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AGING AND RETIREMENT: EVIDENCE ACROSS COUNTRIES

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Political Economy Models of Social Security.

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Aging and Retirement: Evidence Across Countries[¤]

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Abstract

How do demographic factors in‡uence retirement? Using a large cross-country data set, I show that in countries with a larger share of elderly in their population the length of retirement is longer. This result holds true if I control for wealth e¤ects, and when the e¤ective labor force participation rate of the elderly is used instead of the o¢cial retirement age. Retirement policies and the social security size are strictly related: a new variable, representing the aggregate relevance of retirement policies, turns out to be signi…cant in explaining the size of social security. Finally, the total amount of social security transfers is positively related with the increase of the elderly population, while in per capita terms this relation is not signi…cant.

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1. Introduction

In the last decades, the majority of countries around the world have experienced a substantial aging of their populations. Demographic projections forecast a decline in the average annual growth rate of population and signi…cant changes in the age structure. Throughout the OECD area the proportion of individuals aged 65 and over has risen by more than 40% in the last decades and it is expected to increase at an annual rate of about 1,6 per cent in the second and third decades of the current century. This trend is common to many countries around the world, not only to OECD countries.

What will the impact of the aging process be on retirement? Is there a relation between the aging of the population and the length of retirement?

These are crucial questions in the current debate on social security. Retirement policies are a main determinant of the structure of the labor force and of the social security system. As such, they represent an important channel through which the aging process will a¤ect the current PAYG social security programs. On one hand, the existence of early retirement provisions and the increase in longevity, coupled with lower fertility rates and with the aging of the baby-boomers, has dramatically reduced the employment rate of the elderly, and raised the ratio of retirees to workers (dependency ratio). To this respect, studies by the OECD (1998) suggest that "active aging", the capacity of the elderly to lead productive lives in the society, should be encouraged by allowing a higher degree of ‡exibility in how individuals and families may allocate their time (in working, learning, leisure and in care-giving), especially through a more ‡exible work-retirement transition. On the other hand, retirement policies are a key component in the design of the social security systems. In the majority of the countries around the world, there exists a legal retirement age at which the elderly are induced, or even forced, to exit the labor market in order to collect their pensions (see Social Security Throughout the World). Clearly, the impact of the aging process on the retirement policies will in turn a¤ect the social security

systems. This paper suggests that the impact of demographics on social security is more complex than a simple increase in the demand for pensions due to the aging of the populations. Other aspects of the social security system need to be examined.

Many empirical studies have mainly focused on the determinants of the size of the social security systems around the world, showing the relevance of the demographic factors (Tabellini (1990), Perotti (1996), Breyer and Craig (1997), Mulligan and Sala-i-Martin (1999), Lindert (1996), Razin et al. (2001)). Other studies have characterized the determinants of retirement, and its evolution over time (Costa (1998)). Recent studies have focused on the relation between retirement and pensions (Brugiavini (1997), Gruber and Wise (1997), Latulippe (1997), Samwick (1998)). However, none of these contributions has analyzed the impact of demographics on the retirement policies, and thereby on the entire social security system.

This paper aims at …lling this gap. To this extent a cross-country analysis seems appropriate. The comparison of several countries, which di¤er in their organizations and economic conditions and in the demographics will improve our understanding of the determinants of the di¤erent retirement programs and will represent a reference for further discussions on comprehensive reforms of retirement and social security programs.

This paper has three main contributions. First, it builds a new large data set, which includes informations on demography, retirement and social security for many countries around the world. Second, it provides evidence suggesting that the demographic factors, captured by the proportion of elderly (individuals aged more than 65 years) in the population play a signi…cant role in explaining the retirement policy. The key result is that in countries with a larger share of elderly in the population, the length of retirement is longer. This key result is still valid if only OECD countries are considered, to control for wealth e¤ects, which may be a signi…cant responsible of the positive relation between older populations and longer length of retirement. This result is also consistent with the e¤ective

retirement behavior, since the data show that in countries with a larger share of elderly in the population the labor force participation of the elderly is lower, and with time series …ndings, which show that the labor force participation of the elderly decreases over time, as population ages (Costa (1998)). The data provide also evidence that in countries with a larger share of elderly the o¢cial retirement age is higher, although this e¤ect is much weaker in the sub-sample of OECD countries, due to the limited variation in retirement age across the OECD countries. The interpretation of these results suggests that the o¢cial retirement age has to increase in countries with more numerous elderly, to limit the size of the bene…ciaries, although, since populations with more elderly live longer, this increase in the retirement age is not large enough to compensate the higher longevity, and thus in these countries the length of retirement is longer. Third, the o¢cial retirement age is signi…cant in explaining the social security level: a longer length of retirement induces a larger social security expenditure. In per capita terms the result is however less clear, since the total amount of the social security transfer has to be divided among a more numerous group. To capture the combined e¤ect of demographics and retirement policies on social security, a new variable is introduced. This variable, representing the aggregate relevance of retirement policies, turns out to be signi…cant in explaining the level of social security.

The results obtained in this empirical analysis are consistent with what political economy theories of social security might predict about the relationships between aging, retirement and social security: when the elderly are more numerous, they have more political power, which they can exert to both enjoy a longer retirement span and obtain a larger social security transfer.

The paper proceeds as follows: in the next Section I survey what political economy theories might predict about the relationships between aging, retirement and social security. Then I describe the data. In Section 4, I analyze the relation between demographic factors and retirement, and address two problematic issues: the role of wealth e¤ects, by restricting the analysis to a sub-sample of OECD

countries, and the distinction between retirement o¢cial and actual age, using both the o¢cial retirement age and the e¤ective labor force participation of the elderly. This section includes also a discussion on the role of other determinants of retirement. In section 5 I assess the relevance of demographic and retirement variables to explain social security. Section 6 concludes.

2. What do theories predict?

The theoretical literature on social security has largely analyzed the impact of the aging process on the current social security systems, but has generally disregarded retirement. Although theoretical contributions have focused on the …nancial (Auerbach and Kotliko¤ (1987)) and/or political (Bohn (1999), Boldrin and Rustichini (2000), Cooley and Soares (1996), Meijidam and Verbon (1996), Galasso (1999), Breyer and Stolte (1999)) sustainability of the current social security systems, few interesting predictions may be drawn from some of these theories on the role of retirement policies.

Political economy models of social security have provided interesting explanations of the relation between aging and social security (see Galasso and Profeta (2001) for a survey). In median voter's models, an increase in the proportion of elderly in the population raises the median voter's age, and thus increases the total size of the social security system (Browning (1975), Tabellini (1990)). However, in per capita terms the result is ambiguous, since more resources have to be shared among more people. Razin, Sadka and Swagel (2001) suggest that, as long as the median voter is not a retiree, his willingness to pay the higher tax needed to …nance the larger group of bene…ciaries decreases, and thus the political equilibrium tax rate and the per capita social security transfer may decrease with the aging of the population.

Interest groups models deliver similar results: a more numerous group of elderly may exert more political pressure to obtain a larger social security transfer (Verhoeven and Verbon (1991)). However, the per capita transfer may decrease, since the opposition by the taxpayers increases, due to the higher tax per person

that they have to pay and to the larger deadweigth costs associated to the higher tax per person (Becker (1983, 1985)). A similar result is obtained in Turner (1984), where the shadow price of bene…ts (which is shown to be the ratio of bene…ciaries to taxpayers) increases with the size of the elderly, and thus average bene…ts fall. Turner (1984) provides also empirical evidence that the old-age population has a negative e¤ect on average social security bene…ts.

