiento en México*, *ENASEM*), introduced in section 3, a panel data set that contains detailed information on the health and financial situation of the elderly. It allows us to link, in section 4, the participation of individual elderly with their economic and social circumstances and health. We present and discuss estimations of the causality between labor force participation and health, and an analysis of the joint choice of sector (formal, informal) and receipt of benefits. Section 5 concludes.

2. Stylized facts: Elderly at Work

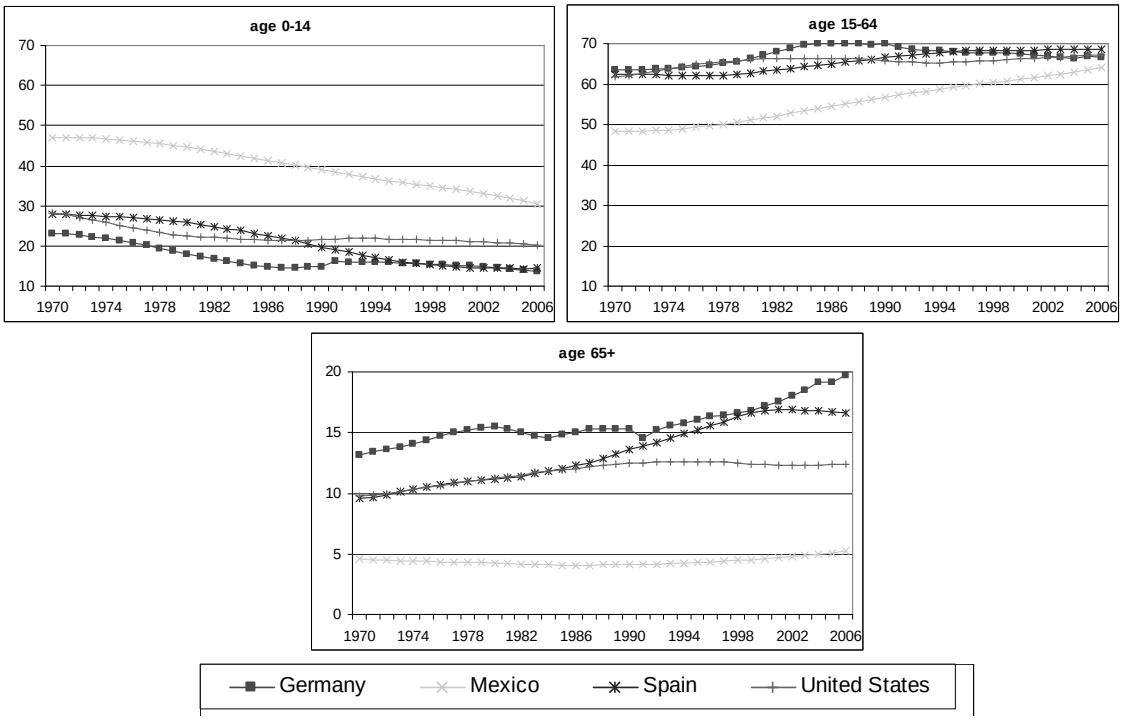
2.1 Aging

Similar to other OECD countries, Mexico has an aging population. In many European countries the process has already advanced to increases of the share of the oldest cohorts, while in Mexico aging is still in its early stages, reflected by a major decline in the size of the youngest age cohorts (Burniaux *et al*., 2004; Wong, 2001; Zúñiga Herrera, 2004), similar to Latin-American countries as Brazil and Colombia (CEPAL, 2008). Despite the relatively young population at this moment, the decline of the youngest cohorts implies that in the medium and long run the proportion of older people will increase drastically.

Figure 1 shows the population distribution over the age groups for several OECD-countries, where the third panel shows the share of people aged 65 or more. Notice that in all other countries the share of elderly people steadily grew between 1970 and 2006, to 19.7% in Germany and around 15% for several other countries. In Mexico the share of people aged over 65 is well below the shares of this age group in the other countries, and rather stable around 5% of the total population. This stability however is not likely to continue forever, because the other two panels show that Mexico is converging to the other countries. Especially the share of children younger than 15 strongly decreased, and now is at about 30%, the point where the other countries were in 1970. Also in the other countries the share of young people decreased since 1970, but at a lower rate than in Mexico. The reduced birth rates are already reflected in the share of people aged 15-64. While in other countries this group's share increased only marginally, in Mexico the share grew from 48% to 64% and caught up with the other countries. It is to be expected that these trends continue, and that Mexico's elderly population will start to grow similar to what has happened in other countries.

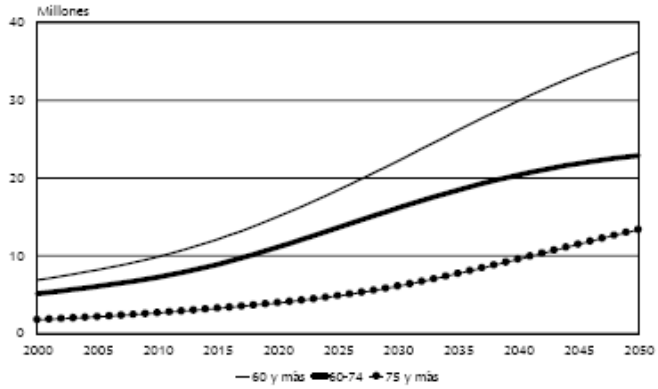
Projections of the elderly population in Mexico are shown in figure 2, drawn from Zúñiga Herrera (2004). The number of elderly aged 60 or more is expected to grow from about 8 million in 2000 to more than 36 million in 2050, with highest growth rates before 2020. The share of elderly aged over 60 will grow from about 7.3% of the total population in 2000 to 17.5% in 2030 and 28% in 2050 (Zúñiga Herrera, 2004).

Figure 1 Population distribution by age, 1970-2006



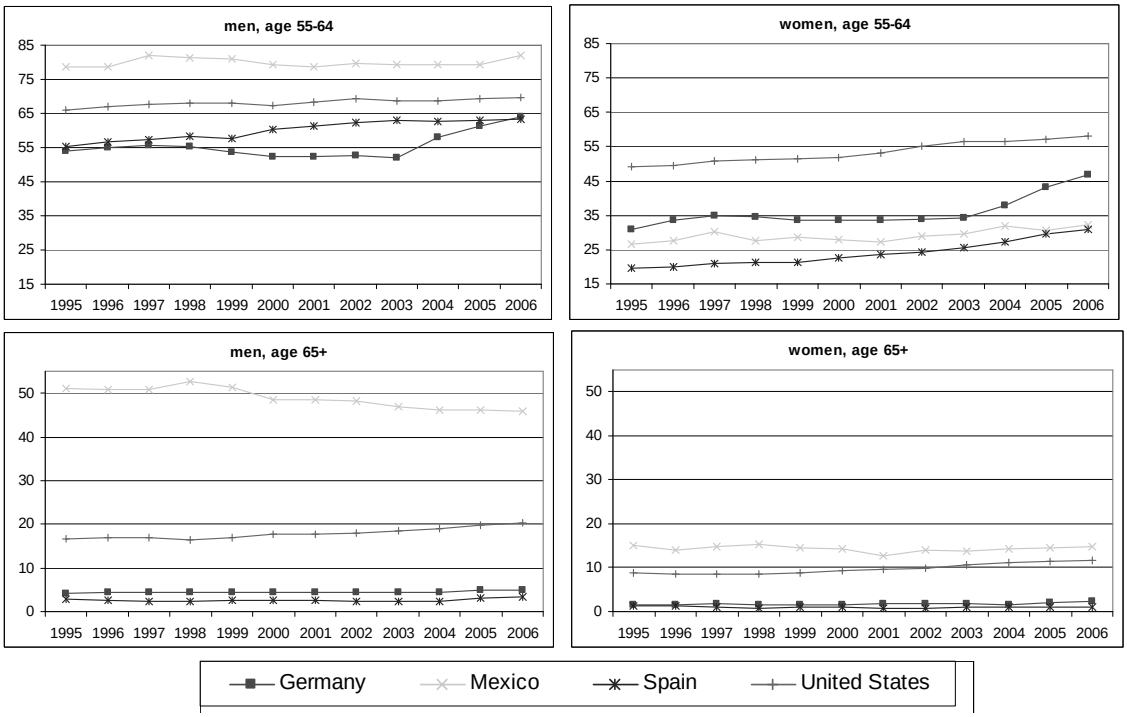
Source: OECD (2007)

Figure 2 Population aged 60 or older, 2000-2050



Source: CONAPO, Zúñiga Herrera (2004,Gráfica 4)

Figure 3 Labor force participation by gender and age, 1995-2004



Source: OECD (2007)

2.2 Labor force participation

In figure 3 we compare the labor force participation of elderly in Mexico with the participation rates in the same set of countries as used in figure 1. Participation in Mexico is higher for all groups except women aged 55-64. In that group the participation rate in Mexico is not different from other countries, but for the men in the same age group the participation in Mexico is much larger compared to the other countries. The difference becomes even more striking when we look at men aged over 65. In Mexico more than 50% is still active in the labor market, while in the USA this is only 18% and in none of the remaining countries the fraction of working men over 65 reaches 10%. Strikingly, participation of male elderly is about double the size of participation in countries as Argentina, Brazil and Colombia (CISS, 2006; CEPAL, 2008). Participation among women over 65 is much lower than male participation, also in Mexico, but unlike for younger women, Mexico has the highest share of elder women working.

2.3 Social security contributions

An important feature of the labor market in Mexico is the size of the informal sector. Estimates of the total size of the informal economy are by its nature difficult to make, due to issues about the definition of informality and difficulties to measure unregistered activities. A definition that is relevant for the labor market in Mexico is the distinction between jobs that give access to social security services and jobs that do not provide access. The latter are generally considered as informal sector jobs, while jobs with employers who pay the legally required contributions to social security plans are considered formal sector jobs.

Informality is often associated with segmentation of the labor market, interpreting the choice for an informal job as a 'negative' choice caused by a lack of opportunities to obtain jobs in the formal sector (Fields, 1990). Research for Mexico suggests that the choice for the informal sector is not due to segmentation but has a voluntary component where at a certain moment the benefits obtained when accepting a formal job do not outweigh disadvantages (Maloney, 1999, 2004; Gong and Van Soest, 2002; Navarro-Lozano and Schrimpf, 2004; Levy, 2008). Maloney (2004) estimates that during the 1990s about 55-60% of the labor force held an informal job, while Levy (2008) reports that 58% of the economically active population in 2006 is working in the informal sector.

