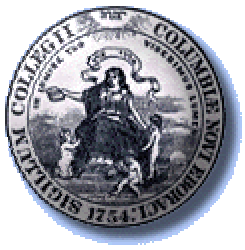

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Social Security in Theory and Practice With Implications for Reform

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Social Security in Theory and Practice with Implications for Reform

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Abstract

166 countries have some kind of public old age pension. What economic forces create and sustain old-age Social Security as a public program? In the first part of the paper, we document some of the internationally and historically common features of Social Security programs including explicit and implicit taxes on labor supply, pay-as-you-go features, intergenerational redistribution, benefits which are increasing functions of lifetime earnings and not means-tested.

The rest of the paper discusses various positive theories of Social Security and compares each of them with the empirical regularities uncovered in the first part. We partition theories into three groups: "political", "efficiency" and "narrative" theories. We explore three political theories: the majority rational voting model (with its two versions: "the elderly as the leaders of a winning coalition with the poor" and the "once and for all election" model), the "time-intensive model of political competition" and the "taxpayer protection model". We then discuss the "efficiency theories," which view creation of the SS program as a full or partial solution to some market failure. Efficiency explanations of social security include the "SS as welfare for the elderly", the "retirement increases productivity to optimally manage human capital externalities", "optimal retirement insurance", "labor market congestion," the "prodigal father problem", the "misguided Keynesian", the "optimal longevity insurance", the "government economizing transaction costs", and the "return on human capital investment" theory. Finally we analyze three "narrative" theories of social security: the "chain letter theory", the "monopoly capitalism theory", and the "Sub-but-Nearly-Optimal policy response to private pensions theory".

The political and efficiency explanations are compared with the international and historical facts and used to derive implications for replacing the typical pay-as-you-go system with a forced savings plan. Most of the explanations suggest that forced savings does not increase welfare. In fact, it may decrease it.

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When economists analyze a reform of old age Social Security (hereafter SS), two important questions must be answered. First, is the reform desirable? That is, will the reform improve welfare for a significant number of people? Fully answering this question is impossible without a positive theory of the creation and evolution of SS. For example, if we evaluate various reform proposals under the belief that SS plays a certain role (say, if we think that SS was created to make sure that the young "save enough" for their elder years), but in reality, SS plays another role (say, it was created to induce the elderly to retire so their jobs could be given to more productive young workers), then we may end up adopting the wrong reform: one which maximizes the lifetime rate of return, but keeps the elderly working! Since any reform evaluation implicitly assumes a positive theory of SS, our task in this paper is to be explicit about the facts and about the implications of various positive theories.

The second question in evaluating reform is whether it is sustainable. Are the most popular proposals (like a "fully funded" or an "individual accounts" system) sustainable? An important reason to question the sustainability of fully funded reforms is that no SS program in history has been fully funded for any important length of time.[1] At the same time there are several SS programs which were supposed to be fully funded, but were unfunded by the political system in short order. Take, for example, Chile's original SS program (Foxley et al, 1979, p. 124; Edwards 1998, p. 37), Germany's original program (Börsch-Supan and Schnabel 1997, p. 7), one of the original French programs, the first U.S. SS law (passed in 1935, scheduled to come into effect in 1937 and to be partially funded, but rescinded in 1939; Miron and Weil 1997 p. 5), and Sweden's first system (Palme and Svensson 1997, p. 11). A number of individual accounts systems have also failed to be politically sustainable, including those in Seychelles and Egypt (Gruat 1990, p. 416) and St. Vincent (Haanes-Olsen 1989, p. 19), the system for the American clergy (Mulligan 1997), and some African (Gruat 1990, p. 408) and Caribbean (Jenkins 1981, p. 633) Provident Funds.

To analyze the sustainability of a reform, we also need to have a positive theory of social security. A good theory of SS, therefore, needs to explain not only why SS exists, but also what are the social, economic, and political forces that create these programs, keep them in place and allow them to grow. The main purpose of this paper is to identify such a positive theory or theories of SS. We begin with a number of "observations," or potential observations, for the design of social security programs which are

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[1]For our purposes, a fully funded system is one which delivers a rate of return greater than the growth of labor income without taxing that income at higher and higher rates. This definition rules out, for example, systems like Singapore's "Provident fund" which appears to be a fully funded system but in fact delivers rates of return to contributors of no more than the rate of labor income growth.

important for distinguishing reasonable theories of SS from unreasonable ones. It is important for our purpose that the observations reviewed relate to one or more of the positive theories. As a result, only some of these observations have been the subject of several previous empirical studies, while others have not been previously explored (perhaps because their theoretical relevance was not previously anticipated?) and are original to this paper. In these latter cases at least, it remains unclear whether the observation will hold up to additional and more detailed study. But it all cases we show how an observation helps us distinguish among the various theories.

After reviewing the empirical observations, we analyze the main positive theories of SS found in the economics literature and explain how each theory compares with the empirical regularities documented in the first section. We suggest that SS theories can be grouped into three categories: Political, Efficiency and Narrative theories. In Section II we compare the main differences between political and efficiency theories of SS. In Section III, we review the political theories in detail. In Section IV we derive the empirical implications of efficiency theories of SS. In Section V we discuss what we call "narrative theories", that is, stories which have been mentioned in academic and popular discourse, but have not been formalized. Finally, Section VI uses each of the theories to evaluate the desirability of "reforming" pay-as-you-go SS by replacing it with a forced savings program. Since our purpose is to develop and distinguish positive theories, we can only draw some of the theories directly from the previous literature, while others must be extended and/or reinterpreted in order to facilitate comparison with other theories and with observations.

I. Documented and Undocumented Facts about Government Spending on the Elderly

At least 166 countries have public old age pension programs.[2] In some of the countries, public old age pensions can be dated back at least a hundred years. Although each of the programs is unique in many respects, they also tend to have many common features. These common design features may help us understand why all these countries have SS programs, what are the forces keeping them in place and perhaps allowing them to grow over time. This section describes those regularities, drawing on the work of Sala-i-Martin (1996) and Mulligan and Sala-i-Martin (1999a) and offering several new contributions. The regularities are listed in Tables 1 and 2 for the reader's convenience. These tables cross-tabulate the positive theories with "implications" for, and "facts" about, SS. Our purpose is not only to help the reader

[2]U.S. SSA *Programs* (1997).

identify the "correct" theory, but also to show which implications are more important for distinguishing one theory from another. Hence, we make no attempt to sort or weight facts by how true they are. In fact, we include some "implications" which have yet to be carefully verified but are nonetheless crucial for distinguishing among theories. We postpone comment on the strength of the evidence in each case in Sections II, III, and IV.

I.A. Social Security Induces Retirement, with benefits being a declining (and often nonlinear) function of elderly labor income

The majority of SS programs in the world implicitly or explicitly tax the labor income of the elderly (Sala-i-Martin 1996). Retirement and earnings tests are among the reasons for this. The retirement test means that a person must be retired in order to receive any of his SS benefit. With the earnings test, a SS beneficiary has his benefit reduced in proportion to the amount he earns from a job (the proportion is often referred to as the "benefit reduction rate" or BRR). BRRs are sometimes even 100%, that is, $1 of benefits lost for each $1 earned by the beneficiary. Sometimes there are increments in future benefits in exchange for benefits foregone (due to earnings or retirement tests) during years worked past the retirement age, which are sometimes known as Delayed Retirement Credits (DRC). Mulligan and Sala-i-Martin (1999a) find that in 1995, 47% of the countries required retirement and had no DRC, 12% had a retirement test and unfair DRC,[3] 11% had earnings tests with no DRC, 3% had earnings tests with unfair DRC and 3% had current retirees covered with a previous law that induced retirement. A third work disincentive for persons at or beyond the normal retirement age is that they are liable for the payroll tax if they work but, unlike working persons below retirement age, their production of taxable earnings does not earn them credit toward future retirement benefits. For these two reasons, SS tax and benefit formulas explicitly and implicitly tax work by the elderly, and do so at a higher rate than for the young.

Consider, for example, the U.S. SS benefit formulas. Between 1939 and 1959 retirees lost all of their SS benefit if their earnings exceeded a rather low earnings limit by even one dollar![4] The 100% tax was used somewhat less between 1960 and 1971 when a 50% benefit reduction rate was introduced on

[3]In other words, the incremented future retirement benefits were less in expected present value than the benefits foregone due to the retirement test.