What about retirement? Median voters' models have to focus exclusively on explaining one dimension of the social security system, since equilibria may not exist in a multidimensional issue space, and they have typically chosen to focus on explaining the size of the social security system, thus disregarding retirement. This gap is …lled by Mulligan and Sala-i-Martin (1999) who develops an interest groups model to explain the association between retirement and social security. Social security systems arise from the political competition between two groups, young and old, each one exerting political pressure on the policymakers to obtain a positive transfer from the other group. This political pressure is time-intensive, i.e., the amount of time dedicated to political activities determines the political pressure and therefore the political success of a group. Once retired, the old have more time to exert pressure, and therefore they win the political competition and receive a transfer from the young (social security). More political pressure from the elderly implies more social security. This provides a testable prediction on the relation between retirement and social security: more time-intensive political pressure of the old, which can be measured by the proportion of retirees weighted by the length of retirement, is related with a larger social security size.

Mulligan and Sala-i-Martin (1999) however are not able to provide any direct prediction on the relation between aging and retirement, since the size for the two groups, young and old, is assumed to be equal. Profeta (2000) provides an extension of Mulligan and Sala-i-Martin (1999) including size e¤ects and other characteristics of the political process to study the impact of the aging process on both retirement and social security. Some predictions may be drawn from these models. When the elderly are more numerous, they have more political

power. This allows them to obtain a larger social security transfer. If retirement and social security are associated (as shown by Mulligan and Sala-i-Martin (1999)), there is an intermediate step in this …nal result: more political power of the old implies that they can enjoy more leisure, and thus obtain a larger social security transfer. Thus a testable prediction arises: in countries with more elderly, people enjoy larger retirement spans. However, as the opposition of the taxpayers increases (Razin, Sadka and Swagel (2001), Becker (1983 and 1985), Turner (1984)), the per capita social security may decrease, or these oppositions may have the purpose of increasing the o¢cial retirement age. What exactly the equilibrium o¢cial retirement age and per capita social security transfer will be may be derived only in a bi-dimensional model.

To summarize, regarding the relation between aging and retirement, political economy models seem to suggest that (i) in countries with a larger share of elderly in their population the length of retirement is longer. Then, about the relation between retirement and social security, they predict that: (ii) a longer length of retirement is associated with a larger social security expenditure, and a (iii)a larger proportion of retirees weighted by the length of retirement is associated with a larger social security expenditure. Finally, about aging and social security, they predict that: (iv) there exists a positive relation between the proportion of elderly in the population and the size of the social security; (v) this relation may be not signi…cant or reversed in per capita terms.

The following empirical analysis aims to test these predictions.

3. Data sources and description

I construct a large data set on social security, retirement, and demographic variables, using cross-country data. The sample includes all the countries in which a retirement program exists and data on at least one of the other two …elds of interest, demography and social security, are available[1]. A sub-sample of OECD countries[2] is separately considered at certain stages of the analysis.

The year which data refer to may di¤er across countries to re‡ect unavail-

ability of more recent data, but it lays into the interval 1995-1999. The data are collected from di¤erent sources: (1) United Nations Demographic Yearbook (several years); (2) Social Security Throughout the World (1999); (3) Yearbook of Labour Statistics of the International Labour O¢ce (1999); (3) OECD Social Expenditure Database (Second edition) (4) World Development Report of the World Bank (1995).

The Demographic factors are captured by the proportion of elderly (individuals aged more 65 years) in the population (OM and OW for men and women respectively), by the proportion of people above o¢cial retirement age in the population (ORM and ORW for men and women respectively), and by the life expectancy at birth (EM and EW for men and women respectively). The …rst source, the United Nations Demographic Yearbook, provides the life expectancy at birth for men and women. It also provides the total number of people in each age group, from which I can obtain the number of people over 65 years old (VM for men and VW for women) and, using the information on the o¢cial retirement age contained in the Social Security Throughout the World, as it will be explained below, the number of people above retirement age (TOM for men and TOW for women). The United Nations provide also the total number of people in the population (M total men and W total women), and thus the variables OM; OW; ORM, ORW may be calculated as proportions. Finally, I calculate the weighted average of the respective variables for men and women and get the proportion of people over 65 in the population (O), the proportion of people above retirement age (OR), and the life expectancy of the all population (E).

A measure of the Retirement policy is given by the o¢cial retirement age (RAM for man and RAW for women). This is derived from the last available Social Security Throughout the World (1999), which provides a report for each country. I use the age considered as "qualifying condition" to receive an old-age pension with full bene…ts. Early retirement provisions or lower bene…ts associated with a lower contribution period do not enter into the analysis. Transition phases for countries that have started a reform apply as their current regulation.

Retirement policy can be also described by the expected length of retirement (RM for men and RW for women), that is de…ned as the di¤erence between the life expectancy and the legal retirement age, and by the working life (PRM for men and PRW for women), i.e., the ratio between the legal retirement age and the life expectancy. These last two measures are meant to capture the di¤erent relevance that the legal retirement age has in di¤erent demographic scenarios. As before, a weighted average of the variables for men and women is calculated to indicate the length of retirement (R) and the working life (PR) of the overall population. To compare the o¢cial and the e¤ective retirement age, I use data on the labour force participation by age from the Yearbook of Labour Statistics of the International Labour O¢ce (1999). This source provides the total activity rate of the population (Atot), i.e. the ratio between the total active population and the total population. It also contains the activity rates by age, i.e. the active population in di¤erent age groups as a proportion of the total population in the same age group. I call them ASC for people over 65 years, AC for people between 55 and 60 years old, AS for people between 60 and 65 years old. Using these data, I aggregate the activity rate for people between 55 and 65 (ACES) and for all people above 55 years old (ACESESC). All these variables are also separately de…ned for men and women (indicated here with an M or a W at the end of the corresponding variable). I also standardize these variables by dividing the activity rate of each group of age by the total population's activity rate.

The level of Social Security is measured as the level of old-age pension expenditure as percentage of GDP, both overall (P) and in per capita level (b is the ratio between the percentage of old age pension expenditure over GDP and the proportion of people over 65 in the total population; $b1$ is the ratio between the percentage of old age pension expenditure over GDP and the proportion of people above retirement age in the total population). These data are available only for OECD countries and come from the 1995 value reported into the OECD Social Expenditure Database.

Finally, I include other variables which may represent signi…cant determinants

of retirement, as the rural and urban populations (rural and urban), the human capital, i.e. the years of schooling (H). The analysis also uses the per capita GDP, calculated as PPP in current international $ (GDPpc), and the level of public health expenditures as percentage of GDP (HealthGDP). These data are obtained from the World Bank Development Report (1995).

Table 1 summarizes all the variables used in the analysis and provides some basic statistics.

4. Demographics and Retirement

This section aims to test prediction (i) in countries with older populations the retirement length is higher.

4.1. All countries

At a first exam of the data, based on graph 1, countries with older populations, as measured by the proportion of elderly in the population, show higher legal retirement age. This result is valid for both men and women. The graph also shows that countries with higher life expectancy have a higher proportion of elderly in the population, aging being largely due to people living longer. Therefore, better measures of the use of the retirement provision have to be considered, which take into account the role of life expectancy. In particular, I consider two variables: the expected length of the retirement period, i.e., the difference between the life expectancy and the legal retirement age, and the working life, i.e., the ratio between the legal retirement age and the life expectancy. The plots show a clear positive relation between the share of elderly in the population and the length of retirement and a negative relation between the proportion of elderly and the working life, for both men and women. Notice that young populations, i.e., countries with low shares of elderly in the population, are more scattered in their expected length of retirement, whereas older populations enjoy longer expected retirement spans. The same results hold true for the expected working life.