Social security in Mexico is organized through institutes that offer a bundled set of benefits for their affiliates, including health insurance, disability, work-risk and life insurance, housing loans, day care services for children, and retirement pensions. The largest institute, the Instituto Mexicano del Seguro Social (IMSS), provides social security services for employees in the private sector, while the ISSSTE (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado) serves public sector workers. Smaller institutions provide services for Petroleos Mexicanos (PEMEX, the state oil company), the army, navy, federal states, and municipalities. The retirement pensions offered by the social security institutes used to be a pay-as-you-go system with defined benefits, where the working people paid for the pensions of the retired generations. Retirees received a pension that was a given percentage of their last salary(ies). The IMSS had a normal retirement age of 65 years, while early retirement (with a reduced pension) from age 60 onwards was possible if one had contributed at least 10 years. A major change to their pensions was implemented in 1997, when the prevailing system was replaced by a system of personal retirement accounts with defined contributions. Instead of paying for the elderly of that moment, working people's contributions where added to individual savings accounts, together with a government subsidy that guarantees a minimum pension for all participants. The savings in those accounts[1] are used to pay a pension after retirement, of which the level depends on the accrued savings. The normal retirement age and the earliest retirement age (65 and 60 years, respectively) have not changed, but the minimum number of years with contributions increased to 25 years.[2] People who contributed under both regimes, that is, before and after 1997, can, at the moment of retirement, choose to retire under the regime that gives them the highest pension. A difference between the pension plans of ISSSTE and IMSS was that the minimum retirement age was practically absent for public sector workers. The reform of the ISSSTE pensions from a pay-as-you-go system to individual accounts is implemented only in 2007, to a system that is largely identical to the new IMSS system (except that the choice between the old and the new regime has to be made directly).

The first column in table 1 shows the number of people who have access to social security services. Only about 44% of the total population was covered by social security in 2004. This number does not tell us how many people save for a retirement pension, because the coverage of social security, in particular its health insurance, is individually available for the partner, children and parents of the holder of a formal job, while a retirement pension is available only for the insured worker (or, in case of death, for the partner) and not for the other individuals covered through the job holder. Therefore, for the coverage of retirement pension schemes, we have to look at the second column of table 1, where only the economically active

[1] Managed by privately arranged AFOREs (*Administradora de Fondos de Ahorro para el Retiro*)
[2] Retirement before age 60 is possible under the new system if the worker has saved enough to obtain a pension of at least 130% of the minimum pension guarantee.

population is considered. More than 60% of them do not have social security through the own job; only about 15 million people are covered. This is not exactly the same as participation in a pension scheme, but gives a good indication (similar to the estimates of García Nieto *et al*. (2005)). However it is likely that a sizeable number of those who currently contribute to a pension plan cannot expect to receive the minimum pension once they reach the retirement age because they do not fulfill the rules of the minimum number of years of contribution.

The last two columns of table 1 show the number of pensions paid in 2000 and 2004. The total number of pension beneficiaries grew from about 2 million in 2000 to 3 million in 2004, an annual growth rate of 9.6%. These numbers include pensions due to disabilities and widows, but a large part of the pensions are paid as a retirement pension, as is confirmed by the numbers for IMSS shown in table 2. Clearly the number of retirement pensions (both unemployment or early retirement, and full retirement pensions) is growing rapidly, and given the expected growth in the number of elderly people (figure 2) it is likely that the number of claimants of an old-age pension will continue to grow rapidly (Partida Bush, 2004).

Table 1 Population with social security (2004) and granted pensions (2000, 2004), by social security institute (thousands of persons)

	Population	Employee, insurance holder	Population with a pension	
			(2000)	(2004)
Total population	104 320			
Economically Active Population	--	43 859		
Population with social security	45 873	15 249	2 075	2 997
IMSS	34 153	11 941	1 533	2 112
ISSSTE	7 478	2 625	303	533
Other [a]	3 147	251	137	223
Private institutes	1 094	432	102	130

[a] Includes PEMEX (state oil company), Army, Navy, and people insured via the National Health Ministry (*Seguro Popular*).
Source: INEGI, IMSS. Encuesta Nacional de Empleo y Seguridad Social (Cuadros 2.1 y 4.6).

Table 2 Pensions granted by the IMSS, by type of pension and insurance class, 1997-2006

	Direct pensions				Pensions for surviving relatives		
	Disability	Old age (unemploy.)	Old age (retirement)	Permanent invalidity	Widow(er)	Orphans	Other dependents
1997	302 201	371 676	192 954	189 982	421 940	140 582	33 807
1999	301 652	451 662	203 735	197 113	446 060	112 685	33 215
2001	280 011	545 139	220 810	208 962	476 164	91 455	32 596
2002	277 637	594 306	229 702	215 729	494 603	87 897	33 375
2003	279 848	636 861	237 769	220 814	513 220	83 708	34 754
2004	277 318	691 860	244 083	224 126	537 455	85 551	36 281
2005	275 144	741 108	251 394	227 591	559 203	84 529	37 485
2006	325 642	788 232	263 109	269 105	598 343	91 620	44 374

a Pensions paid directly to the insured person
b For the pensions for widows, orphans, and other economically dependent relatives, the number refers to the number of pensions granted to survivors of people who were insured for Disability and life, and Work hazards
Source: IMSS. Memoria Estadística (varios años). (http://200.23.8.5/est/contenidos/espanol/rutinas/ept.asp?t=msoc09&s=est&c=1887)

3. Relation between participation, retirement and health: data and descriptive statistics

Research focused at the retirement decision in Mexico is scarce, but in international research financial incentives allowing (early) retirement are generally found to be important determinants of the decision to stop working (Lumsdaine and Mitchell, 1999). A recent contribution for Mexico is Aguila (2008), who concludes that the social security reform of 1997 increased consumption while crowding out savings for low and lower-middle income earners, an effect that is stronger for people close to retirement age. Aguila (2007) concludes that also in Mexico the financial incentives are a major determinant of retirement. In general the pensions in Mexico are less generous than in European countries, and the consequential lack of financial resources can be expected to be an important explanatory factor for the high

labor force participation among elderly that was shown in the previous section. Other factors such as health status may however pose restrictions on the employability of the elderly. The role of health in labor force participation and retirement decisions, and more general the link between health and socio-economic status, is not well understood (Smith, 1999; Adams *et al*., 2003). More insight is important to be able to infer the impact of policies that aim to stimulate labor force participation and improve the health of the population.

In this section we introduce the data that is used in the econometric analysis of section 4. Here we give descriptive statistics of labor force participation, health, access to social security and retirement pensions in a sample of elderly Mexicans.

3.1 Data: Mexican Health and Aging Study

The data used in this chapter are from the *Mexican Health and Aging Study* (*MHAS*; Puig *et al*., 2006; Wong *et al*., 2007). *MHAS* is organized as a panel survey, where the baseline survey (held in 2001) is constructed as a nationally representative sample of the about 13 million Mexicans aged 50 and over. The questionnaire contains questions about socio-demographic status (including information on children living outside the household), health status, functional limitations, use of health services and other sources of support, current and previous labor status, sources of income and properties. Information on the health status consists of a self-evaluated, subjective, health assessment of the respondent's general health. In addition there is more objective information collected via a large set of questions regarding whether a doctor or other medical personnel has ever told the respondent that he or she suffered from specific health problems such as of hypertension, diabetes, cancer, respiratory problems, heart problems, stroke, arthritis, and many other diseases and symptoms.

Both the heads of the selected households as well as their partners were interviewed, resulting in a total sample size in 2001 of 15,186 individuals. In the follow-up survey of 2003, attempts where made to interview the same age-eligible persons and their household members, even if the household had moved or split. Some could not be traced or refused to participate (5.8% of the targeted households) while others died in the two years between the interview and a next-of-kin was interviewed (3.8% of the interviewed individuals) (Wong and Espinosa, 2004).

In the analysis we focus on the households that did not face a change in composition due to divorce or death. Such major changes in household composition are likely to dominate other decisions. Dropping observations with incomplete information on essential variables (in particular, employment and health[3]) leaves us with 10,106 individuals with information both in 2001 and 2003. Table 3 shows that more than half of the sample, 56.1%, is female. In 2001, 65.6% of the sampled elderly were younger than 65 years, a percentage that dropped to 58.9% in 2003. These percentages hardly differ between men and women.

[3] Incomplete information on detailed health characteristics is recoded as the absence of the problem at hand. Observations where the detailed health information is completely missing in one or both years are excluded from the analysis.

Table 3 Number of observations, by gender and age, 2001 and 2003

gender	age (2001)		age (2003)		total	%
	50-64	65 or more	50-64	65 or more		
men	2 816	1 620	2 530	1 906	4 436	43.9
women	3 817	1 853	3 425	2 245	5 670	56.1
total	6 633	3 473	5 955	4 151	10 106	100
%	65.6	34.4	58.9	41.1	100	

3.2 Work and health in 2001

Before we come to a more detailed analysis we have a look at some descriptive statistics of the relevant variables. The left panel of table 4 shows the labor force participation of men and women by age. Participation is much larger for men than for women, in every age group, and decreases with age. As we noted in section 2, these participation rates, which are similar to the numbers reported in Pedrero Nieto (1999), are much higher than in other OECD-countries, where hardly anyone aged over 65 reports to be working (OECD, 2007) and also higher than in most of the larger South-American countries (CISS, 2006). The second panel of table 4 gives the size of the informal sector among the employed people. In every age group the number of people working in an informal job (defined as a job that does not provide access to health services) is larger than the number with a formal job, which is in line with the numbers mentioned in section 2. On average, 71.9% of the working elderly have an informal job. The older the people are, the larger is the share working in the informal sector. In all groups, women are more often found in an informal job – but keep in mind that overall participation among women is much lower than among men. The number of elderly women with a formal job is thus extremely low.

Panel 3 of table 4 lists the percentage of people who obtain income from a retirement pension. Overall, 12% of the elderly receive a retirement pension, a percentage that matches with the numbers presented before.[4] As we expected there is a positive relation with age, with a large increase in beneficiaries especially between 60 and 65 years of age. Still, even among the oldest elderly, less than 30% of the men receive a retirement pension, and among women the percentage with a pension is less than 10%. Further, receipt of a pension does not imply that the receiver does not work anymore, as the rightmost panel of the table shows. Especially among the younger elderly with a pension, a large fraction is still at work, mainly in an informal job (not in table).