[4]Those aged 75+ were exempt from the earnings test beginning in 1950, those aged 72+ exempt beginning in 1954, and those aged 70+ beginning in 1982 (Myers 1993 pp. 272-5).

some of the earnings above the exemption amount (Myers 1993 p. 274). Since 1975, the U.S. has been introducing and increasing DRCs (House Committee 1996, p. 31), which by itself tended to reduce but not eliminate the elderly work disincentive of SS benefits. By 1995, Gruber and Wise (1999, Table 1) calculate the implicit tax rate on earnings to be about 20%. Since then, the U.S. earnings test has been eliminated. But the recent U.S. years without the earnings test are few in the context of the international history of Social Security. Furthermore, as we explain above, even in 2002 SS tax rules discourage work by the elderly.

More examples of 100 percent taxes in the U.S. are found in old age assistance programs prior to the 1970s. State administered old assistance programs typically (implicitly) taxed earnings at a 100 percent rate (Myers 1993 pp. 827, who also points out that some states administering old age assistance exempted the first 80 dollars of monthly income). International examples are also common: elderly Spaniards and Belgians are not allowed to collect their government pension if they earn any labor income at all (Boldrin et al 1997 p. 16, SSA *Programs* 1997 p. 330, Pestieau and Stijns 1997, p. 9[5]).

In addition to old age pensions, another quantitatively important subsidy for the elderly is government financed health care. These programs are typically available to all elderly regardless of the amount or composition of their income. However, U.S. Medicare policy has a "secondary payer" provision which requires elderly workers to continue to purchase medical insurance from their employers until they retire, which may act as a tax on elderly work. Requiring government medical subsidy beneficiaries to queue prior to receiving services may also serve to discourage work by the elderly.

I.B. Benefits do not depend on asset income

Although SS benefits are tightly linked to the beneficiary's labor income, in 98% of the countries for which we have data there is no link to the beneficiary's non-labor income. Only two of the 89 countries studied by Mulligan and Sala-i-Martin (1999a) have old age public pension formulas which depend on the non-labor income of the beneficiary.

Mulligan and Sala-i-Martin's finding is based on analysis of benefit formulas, but there are in principle other subtle ways benefits and asset income might be linked. For example, the non-labor income of the elderly could be directly taxed more (or less) heavily than the non-labor income of the young. We

[5]This rule may have changed in recent years since, according to SSA *Programs* 1997, p. 35, 282118 francs ($8993) could be earned in 1997 without sacrificing the pension benefit.

have not systematically studied foreign tax systems in this regard, but the U.S. and other governments seem to do just the opposite by favorable tax treatment of retirement savings, and allowing elderly taxpayers special exemptions from property and capital gains taxes. Another example is the taxation of SS benefits in a way that is related to asset income. The U.S. has taxed SS benefits since 1983 (Myers, p. 147) and, because marginal tax rates vary with a taxpayer's income, the amount of that tax has some relationship with a beneficiary's asset income. On the other hand, the U.S. has offered special tax exemptions to the elderly for an even longer period and the after-tax value of these exemption increases with asset income.

Another way to (implicitly) reduce old age benefits as a function of non-labor income is to have a special means-tested program for the elderly in addition to a public old age pension program. The U.S. has such a welfare program, Supplemental Security Income (formerly Old Age Assistance). However, it is a small program compared with SS and Medicare - the old age portion of SSI is than $20 billion, as compared to more than $500 billion for SS and Medicare (House Committee, OMB 1998 Table 8.5). Medicaid is another welfare program enjoyed disproportionately by the elderly because they have a greater demand for medical care. However, this has been a quantitatively important program only in recent years, and did not even exist for most of the history of SS. Furthermore – when taken together with the favorable tax treatment of elderly non-labor income – it is not clear that old age benefits are, on average, reduced in an important way with elderly non-labor income.

A related question is whether SS, tax, and other government policies for the elderly are progressive or regressive. Many studies of American SS (Burkhauser and Warlick 1981, Garrett 1995, Coronado et al 1999[6]), Medicare (McClellan and Skinner 1997), and elderly tax policy (Nelson 1983) suggest that government policy toward the elderly is neither progressive nor regressive.[7] Third World Social Security Programs appear to be regressive (Pampel and Williamson 1989, page 10; Midgley 1984).

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[6]More specifically, Coronado et al 1999 consider future retirees as distinguished by their lifetime income. They estimate that, under current law, the bottom quintile will have paid 3.3% of their lifetime income *more* in Social Security taxes than they receive in benefits. The top quintile are also expected to pay more in Social Security taxes than they pay in benefits, but only an amount equal to 2.6% of their lifetime income.

[7]Boskin et al (1987) is one study showing a little progressivity in the OASI system. Lee et al (1999) find a little progressivity in the Medicare system between 1990 and 1995, mainly due to increased spending on home health care; the authors speculate that this change is a temporary one.

Several European programs have far more generous benefits at higher salary levels (apRoberts 1996, pp. 109, 112) and may thereby be more regressive than American SS. Perhaps these results are surprising, because in some countries at least a year of retirement benefits is a smaller fraction of lifetime income for the rich (see, for example, the U.S. replacement rate calculations by House Committee 1996, p. 27). This observation would be enough for the incidence analysis if income were uncorrelated with the likelihood of paying taxes or receiving benefits, but these studies point out that the (lifetime) poor enter the labor market (and begin paying payroll taxes) earlier in life, have shorter life expectencies, and are less likely to be married (and thereby value the widow component of benefits). Furthermore, especially in developing countries, the poor are less likely to be in the urban areas where it is easiest to know about and collect benefits, more likely to be in a minority group treated differently by the program, and less likely to be in an occupation preferentially treated by the program. Mulligan and Philipson (2000) suggest that, if SS has had the effect of changing life cycle consumption profiles among the poor (perhaps intentionally, as in some of the positive theories we discuss below, or perhaps as an accidental byproduct of other policy motives), then SS may be substantially more regressive than suggested by previous studies because the poor value the income they give up in taxes when young more than the additional old age benefits these taxes (with interest) might purchase. SS may also appear regressive in recent years if we take consumption as the measure of well-being, and include age-dimension of redistribution, because the elderly seem to consume more than the nonelderly (Hurd 1990, Table 10).

I.C. Benefits increase with lifetime earnings

Benefits are typically an increasing function of average annual earnings before retirement. For 130 out of 139 countries studied by Sala-i-Martin (1996), the pension is linked to his previous wage history. In some countries the benefits are simply proportional to the contributions. In some others (eg., Canada, Denmark, Finland, Iceland, Japan, New Zealand, Norway, and Sweden) the pension has two or even several tiers: a basic pension, usually unrelated to previous contributions, provides a minimum amount of income for all the elderly. A second tier relates the pension benefits to the history of previous wage earnings.

In some countries, the income earned during the years nearest to retirement typically count more than the income earned earlier in life. In some others (eg., U.S.), nearly the entire life history of earnings is used and each year is given equal weight. Other countries (eg., Turkey) only use the very recent earnings history prior to retirement for benefit calculations.

I.D. Pensioners often consume as much or more than do the young

In developed countries, consumption by the old is comparable to, or exceeds, consumption of those who have not retired. To establish this point, several considerations are necessary. The first is: (1) the relative money income of households headed by the old (those age 65+) and those headed by the young. In 1997, the elderly-nonelderly ratio of U.S. medians was 0.64 and means was 0.72.[8] In 1973 (means), 1973 (medians) and 1981 (medians), the ratios were 0.49, 0.53, and 0.64, respectively (Danzinger et al 1984, pp. 177-9).

In order to measure consumption per capita, several adjustments are necessary. To what extent:

(2) do the elderly own larger stocks of household durables and equity?

(3) are different taxes paid by the elderly?

(4) do the elderly head smaller households with fewer children?

(5) can the elderly draw down asset stocks?

(6) do the elderly enjoy in-kind government transfers?

(7) do the elderly have time available for household production or economizing on market expenditures?

(8) do the elderly avoid job related expenditures?

(9) do the elderly have gifts as an additional income source?

(10) do the elderly enjoy Medicare and Medicaid as additional consumption?

(11) do the elderly misreport money income?

(12) do the elderly have greater medical needs?

(13) do the elderly miss job-related fringe benefits?

(14) do the poor elderly live with nonelderly households?

Items (2)-(10) suggest that the elderly would consume more when relative money incomes were the same. Some research (Radner 1981) suggests that the elderly understate money income in response to census surveys significantly more than do the nonelderly, so item (11) may also go in the same direction as the previous items. Items (12)-(14) are biases in the other direction.