The econometric analysis confirms these results (table 2). The proportion of

elderly in the population has a signi…cant, strong, positive correlation with the legal retirement age (regressions 2.1, 2.2), but more aged populations also have a higher life expectancy (regressions 2.3, 2.4). Nevertheless, more aged populations are associated with larger length of retirement and lower working life (regressions 2.5, 2.6, 2.7, 2.8). Since these simple regressions may be picking up other e¤ects (such as countries e¤ects), I look at a more robust result by using an instrumental variable, health expenditures as a percentage of GDP (HealthGDP). This variable shows a strong, positive correlation with the proportion of elderly in the population, but it is not signi…cant to explain retirement age when considered together with the proportion of elderly (regressions 2.9 and 2.10). The results in regressions 2.11, 2.12 and 2.13 support the conclusion that more aged populations have higher retirement age, larger retirement length and lower working life. Thus, demography is an important determinant of retirement.

This …rst exam of the data suggests that the relation between aging and retirement exists, is signi…cant, and goes in the direction predicted by the theories: older populations are associated with larger retirement spans. However, this preliminary analysis has two drawbacks. First, since many countries with di¤erent income are analyzed together, very strong wealth e¤ects may have been included, which in‡uence the result. In fact, income is an important determinant of both demographics and retirement: in countries with higher income, populations are older and live longer (demographics is somewhat endogenous) and, if leisure is a normal good, they enjoy more leisure, and thus spend more time in retirement. Thus, income might be the only responsible of the identi…ed relation between aging and retirement. Second, the distinction between o¢cial and actual retirement age has to be discussed. These …rst results seem to suggest that a more aged population require a higher legal retirement age, however the length of retirement is always longer. Thus, populations live longer and, despite the higher retirement age, they spend more time in retirement. In other words, this result suggests that people want to enjoy more retirement when they live longer. Thus, when the e¤ective rather than the o¢cial retirement age is considered, I expect

older populations to be associated with a lower labor force participation of the elderly. These two issues are addressed in the following sections.

4.2. OECD countries

In this section I perform the same analysis as in the previous one for a sub-sample including only OECD countries. In this way, wealth is implicitly hold constant across observations and the analysis can focus on the "pure" relation between aging and retirement.

Graph 2 and Table 3 show the results. At a …rst sight, comparing the plots in graph 2 and graph 1, OECD countries (graph 2) represent the left part of the corresponding plots in graph 1, meaning that the developing countries are the younger ones while OECD countries are the older ones. The …rst plots in graph 2 suggest that in countries with older populations retirement age is generally higher, although the relation is not as clear as before. In fact, the proportion of old is now not signi…cant to explain retirement age (regressions 3.1, 3.2). These plots also highlight the role of developing countries in the sample: they display larger di¤erences in retirement age, which are related with the proportion of elderly in their populations. OECD countries, instead, are older, and they have very similar retirement ages. The next plots show that the proportion of old is still highly correlated with life expectancy, meaning that aging is due to living longer. This result is con…rmed by regressions 3.3 and 3.4, where expectancy life (for men and women) is signi…cant in explaining the proportion of old (R^2 is about 0,6). While the results on retirement age are not signi…cant, the relation between the length of retirement (and similarly, the working life) and the proportion of old is still signi…cant in OECD countries. The econometric analysis shows that the proportion of old is signi…cantly associated with a longer length of retirement and a shorter working life. Moreover, in this case the explanatory power of the proportion of elderly is higher than when all countries are considered (the R^2 are between 0,36 and 0,4 for men and between 0,31 and 0,38 for women).

Thus, the relation between older populations and longer length of retirement

is reinforced in the sub-sample of OECD countries, which implicitly controls for wealth e¤ects. With respect to developing countries, OECD countries have a higher retirement age and longer life expectancy, due to their higher income. Due to these factors, it is not appropriate to analyze the relation between aging and retirement by measuring the length of retirement in the all sample. Using a sub-sample of countries with comparable income a pure demographic e¤ect emerges: the older is the population, and thus the higher the life expectancy, the longer is the time spent in retirement. In spite of having a similar wealth and quite similar retirement ages, the di¤erences in the length of retirement among OECD countries are signi…cantly explained by di¤erences in the proportion of old-age population. A more aged population is induced to exert its political power in order to enjoy a larger retirement span, as it is predicted by the models surveyed in section 2.

4.3. E¤ective and o¢cial retirement age: Demographics and other determinants

In this section I use the International Labour Organization's data on the labour force participation by age to examine the actual retirement behavior of the individuals and compare it with the o¢cial retirement policy. The distinction between o¢cial and e¤ective retirement age captures the di¤erence respectively between the policy-maker's decision (which has the purpose of limiting the size of the bene…ciaries) and the individuals' retirement choice. Costa (1998) argues that the following factors play a crucial role in explaining the e¤ective retirement age: income (since leisure is a normal good, richer people tend to enjoy more leisure and thus more retirement), social security level (people retire earlier if they know that they can draw from a pension plan as their income source during retirement), rate of urbanization (in the agricultural sector workers can retire later), health conditions of the elderly (worse health conditions by the elderly implies an early retirement), incentives included in the contracts[3].

A good measure of the e¤ective retirement age is given by the labour force

participation rates of people older than 65 years. Indeed, since in many OECD countries a large part of the population is already retired before age 65, I also consider the labour force participation of people between 55 and 65 years old, and of the total population over 55 years old. The analysis is performed for the sample of all countries included in the ILO statistics[4] and for the OECD sub-sample[5].

For the ILO sample, graph 3 shows the existence of a negative relation between the labor force participation rate of people above 65 years old and the proportion of old in the population. This negative relation is stronger for the sub-sample of men[6]. A negative relation albeit weaker also arises between the labor force participation rate of people between 55 and 65 years old and the proportion of old, and between the labor force participation of people above 55 years old and the proportion of old. These last two measures are meant to take into account the e¤ective behaviour of the elderly, who may decide to retire between 55 and 65 years old, since, as many studies pointed out (see Gruber and Wise (1997)), a large fraction of the population retire before 65 years old. Focusing on men, the econometric analysis con…rms that the proportion of elderly in the population is negatively and highly signi…cantly correlated with the labor force participation of man above 65 years old ($R^2 = 0;61$, see table 4, regression 4.1). A weaker relation exists with the labor force participation of man between 55-65 and above 55 years old (see regressions 4.2 and 4.3 respectively). These results indicate that in older populations the elderly work less, and thus retire more. Since retirement behavior is in‡uenced by the wealth, and wealth may have a signi…cant impact also on demographics, as explained in the previous section, I restrict the analysis to a sub-sample of OECD countries, to control for wealth e¤ects. The results con…rm the existence of a negative relation between the labor force participation of people above 65 years old and the proportion of elderly in the population (graph 4 and regression 4.4). However, the proportion of old is not highly signi…cant to explain the participation rates of people between 55 and 65 years old (regression 4.5) and of people above 55 years old (regression 4.6). This suggests that income may play a role in accounting for the retirement behavior of individuals aged from

55 to 64 years: in richer countries the elderly have enough wealth to a¤ord to retire at earlier ages (between 55 and 65 years old), whereas in poorer countries they cannot.