Table 4 Labor force participation, per sector, and retirement pensions, by age and gender, 2001 (%)

	participation			informal sector[a]			retirement pension			working[b]		
	gender			gender			gender			gender		
age	men	women	total	men	women	total	men	women	total	men	women	total
50-54	89.0	34.8	57.7	57.2	68.7	61.2	3.8	5.8	4.9	45.2	26.1	32.3
55-59	81.4	29.1	51.8	65.5	74.5	68.3	6.4	9.6	8.2	44.3	12.5	23.2
60-64	68.1	22.3	41.4	75.8	81.5	77.6	19.2	13.4	15.8	37.1	17.3	27.3
65-69	59.0	16.4	36.2	81.4	88.4	83.1	25.0	11.5	17.8	35.0	8.2	25.7
70-74	52.4	11.9	30.8	89.7	93.7	90.5	25.0	12.6	18.4	35.3	10.4	26.2
75-79	39.6	10.6	24.4	88.5	97.2	90.5	30.2	7.1	18.1	24.7	4.2	20.5
80-…	26.8	7.7	16.5	100.0	100.0	100.0	29.7	9.3	18.7	12.9	8.7	11.8
total	69.3	24.1	44.0	69.9	76.5	71.9	15.3	9.6	12.1	33.5	14.5	25.0

a Share of the informal sector among the employed people
b Share of working people among the people with a retirement pension

Table 5 shows that the self-assessed health, measured on a five-point scale running from poor (0), fair (1), good (2), very good (3) to excellent (4), decreases with age: on average the older

[4] Table 2 counts about 1.6 million labor-related pensions in 2001, about 12% of the total population aged over 50 years.

people report a worse health. Noteworthy is the difference among men and women: in every age category (except the oldest group) women report worse health than men.[5] Displaying the same information for the objective health is less straightforward due to the large variety of health-related characteristics. In table 6 we break down the information for a subset of characteristics by age (under and over 65 years) and gender. For most diseases we see that prevalence is higher in the older age category, while especially in the group aged less than 65 years we see an almost systematically higher prevalence among women.

Table 5 Self-assessed health by age and gender, 2001

	gender		
Age	*men*	*women*	*total*
50-54	1.602	1.320	1.439
55-59	1.445	1.214	1.314
60-64	1.365	1.174	1.253
65-69	1.290	1.113	1.195
70-74	1.213	1.019	1.110
75-79	1.172	0.976	1.069
80 or more	1.100	1.118	1.110
total	1.389	1.185	1.275

Table 6 Objective health by age and gender, 2001

	under 65		*over 65*	
disease	*men*	*women*	*men*	*women*
hypertens./high blood pressure	0.267	0.440	0.340	0.498
diabetes/high blood sugar	0.131	0.172	0.143	0.185
cancer/malignant tumor	0.006	0.029	0.013	0.022
respiratory ill.(asthma)	0.045	0.063	0.080	0.073
heart attack	0.032	0.021	0.050	0.040
stroke	0.016	0.020	0.041	0.028
arthritis/rheumatism	0.127	0.226	0.202	0.316
liver/kidney infection	0.088	0.127	0.075	0.101
tuberculosis	0.002	0.004	0.004	0.003
pneumonia	0.010	0.016	0.019	0.021
fallen down	0.251	0.401	0.317	0.510
mental health problems	2.675	3.834	3.341	4.335
problems with (i)adl	2.160	3.451	4.060	5.675

Table 7 and 8 show the labor force participation and access to health services by age and health status. In table 7 we find a positive relation between participation and health for every age group: those who report better health are more often found to be working. Overall, 31.1% of the people in poor health are working, a percentage that raises to 61.3% of those who report very good or excellent health. Not shown in the table is that the same pattern is found for men and women, obviously at a much lower level of participation among women. Table 8 shows that the people with a better health have more access to health services, including access related to being employed in a formal job and access based on a formal job of the partner or children or due to a retirement pension. While 71.6% of the elderly in very good/excellent health have access to medical services provided by the social security institutions, only 55.9% of those in poor health have access.[6] The better access for the people who report a better health is found in all age groups, where the difference in access between people with poor health and (very) good health is largest for the youngest and the oldest elderly. Not shown in the table is that the access to health

[5] In following tables and empirical analysis, the categories 'very good' and 'excellent' self-assessed health are taken together, given their small sizes.

[6] Note that these numbers date from the period before the introduction of *Seguro Popular*, with very limited availability of affordable services outside the institutions of the social security.

services among women is slightly higher than among men. Obviously, for most women this access is not due to their own job, as we observed very low participation rates among women.

Table 7 Participation by age and health, 2001 (%)

	self-assessed health				
age	*poor*	*fair*	*good*	*very good*	*total*
50-54	46.0	51.5	65.6	73.6	57.7
55-59	39.5	47.2	61.4	66.7	51.8
60-64	28.8	39.3	48.9	57.1	41.4
65-69	31.4	33.0	43.1	49.3	36.2
70-74	20.4	32.1	36.4	40.6	30.8
75-79	18.8	19.3	38.2	38.5	24.4
80 or more	16.7	15.7	16.5	22.7	16.5
total	31.1	40.2	53.4	61.3	44.0

Table 8 Access to health services by age and health, 2001 (%)

	self-assessed health				
age	*poor*	*fair*	*good*	*very good*	*total*
50-54	53.2	60.5	65.4	72.2	62.4
55-59	54.9	60.5	65.4	70.4	61.8
60-64	60.1	64.4	65.1	66.7	64.1
65-69	60.9	67.0	66.9	75.3	66.3
70-74	57.8	65.2	69.3	71.9	64.8
75-79	50.9	66.6	62.5	69.2	61.7
80 or more	45.4	55.1	58.7	81.8	54.9
total	55.9	62.7	65.5	71.6	63.0

Note: Access to social security includes rights due to one's own job or a retirement pension, but also 'secondary rights' obtained via a formal job of the partner or children.

3.3 Changes between 2001 and 2003

Table 9 shows the labor force participation in 2003 versus the participation in 2001. We notice that there is a great persistence; more than 85% of those who were not working in 2001 also were inactive in 2003 while 77% of those who were employed remained active in the labor market. 23% stopped working, while 15% started to work after having been inactive. Changes in self-assessed health are shown in table 10, separately for elderly who were working in 2001 (left panel) and for non-working elderly (right panel). For health we see a smaller persistence than for participation; although the numbers on the main diagonals are large, there is some tendency towards a fair health, both from poor and good health, while a majority of those who reported very good or excellent health in 2001 report a good health in 2003.

Table 9 Transitions in participation between 2001 and 2003 (%)

working in	*working in 2003*		
2001	*no*	*yes*	*total*
No	85.6	14.4	100
yes	23.4	76.6	100
total	58.2	41.8	100

Table 10 Health transitions between 2001 and 2003, by participation (%)

	employed in 2001					*not employed in 2001*				
self-assessed	*self-assessed health, 2003*					*self-assessed health, 2003*				
health, 2001	*poor*	*fair*	*good*	*very good*	*total*	*poor*	*fair*	*good*	*very good*	*total*
poor	39.8	44.2	13.8	2.2	100	48.9	41.6	9.0	0.5	100
fair	15.1	60.2	22.1	2.6	100	19.0	60.7	18.3	1.9	100
good	6.3	40.1	46.6	6.9	100	8.5	43.5	40.9	7.1	100
very good	4.5	23.7	52.2	19.6	100	3.5	28.3	50.9	17.3	100
total	13.8	48.1	32.6	5.5	100	21.7	51.3	23.5	3.6	100

4. Relations between participation, retirement and health: causal models

The tables in the previous section suggest that there is a relation between labor force participation, the receipt of a retirement pension, and the health status. However that does not say anything about causality. In this section we analyze causal relations between changes in labor force participation and in health status. Section 4.1 briefly reviews theoretical arguments and empirical evidence, and describes the analytical model. Estimates for Mexican elderly are presented and discussed in section 4.2. Section 4.3 digs deeper into the effect of labor force participation on health, and section 4.4 analyzes the participation decision acknowledging that receipt of a pension does not necessarily imply withdrawal from the labor force.

4.1 Theory and empirical evidence

Theoretical retirement models identify various reasons why health status is a determinant of the optimal retirement age (Lumsdaine and Mitchell, 1999). Most arguments suggest a relation where poor health reduces the optimal retirement age and thus the labor force participation. First, poor health reduces the productivity of a worker and therefore the expected earnings, implying that work becomes less attractive in comparison with retirement. Second, job tasks are more demanding when health is weaker, changing the preferences in favor of leisure. Third, more time may be necessary to care for one's health, further increasing the utility of leisure and reducing participation. Fourth, with poor health one may be entitled for disability benefits that facilitate withdrawal from the labor market. A fifth effect of poor health is a reduction of life expectancy, which shortens the time horizon of the optimization problem. An anticipated negative health shock then results in a shorter work life (and also in fewer retirement years). A counter-effect that postpones retirement is that the utility of consumption may increase relative to leisure given that the costs of treatment may increase necessary expenses.

Empirical analysis of the effect of health on the retirement and labor force participation decisions is hampered by the possibility of causality running in the opposite direction. Health is negatively affected by one's work if, for example, dangerous labor circumstances or long working hours result in the deterioration of a worker's health. A positive direct effect is also possible: a job may contribute to one's satisfaction and well-being, which may positively affect the (actual or perceived) health. Further, noting that bad health is a legitimate reason to refrain from participation, non-participants may justify their withdrawal from the labor market by overreporting health problems (known as the 'justification hypothesis', see for example Anderson and Burkhauser, 1985). Under this hypothesis, part of the (self-evaluated) health status measures a person's attitude towards work or the preference for leisure.