Danziger et al (1984) have quantified items (2)-(4) for 1973, and their results are shown in the

[8]Census Bureau (1998), Table FINC-03.

lefthand bar in Figure 1. The lowest bar reflects the relative reported household cash income from all sources (including SS) of 0.486. Accounting for the greater household durables and equity owned by elderly households suggests that the elderly consume 9 percent more than is indicated by their cash income and increases the relative consumption estimate from 0.486 to 0.522. Specially elderly tax treatment was another 10% of elderly household cash income in 1973, increasing the relative consumption estimate from 0.522 to 0.562. Elderly households are significantly smaller than nonelderly households, although this is mitigated somewhat by the fact that the nonelderly households have children with lesser "needs" than adults. The net result is to revise the estimate of relative consumption per adult from 0.562 to 0.853. Household composition is their most significant adjustment, although it may not be the most significant on the list (2)-(14) since the elderly enjoy 61% more leisure time.[9]

[9]Authors' calculations from the March 1997 CPS, assuming daily leisure hours = 16 - daily hours worked.

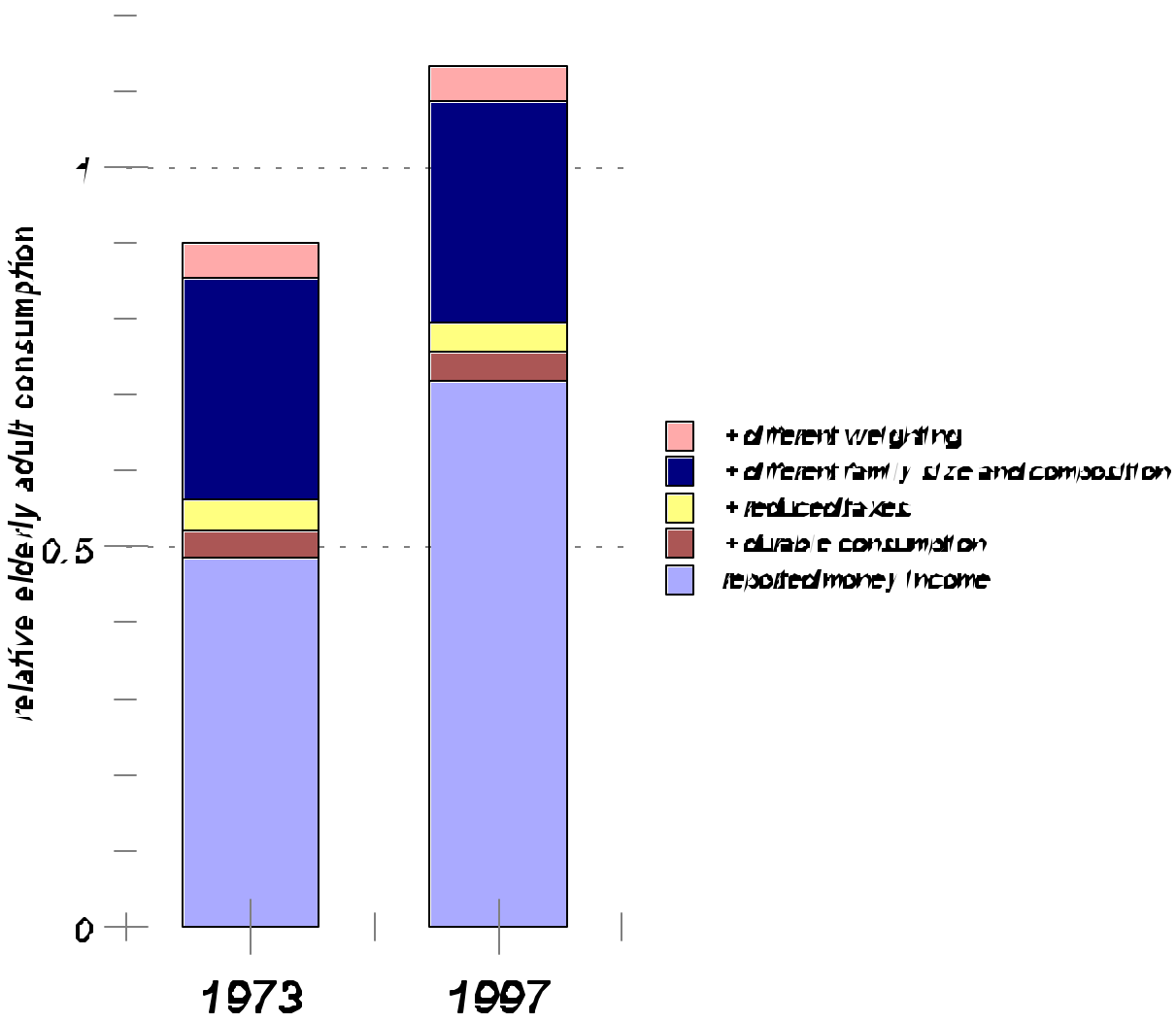

Figure 1 American Relative Elderly Adult Consumption, 1973-97
based on Danziger et al (1984)

The relationship between income and household size differs between the elderly and nonelderly population (Danzinger et al, pp. 184), so it matters whether relative incomes are weighted by households or persons. The relationship between household income and the propensity to live in a household headed by someone of a different elderly/nonelderly status also varies with age, so it also matters whether relative per capita incomes are classified according to the age of the head or assigned to individuals and then classified according to the age of the individual. So a final adjustment made by Danzinger et al is to reweight their 1973 data and compute relative consumption per adult of 0.900 rather than 0.853.

We use Danzinger et al's 1973 numbers to construct a rough estimate of 1997 relative consumption. As computed by the Census Bureau (1998), relative elderly reported cash income has risen

substantially, a finding which we enter in Figure 1 as the lower part of the right-hand bar with height 0.72. We then make the conservative assumption that the Danzinger et al adjustments have been unchanged as a fraction of *nonelderly* income over the period 1973-97. This is a conservative assumption because, presumably, some of the adjustments increased over time together with elderly money income.[10] We find elderly consumption to exceed nonelderly consumption by 13% in 1997![11]

Hurd (1990, Table 10) quantifies items (3), (4), (6), (11) and (13), and suggest that Danziger et al (1984) missed two quantitatively important items, and mis-estimated a third. First, item (6) is significantly greater than (13) in magnitude.[12] Second, the effect of household-size on the relation between consumption and money income may have been understated. Third, the underreporting of asset income by the elderly seems to be substantial. Figure 2's left bar displays each of Hurd's adjustments, and we see that elderly consumption may have exceeded nonelderly consumption even in the 1970's. Since Hurd did not have a durable consumption adjustment, we add Danziger et al's at the very top of the bar, so that the 1979 bar has total height of 1.32. The right bar then offers an estimate of the 1997 relative elderly consumption, beginning with the left bar and using the same procedure as used in the production of Figure 1.[13] We see how 1997 elderly consumption might be estimated to substantially exceed nonelderly; the right bar's total height is 1.52. Even without regards for the durable and capital income adjustments, elderly consumption seems to exceed nonelderly consumption by 20% or more. An update and improvement of Danzinger et al's and Hurd's analysis is certainly appropriate, but it appears difficult to

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[10]There is some direct evidence that elderly federal tax favors have increased substantially over time. Nelson (1983, Table 1) found tax expenditures on the elderly to increase from 1974 to 1982 by 464% in nominal terms and 215% as a ratio to GNP (Council of Economic Advisers)! Updating Nelson's calculations using OMB (1998), we find a decrease of 13% as a ratio to GNP over the period 1982-1997, which implies a net 1974-97 increase of 182% as a ratio to GNP.

[11]If we do the 1997 calculation beginning with the ratio of median elderly family income to median nonelderly family income (0.64), we find the elderly consuming 6% more per adult.

[12]Hurd reports the aggregate effect of items (3), (6), and (13), which can be compared to Danzinger's 1973 calculation of item (3) alone.