The above results hold true if the labor force participation rate by age in each country is standardized by dividing it by the labor force participation rate of the total population.

In a nutshell, the result obtained with a measure of the e¤ective retirement age resembles what was found for the o¢cial retirement age. In populations with a larger share of elderly, people live longer, and decide to spend their extra time more at leisure than at work. This e¤ective behavior of people is re‡ected by the policy outcome: when the old are more numerous they have more political power and can mitigate any increase in the retirement age in order to enjoy more retirement.

To conclude this section, I can now go back to Costa (1998) and consider those factors, other than demographics, which may in‡uence retirement. I have already discussed the role of income, by the analysis on the sub-sample of OECD countries. I can now focus on the urbanization rate, a key factor in the analysis of Costa (1998), which also has an interesting interpretation in the political economy literature surveyed in section 2. Focusing on men, graph 5 shows that more urbanized populations are older, enjoy a larger length of retirement and a lower working life, based on the o¢cial de…nition of retirement age. As expected, labor force participation rates of the elderly is lower in more urbanized populations. The opposite is true for more rural populations. As pointed out by Costa (1998), rural workers can continue to work until old age, while old workers in manufacturing are pushed out of the labor force, due to their reduced productivity. This result may be interpreted following Mulligan and Sala-i-Martin (1999): the reduced productivity of the elderly with respect to the young (see evidence in Kotliko¤ and Gokhale (1992)) implies that they have a lower wage and thus they are induced to retire. The econometric analysis con…rms these relations (table 5, regressions from 5.1 to 5.6). Even when the rate of urbanization is included, the

proportion of elderly is still signi…cant to explain retirement: populations with a larger share of elderly are associated with a larger length of retirement ($R^2 = 0;34$ in regression 5.7) and a lower labour force participation of the elderly ($R^2 = 0;66$ in regression 5.8).

Other factors may in‡uence retirement, such as the level of human capital (countries with higher human capital are older, enjoy a larger retirement span and a shorter working life, and have a lower labor force participation rate of people over 65 years old, as shown by regressions 5.9, 5.10 and 5.11) or the health conditions of the elderly. These factors are mainly related to income, and thus I choose not to analyze them in details.

It is worth noting that these results are consistent with the time series …ndings in Costa (1998) that the U.S. labor force participation of the elderly has declined as population has aged since 1880. She claims that at the beginning of the XX century the wealth e¤ect was dominant, and people retired earlier as they became richer. Then the responsiveness of retirement to income has decreased and other factors have emerged, such as the worsening in the average health of the elderly population, sectorial shifts from agricultural to manufacturing, and the technological change. After 1940 the provision of private pension plans and larger social security bene…ts have contributed to induce people over 65 years old to retire.

5. Demographics, Retirement and Social Security

The aim of this section is to analyze how the impact of demographics on retirement may in turn a¤ect social security. As for the theory (see section 2), also the empirical literature on social security have mainly focused on the direct impact of demographic factors on the size of the social security systems, while it has neglected the role of the retirement policies. A common evidence emerging from these studies is that the size of social security is larger the greater is the proportion of elderly people in the population (Tabellini (1990), Perotti (1996), Breyer and Craig (1997)). However, when the dependent variable is the bene…t per re-

tiree instead of the total bene…t, the proportion of elderly may turn out to be not signi…cant, as in Breyer and Craig (1997) and in Mulligan and Sala-i-Martin (1999).

The data collected in this paper con…rm these predictions. Due to availability only of OECD data on social security expenditures, the sample is restricted to OECD countries. Table 6 shows that the proportion of old displays a positive correlation with the overall social security expenditure (regressions 6.1). However, this correlation becomes much weaker if the per capita size of social security is used, and the proportion of elderly is almost not signi…cant to explain the per capita level of social security (regression 6.2). This is not surprising. When the per capita level is considered, there exist opposite e¤ects of aging on social security. On one side, a rise in the share of elderly in the population implies that a larger social security system is needed (size e¤ect); on the other side, the total amount of transfer has to be divided among more people and the per capita transfer may be reduced (per capita e¤ect). These results correspond to the predictions emerged from section 2 about the relation between aging and social security.

I can now turn to the focus of this paper, i.e. the role of retirement, and analyze the unexplored relation between retirement and social security. First, the data show that the length of retirement has a positive impact on the social security level. In fact, the expected length of retirement is positively correlated to the total social security expenditures, whereas the working life shows a negative correlation (regressions 6.3 and 6.4). However the length of retirement is not signi…cant to explain the per capita social security transfer (regressions 6.5 and 6.6). These results are consistent with the explanation given in section 2: when the old are more numerous they choose to spend more time in retirement and they can get more overall social security transfers. However, in per capita terms, this result is ambiguous, it may be not signi…cant or even reversed, since the larger transfer has to be divided among more people. Retirement and social security are thus strictly related.

To further investigate this issue, I adopt the following approach. I lump together retirement and demographic variables. The former variables are not signi…cant, but the overall …t improves (regressions 6.7 and 6.8), to suggest that, despite collinearity problems, both elements may be considered as determinants of the social security's size. Therefore I introduce a new variable: the product between the proportion of people above retirement age in the population and the length of retirement (A), which I interpret as the importance that the retirement period has for the proportion of retirees, i.e., the aggregate relevance of retirement policies. This variable turns out to be signi…cant in explaining the overall level of social security expenditures (regression 6.9), thus suggesting that retirement and social security are strictly related, and that the demographic factors, which contribute to determine the proportion of people above retirement age, play a crucial role in this relation. In a political economy context, the proportion of retirees, weighted by their use of the retirement provision, represents the importance that aggregate leisure (the time spent not working, i.e. retired) has for the elderly. They may convert this period of time into political power to favor retirement and social security. In other words, this new variable A can be interpreted as the time-intensive political pressure of the elderly (see Mulligan and Sala-i-Martin (1999)). More political pressure from the elderly implies more social security. This e¤ect is captured by the positive relation between the variable A and the level of social security expenditures. Again, in per capita terms this e¤ect disappears, and variable A is not signi…cant any more to explain the level of per capita transfers (regression 6.10), suggesting that opposite e¤ects are at work: on one side when the elderly are more numerous they spend more time in retirement and thus they can exert more time-intensive political pressure to obtain a larger total amount of social security transfer; on the other side, this larger total amount has to be shared among more retirees.

To summarize, the data con…rms the predictions of section 2 on the relation between retirement and social security: a longer length of retirement, as well as a larger proportion of retirees weighted by the length of retirement are associated

with a larger social security expenditure.

6. Concluding Remarks

The recent debate on the future of social security systems has posed several questions, mainly related to the aging process experienced by the majority of countries around the world. The empirical and theoretical literature have largely examined the …nancial and political sustainability of the current social security systems to the expected demographic dynamics. In particular, political economy models of social security have provided interesting explanations of the impact of the aging process on social security.