Another measurement issue is that it may be difficult to capture all relevant health aspects in one measure. The self-assessed health measure can be expected to give a good summary of overall health because the respondent will give a general evaluation of his or her health, capturing all relevant aspects. However, diseases and other health problems can result in a variety of physical and cognitive limitations with different implications for labor capacities, and in reporting the health status the respondent not only has work-related aspects in mind. On the other hand, detailed reports on the (more objectively observable) prevalence of diseases and symptoms that do not suffer from justification bias are necessarily incomplete.[7] There is no obviously better alternative way to combine the information generated by the variety of objective health characteristics into one measure, and in a bidirectional causal model it is impossible to include all the relevant health aspects as endogenous variables. Therefore the self-reported health status as the best available summary of health is used in the analysis, while accounting for potential endogeneity and misreporting due to justification by using the objective health measures as identifying variables, as we should expect a close relation between the objective measures and the self-reported health.[8]

The available empirical evidence suggests that poor health negatively affects labor force participation and leads to an earlier retirement, but the range of estimates varies widely, partly due to the variety of measures applied (Currie and Madrian, 1999). Evidence on a relation running from participation to health is mixed. Cutler *et al*. (2000) showed that economic crises that hit Mexico in the 1980s and 1990s increased the mortality rates by a reduction in the incomes, suggesting that in Mexico a relation running from labor market status to health exists. Van Gameren (2008) suggests that for Mexicans aged 50 and over health negatively affects labor force participation, but that there is no clear evidence of an effect in the opposite direction. In that paper however only the survey of 2001 is used, and only men and women with a labor history are (jointly) included.

In the empirical analysis we follow the framework set out by Stern (1989) and Cai (2007) to analyze the causal effects of health and labor force participation (see Appendix A for details). They derive a simultaneous equations model consisting of a participation equation (P_{it}^{*}) and an equation for the health status (H_{it}^{*}),

$$P_{it}^{*} = \lambda_P^{1} H_{it}^{*} + \beta_P^{1} x_{P,it} + v_{P,it}, \quad (1)$$

$$H_{it}^{*} = \alpha_H^{1} P_{it}^{*} + \beta_H x_{H,it} + v_{H,it}, \quad (2)$$

[7] The detailed reports are also answered by the respondent, but the level of specificity and concreteness of the questions and concepts leaves much less room for a subjective answer than is the case with the question regarding the general health status.

[8] In empirical work several approaches are followed with regard to the potential endogeneity of health in the retirement or participation decision. Some studies tackled the endogeneity of self-evaluated health through instrumentation with available objective health indicators such as the prevalence of diseases, medicine usage, or functional limitations. Some researchers find indications of endogeneity (*e.g.* Kerkhofs *et al*., 1999; Disney *et al*., 2006; Cai and Kalb, 2006; Cai, 2007), but in other cases there is no or only weak evidence that self-rated health is endogenous (*e.g.* Stern, 1989; Dwyer and Mitchell, 1999; Wolff, 2005). Dwyer and Mitchell (1999) test for the endogeneity of objective measures using parental health and mortality and respondent's height/weight ratio as instruments, and conclude that there is no problem with endogeneity of health. Bénitez-Silva *et al*. (2004) exploit the availability in their data of both self-rated disability and the receipt of disability benefits (indicating officially, objectively approved disability), and conclude that the subjective and objective measures are sufficiently close to each other so that the hypothesis that subjective disability is an unbiased estimator of the objectively determined disability cannot be rejected. In an analysis of ten European countries Kalwij and Vermeulen (2008) find that the self-evaluated health status is endogenous in some but not all countries. They conclude that health should be included as a multidimensional factor using both subjective and objective health information, but also that the dimensions important in explaining the participation decision differ between countries.

where observed participation P_{it} equals 1 if $P_{it}^{*}>0$, and zero otherwise, and the parameter λ_P^1 measures the (causal) effect of health on the participation decision. H_{it}^{*} is the continuous counterpart of the observed self-assessed health H_{it}, measured on a four-point scale. Due to the justification hypothesis, the self-assessed health is not necessarily equal to the true health. The parameter α_H^1 represents the sum of the (causal) effect of labor force participation on the true health, which could be negative (*e.g.* because of bad labor conditions) or positive (*e.g.* due to increased satisfaction), and of the effect of justification. The latter has a positive value, as the hypothesis states that participating elderly report a better health status than they have in reality. The explanatory variables in the two equations ($x_{P,it}$, $x_{H,it}$) may be different.

The joint estimation of the model given by the two equations is not straightforward, due to the qualitative nature of the dependent variables, and therefore we opt for a two-stage method. In the first stage, reduced forms of both the participation equation and health equation are estimated, including all available variables. The results from those estimations are used to calculate the propensity to participate in the labor market ($\hat{P}_{it}$) and the 'health stock' ($\hat{H}_{it}$) of each individual *i* in each time period *t*. In the second stage the structural model defined by equations (1) and (2) is estimated, where the predictions $\hat{H}_{it}$ and $\hat{P}_{it}$ replace the endogenous explanatory variables H_{it}^{*} and P_{it}^{*} (see Appendix A for more details).

What remains is to be discussed is which variables are included in the model; until now we have only stated that objective health is used to identify the health equation. Cai (2007), using Australian panel data, includes marital status, children and age to identify the employment equation, while information on smoking, drinking, physical activities and the prevalence of a long-term health condition identify the health equation. Demography, education, job history, occupational and spousal information are included in both equations. His preferred instruments in the health equation, the specific and objective health indicators such as symptoms, types and severity of disability or health conditions, which are likely to be major determinants of the general health, were not available (Cai, 2007).[9] In our data the objective indicators of the respondents' health are available and used to identify the health equation. The objective health measures have a strong explanatory effect on the observed self-assessed health and are thus clearly related with the endogenous variable. Some diseases and symptoms however turned out to be invalid as instruments and are excluded from the analysis.

Job and occupational history, and the history of contributions to pension plans are used to identify the job equation, instead of using them in both equations. History of contributions pension plans is summarized by a block of dummy variables that combine different ages and numbers of years with deposits at pension plans. The age classes are bounded by the early and the normal retirement ages, 60 and 65 years. However retirement is generally only possible if for at least 25 years deposits have been made, while with 10 years with deposits more flexible solutions can be available already. The reference category is formed by the elderly who never made deposits. The variables on job and occupational history show that the large majority of the male sample had their main job in manufacturing or agriculture, while for women the service industry, which includes domestic work, is a major sector of employment (Appendix B). Salaried work and self-employment are the

[9] Others use health and living circumstances during childhood as instruments, but this information has the drawback that, apart from having the (desired) effect on health in later years, it is also likely to have a direct effect on education and via that on human capital formation, wages and labor market outcomes (Currie and Madrian, 1999).

most frequently observed contractual arrangements. We find a clear relation between the labor force participation and the labor history, although the relation is weaker than for health. Overidentification tests do not reject the null hypothesis that the variables can be excluded from the other equation (and thus are valid as instruments).

Additional explanatory variables in $x_{P,it}$ and $x_{H,it}$ include the general demographic situation of the individuals such as age, household composition and the number of children (see Appendix B). Older age is frequently found to correlate with health deterioration. The highest level of education is generally found to be an important factor both for participation and health. More than 50% of our sample has maximum primary education. We create more variation through the inclusion of specific capacities (reading and writing, counting, use of English or an indigenous language). Other variables included in both equations are the degree of urbanization, the available non-business assets, and the access to social security services. Apart from their effects on (need for) participation, these variables may also have an effect health as poverty indicators, knowing that poor people often have more health problems.

4.2 Participation and health: results

Table 11 presents the estimation results of the structural (causal) model outlined above. The effect of health on labor force participation is significantly positive only for men; elderly men with a better (perceived) health are more likely to be employed than men with a weaker health. For elderly women we do not find a significant effect, female labor force participation decisions appear not to be related to their health status. The analysis includes all sampled people aged over 50, including those who never had a paid job. Especially among women a large share never had a paid job, and the participation decision at older age is probably governed by choices made much earlier in life regarding the distribution of task between man and wife. We see that women who are married or living together are much less likely to work, and that the more children they have the less likely it is that they are employed. These variables have no contribution at all to the explanation of participation of male elderly.

The effect of previous deposits at pension plans varies greatly between men and women, which obviously relates to the differences in labor histories. The older the men who made deposits at pension plans are, and the longer the duration of the contributions, the lower the probability that they are still in employment. Obviously the older they are and the longer they contributed, the more likely it is that they fulfill the requirements to obtain a retirement pension and have the financial capacities to stop working. Among women, the number of those who never worked –and thus never contributed to any pension plan– is much larger than among men. Therefore we find a strong positive effect on participation for women who ever made contributions to a pension plan and are younger than 65 years, especially if they have contributed between 10 and 25 years. With more years in the labor market and with contributions to a pension plan, they can qualify for a (better) retirement pension.