[13]Remember that our procedure assumes that the various adjustments are the same fraction of nonelderly money income in 1979 as in 1997. This assumption may be fairly accurate for the items considered in Figure 1, but Figure 2's adjustments include one for the value of elderly medical subsidies, and these have grown dramatically as a fraction of nonelderly money income. For this reason, our 1997 value of "reduced taxes and fringes, increased in-kind subsidies" is too small.

make the case that the elderly are consuming significantly less than are nonelderly adults.[14]

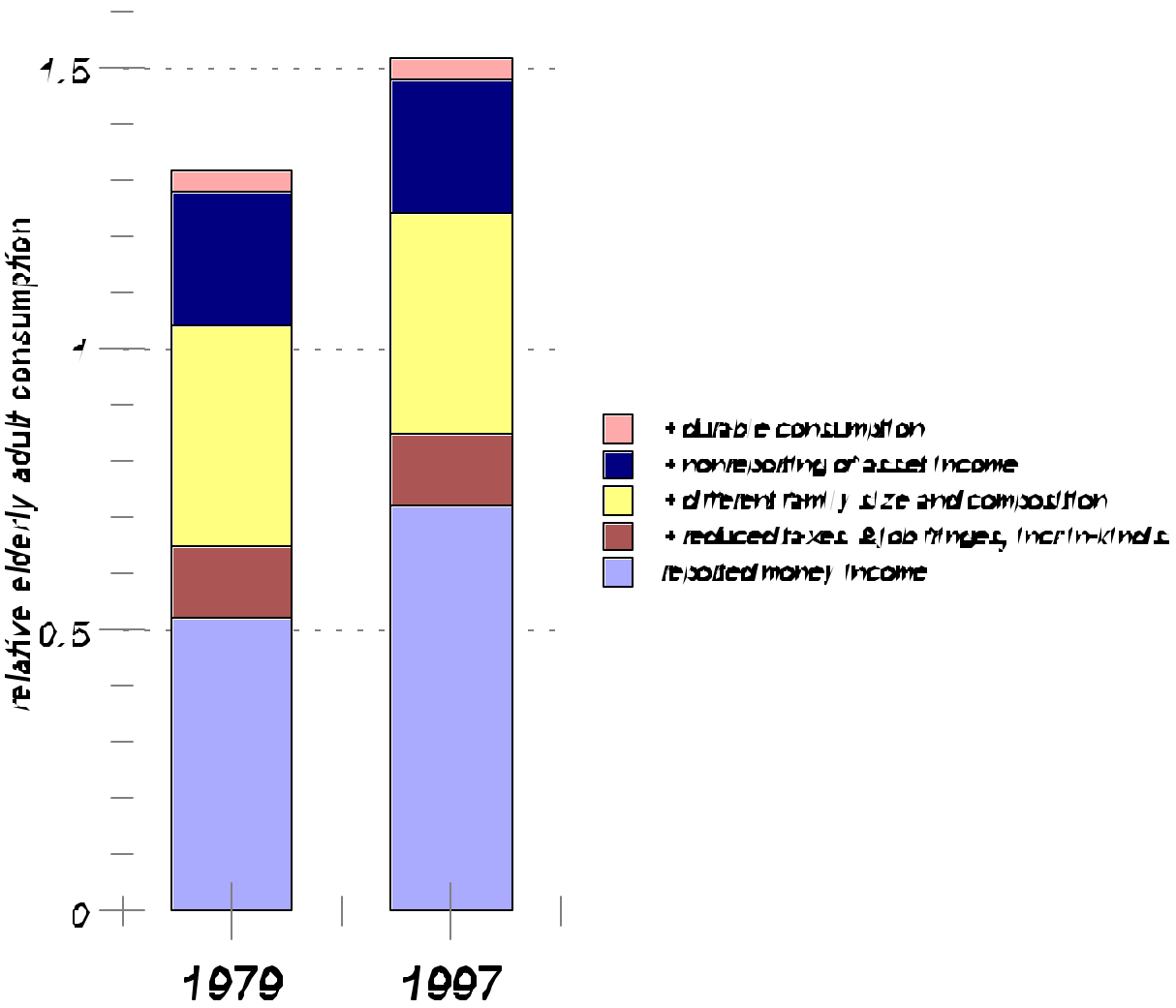

Figure 2 American Relative Elderly Adult Consumption, 1973-97
based on Hurd (1990)

[14]Fuchs' (2001) calculations for the calendar year 1997 can be used to calculate an upper bound for item (12), namely that some of elderly expenditure goes toward medical care. If we suppose that none of his public health care expenditure counts as personal income (and that personal income is essentially the same as the "money income" concept used by Danzinger et al and Hurd), then his Table 2 implies that health care expenditure is 48% of money income for the elderly. Since the 1997 money income bar has height 0.72 in Figure 2, and the young presumably have some health care expenditure, we have that item (12) reduces the 1997 consumption bar by no more than 0.34. We also suspect that Figure 2's 1997 consumption bar is too short for comparison with Fuchs' calculations, because our Figure 2's understatement of the "reduced taxes and fringes, increased in-kind subsidies" item (see our previous footnote).

We believe the old do relatively better in European countries because American public old age pensions are among the least generous available to citizens of developed countries, and support our suspicion with data from a French 1995 household budget survey.[15],[16] The survey measures consumer expenditures, which we report in Figure 3 as averaged by the age of household head. The solid bars graph consumption adjusted for family size and consumption by the INSEE, which we convert to 1995 dollars using an exchange rate of 5.36.[17] The hollow bars graph unadjusted consumption. Since the majority of French men retire by age 60 (Blanchet and Pelé 1997, Figure 11), it is interesting to compare the consumption of the groups aged 55-64 and aged 65-74 with that of younger age groups. We see the two older groups consuming somewhat more when adjusted for family composition and somewhat less unadjusted. It should be noted that the calculations in Figure 3 include housing and durables services only to the extent that households are paying rent or making mortgage payments.[18] Presumably both the incidence and tenure of French home ownership is highest among older age groups as it is in the U.S., so true consumption is understated most in Figure 3 for the aged. The biases (6)-(14) are also unaccounted in Figure 3.

[15]The INSEE (1995) data was kindly provided by Didier Blanchet.

[16]The excessive generosity of European SS programs can be seen in the fact that, in nearly every European country for which we have 1989 data, the fraction of GDP devoted to *publicly provided pensions* equals or exceeds the fraction of population aged 65+. Note that "publicly provided pensions" exclude the rest of benefits enjoyed by the elderly (eg., medical).

[17]The first adult (age 15+) is counted as 1 consumer unit, additional adults 0.7, and children 0.5. Exchange rate from U.S. SSA *Programs* (1995).

[18]Didier Blanchet, personal correspondence, February 25, 1999.

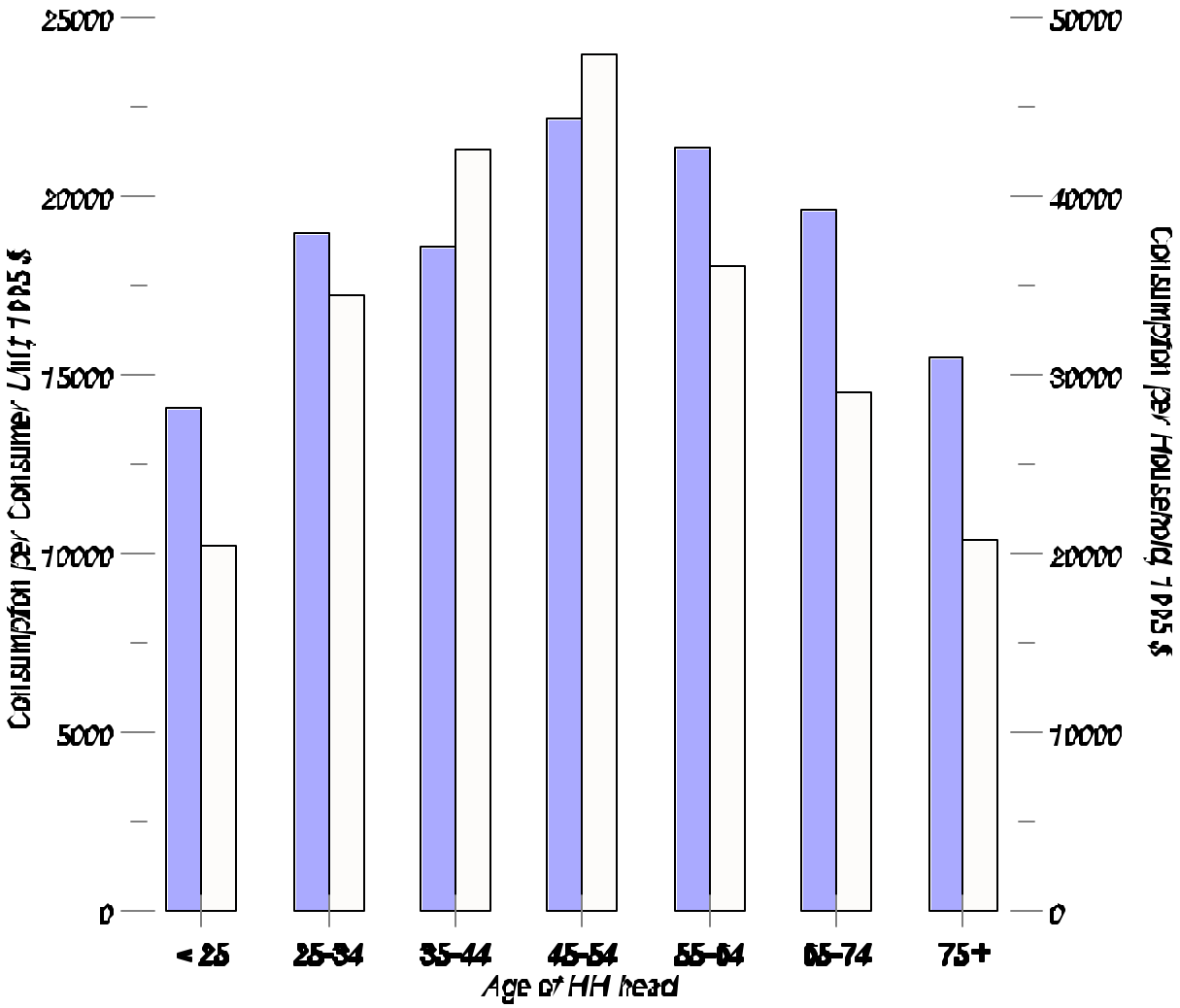

Figure 3 French Consumption Age Profiles, 1995

Another indicator of the generous government treatment of the elderly is the poverty rate among the old as compared to that among children. Preston (1984) shows how the American old are significantly better in this dimension and how their advances in this dimension have coincided with the growth of SS.