Current retirement policies have undergone a close scrutiny, to assess their sustainability in the prospected demographic scenario. In fact, in many countries around the world some reforms have already been introduced, such as the increase of the legal retirement age, more ‡exibility in the mandatory retirement rules, and the reduction of early-retirement provisions. In many cases, further signi…cant reforms will be needed in the future. However, the existing literature has provided no answer on the impact of demographic changes on the retirement policies, although these are a major component of the design of the social security systems. This paper shows that demographic variables are a main determinant not only of the size of the social security system, as it has been widely recognized, but also of the retirement policies, and thereby of the social security size. The main result of this work is that older populations are signi…cantly associated with longer length of retirement and shorter working life. This may be due to the fact that older populations live longer and, though they generally have a higher o¢cial retirement age, this increase in retirement age is not large enough to compensate the increased longevity. In other words, the extra time is spent more in retirement than at work. A policy implication which can be drawn from this analysis is that there exists “space” for more signi…cant increases in retirement age as populations age. This would reverse the trend towards more length of retirement. However, as long as the political power of the old increases, this policy may not be politically

sustainable. The main result of this work holds true when I control for wealth e¤ects, and when the e¤ective labor force participation rate of elderly is used instead of the o¢cial retirement age. Additionally, I found that populations with a larger share of elderly require a larger social security size, though, unsurprisingly, this result is much less clear in per capita terms. Finally, longer retirement spans characterize countries with larger social security expenditures. The overall e¤ect of demographic factors and retirement policies on the levels of social security is captured by a variable measuring the proportion of retirees, weighted by their use of the retirement provision.

These results suggest a new perspective for the analysis of the future of social security, both at theoretical and empirical level. Political economy models of social security performs quite well in explaining the role of the demographic variables on the social security size. In a multidimensional framework, in which retirement and social security are contemporaneously analyzed, they may represent a good candidate to model the impact of demographics, and of other relevant variables on both retirement and social security systems. In this context, questions on the sustainability of current retirement and social security programs and on future reforms may appropriately be addressed.

Notes

[1]The countries are the following: Afghanistan, Albania, Algeria, Antigua, Argentina, Armenia, Australia, Austria, Bahamas, Bahrain, Barbados, Belarus, Belgium, Belize, Benin, Bermuda, Bolivia, Brazil, Bulgaria, Burkina faso, Burundi, Cameroon, Canada, Cape Verde, Central African rep., Chad, Chile, China, Colombia, Congo (Zaire), Congo republic of, Costa Rica, Croatia, Cyprus, Czech republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Estonia, Ethiopia, Fiji, Finland, France, Gabon, Gambia, Georgia, Germany, Greece, Guatemala, Guinea, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Iran, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Korea, Kuwait, Krygyz Republic, Latvia, Lebanon, Lybia, Lithuania, Luxembourg, Madagascar, Malaysia, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Morocco, Netherlands, New Zealand, Nicaragua, Niger, Norway, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russia, Rwanda, Saudiarabia, Senegal, Seychelles, Singapore, Slovakia, Slovenia, Solomon Islands, South Africa, Spain, Sri lanka, St. Lucia, St.Christopher and Nevis, Sudan, Swaziland, Sweden, Switzerland, Syrian Arab republic, Tanzania, Togo, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Kingdom, United States, Uruguay, Uzbekistan, Vanuatu, Venezuela, Vietnam, Western Samoa, Yemen, Zambia and Zimbabwe.

[2]Australia, Austria, Belgium, Canada, Czeck republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States

[3]In a famous article Lazear (1979) argues that if employers o¤er wages tied to the seniority rather than marginal product, they have an incentive to impose mandatory retirement, in order to remove more expensive older workers, who are paid more than their marginal product, and incentivate younger workers, who are paid less than their marginal product, to remain with the …rm.

[4]Australia, Austria, Bahamas, Barbados, Belgium, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Czech Republic, Denmark, Dominican Republic, Ecuador, Estonia, Ethiopia, Finland, France, Germany, Guatemala, Honduras, Hong Kong, Hungary, Iceland, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Korea, Latvia, Lebanon, Lithuania, Luxembourg, Madagascar, Malaysia, Malta, Mexico, Morocco, Netherlands, New Zealand, Nicaragua, Norway, Pakistan, Peru, Philippines, Poland, Portugal, Romania, Russia, Singapore, Slovenia, Spain, Sri Lanka, Sweden, Switzerland, Ukraine, United Kingdom, United States, Uruguay, Venezuela and Zimbabwe.

[5] See footnote 2.

[6] The female labor force participation provides less reliable results due to the existence of strong cohort e¤ects.

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Table 1. The Variables (Basic Statistics)

VARIABLE	OBS.	MEAN	STD ERROR	MIN	MAX
Demographic					
M total man	129	18490745,3	66429380,1	22698	581820407
W total women	129	18245178,7	62632387,9	21640	548690231
POP = M+W total population	129	36735924,0	129042906,5	44380	62993392
TOM total man above the official retirement age	129	1603773,1	5850091,1	1266	46143065
TOW total women above the official retirement age	129	2293323,4	7706883,8	1298	70695979
VM total man above 65 years old	127	1062218,8	3334620,1	604	28661117
VW total women above 65 years old	127	1424976,9	4129445,8	662	34332275
OLD = VM+VW people over 65 years old	127	2487195,7	7426326,9	1266	62993392
OM = VM/M proportion of man over 65	127	0,1	0,0	0,0	0,2
OW = VW/W proportion of women over 65	127	0,1	0,1	0,0	0,2
O = OLD/POP proportion of people over 65	127	0,1	0,0	0,0	0,2
ORM = TOM/M proportion of man retired	129	0,1	0,0	0,0	0,2
ORW = TOW/W proportion of women retired	129	0,1	0,1	0,0	0,3
OR = (TOM + TOW)/POP proportion of retiree	129	0,1	0,1	0,0	0,2
EM expectancy life of man	141	63,3	9,1	42,9	76,8
EW expectancy life of women	141	68,4	10,3	44,0	83,0
Retirement					
RAM official retirement age of man	141	60,2	4,2	40,0	67,0
RAW official retirement age of women	141	58,2	4,3	40,0	67,0
RM = EM - RAM expected length of retirement (man)	141	3,1	7,4	-17,0	21,8
RW = EW - RAW expected length of retirement (women)	141	10,2	8,9	-12,2	23,5
R = (EM*M + EW*W)/POP - (RAM + RAW)/2 expected length of retirement (total population)	129	7,0	7,9	-14,0	22,4
PRM = RAM / EM expected working life (man)	141	1,0	0,1	0,7	1,4
PRW = RAW/EW expected working life (women)	141	0,9	0,1	0,7	1,3
PR = (PRM*M + PRW*W)/POP expected working life (total population)	129	0,9	0,1	0,7	1,3
A = OR*R proportion of retirees*length of retirement	129	0,9	1,0	-0,9	3,5
ASCM = activity rate of man over 65	49	0,3	0,2	0,0	0,7
ASCW = activity rate of women over 65	49	0,1	0,1	0,0	0,6
ASC = activity rate of people over 65	51	0,2	0,2	0,0	0,7
ACM = activity rate of man 55-65	57	0,7	0,2	0,0	1,0
ACW = activity rate of women 55-65	57	0,4	0,2	0,0	0,9
AC = activity rate of people 55-65	59	0,6	0,2	0,0	0,9
ASM = activity rate of man 60-65	54	0,5	0,2	0,1	0,9
ASW =activity rate of women 60-65	54	0,3	0,2	0,0	0,8
AS = activity rate of people 60-65	56	0,4	0,2	0,1	0,8
ACESM = activity rate of man 55-65	59	0,6	0,2	0,3	0,9
ACESW = activity rate of women 55-65	59	0,3	0,2	0,0	0,8
ACES = activity rate of people 55-65	61	0,5	0,2	0,2	0,9
ACESESCM = activity rate of man over 55	60	0,5	0,2	0,2	0,9
ACESESCW = activity rate of women over 55	60	0,2	0,1	0,0	0,7
ACESESC = activity rate of people over 55	62	0,3	0,2	0,1	0,8
ATOTM = activity rate of man	62	0,6	0,1	0,4	0,9
ATOTW = activity rate of women	62	0,4	0,1	0,1	0,8
ATOT = activity rate of total population	64	0,5	0,1	0,3	0,8
Social Security					
P = old age pension expenditure as % of GDP	27	4,9	2,2	0,2	9,2
B = P/O pension % of GDP/proportion of people over 65	27	39,6	17,8	3,6	87,5
B1 = P/OR pension % of GDP/ proportion of retirees	27	33,6	13,0	2,2	52,6
Other variables					
RURAL = rural population	123	43845,5	22300,6	3000,0	94300,0
URBAN = urban population	126	57198,4	23030,9	5700,0	100000,0
HEALTHGDP = health expenditure as % of GDP	117	3,4	2,1	0,2	8,4
H= years of schooling (human capital)	91	5,3	2,9	0,5	12,0
GDPPC per capita GDP	130	8000,4	7659,5	461,1	31807,4