Table 11 Causal model for participation and health

	men						*women*					
	LFP			health			LFP			health		
health (lin.pred.)	0.404	***	(0.042)				0.055		(0.038)			
labor force part. (lin.pred.)				-0.019		(0.036)				0,012		(0.019)
age	-0.070		(0.048)	-0.074	***	(0.028)	-0.012		(0.037)	-0,066	***	(0.022)
age squared	-0.013		(0.037)	0.047	**	(0.020)	-0.036		(0.029)	0,043	***	(0.017)
#children (live births)	0.000		(0.008)	-0.001		(0.006)	-0.028	***	(0.009)	-0,010	*	(0.006)
couple	0.030		(0.077)	-0.148	**	(0.059)	-0.433	***	(0.063)	-0,077	**	(0.038)
educ.: primary	-0.093		(0.096)	0.134	**	(0.058)	-0.264	***	(0.084)	0,052		(0.057)
educ.: secondary	-0.263	*	(0.146)	0.310	***	(0.090)	0.204		(0.140)	0,296	***	(0.094)
educ.: technical/commercial	-0.595	***	(0.211)	0.507	***	(0.134)	-0.014		(0.138)	0,432	***	(0.087)
educ.: preparatory or higher	-0.079		(0.167)	0.667	***	(0.086)	0.133		(0.187)	0,607	***	(0.089)
able to read and write	0.057		(0.113)	-0.108		(0.081)	0.145		(0.116)	-0,046		(0.059)
able to count from 1 to 10	0.106		(0.131)	-0.023		(0.097)	0.205		(0.129)	-0,002		(0.076)
speaks English	-0.139		(0.099)	0.159	***	(0.061)	-0.003		(0.114)	0,255	***	(0.070)
speaks indigenous language	0.008		(0.101)	0.148	*	(0.076)	0.001		(0.117)	0,103		(0.064)
locality size: 15000-100000	0.100		(0.088)	-0.169	***	(0.051)	0.119		(0.084)	-0,057		(0.046)
locality size: 2500-15000	0.232	**	(0.107)	-0.123		(0.079)	0.269	***	(0.100)	-0,109	*	(0.061)
locality size: <2500	0.386	***	(0.102)	-0.184	***	(0.056)	0.058		(0.092)	-0,212	***	(0.052)
assetsNB	-0.018		(0.038)	0.073	**	(0.036)	-0.045		(0.052)	0,074	*	(0.039)
has access to social security	-0.186	***	(0.068)				-0.341	***	(0.055)			
contributed, age <60, <=10 yrs	-0.018		(0.144)				0.701	***	(0.153)			
contributed, age <60, 10<=25 yrs	0.115		(0.129)				1.217	***	(0.168)			
contributed, age <60, >25 yrs	-0.338	***	(0.127)				1.076	***	(0.193)			
contributed, age 60-65, <=10 yrs	-0.280		(0.214)				0.572	*	(0.333)			
contributed, age 60-65,10<=25 yrs	-0.531	***	(0.201)				1.011	***	(0.292)			
contributed, age 60-65, >25 yrs	-0.657	***	(0.136)				0.409	*	(0.244)			
contributed, age >=65, <=10 yrs	-0.364	***	(0.138)				0.369		(0.331)			
contributed, age >=65, 10<=25 yrs	-0.342	**	(0.151)				0.116		(0.337)			
contributed, age >=65, >25 yrs	-0.739	***	(0.134)				-0.321		(0.282)			
occ.: production, repair, maintenance	1.882	**	(0.852)				1.240	***	(0.110)			
occ.: agriculture	2.067	**	(0.869)				0.999	***	(0.148)			
occ.: professional, technical, education	1.961	**	(0.877)				0.952	***	(0.161)			
occ.: management position	2.180	**	(0.878)				1.647	***	(0.281)			
occ.: administrative activities	1.747	**	(0.891)				0.804	***	(0.149)			
occ.: merchants, sales representative	2.340	***	(0.866)				1.762	***	(0.117)			
occ.: service industry, domestic work	2.175	**	(0.858)				1.250	***	(0.093)			
occ.: other	1.607	*	(0.870)				1.259		(3.725)			
contr.: boss	0.516	***	(0.176)				1.109	***	(0.224)			
contr.: self-employed	0.502	***	(0.073)				0.875	***	(0.086)			
contr.: commission, other payment	0.040		(0.114)				0.488	***	(0.115)			
contr.: without payment	0.330		(0.427)				0.133		(0.129)			
contr.: other/unknown	0.239		(0.425)				0.009		(0.484)			
dis.: cancer/malignant tumor				-0.630	*	(0.323)				-0,180		(0.170)
dis.: respiratory ill.(asthma)				-0.410	***	(0.093)				-0,152		(0.103)
dis.: heart attack				-0.580	***	(0.132)				-0,438	***	(0.154)
dis.: arthritis/rheumatism				-0.241	***	(0.063)				-0,283	***	(0.052)
dis.: liver/kidney infection				-0.245	**	(0.096)				-0,252	***	(0.074)
dis.: pneumonia				-0.232		(0.258)				-0,090		(0.223)
dis.: fallen down				-0.089		(0.054)				-0,114	**	(0.049)
dis.: #mental health problems				-0.129	***	(0.014)				-0,134	***	(0.009)
overweight: 25<=bmi<30				0.056		(0.057)				0,119	**	(0.054)
overweight: 30<=bmi				0.037		(0.067)				-0,026		(0.035)
sympt: swollen feet/ankles				-0.194	***	(0.065)				-0,171	***	(0.056)
sympt: difficulty breathing				-0.102		(0.081)				-0,119	*	(0.071)
sympt: fainting spells.vertigo				-0.148	**	(0.070)				-0,220	***	(0.054)
sympt: intense thirst				-0.064		(0.062)				-0,118	*	(0.067)
sympt: sev.fatigue/exhaustion				-0.247	***	(0.064)				-0,167	***	(0.056)
sympt: wheezing/cough/phlegm				-0.019		(0.058)				-0,072		(0.062)
sympt: pain in lower limbs				-0.321	***	(0.061)				-0,251	***	(0.048)
sympt: stomach pain. indigest.				-0.122	*	(0.068)				-0,103	**	(0.046)
sympt: involunt. loss of urine				-0.242	***	(0.092)				-0,116		(0.081)
constant	5.347	***	(1.768)				0.225		(1.212)			

cut-off point 1				-5.103	***	(1.043)				-4,782	***	(0.743)
cut-off point 2				-3.255	***	(1.031)				-2,685	***	(0.733)
cut-off point 3				-1.550		(1.022)				-0,951		(0.729)
rho	0.610	***	(0.021)	0.240	***	(0.012)	0.625	***	(0.015)	0,272	***	(0.011)
#observations	8872			8872			11340			11340		
Chi2 Test	1190.4			895.1			1244.8			1477.7		
p-value Chi2	0.000			0.000			0.000			0.000		
LogLikelihood	-4248.0			-8952.0			-4616.6			-10681.9		

* p<0.10, ** p<0.05, *** p<0.01
Note: Standard errors obtained via bootstrapping (100 draws)

Both for men and women the variable that indicates access to social security services, either due to one's own work or pension or due to working relatives, has a strong negative effect on the participation decision.[10] Empirical evidence from the USA suggests that individuals who rely on their current employer for health insurance have an incentive to remain employed, while individuals with other sources of health insurance have less reasons to participate in the labor market (Currie and Madrian, 1999; Gruber and Madrian, 2002). The negative effect of access due to others (partner, children) on participation is a strong effect among Mexican elderly because many more elderly than in the USA are entitled to insurance through their partner or children.

The general health status is explained by the objective health characteristics, age and poverty indicators. Older men and women report to be less healthy, while elderly with more education report a better health status. Households who possess more assets are in a better health while elderly living in rural areas are less healthy. Neither for men nor women we find an effect of labor force participation on the health status.

4.3 Participation and specific health problems

In the analysis above we find strong indications that the general (self-assessed) health status affects the male participation decision, but we encounter no evidence of an effect in the opposite direction. A complication with the analysis is that we cannot disentangle the direct effect of participation on the true health status from the effect due to justification of the labor status (see section 4.1 and Appendix A). The two effects may neutralize each other, resulting in the estimated absence of an effect of labor on health while in reality an effect of labor on (true) health may exist.

In this section we reconsider the effect of labor force participation on health by looking at specific diseases and symptoms instead of the self-reported health status used above. The information on the specific diseases and symptoms is derived from survey questions if a doctor or other medical specialist had told the client that he or she suffered from the disease. This phrasing leaves much less room for interpretation or justification, and therefore we can directly estimate an equation with the true prevalence of a disease or symptom, without having to account for justification. Each disease and symptom can have a different effect on participation, while their prevalence may be correlated, and an unmanageably large

[10] Access to social security is suspect to be endogenous, as the access may be obtained due to one's own job; however the indicator used here includes access obtained due to the partner's or children's job, and participation includes formal and informal employment where the latter does not give access rights. The total set of instruments passes the overidentification tests, indicating their validity and suggesting no direct effect of access rights on health. The parameter estimates, in particular the effects of health and participation, only show minor changes if only access due to working relatives is included in the model.

simultaneous equation system with equations for participation and all diseases would be required to take all effects in account.

An alternative strategy to avoid potential endogeneity is to explain the health situation in 2003 on the basis of the circumstances in 2001. By definition, all explanatory variables are pre-determined, and possibly explain the occurrence of health problem *j* in the two years before the interview of 2003:

$$S_{i,03}^{j} = \alpha_H^{j} P_{i,01} + \zeta_H^{j} x_{i,01} + \gamma_H^{j} S_{H,i,01} + u_{H,i,01}^{j}, \quad (3)$$

where we use the observed labor force participation ($P_{i,01}$) instead of the latent variable $P_{i,01}^{*}$. As explanatory variables we use all the exogenous variables used in the estimations in table 11, thus $x_{i,01}$ includes the detailed job characteristics, and we use the complete detailed health situation as reported in 2001, $S_{i,01}$, including the lagged dependent variable $S_{i,01}^{j}$, which allows to control for persistence of the health situation.

Table 12 summarizes the main findings of the probit estimates of equation (3) for each of the specific diseases and symptoms, separately for men and women. We do not find many significant effects of labor force participation in 2001 on the prevalence of diseases and symptoms in 2003. The only significant effect that we find for men is a positive effect of participation on the probability to have overweight. For women we find a few more significant effects, but except for the incidence of fall accidents, the significant effects have a negative effect on the prevalence of disease or symptoms: work seems to protect them against hypertension, diabetes, cancer, pneumonia and (i)adl-problems, an effect that is also found for several symptoms. However it seems unlikely that the protective effect of labor force participation is a true effect. Probably the effect relates to other (unmeasured) factors that make that working women are healthier; the small group of working elderly women is a selective group. In all cases, for men and women, the persistence of diseases and symptoms is very high: reporting a problem in 2001 strongly increases the probability that the problem also is reported in 2003. Leaving out the persons who already reported the specific health problem in 2001 does not alter the conclusion about the role of labor force participation on the prevalence of health problems in 2003 for the remaining persons.[11,12]

The effect of labor on health not necessarily runs via participation but may be related to job type. For a limited number of health problems we find that job characteristics are significant, suggesting that there are effects of the sector and the type (salaried, self-employed, etc.) of the main job during the work-life on the development of health after 2001. In particular there are indications that workers in service sector, professional and office workers have less health problems while among women we see that self-employed women have more problems.

Altogether the results suggest that there are only small effects of labor force participation in 2001 on the health in the next two years.

Table 12 Effect of participation in 2001 on health in 2003
-see at the end of the paper -

[11] Previous episodes of bad health or accidents may have affected both participation and health status in 2001. Given the persistence we have to observe people over a longer period to be able to determine causal effects more precisely.

[12] A similar analysis explaining employment in 2003 with information from 2001 indicates that a heart attack, diabetes, hypertension, tuberculosis, and limitations with daily activities have strong negative effects on participation two years later.