The same may be true for undeveloped countries, although data is more difficult to obtain and the tendency for poor elderly to merge with younger households is probably greater. D. Gale Johnson (1998, pp. 2-3) calculates very similar rural incomes per family member across age groups in his study of the Chinese provinces of Sichuan and Liaoning.

I.E. Social Security is financed with special payroll taxes

The vast majority (96.6%) of countries have payroll taxes earmarked for SS (Sala-i-Martin 1996). Some of the payroll taxes are paid by the employer and some by the employee (the relative importance of each varies widely across countries – see Mulligan & Sala-i-Martin 1999a). In some countries an additional share is paid by the government.

In practice, the fact that SS is financed with a special payroll tax means that SS is financed through its own special budget. This is a key difference between SS and most other public programs, which are usually financed through the regular budget rather than through a specific tax.

Of course, tax dollars are fungible so that "earmarking" one tax or another need not have any economic consequence. However, it turns out that - both in cross-section and time series - the amount of revenue collected by payroll taxes is an excellent predictor of the amount of revenue spent on SS beneficiaries.

I.F. Benefits are usually, but not always, paid as a life annuity

In most countries and time periods, government old age pensions are paid as a life annuity. Benefits begin at retirement age[19] and are paid in regular intervals (usually monthly) until the beneficiary dies. In many countries, retirees do not have the option of receiving a lump sum payment or to borrow against their government-backed annuity. There are a number of exceptions, however, where governments require or offer the option of receiving all or part of the actuarial value of the annuity in one lump sum payment. Many such countries, such as India, Indonesia, and Malaysia, have individual accounts systems referred to by the SSA as "Provident Funds." A few other countries, such as Bahrain, Egypt, and Mexico's new system, do not have Provident Funds but nonetheless offer lump sum *options*. Lump sum payments are more commonly paid to survivors or to the disabled. At least four countries (Nepal, Sri Lanka, Tanzania, and Vanuatu), *require* their elderly to take their benefits as a lump sum (U.S. SSA *Programs* 1995). Other countries, such as the U.K., do not offer lump sum payments from their public pension programs, but leave lump sum private pension distributions untaxed while taxing pension payments – strongly encouraging lump sum distributions (Daykin 1996, pp. 45, 55).

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[19] We define *retirement* age as the age at which the person starts collecting SS benefits, whether he actual "retires" -stops working- or not. As we argued above, in most countries, people start collecting benefits when they stop working.

I.G. Government Retirement Ages have not Risen with Life Expectancy and Health

Life expectancy has risen dramatically over time in the U.S. (Lee 1996, House Committee Table 1-11) and other countries. For example, the House Committee estimates that, over the history of the SS program, life expectancy at age 65 has risen 3.5 years (29%) for men and 5.8 years (43%) for women. Costa (1998, Chapter 4) reports dramatic 20th century reductions in disease incidence, blindness, and other health indicators among the elderly. While life expectancy and health among the elderly have risen over time, the earliest age of eligibility for OAI has fallen. In the beginning of the program, the earliest age was 65 for both men and women. The age restriction for female workers and wives of male workers was lowered to 62 in 1956. 62 became the early retirement age for men in 1961 (Myers 1993, p. 240) and, under current law, scheduled to remain at 62 for the indefinite future (House Committee, Table 1-8). 60 became the early eligibility age for widows in 1965 and later for widowers (Myers 1993, pp. 241-5). Holding constant the early retirement age, the "normal retirement age" affects the amount of benefits available at the early retirement age, but has been constant at 65 throughout the history of the program (House Committee, Table 1-8). However, the normal retirement age is scheduled to increase from 65 to 67 over the next 22 years (House Committee, Table 1-8).

Eligibility for permanent disability benefits began at age 65. This age was lowered to 50 in 1956 and, effectively, lowered to zero in 1960 (Myers, pp. 239-40). The definition of "disability" was also broadened over time (Myers, pp. 238ff). A result of these and other changes is a reduction over time in the age of DI beneficiaries (House Committee Table 1-27).

Detailed cross-country comparisons are beyond the scope of this paper, but we believe the same trends in life expectancy and government retirement ages have occurred in other countries. For example, the minimum age of old age pension eligibility under Otto von Bismarck's 1889 program was 70 (Myers, 1993, p. 264) whereas the current German age is 60 (SSA *Programs*, 1997). So-called "unemployment" and "disability" benefits provide income for retirees younger than 60 to such an extent that the *average* age at retirement in Germany is actually less than 60 (Börsch-Supan and Schnabel 1997, pp. 16ff, Figure IV-1).

I.H. Governments Finance and Administer Most Old Age Pensions

Most old age pensions systems in the world are administered by the government. Of course, there are private pensions around the world, but more people are covered by government pensions then by

private pensions.[20] The importance of the government in the Old Age Pension market contrasts with its lesser importance in other markets such as manufacturing, automobile insurance, to name a couple.

Along with government finance and administration goes compulsion: the vast majority of "so-called" contributions to SS systems are not voluntary in the sense that all workers are forced to participate.

I.I. The Public Sector Determines Benefit Formulas

Not only is the government involved with financing and administering pensions, but the amount of pension to be paid to any individual is determined by a formula which is politically determined, rather than determined by some non-government institutions. For example, in the United States, the Congress and the SS Administration determine how benefits depend on earnings, age, health, marital status, etc. Political considerations seem to be an important determinant of the overall level benefits paid to the old, as pointed out by Diamond (1977, p. 277).

It should be noted that public benefit formulas could very well be determined privately. The government could, for example, match public pensions to private pensions dollar for dollar, but this is almost never the case.

I.J. Social Security is mostly PAYG and Redistributes Across Cohorts

Mulligan and Sala-i-Martin (1999a) show that the overwhelming majority of the programs (98%) have pay-as-you-go (PAYG) features. Of these, a fraction have full-funded much, but not all, of their program.[21] This means that most SS programs throughout the world entail intergenerational redistribution. In fact, the cross-cohort redistribution is much more important than redistribution in any other dimension by these programs (e.g., Auerbach et al 1992, McClellan and Skinner 1997, Jensen and Raffelhuschen 1997, Hagemann and John 1997, House Committee 1996 table 1-50).

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[20]One study showing this in a sample of 10 countries is Torrey and Thompson (1980).

[21]For our purposes, a fully funded system is one which delivers a rate of return greater than the growth of labor income without taxing that income at higher and higher rates. This definition rules out, for example, systems like Singapore's "Provident fund" which appears to be a fully funded system but in fact delivers rates of return to contributors of no more than the rate of labor income growth. A pay-as-you go system pays retirees according to the labor income taxes levied on the young, which typically means returns a less than "fair" unless labor income tax rates increase over time.

Other tax and spending policies favor the elderly, although their generational incidence may not as visible. Many governments, for example, (especially in Europe and countries with high unemployment rates) give tax breaks and other benefits to firms and older workers who agree to early retirement, with the purpose of managing the "unemployment problem." Obviously such taxes and subsidies favor the elderly since they tend to get “subsidies” to leave their jobs, “pensions” for staying retired, and leisure. Auerbach, Kotlikoff, and colleagues have made a number of calculations of the generational incidence of public policy as a whole, including Social Security, health, education, and other programs. They usual find the net generational transfer to be large, in the direction of older cohorts. Social Security and health programs are the major contributors to this result: “the real culprit in most of the countries with imbalances is the interaction of their population aging with their large and growing transfer payments to the elderly in the former pension payments and health care expenditures." (Auerbach et al. 1999, p. 6). Education spending does redistribute in the other direction, but to a much lesser extent (Auerbach et al. 1999, p. 77).