Table 2. Demographics and Retirement (All countries)

DEPENDENT VARIABLE	INDEPENDENT VARIABLES			OBS	R**2
Estimation by Ordinary Least Squares					
(2.1) RAM	Constant 56,4 (0,645)	OM 67,224 (9,217)		127	0,298
(2.2) RAW	Constant 55,394 (0,627)	OW 36,95 (6,396)		127	0,211
(2.3) OM	Constant -0,103 (0,017)	EM 0,002 (0,0002)		127	0,415
(2.4) OW	Constant -0,193 (0,024)	EW 0,0039 (0,0003)		127	0,519
(2.5) RM	Constant -2,233 (1,15)	OM 95,134 (16,44)		127	0,211
(2.6) PRM	Constant 1,053 (0,02)	OM -1,539 (0,292)		127	0,182
(2.7) RW	Constant 3,182 (1,105)	OW 93,927 (11,265)		127	0,357
(2.8) PRW	Constant 0,958 (0,017)	OW -1,214 (0,176)		127	0,274
(2.9) HEALTHGDP	Constant 0,851 (0,260)	O 35,705 (2,951)		107	0,582
(2.10) RA	Constant 56,076 (0,729)	O 49,93 (12,195)	HEALTHGDP -0,027 (0,26)	107	0,270
Estimation by Instrumental Variables					
(2.11) RA	Constant 56,10 (0,856)	O 48,243 (10,28)		107	0,270
(2.12) R	Constant -1,983 (1,47/)	O 125,444 (17,74)		107	0,317
(2.13) PR	Constant 1,043 (0,025)	O -1,826 (0,295)		107	0,255

Table 3. Demographics and Retirement (OECD countries)

DEPENDENT VARIABLE	INDEPENDENT VARIABLES		OBS	R**2
Estimation by Ordinary Least Squares				
(3.1) RAM	Constant 61,446 (1,730)	OM 24,731 (16,218)	27	0,08
(2.2) RAW	Constant 61,684 (2,8)	OW 5,645 (18,276)	27	0,003
(2.3) OM	Constant -0,339 (0,0727)	EM 0,006 (0,001)	27	0,597
(2.4) OW	Constant -0,488 (0,103)	EW 0,008 (0,001)	27	0,603
(2.5) RM	Constant -0,902 (1,875)	OM 73,023 (17,58)	27	0,408
(2.6) PRM	Constant 0,983 (0,026)	OM -0,945 (0,248)	27	0,369
(2.7) RW	Constant 5,863 (2,686)	OW 68,842 (17,529)	27	0,38
(2.8) PR	Constant 0,91 (0,034)	OW -0,765 (0,227)	127	0,274

Table 4. Effective retirement age and proportion of old

DEPENDENT VARIABLE	INDEPENDENT VARIABLES		OBS	R**2
Estimation by Ordinary Least Squares				
			ILO countries	
(4.1) ASCM	Constant 0,669 (0,050)	OM -5,066 (0,591)	49	0,61
(4.2) ACESM	Constant 0,837 (0,047)	OM -2,46 (0,55)	59	0,56
(4.3) ACESESCM	Constant 0,725 (0,046)	OM -3,22 (0,541)	60	0,378
			OECD countries	
(4.4) ASCM	Constant 0,647 (0,129)	OM -4,783 (1,267)	20	0,44
(4.5) ACESM	Constant 0,882 (0,134)	OM -2,726 (1,256)	24	0,17
(4.6) ACESESCM	Constant 0,622 (0,151)	OM -2,031 (1,414)	24	0,1

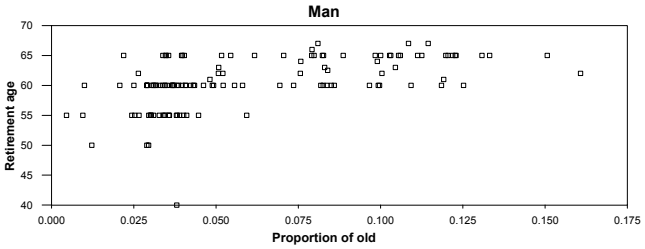
Table 5. Other determinants of retirement

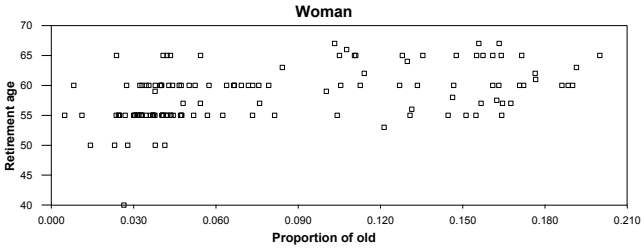
DEPENDENT VARIABLE	INDEPENDENT VARIABLES			OBS	R**2
Estimation by Ordinary Least Squares					
(5.1) RM	Constant -6,299 (1,47)	URBAN 0,000 (0,000)		126	0,29
(5.2) PRM	Constant 1,127 (0,026)	URBAN -0,000 (0,000)		126	0,28
(5.3) ASCM	Constant 0,701 (0,11)	URBAN -0,000 (0,000)		49	0,25
(5.4) RM	Constant 10,75 (1,227)	RURAL -0,0001(0,00002)		123	0,276
(5.5) PRM	Constant 0,834 (0,02)	RURAL 0,000 (0,000)		123	0,266
(5.6) ASCM	Constant 0,074 (0,062)	RURAL 0,000 (0,000)		47	0,243
(5.7) RM	Constant -7,098 (1,455)	URBAN 0,0001 (0,0000)	OM 51,48 (17,79)	126	0,339
(5.8) ASCM	Constant 0,836 (0,077)	URBAN -0,000 (0,000)	OM -4,479 (0,595)	49	0,664
(5.9) RM	Constant -5,586 (1,256)	H 1,728 (0,209)		91	0,435
(5.10) PRM	Constant 1,114 (0,021)	H -0,028 (0,003)		91	0,42
(5.11) ASCM	Constant 0,668 (0,076)	H -0,055 (0,01)		39	0,43