4.4 Work and retirement pensions in more detail

Labor force participation and the receipt of a retirement pension are not exclusive states. People can receive a retirement pension after a career in a formal job in which they contributed to the plans for a sufficiently long period, but decide that the income is not sufficient and continue to work in another (formal, or more likely, informal) job. In this section we analyze the joint labor force participation and retirement decision with a multinomial logit model, distinguishing five states: (1) no work, no retirement benefits; (2) no work, only retirement benefits; (3) informal job, no retirement benefits; (4) formal job, no retirement benefits; and (5) retirement benefits combined with a formal or informal job. The latter state comprises both formal and informal jobs with retirement benefits, because the number of people who have a formal job while receiving retirement pension is very low (table 13).[13] Table 13 further shows that the large majority of women over 50 are not employed and do not receive a retirement pension. Most of these women never worked in a paid job and never contributed to a pension plan. Among men we see a more balanced distribution; therefore we perform the analysis only for men.

Table 13 Employment and retirement pensions, 2003

	gender		
employment and retirement	*men*	*women*	*total*
not employed, no pension	17.92	69.86	47.06
not employed, with pension	16.84	6.74	11.17
informal sector, no pension	41.82	18.17	28.55
informal sector, with pension	6.56	0.83	3.34
formal sector, no pension	15.44	4.14	9.10
formal sector, with pension	1.42	0.26	0.77
total	100	100	100
number of observations	4,436	5,670	10,106

Note: The states "informal sector, with pension" and "formal sector, with pension" are taken together in the analysis.

In the multinomial logit model we explain the situation in 2003 using explanatory variables measured in 2001, as we did in section 4.3. By doing so we avoid problems with reverse causality, because the choice made in 2003 has no effect on the situation in 2001. Table 14 presents the marginal effects, *i.e.* changes in probabilities due to a one unit change in the continuous explanatory variables or a shift from 0 to 1 in case of the dummy variables, on the probabilities for a man with average characteristics. The initial situation, the work/pension-combination in 2001, has a large predictive value for the status in 2003: stability is high, transitions are less likely. This holds especially for nonworking people with a pension; they are improbable to change their labor market status. Those who receive a pension while working in an informal job are the most likely to change situation: it is probable that two years later they still receive the pension but stopped working. The effects of the other characteristics are remarkably insensitive for the inclusion of the initial state.

Age combined with the number of years with contributions to pension plans, which determine the opportunities to obtain a pension, is an important factor in the explanation of the observed situation. Elderly over 65 are much more likely to receive a pension, and so do those who contributed to a pension plan for 25 years or more – either with or without an additional job. Also the group aged between 60 and 65 with at least 10 years of

[13] Tests suggest that the two states can be combined, while for all other combinations the hypothesis that the parameters are equal is strongly rejected. A Hausman test indicates that the Independence of Irrelevant Alternatives (IIA)-hypothesis is not violated and thus a multinomial logit model is appropriate.

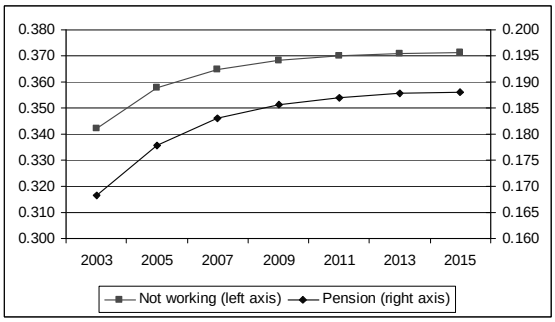
contributions has an increased possibility to receive a pension, but with a stronger effect on the alternative to work in addition to the pension. Historical contributions to pension plans strongly reduce the chance to be working in an informal job without receipt of a pension. The financial opportunities thus appear of great importance for the decisions. Having access to social security (health) services in 2001, either due to one's own contributions or related to contributing relatives, is important for the prediction of the observed labor status in 2003. Those with access are more likely to receive a pension, or, to a lesser extent, to have a formal job. Access in 2001 strongly reduces the likelihood of being in the informal sector without a pension in 2003.

A higher level of education increases the probability that a pension is received without an additional job. Apparently, men with higher education obtained the better-paid formal jobs with sufficiently good pension rights. Surprising is that the reasoning regarding effects of education does not hold for elderly with preparatory or higher level of education; for these levels we find no effect at all. Maybe this is due to the relatively small number of people with these levels of education, or their increased access to pensions is captured by other determinants.

Table 14 Determinants of participation and pension receipt in 2003
-see at the end of the paper -

Simulations of the probabilities of work and pension for the sampled elderly can illustrate the results. In figure 4 we show the probabilities that a man with average values on all the characteristics in the model of table 14, obtains a pension. Assuming that nothing changes in the average characteristics over time, but that the estimated probabilities two years later have become reality, allows the construction of a longer-run projection. The figure shows an increase of pension beneficiaries over time, and an increase in the number of non-working elderly men. Given the assumed absence of changes in characteristics, the distribution converges to a stationary state. This illustration is imperfect, the direct use of predicted pensions overestimates the true probabilities because they need to be compensated for the inflow of younger elderly who are not retired yet, which however is partly compensated because in reality the "average man" changes over time. Younger generations generally have higher educational levels and better jobs, increasing the likelihood that they participated in a pension plan and may become claimants later. It would be interesting but is beyond the scope of this chapter to make precise predictions of the number of beneficiaries of a retirement pension. It would require mimicking the changes over time in the population distribution for all its characteristics, a task with a lot of uncertainties, even if we abstract from changes in public policies and behavioral changes.

Figure 4 Probabilities of pension and not working for an average elderly man, 2003-2015



5. Concluding remarks

It is clear that the size of the younger generations in Mexico is decreasing, which implies that in the longer run the elderly population will significantly increase in size. Measures have to be taken now to construct a sustainable framework for retirement pensions and health care services, in order to avoid running into financial problems when large groups of people want to retire or need more care. For the design of a sustainable social security it is relevant to know the mechanisms that govern the labor force participation and retirement decisions. We analyze the relation between labor force participation, retirement pensions, and health using data from the *Estudio Nacional sobre Salud y Envejecimiento en México* (*ENASEM*), a panel data set that contains detailed information on the health and financial situation of the elderly aged 50 and over.

A causal analysis of the effects of health on labor force participation and vice versa show an important role of health in participation decisions of men, where a better health increases the participation rate. For women this effect is absent. We do not find clear indications of an effect running in the opposite direction. In the causal analysis neither men nor women show an effect running from labor force participation to health, and also in an analysis of the changes in health over a two year period we do not find clear effects of participation in the initial year on the prevalence of diseases or symptoms two years later.

The financial situation, in particular previous contributions to a pension plan, and the right to obtain a pension from the plan, are important driving factors for the male participation decision. Older men who have contributed during a longer period are more likely to stop working completely than younger men or men with fewer years of contribution. Many women indicated they never had a paid job, and apparently participation is not reconsidered at old age but simply a continuation of historical decisions: we find that women living together with a partner, or with children, are less likely to work. However we find that opportunities to qualify for a pension increase the chance of continuation of participation among women.

A factor that is important in both the male and female participation decision is the access to health care services provided by social security institutions. Both for men and women the variable that indicates access to social security services, which can be derived from working relatives, has a strong negative effect on the participation. Apparently, having access due to others (partner, children) strongly reduces the need or desire to have a paid job.

In the final section it is acknowledged that being active in the labor market and the receipt of a retirement pension are not exclusive states, but that some people remain working, often in an informal job, while receiving a pension. The expected effects of the financial

background are found when explaining the decisions of elderly men. People who made contributions to pension plans are more likely to receive a pension, although it does not discriminate between receiving it with or without an additional job. Over a period of two years there is a high persistence; only the receipt of a pension while working in an informal job strongly increases the probability to change status, in particular the probability that two years later they stopped working. Access to social security strongly reduces the probability that one is employed in the informal sector without a pension two years later.

The financial situation, in particular the opportunity to obtain a retirement pension after earlier contributions, the access to health care services, and the health itself are important driving factors behind the decisions about participation in the labor market and the sector choice. Redesign of the social security system, including health insurance and retirement pensions, will have effects on participation decisions, and therefore on future contributions to the insurance and pension plans, not only directly but also indirectly as it may change the pros and cons of obtaining formal instead of informal employment. Taking into account the foreseeable aging that will reduce the number of potential contributors in the long run, each proposal for a better system should make sure that enough people contribute to the plans in order to avoid an excessive burden for a limited number of contributors.

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Appendix A *Analytical model and estimation strategy*

Causal effects of health and labor force participation are analyzed in a model that derives from Stern (1989), extended to a panel data context by Cai (2007). For each individual *i* participation in

year t, P_{it}, is described as a function of health status H_{it}^{**}, a set of individual characteristics, and a random disturbance term:

$$P_{it}^{*} = \lambda_P H_{it}^{**} + \beta_P x_{P,it} + u_{P,it}, \quad \text{(A1)}$$

where P_{it}^{*} is an unobserved variable representing the propensity that an elderly person participates in the labor force in period t, and P_{it} equals 1 if $P_{it}^{*}>0$, and zero otherwise. The parameter λ_P measures the (causal) effect of health on the participation decision.

The equation that describes the true but unobservable health H_{it}^{**} is given as:

$$H_{it}^{**} = \alpha_H P_{it}^{*} + \beta_H x_{H,it} + u_{H,it}; \quad \text{(A2)}$$

true health depends on individual characteristics $x_{H,it}$ and on the propensity to work P_{it}^{*}. The parameter α_H represents the (causal) effect of labor force participation on the true health. Observed is the subjective, self-assessed health H_{it}, while H_{it}^{*} is the continuous latent counterpart of H_{it}, where $H_{it}=k$ (k=0, ..., 3) when $m_k<H_{it}^{*}\leq m_{k+1}$ (m_k are cut-off points to be estimated along with the other parameters; $m_0=-\infty$ and $m_4=\infty$). If non-participants justify themselves by exaggerating their health problems, there will be a difference between the true and the self-assessed health,

$$H_{it}^{**} = H_{it}^{*} - \delta_J P_{it}^{*} - u_{J,it}, \quad \text{(A3)}$$

where the parameter δ_J will has a positive value: participating elderly (with a larger value of P_{it}^{*}) report a better health status (H_{it}^{*}) than they have in reality (H_{it}^{**}).