I.K. Spending on the Elderly Dominates Government Budgets in Developed Countries

Old age subsidies are very important parts of government budgets in developed countries. Mulligan and Sala-i-Martin (1999a) calculate that nearly 10 percent of U.S. GNP is spent by government at all levels on those aged 65 and over in the U.S., including Social Security (5% of GDP) and Medicare (2% of GDP). Furthermore, American government expenditures on the elderly are smaller relative to other developed countries. For example, public *pensions* represent 13% in Italy, 16% in Sweden, and 20% in Belgium. Some less developed countries also have large SS programs. For example, SS represents 7% of GDP in Brazil.[22] Even larger shares are computed when medical and other old age subsidies are added to public pensions (in some countries, the government even pays for travel expenses for the elderly to go on vacation. An example of this is Spain which does it through its INSERSO program).

I.L. Government Regulation Increasingly Favors the elderly

In addition to the taxes and regulation shown on government budgets, there are three areas of regulation that we might categorize as favoring the elderly or taxing the elderly:

(i) regulation of business, especially environmental regulation

[22]These are 1989 numbers from IMF (1991).

(ii) retirement and disability regulation

(iii) age discrimination laws

A careful analysis of the generational incidence of regulation (and whether a regulation even promotes its advertised objective) is well beyond the scope of this paper, but we might guess that older people own most of the capital so that regulations that tax current capital and benefit labor are harming mainly the current elderly. Perhaps this is especially true for environmental regulations which restrict the operations of current business and convey benefits decades in the future.

It is unclear whether regulations of type (i) have increased or decreased over time. Over the last 100 years, it seems clear that the amount of environmental and anti-business regulation has increased more rapidly than population and probably more rapidly than GNP. This trend may have reversed with the massive deregulation around 1980. Hopkins' (1996) data shows that, while the per capita costs of environmental regulation have risen 1977-94, the per capita costs of paperwork and price and entry controls have fallen enough the total per capita cost of Federal Regulation (and perhaps also the portion of that cost falling on business) may have fallen over the period. Thus Hopkins' data suggests that the elderly may have been net gainers from regulation over the period 1977-94.

New retirement regulation and age discrimination laws might be seen as allowing older workers to renegotiate previous implicit contracts. Young workers, of course, would like to promise not to engage in this kind of regulation when they are older but, once they become older and the implicit contracts are given, the older worker will benefit by renegotiation. Retirement legislation and age discrimination laws (eg., the 1990 Americans with Disabilities Act and Regulation B of the 1975 Equal Credit Opportunity Act) have undoubtably increased over time. On indicator of the increased retirement-related regulatory activity is the number of Federal District Civil Social Security court cases commenced, which increased from less than 1% to more than 5% of all Federal District Civil court cases. Our overall impression is therefore that the elderly have been net losers from regulation over the long period but net gainers over the last couple decades.

In sum, business and environmental regulation may favor the young, but based on Hopkins' findings that business and environmental regulation costs have fallen in the last 20 years and based on our findings that retirement regulation has increased over time, we enter in Table 1 the "fact" that regulation has increasingly favored the elderly. This is obviously a very tentative conclusion. We show later in the paper how important is this conclusion for distinguishing among positive theories of SS, so carefully calculating the generational incidence of regulation may be one of the more important areas for future

empirical research on generational questions.

I.M. Similar Public Pension Programs are found in Democracies and Nondemocracies

Pension programs seem to appear in democratic countries as much as they do in nondemocratic ones. One of the very early programs was created in Emperor Wilhelm's autocratic German state in the 1880s. Other examples of nondemocratic countries that created such programs are Lenin's USSR in 1922, King Alfonso XIII's Spain in 1919, Emperor Hirohito's Japan in 1941, Kuwait in 1976, General Peron Argentina in 1946, and General Avila-Camacho's Mexico in 1943. Democratic examples are the United Kingdom in 1908, Sweden in 1913, or the United States in 1935.[23]

Modern Soviet and Chinese (presumably nondemocratic) pension systems are interesting case studies. The Soviet Union 1960-1990 had a system similar to Western European systems, including retirement at early ages, pay-as-you-go, and payroll taxes (although not "paid by employees") (Liu 1993, p. 61). These basic similarities with American and Western European programs did not change under Gorbachev and after (Liu 1993, pp. 62ff). China also has a system for urban workers with a number of similarities to Western European systems including payroll taxes, benefits based on pre-retirement earnings, no means test, pay-as-you-go, and probably induced retirement (Tyabji pp. 56-59, SSA *Programs* 1995). Hong Kong (with a very different political system and part of the time a democracy), on the other hand, has a public assistance program for the elderly rather than an earnings-related public pension system for nongovernment employees (Tyabji p. 59, SSA *Programs* 1995).

Mulligan, Gil, and Sala-i-Martin (2002) report on nine dynamic case studies – Greece, Portugal, Spain, Italy, Argentina, Brazil, Chile, Peru, and Uruguay – for the period 1960-90, which they selected based on their extreme changes or their economic and demographic similarity to countries with extreme changes. With the exception of Greece and Chile, they find that formerly nondemocratic countries do not, relative to their democratic neighbors, change their program (in terms of the amount of SS spending, and the design of tax and benefit formulas) after experiencing democracy. Similarly, formerly democratic countries do not change their program when becoming nondemocratic. Greece is an exception because spending grew slowly under the 1967-74 military regime – relative to spending growth before and after

[23]The POLITY IV project rates each of the regimes mentioned in the text (and many others) in terms of their degree of democracy on a 0 to 10 scale (10 most democratic): Germany (1), USSR (0), Spain (6), Japan (5), Kuwait (0), Argentina (0), Mexico (0), UK(8), Sweden (10), and US(10).

the regime and relative to contemporaneous spending growth in democratic countries. However, Mulligan, Gil, and Sala-i-Martin found no evidence that the Greek military regime had different tax or benefit formulas. They also found an opposite pattern in Chile: most of the spending growth 1925-80 occurred under nondemocratic regimes, and that payroll tax rates reached extremely high levels under General Pinochet.

It is well known that rich countries are more democratic (Barro (1998) is a recent study) and they devote a larger fraction of their income to SS. But multiple regression studies of the determinants of SS spending (eg., Pampel and Williamson 1989, Lindert 1994, Mulligan, Gil, and Sala-i-Martin 2002) show that, holding constant population age or per capita income, there is neither a significant partial correlation between democracy and SS spending's share of GDP, nor a significant interaction between democracy and the other variables in a spending regression. This result is robust to the inclusion of alternative variables such as measures of inequality such as the Gini coefficient, religion variables, the female labor force participation rate, and various dummies for continent and colonial status. Perhaps Lindert's results show most easily the point that democracies do not spend more on SS. Half of the observations were democratic in his panel study of OECD 26 countries for the years 1880-1930. Holding constant GDP per capita, the fraction of the population elderly, and other variables, Lindert finds SS/GDP to vary among democracies according to the voter turnout rate, but the typical democracy spending the same on SS as the typical nondemocracy.[24] He also points out that most of the now developed countries were switching to democracy in the XIX and early 20th century, while the vast majority of SS growth in those countries occurred at least 50 years later (Lindert 1994, p. 5).

Mulligan, Gil and Sala-i-Martin (2002) also study the design of SS programs in a multiple regression framework. They find no evidence that, holding constant economic and demographic variables, democracies and nondemocracies are systematically different in terms of their use of retirement tests, earnings tests, or in their splitting of the payroll tax between employer and employee. They do find democracies to be significantly more likely to cap their payroll tax.

I.N. Elderly are more single-minded in their politics

The elderly are single-minded in their politics. The most important concern among elderly voters are government old age subsidies and is believed by many politicians that the votes of the elderly are

[24]By SS, we refer Lindert's "government subsidies to old age pensions."

much more elastic to a candidate's stance on old age subsidies than are the votes of any other group to any other issue.

Fortune magazine recently conducted a poll of 329 Washington "insiders", "including members of Congress, their staffs, and senior White House officials" (December 8, 1997, p. 146). Respondents were asked to rank the clout in Washington of 120 interest groups, labor unions, and trade associations and to assess the importance of a list of lobbying techniques.[25] Two of the three top rated lobbying techniques were "having *active* allies in a Congressman's district" and "mobilizing *grassroots* action, such as phone calls and letters" (p. 146, italics added). A successful group has "large numbers of geographically dispersed and politically *active* members who focus their energies on a *narrow range of issues*" (p. 146, italics added). The same survey identified the *American Association of Retired Persons* as the most powerful lobby in Washington.

I.O. Social Security "crowds out" other government spending?