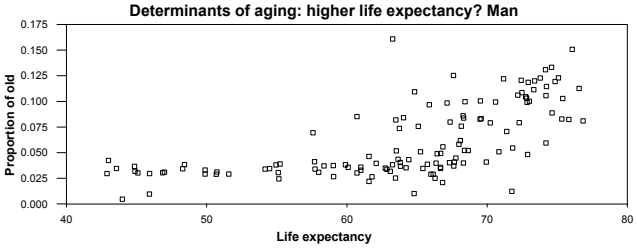
Table 6: Demographics, Retirement and Social Security

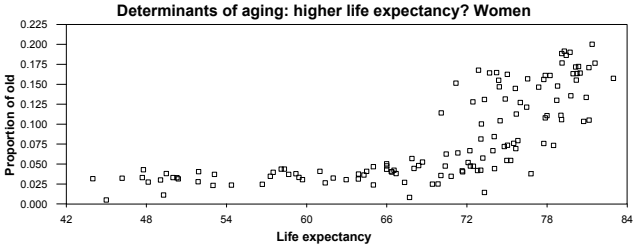
DEPENDENT VARIABLE	INDEPENDENT VARIABLES			OBS	R**2
Estimation by Ordinary Least Squares					
(6.1) P	Constant -0,668 (1,038)	O 45,25 (8,026)		27	0,559
(6.2) B1	Constant 11,13 (7,78)	O 181,35 (60,15)		27	0,26
(6.3) P	Constant 1,367 (1,188)	R 0,306 (0,096)		27	0,287
(6.4) P	Constant 25,156 (6,643)	PR -23,84 (7,826)		27	0,27
(6.5) B1	Constant 21,322 (7,752)	R 1,053 (0,629)		27	0,1
(6.6) B1	Constant 103,85 (42,92)	PR -82,847 (50,57)		27	0,09
(6.7) P	Constant -0,597 (1,077)	O 48,51 (12,498)	R -0,04 (0,118)	27	0,56
(6.8) P	Constant -2,176 (8,658)	O 46,73 (11,75)	PR 1,56 (8,9)	27	0,56
(6.9) P	Constant 1,725 (0,828)	A 1,823 (0,428)		27	0,42
(6.10) B1	Constant 24,969 (6,025)	A 4,9 (3,117)		27	0,09

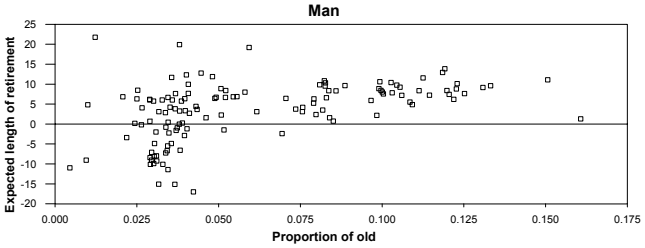
Graph 1. Demographic Factors and Retirement

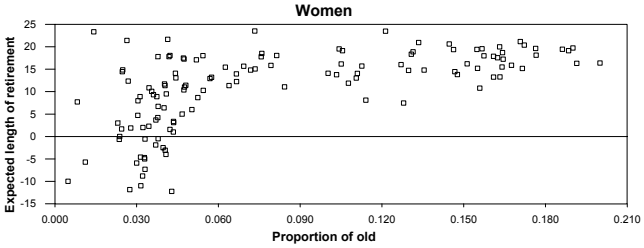


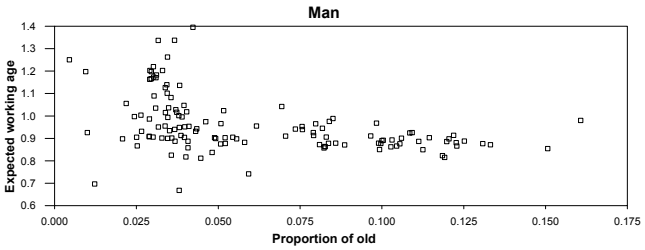


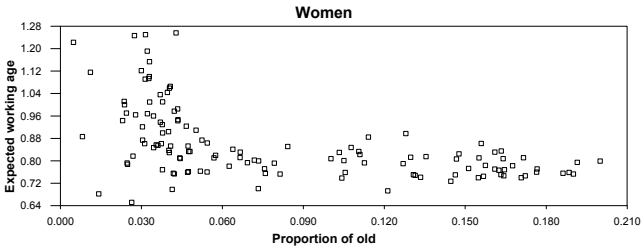




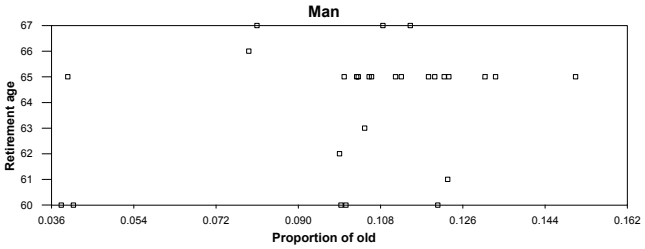


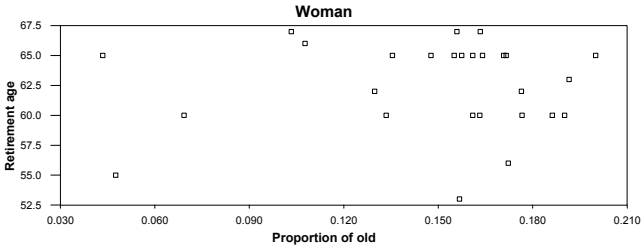


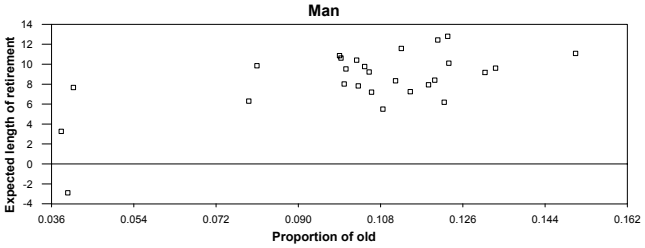


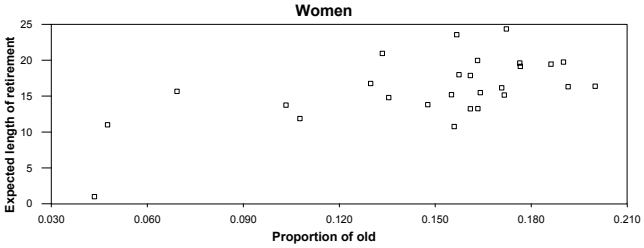


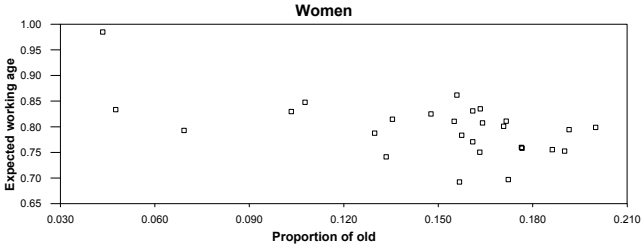
Graph 2. Demographic Factors and Retirement. OECD