Substitution of (A3) in the participation equation (A1) yields the labor force participation equation that forms the basis of the empirical work:

$$P_{it}^{*} = \lambda_P^{1} H_{it}^{*} + \beta_P^{1} x_{P,it} + v_{P,it}, \quad \text{(A4)}$$

where $\lambda_P^{1}=\lambda_P/(1+\lambda_P\delta_J)$, $\beta_P^{1}=\beta_P/(1+\lambda_P\delta_J)$, and $v_{P,it}=(u_{P,it}-\lambda_P u_{J,it})/(1+\lambda_P\delta_J)$. Substitution of (A3) in the true health equation gives the empirical model for H_{it}^{*}:

$$H_{it}^{*} = \alpha_H^{1} P_{it}^{*} + \beta_H x_{H,it} + v_{H,it}, \quad \text{(A5)}$$

where $\alpha_H^{1}=\alpha_H+\delta_J$ and $v_{H,it}=u_{H,it}+u_{J,it}$. Both disturbance terms can be decomposed in an individual part independent of time and a time-varying part, $v_{m,it}=\varepsilon_{m,i}+\eta_{m,it}$ ($m=P, H$).

Equations (A4) and (A5) link labor force participation and self-assessed health to each other. Only the sum of the two sources of endogeneity, α_H^{1}, is identifiable, but whether the endogeneity occurs because participation directly affects the true health status (α_H) or is due to justification of the labor status (δ_J) is not identifiable. However the sign of α_H^{1} can give information about which type of endogeneity dominates.

The joint estimation of the simultaneous equations model formed by the labor force participation (A4) and health status (A5) is not straightforward, due to the qualitative nature of the dependent variables. Assuming that the disturbances are normally distributed, equation (A5) is essentially a panel ordered probit model, while equation (A4) is a panel probit model. Panel models of this type have not been estimated frequently. An exception is Cai (2007), who estimates both a two-stage version of the model as well as a full-information maximum likelihood (FIML) method. Two-stage estimation is consistent but the correlation between the disturbance terms $v_{P,it}$ and $v_{H,it}$ cannot be estimated and is therefore assumed to equal zero. FIML allows estimation of the correlation between the disturbance terms; however it requires evaluation of a multidimensional integral of a multivariate normal distribution function.[14] Therefore we opt for the two-stage method.

In the first stage, reduced forms of both equations are estimated. A panel probit model is used to estimate a reduced form model of participation including all variables in $x_{P,it}$ and $x_{H,it}$,

[14] Estimations of the cross-sectional model occur more frequently, usually applying the two-stage method (see Van Gameren, 2008). Maximum simulated likelihood applications are found in Cai and Kalb (2006) for cross-section data and in Cai (2007) with panel data. Cai and Kalb (2006) find an insignificant correlation for men and a significant negative value for women. The latter implies a bias towards zero in the effect of health on participation if the model does not account for correlation (Stern, 1989; Cai and Kalb, 2006). We have more information on work history and objective health than Cai and Kalb (2006), which reduces the probability that omitted factors affect both labor force participation and health, and thus raises the chance that the assumption of no correlation is valid. Checks with recursive bivariate ordered probit models (Sajaia, 2007) suggest that the correlation is indeed small both in 2001 and in 2003.

$$P_{it}^{*} = (\beta_P^{1} x_{P,it} + \lambda_P^{1}\beta_H x_{H,it}) / (1-\alpha_H^{1}\lambda_P^{1}) + v_{P,it}^{*} = \zeta_P x_{it} + v_{P,it}^{*}, \quad \text{(A6)}$$

where x_{it} contains all the exogenous variables in $x_{P,it}$ and $x_{H,it}$. The disturbance term can be decomposed in a time-constant and a time varying part, $v_{P,it}^{*}=\theta_{P,i}+\omega_{P,it}$ with $\theta_{P,i}=(\varepsilon_{P,i}^{1}+\lambda_P^{1}\varepsilon_{H,i}^{1})/(1-\alpha_H^{1}\lambda_P^{1})$ and $\omega_{P,it}=(\eta_{P,it}^{1}+\lambda_P^{1}\eta_{H,it}^{1})/(1-\alpha_H^{1}\lambda_P^{1})$. Similarly a reduced-form health equation is estimated using a panel ordered probit model,[15]

$$H_{it}^{*} = (\alpha_H^{1}\beta_P^{1} x_{P,it} + \beta_H x_{H,it}) / (1-\alpha_H^{1}\lambda_P^{1}) + v_{H,it}^{*} = \zeta_H x_{it} + v_{H,it}^{*}, \quad \text{(A7)}$$

where $v_{H,it}^{*}=\theta_{H,i}+\omega_{H,it}$ with $\theta_{H,i}=(\alpha_H^{1}\varepsilon_{P,i}^{1}+\varepsilon_{H,i}^{1})/(1-\alpha_H^{1}\lambda_P^{1})$ and $\omega_{H,it}=(\alpha_H^{1}\eta_{P,it}^{1}+\eta_{H,it}^{1})/(1-\alpha_H^{1}\lambda_P^{1})$. The results from these estimations are used to calculate the propensity to participate in the labor market $\hat{P}_{it}$ and the 'health stock' $\hat{H}_{it}$ of each individual i in each time period t:

$$\hat{P}_{it} = \zeta_P x_{it}, \quad \text{(A8)}$$

$$\hat{H}_{it} = \zeta_H x_{it}. \quad \text{(A9)}$$

In the second stage the structural model defined by equations (A4) and (A5) is estimated, where the predictions $\hat{H}_{it}$ and $\hat{P}_{it}$ replace the potentially endogenous explanatory variables H_{it}^{*} and P_{it}^{*}:

$$P_{it}^{*} = \lambda_P^{1}\hat{H}_{it} + \beta_P^{1} x_{P,it} + v_{P,it}, \quad \text{(A10)}$$

$$H_{it}^{*} = \alpha_H^{1}\hat{P}_{it} + \beta_H x_{H,it} + v_{H,it}. \quad \text{(A11)}$$

For equation (A10) a panel probit model with P_{it} as dependent variable can be used. Equation (A11) with H_{it} as the dependent variable can be estimated by panel ordered probit model. Both models include the individual-specific part of the error terms as random effects.

[15] A probit panel data model is available in Stata v9.2: xtprobit. An ordered probit panel data model can be estimated with the unofficial Stata command reoprob (Frechette, 2001).

Appendix B *Descriptive statistics of explanatory variables*

Table B Descriptive statistics of the variables in the models, 2001

	men		*women*	
	mean	std.dev.	mean	std.dev.
age	62.128	9.150	61.485	8.967
#children (live births)	5.884	3.608	6.063	3.639
couple	0.836	0.369	0.584	0.492
educ.: primary	0.551	0.497	0.538	0.498
educ.: secondary	0.076	0.265	0.052	0.222
educ.: technical/commercial	0.029	0.168	0.082	0.274
educ.: preparatory or higher	0.129	0.335	0.060	0.239
able to read and write	0.853	0.354	0.775	0.417
able to count from 1 to 10	0.945	0.227	0.918	0.274
speaks English	0.111	0.315	0.059	0.236
speaks indigenous language	0.081	0.274	0.061	0.240
locality size: 15000-100000	0.152	0.359	0.153	0.360
locality size: 2500-15000	0.091	0.288	0.088	0.284
locality size: <2500	0.183	0.387	0.150	0.357
non-business assets	0.333	0.666	0.300	0.515
has access to social security	0.613	0.487	0.642	0.479
contributed, age <60, <=10 yrs	0.053	0.225	0.031	0.175
contributed, age <60, 10<=25 yrs	0.097	0.296	0.030	0.172
contributed, age <60, >25 yrs	0.077	0.267	0.025	0.157
contributed, age 60-65, <=10 yrs	0.014	0.120	0.005	0.076
contributed, age 60-65,10<=25 yrs	0.023	0.151	0.007	0.087
contributed, age 60-65, >25 yrs	0.039	0.194	0.010	0.101
contributed, age >=65, <=10 yrs	0.033	0.180	0.007	0.086
contributed, age >=65, 10<=25 yrs	0.043	0.203	0.007	0.084
contributed, age >=65, >25 yrs	0.081	0.273	0.011	0.105
occ.: production, repair, maintenance	0.387	0.487	0.125	0.330
occ.: agriculture	0.276	0.447	0.064	0.246
occ.: professional, technical, education	0.088	0.284	0.067	0.251
occ.: management position	0.021	0.146	0.007	0.084
occ.: administrative activities	0.054	0.226	0.062	0.241
occ.: merchants, sales representative	0.081	0.273	0.120	0.325
occ.: service industry, domestic work	0.080	0.271	0.231	0.421
occ.: other	0.007	0.084	0.001	0.032
contr.: salary	0.579	0.494	0.399	0.490
contr.: boss	0.043	0.204	0.014	0.120
contr.: self-employed	0.289	0.453	0.165	0.372
contr.: commission, other payment	0.073	0.260	0.046	0.211
contr.: without payment	0.005	0.071	0.046	0.210

Note: The objective health measures, included only in the health equation, are listed in table 6.