It is not clear whether a greater share of GNP devoted to SS is associated with more or less other government spending as a share of GNP. In a cross-section of 57 countries with available data for the years 1972-90, the correlation between SS/GNP and other government spending/GNP is 0.5. Some, but not all, of that positive correlation can be "explained" with GNP per capita (authors calculations using the IMF *Government Finance Statistics* and the Penn World Tables). We conjecture that another part of it can be explained by the fact that governments spend resources on the elderly without necessarily referring to those expenditures as public pensions.[26]

In U.S. history, SS growth has not crowded out other spending but nor has it been associated with much growth of other government spending. Government spending on the elderly/GNP at all levels grew by 8 percentage points over the period 1950-96 while other government spending grew by only 2 percentage points (OMB, Mulligan and Sala-i-Martin 1999a Figure 1). Lindert does find some evidence suggesting that spending on the elderly crowds out education spending in his panel study of OECD 26 countries for the years 1880-1930.

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[25]Each list presented to the respondents was chosen by a panel of experts which included "members of Congress, professional lobbyists, academics, congressional staff, and pollsters" (p. 158).

[26]However, health care is an important example and results are similar if public health expenditures are reallocated from "other" spending to "social security spending".

Other studies have found that the aging of the population is associated with less government spending on education, which is consistent with the hypothesis that government spending on the elderly crowds out other government spending. One example is Poterba's (1997) panel study of U.S. states for the period 1960-90.

We enter in Table 1 the "fact" that elderly spending crowds out other spending. This is a very tentative conclusion because of the contradictory findings with cross-country, time series, and regional data sets but, a conclusion which is important for distinguishing among positive theories of SS.

I.P. There is not a Stable Relation Between Demographics and Spending per Elderly

Demographics are certainly related to government spending on the elderly, but the relation is not a simple one. Some of the evidence suggests that, as a proportion of GDP, older countries spend more per elderly. We see this across countries and, since WWII, over time for developed countries. For example, in 1950 the number of U.S. citizens aged 65+ was 12.4 million (8.1% of the U.S. population) while in 1996, they were 33.9 million (12.8% of the population). The population share of the 65+ has therefore grown by a factor of 1.6. However, the share of SS in GDP has grown by a factor of 15.6 while the share of all federal programs devoted to the retired has grown by a factor of 7 and that government spending at all levels has grown by more than a factor of 5 (Mulligan and Sala-i-Martin 1999a, Table 1, Figure 1). Hence, the fraction of GDP devoted to the retirement aged through public programs has grown more over the period 1950-96 than one might have predicted by the growth of the elderly population.

Other comparisons suggest that government spending per elderly is independent of the age of the population. The last 100 years in the U.S. is one case, where Union Army Pensions in the 1890's amounted to 1.2% of GNP for beneficiaries who were only 1.5% of the population (Costa p. 162, Census Bureau series HS Y-457, A-7, and F-1) – a ratio of 0.80. Today's government spending on the elderly amounts to 9.4% of GNP and represent a 12.7% of the population – a ratio of 0.74. Lindert (1994, p. 28) obtained similar results in his panel study of OECD 26 countries for the years 1880-1930.[27] Parsons (1982) found no cross-state relationship between the fraction of the population over age 65 and 1930's

[27]Some of Turner's (1984) specifications suggest that, holding constant other variables, U.S. spending per elderly *declines* with the population fraction elderly over the period 1947-77. Others of his specifications suggest the opposite result. Our unsuccessful attempts to replicate his results suggest that spending per elderly increases with the population fraction elderly over the period 1947-77 (and over the period 1947-1995).

state old age assistance benefits per beneficiary.

I.Q. Program size is positively correlated with retirement incentives

In a cross-section of countries, the fraction of GDP devoted to public pensions is positively correlated with the incentives to retire implicit in benefit formulas. In a cross-section of 55 countries for the period 1972-90, Mulligan and Sala-i-Martin (1999a) find that countries whose SS benefit formulas include an implicit 100 percent tax rate devote 3% more of GDP to SS. Regressing SS's fraction of GDP in the same cross-section on income per capita, the fraction of the population aged 60 and over, and the dummy variable for whether SS benefit formulas include an implicit 100 percent tax rate, they find the coefficient on the dummy variable to be positive and statistically significant (with 2-3% more of GDP devoted to SS in countries with 100% tax rates). Thus, countries with SS programs providing larger incentives for retirement tend to have larger programs.

I.R. Program size is positively correlated with economic growth

In cross-sections of countries, the fraction of GDP devoted to public pensions is positively correlated with per capita income growth. Sala-i-Martin (1996) regresses per capita income growth in a cross-section of 74 countries on SS's fraction of GDP, income per capita, public investment's fraction of GDP, private investment's share of GDP, and government consumption's share of GDP, and finds a positive partial correlation between the SS variable and economic growth. Cashin (1995) finds a similar result following OECD countries over the time period 1971-88. And, of course, SS and economic growth are correlated in very long time series because SS and economic growth are both relatively recent historical phenomena.

I.S. It is Difficult to Borrow Against Future SS Benefits

It seems to be difficult for a worker to borrow against his future SS benefits. Perhaps part of the difficulty is due to government regulation and another part due to reluctance for borrowers to use those benefits as collateral. This may be an important difference between SS and government debt, because the former is difficult to use as collateral while the latter is among the best collateral in the world.

I.T. Little Evidence for Adverse Selection in Life Insurance and Annuities Markets

Only a subset of the population purchase private life insurance or private annuities. It has been

suggested that, because of adverse selection, high mortality individuals should purchase life insurance while low mortality individuals should purchase annuities (eg., Friedman and Warshawsky 1990). In fact, those who purchase private life insurance live *longer* than the general population and there is little mortality difference between the population of those with private life insurance and those with private annuities (Cawley and Philipson 1999). Furthermore, life insurance premia decline with the size of the policy rather than increasing (as would be the case when adverse selection led to higher demand for risky customers; Cawley and Philipson 1999).

I.U. Governments Monopolize Some Insurance Markets, But Not Others

Because governments finance, administer, and compel participation in SS, it can be said that they monopolize annuities, disability, and health insurance markets. Governments intervene much less in many other insurance markets such as automobile, fire, and life.

I.V. Some Private Pension Plans are Administered as Cheaply as Social Security

Some, although not all, private pension plans appear to be administered as cheaply as SS. According to Mitchell (1998), Social Security Administration costs are 3.28% of benefits, as compared to Vanguard's 2% of benefits and 5%-10% of benefits for 401(k) plans.[28]

Our interpretation of Mitchell's findings is debatable. Diamond (1998, pp. 14ff) argues that administration involves substantial fixed costs per beneficiary and that SSA has more beneficiaries per benefit dollar, so that SSA's administrative costs per benefit dollar cannot be directly compared to those of Vanguard or other 401(k) plans. He suggests that Vanguard or other pension management group would not manage private pensions for the American labor force as cheaply as does SSA.

II. Positive Theories of Social Security: Political or Efficiency?

Formal theories of SS can be partitioned into two broad categories[29]: *political theories* and

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[28]Mitchell computes private sector administrative expenses as a fraction of assets; I assume benefits to be 10% of assets.

[29] In section V we introduce a third category of SS stories: those which have not been formalized. We call those "narrative" theories. Narrative theories include the "Chain Letter", "Lump of Labor," "Monopoly Capitalism," and the "Sub-but-Nearly-Optimal Policy Response to Private Pensions" models. Because of the lack of mathematical models, we limit our comparison with the other theories.

efficiency theories. Political theories view SS as redistribution, the outcome of a political struggle. Two or more groups of citizens fight (politically) to extract resources from each other and, if a theory predicts the elderly's winning the fight, it becomes a SS theory. There are two main ways to model the political battle: voting models and pressure group models.

We categorize as *efficiency* those theories identifying market inefficiencies and explain how a SS program might be created to alleviate them. Typically, although not always, these theories explain why it must be the government who administers a SS program. For example, one may argue that the market fails to provide a certain kind of insurance for the elderly so that the government needs to step in. Sometimes, the model shows why SS of the kind we observe is the optimal way to eliminate the inefficiency. Sometimes it is only shown that SS partially alleviates the problem.

It is interesting to notice that, even though there are many examples of both political and efficiency arguments, modelswithin these two basic groups share a number of characteristics and predictions. Before going into detailed descriptions of particular explanations, we describe these broad common characteristics. The findings are summarized in Table 1. One characteristic shared by all purely political stories of SS is that the outcomes of political struggles are likely to be economically inefficient. Hence, they suggest that there are SS reforms which may increase welfare. The problem is that the same theories tend to predict that SS reform may not be feasible without political reform. In contrast, to the extent that they argue that SS is the optimal policy to combat some kind of market malfunction, efficiency models will tend to predict that SS reform is less likely to increase welfare.