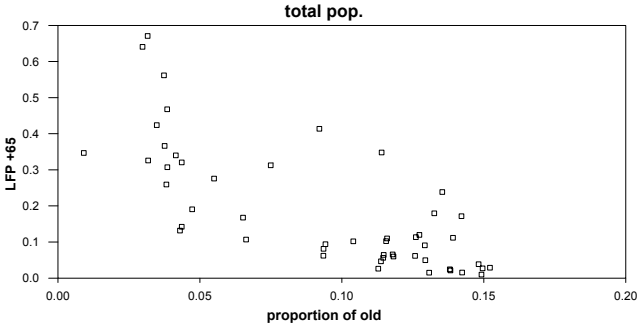


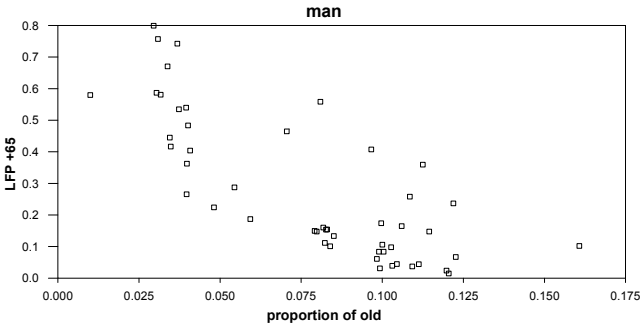


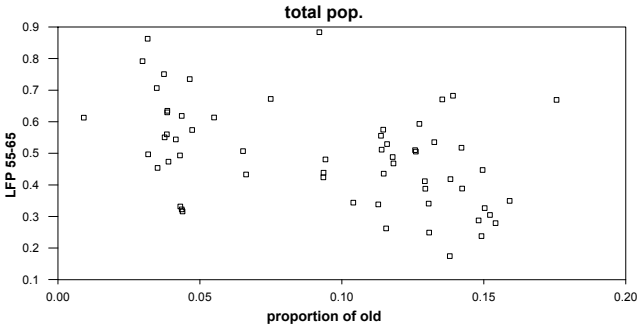


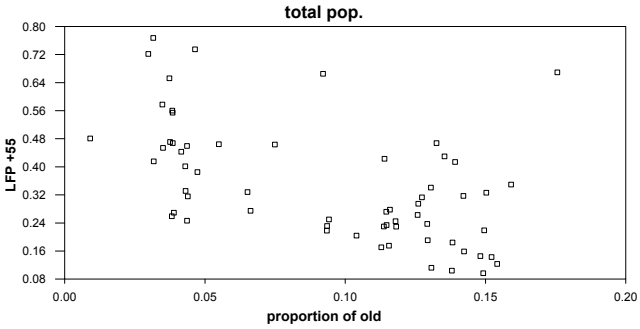


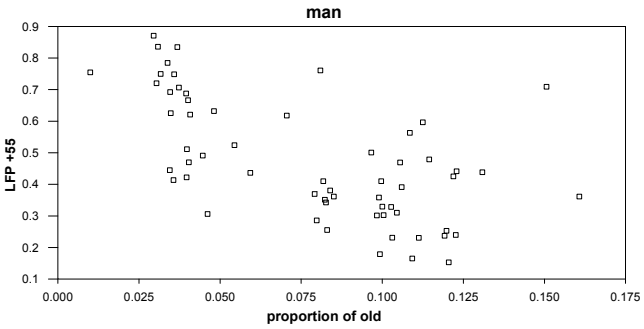
Graph 3. Effective retirement age and Proportion of old



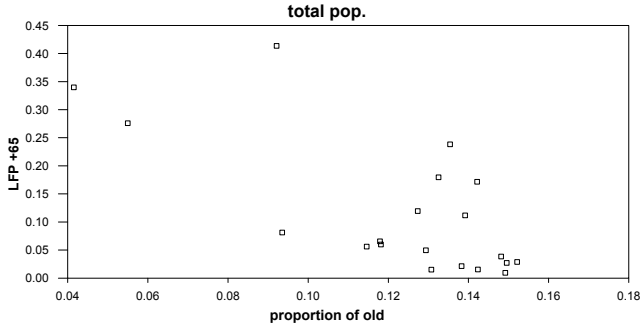


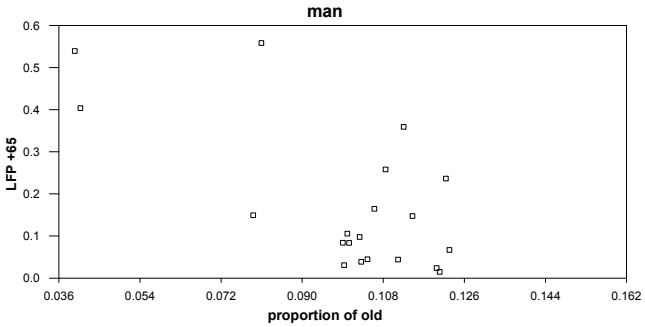


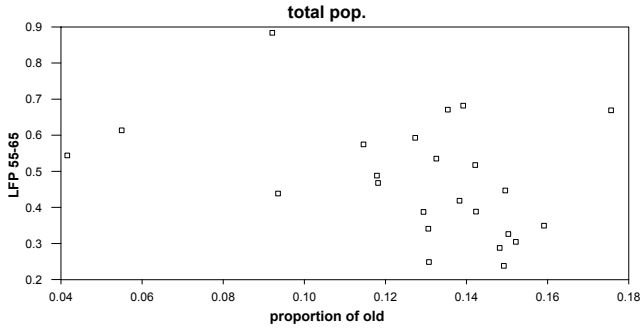


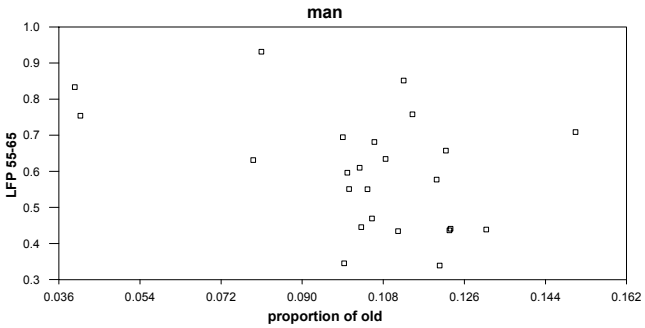


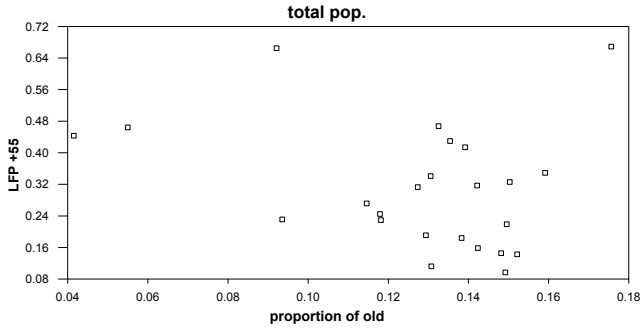
Graph 4. Effective retirement age and Proportion of old. OECD

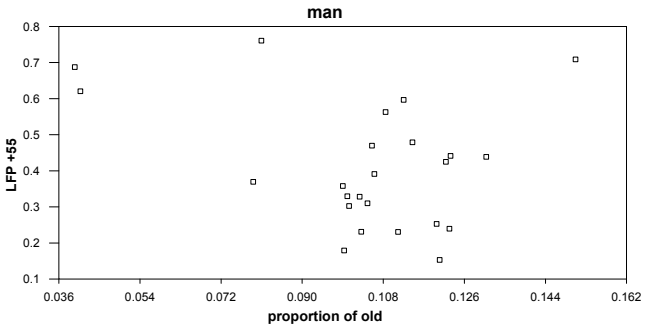












Graph 5. Other Determinants of Retirement