Table 12 Effect of participation in 2001 on health in 2003

	MEN					WOMEN				
	employment	(s.e.)	lagged health	(s.e.)	job char. [b]	employment	(s.e.)	lagged health	(s.e.)	job char. [b]
hypertension/high blood pressure	-0.002	(0,055)	1.350***	(0,048)	23.390	-0.118**	(0,052)	1.330***	(0,039)	17.350
diabetes/high blood sugar level	-0.073	(0,077)	2.641***	(0,079)	35.780**	-0.152**	(0,076)	2.578***	(0,062)	25.390
cancer/malignant tumor	-0.098	(0,187)	1.483***	(0,335)	24.040	-0.481*	(0,263)	1.924***	(0,205)	26.650**
respiratory illness (asthma)	-0.040	(0,091)	1.297***	(0,104)	17.880	0.019	(0,093)	1.266***	(0,087)	14.220
heart attack	-0.013	(0,111)	0.948***	(0,147)	22.020	-0.094	(0,137)	1.405***	(0,138)	33.410***
stroke	0.010	(0,178)	1.578***	(0,217)	17.520	0.210	(0,167)	1.125***	(0,187)	31.820***
arthritis/rheumatism	0.094	(0,063)	0.849***	(0,062)	27.930	-0.063	(0,057)	1.109***	(0,044)	25.090
liver/kidney infection	-0.034	(0,075)	0.749***	(0,085)	26.200	-0.062	(0,070)	0.950***	(0,063)	29.910
pneumonia	0.026	(0,159)	1.098***	(0,285)	17.140	-0.304**	(0,154)	0.758***	(0,195)	30.770***
fallen down	0.016	(0,051)	0.529***	(0,046)	27.780	0.100**	(0,048)	0.650***	(0,036)	19.260
mental health problems [a]	-0.067	(0,062)	0.075***	(0,013)	30.110	-0.050	(0,068)	0.087***	(0,011)	20.540
problems with (i)adl [a]	-0.045	(0,053)	0.071***	(0,009)	25.710	-0.158***	(0,056)	0.051***	(0,008)	40.890**
missing limb, leg or arm	0.073	(0,175)	2.402***	(0,191)	43.260***	-0.764**	(0,356)	2.321***	(0,345)	10.050
swollen feet/ankles	0.005	(0,058)	0.707***	(0,058)	12.680	-0.052	(0,052)	0.786***	(0,041)	14.340
difficulty breathing	0.007	(0,064)	0.697***	(0,071)	31.350	-0.156**	(0,063)	0.730***	(0,058)	19.620
fainting spells, vertigo	-0.013	(0,057)	0.585***	(0,061)	35.990**	-0.113**	(0,052)	0.663***	(0,044)	21.250
intense thirst	-0.099	(0,060)	0.438***	(0,064)	33.370*	0.023	(0,059)	0.672***	(0,052)	39.190**
severe fatigue/exhaustion	-0.014	(0,055)	0.225***	(0,058)	42.490***	-0.047	(0,053)	0.254***	(0,046)	32.780*
wheezing/cough/phlegm	0.019	(0,057)	0.375***	(0,059)	32.220*	-0.068	(0,056)	0.490***	(0,051)	25.940
pain in lower limbs	-0.008	(0,051)	0.336***	(0,048)	57.060***	0.011	(0,049)	0.404***	(0,041)	25.410
stomach pain, indigestion	-0.055	(0,057)	0.385***	(0,059)	26.910	-0.038	(0,053)	0.483***	(0,046)	13.400
pain when urinating	-0.087	(0,068)	0.740***	(0,095)	20.130	-0.048	(0,071)	0.608***	(0,078)	20.340
overweight: 25<=bmi<30	0.150**	(0,052)	0.866***	(0,051)	40.580**	-0.084	(0,053)	0.732***	(0,055)	49.640***
overweight: 30<=bmi	-0.062	(0,066)	1.997***	(0,086)	29.350	0.070	(0,061)	1.764***	(0,080)	35.520**
smoke cigarettes now	0.015	(0,066)	2.121***	(0,055)	19.220	-0.008	(0,091)	2.488***	(0,076)	20.870
drink alcohol now	0.092*	(0,052)	1.071***	(0,043)	24.150	0.017	(0,059)	0.943***	(0,050)	32.090*

* p<0.10, ** p<0.05, *** p<0.01

Note: Probit regressions, in which we also control for the variables used in table 11.

[a] Also for mental health and (i)adl-problems a probit regression is run, where 0 stands for 'no problem' and 1 for 'one or more problems'

[b] Likelihood ratio (χ^2) test of the joint significance of the job characteristics (variables used as instruments for employment in the health equations in table 11).

Table 14 Determinants of participation and pension receipt in 2003

	no work, no pension		no work, with pension		informal job, no pension		working, with pension		formal job, no pension	
2001: not employed, no pension	0.268***	(0.026)	0.166***	(0.026)	-0.355***	(0.022)	-0.025***	(0.009)	-0.054***	(0.012)
2001: not employed, pension	-0.006	(0.040)	0.563***	(0.047)	-0.472***	(0.029)	0.002	(0.012)	-0.086***	(0.011)
2001: informal sect., pension	-0.198***	(0.033)	0.440***	(0.063)	-0.391***	(0.047)	0.226***	(0.050)	-0.077***	(0.013)
2001: formal sector, no pension	-0.020	(0.033)	0.050**	(0.020)	-0.297***	(0.031)	-0.018*	(0.010)	0.285***	(0.038)
2001: formal sector, pension	-0.191***	(0.064)	0.142**	(0.071)	-0.198*	(0.113)	0.150**	(0.061)	0.098	(0.070)
age	-0.002	(0.013)	0.012	(0.007)	-0.057***	(0.017)	0.053***	(0.009)	-0.006	(0.011)
age squared	0.012	(0.010)	-0.005	(0.005)	0.033**	(0.013)	-0.040***	(0.007)	0.000	(0.009)
#children (live births)	0.005*	(0.003)	0.001	(0.001)	-0.002	(0.003)	0.000	(0.001)	-0.003*	(0.002)
couple	-0.036	(0.025)	0.030***	(0.010)	-0.015	(0.029)	0.009	(0.010)	0.012	(0.013)
educ.: primary	-0.019	(0.026)	0.030**	(0.014)	-0.027	(0.033)	0.008	(0.014)	0.008	(0.017)
educ.: secondary	-0.043	(0.041)	0.073**	(0.035)	-0.057	(0.054)	0.001	(0.020)	0.026	(0.027)
educ.: technical/commercial	-0.014	(0.063)	0.120**	(0.057)	-0.127	(0.077)	0.019	(0.032)	0.002	(0.029)
educ.: preparatory or higher	-0.049	(0.045)	0.041	(0.030)	-0.006	(0.058)	0.013	(0.023)	0.001	(0.023)
able to read and write	-0.001	(0.032)	0.000	(0.019)	-0.004	(0.041)	0.016	(0.016)	-0.012	(0.024)
able to count from 1 to 10	0.001	(0.040)	0.001	(0.023)	-0.009	(0.051)	-0.012	(0.027)	0.020	(0.023)
speaks English	0.005	(0.032)	-0.004	(0.013)	0.009	(0.038)	0.021	(0.015)	-0.032***	(0.011)
speaks indigenous language	0.025	(0.033)	-0.023	(0.014)	-0.027	(0.039)	0.021	(0.019)	0.004	(0.019)
locality size: 15000-100000	-0.031	(0.024)	0.000	(0.012)	0.039	(0.030)	-0.004	(0.011)	-0.004	(0.012)
locality size: 2500-15000	-0.058**	(0.028)	-0.013	(0.016)	0.058	(0.038)	0.000	(0.016)	0.013	(0.021)
locality size: <2500	-0.052**	(0.026)	-0.046***	(0.012)	0.141***	(0.033)	-0.023*	(0.013)	-0.021	(0.016)
non-business assets	-0.002	(0.018)	-0.002	(0.009)	-0.001	(0.018)	0.005	(0.005)	0.000	(0.007)
health	-0.057***	(0.011)	-0.011**	(0.005)	0.051***	(0.013)	0.013***	(0.005)	0.004	(0.005)
has access to social security	-0.021	(0.021)	0.127***	(0.013)	-0.212***	(0.024)	0.081***	(0.011)	0.025*	(0.013)
contributed, age <60, <=10 yrs	0.043	(0.049)	0.080*	(0.042)	-0.173***	(0.046)	0.020	(0.031)	0.030	(0.021)
contributed, age <60, 10<=25 yrs	-0.014	(0.039)	0.087**	(0.034)	-0.225***	(0.038)	0.103***	(0.037)	0.048**	(0.020)
contributed, age <60, >25 yrs	-0.056	(0.041)	0.151***	(0.041)	-0.262***	(0.042)	0.138***	(0.042)	0.029	(0.019)
contributed, age 60-65, <=10 yrs	-0.041	(0.063)	0.060	(0.049)	-0.229***	(0.071)	0.087*	(0.051)	0.124*	(0.064)
contributed, age 60-65,10<=25 yrs	-0.073	(0.051)	0.195***	(0.056)	-0.397***	(0.047)	0.280***	(0.064)	-0.006	(0.027)
contributed, age 60-65, >25 yrs	-0.077*	(0.046)	0.215***	(0.049)	-0.385***	(0.048)	0.237***	(0.054)	0.011	(0.027)
contributed, age >=65, <=10 yrs	-0.119***	(0.032)	0.175***	(0.048)	-0.252***	(0.057)	0.095**	(0.043)	0.101*	(0.060)
contributed, age >=65, 10<=25 yrs	-0.122***	(0.032)	0.200***	(0.047)	-0.290***	(0.054)	0.102***	(0.039)	0.109*	(0.056)
contributed, age >=65, >25 yrs	-0.061*	(0.036)	0.145***	(0.035)	-0.339***	(0.051)	0.213**	(0.047)	0.042	(0.042)
occ.: production, repair, maintenance	-0.058	(0.075)	0.045	(0.048)	0.078	(0.100)	-0.028	(0.034)	-0.038	(0.043)
occ.: agriculture	-0.090	(0.069)	0.059	(0.058)	0.083	(0.102)	-0.015	(0.035)	-0.037	(0.040)
occ.: professional, technical, education	-0.035	(0.080)	0.064	(0.072)	-0.039	(0.112)	-0.015	(0.031)	0.025	(0.059)
occ.: management position	-0.106	(0.074)	0.054	(0.080)	0.062	(0.126)	-0.029	(0.024)	0.019	(0.064)
occ.: administrative activities	-0.036	(0.083)	0.089	(0.085)	-0.007	(0.121)	-0.029	(0.024)	-0.017	(0.041)
occ.: merchants, sales representative	-0.123**	(0.057)	0.028	(0.059)	0.140	(0.100)	-0.012	(0.034)	-0.033	(0.034)
occ.: service industry, domestic work	-0.085	(0.065)	0.067	(0.073)	0.029	(0.109)	-0.016	(0.031)	0.005	(0.050)
contr.: boss	0.042	(0.048)	-0.042***	(0.015)	0.005	(0.051)	-0.006	(0.019)	0.001	(0.023)
contr.: self-employed	0.005	(0.022)	-0.049***	(0.011)	0.101***	(0.026)	-0.011	(0.011)	-0.046***	(0.012)
contr.: commission, other payment	0.062*	(0.036)	0.003	(0.016)	-0.019	(0.040)	-0.022*	(0.012)	-0.026*	(0.014)
contr.: other/unknown	-0.097	(0.064)	0.095	(0.076)	0.073	(0.103)	-0.027	(0.028)	-0.044	(0.028)

#observations	4436
Chi2 Test	5388.8
p-value Chi2	0.000
LogLikelihood	-3795.0

* p<0.10, ** p<0.05, *** p<0.01

Note: Marginal effects after multinomial logit estimation, calculated at the means of the variables.