Another prediction shared by all political models is that other dimensions of government activity - such as regulations and mandates - should also favor the elderly (if, through whatever political means, the elderly are powerful enough to get a SS program, they should also be powerful enough to get other political benefits such as regulation favoring them). This prediction is not shared by efficiency models.

Some political theories are built upon explicit game theoretic political models (for example, a median voter model). They tend to predict that the amount and type of redistribution is highly sensitive to the form of the game. Hence they will tend to be inconsistent with the similarity of programs across countries with very different political institutions (even across democracies and nondemocracies). Efficiency models do not explain how large groups of individuals make collective decisions. This is both of virtue and a drawback of the efficiency approach. On one hand, an explicitly political model could

generate refutable predictions about the relationship between political activity and SS. On the other hand, the efficiency approach suggests that the design of SS depends more on economic than political considerations (presumably, the inefficiency that the SS is trying to correct appears in all economies, regardless of their political system), a suggestion which is consistent with the finding that democracies and non-democracies have similar SS programs (holding constant economic variables).

As long as the old are “winners” (and they usually are in models that try to explain SS!), a political model is also consistent with more consumption per old, and SS crowding out other spending. This contrasts with efficiency models which do not identify "losers" from policy, so they do not predict SS crowding out other government spending or that there should be additional legislation favoring the elderly. Efficiency stories make no prediction as to whether the old should consume more or less than the young.

Finally, political theories predict SS results in redistribution from young to old (that is what the political struggle is all about!), while efficiency theories do not necessarily make this prediction. It would therefore seem the political models are either: (1) inconsistent with the kinds of intergenerational linkages assumed by Barro (1974), or (2) inconsistent with self-interested political activity on the part of many of the young and old.

In addition to these common features, within the two main groups, different theories make different predictions. We now introduce simplified analyses of each of the theories, describe their particular predictions and contrast them with the facts that we described above and with other facts which may be interesting.

III. Political Theories of Social Security Compared

We divide the political theories into two groups: theories of majority rational voting and theories of pressure groups. This last category, in turn, includes two types: the time-intensive political competition and taxpayer protection model. We identify eight efficiency theories: welfare for the elderly (or optimal redistribution), internalizing human capital spillovers, SS as “Retirement” Insurance, solving the Prodigal Father problem, misguided Keynesian, SS as Longevity Insurance, government economizing on transaction costs, and human capital investment finance.

In the next Section, we discuss the various political theories in detail and we compare them with the empirical regularities we just highlighted. In the following two sections we discuss the efficiency as well as the narrative theories of SS.

III.A Majority Rational Voting

One simple way to model SS is to have the elderly be the winners of a political battle where the "prize" is a pension. It is common to model public decisions in democratic regimes as the outcome of a majoritarian election among rational voters who vote in their self-interest. The typical result is that the median voter makes the public decision. Before we start discussing the creation of a SS program that benefits the elderly with a median voter model, we need to point out that, in the real world, the voter of median age is NOT a retiree but a taxpaying worker.[30]

Hence, it is immediately obvious that median voter models need some modification before they can be applied to SS. Two modifications have been proposed in the literature: (1) for the old to form a coalition with another group, and (2) have one election to choose a stationary policy for all time, perhaps under the threat of punishment from the unborn. We review those approaches below and show which facts are consistent with the theory and which facts are not.

III.A.1 The Old as Leaders of a Winning Coalition

Given that the elderly are not the majority of voters, one thing they can do to enact a SS program which benefits them is to ally themselves with other groups of voters so as to form a majority coalition. Tabellini (1992) takes this approach and argues that the *old* form a coalition with the *poor* to support a policy taxing the losers of the political battle: the young and the rich.

This approach has a number of interesting predictions. It explains why SS programs are run by the government and why SS crowds out other types of government spending. It is also consistent with the fact that SS benefits are unrelated to whether the beneficiary is disabled and with the fact that benefits take the form of annuities.

The theory also predicts that the size of SS increases with the fraction of the population that is elderly and with income inequality. The size of SS does not seem to be positively correlated with the amount of income inequality, especially once a measure of economic development is held constant (Tabellini 1992 Table 3. Mulligan, Gil, and Sala-i-Martin also fail to find any interaction between inequality measures and democracy in regression equations for SS spending. See also a vast literature on the lack of positive correlation between income inequality and the size of government, including Peltzman

[30]According to the United Nations, the four oldest countries in the world were Monaco, Italy, Greece, and Sweden with 71, 78, 78, and 78 percent of their population under age 60, respectively.

(1980) and Benabou (1996)).

Another problem with Tabellini's story is that the young poor are the majority of Tabellini's hypothesized majority coalition. Those aged 65+ are 13% of the U.S. population (Council of Economic Advisers). They are a larger fraction of voters, but still not 25% of them and hence a minority of any majority coalition. Even in two aged countries with substantial elderly voter turnout - Sweden and Germany - those aged 65+ are only 22% and 33% of voters, respectively. So we expect the young poor to be gaining as much or more from SS as do the old. Instead it is not even clear whether the young poor are net beneficiaries from social security, and there is no question that SS does more redistribution across age groups than across income groups (see section (I.J) above).

Another faulty prediction of Tabellini's model is that, since the winning coalition includes the poor, SS should tend to be progressive (and generate redistribution between the rich and the poor). Our section I.B explains how studies of who pays taxes and who receives benefits under American and third world SS have found little progressivity - and maybe even regressivity. And, under the hypothesis that the poor are the least interested in saving for retirement, it is likely that the poor are worse off under SS (Mulligan and Philipson 2000).

Since the old and the poor have teamed up in Tabellini's model it is possible to have a positive correlation between government spending on the poor and government spending on the old. In other words, it need not be the case that government spending on the old crowd out other government spending although it should crowd out spending that is neither on the old or the poor.

Tabellini's model also fails to explain why SS (implicitly) taxes the labor income of the elderly since it models the old as winners in the election and does not explain why the winners have to tolerate implicit taxes or forced retirement. Nor does it explain why SS benefits are an increasing function of past earnings and are independent of labor income.

The fact that the coalition of old-plus-poor is the winning coalition is simply an assumption and it is left unexplained. It is just as reasonable that alternative winning coalitions would include the middle aged, the rich, or some other group. In other words, why do the old-plus-poor win rather than the young-plus-middle class? Or the young-plus-females?

Nor is it clear why the old-poor coalition would be a stable one, especially given that SS programs redistribute such large amounts and do so with such little progressivity. With so much at stake, what stops the young from offering even higher benefits to the very poor in exchange for their agreeing to vote against - and defeat - SS?

III.A.2 A Once-and-for-all Election

A second way to have the elderly win a majority vote given that they are a minority of the voters is for them to form a coalition with the middle aged.[31] For example, a program might be set up that, even though it hurts the middle aged in the short run, benefits them in the long run because, eventually, they will become old.

Browning (1975) considers a model in which there is one election to decide a policy *for all time.* The key assumption is that only stationary policies are candidates for the election. He shows how the proposal to create a SS wins the election. He also shows that if the election were to be held again sometime in the future, the outcome would be the same stationary policy. Hence, he argues that the assumption of only considering permanent SS programs in the model is justified. We reproduce a simplified version of his overlapping generations model here.

There are three generations of equal size: young, middle age, and old. Each generation lives for three periods. There is no population or economic growth. The discount rate and interest rate are zero (we make this assumption to simplify exposition so that the present values of all future SS benefits and payments can be easily calculated). The three groups must vote on the introduction of PAYG SS program which *will last forever*. The proposal is the following: in each period beginning with the current one, the young and middle aged will pay taxes in the amount T and the old will receive a subsidy of size $2T$. Notice that, with this policy, the middle aged pay T today and gain $2T$ tomorrow, which represents a net gain of T so they would favor this policy. The old pay nothing and gain $2T$ so they also vote in favor. The young break even in present value since they pay T for two periods and get benefits $2T$ in one period so they do not oppose the policy. Hence, this policy would win an election if its opposition were no policy at all.[32] Since it wins an election now, Browning argues, there is no reason to worry that the policy would lose an election later an hence it is reasonable to assume that the policy is permanent.

This theory shares with Tabellini's some of the predictions which are met in the data. However,

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[31]In a sense, the "once-and-for-all election" is a special case of "elderly leaders of a winning coalition."

[32]The young would oppose with slightly positive interest and discount rates because the rate of return they would get on the SS deal would be 0 and they would forgo the rate $r>0$ (the money they pay to the old could be invested at the rate r), but the policy would still attain the winning coalition of the middle aged and old. See Browning (1975) for a proof with nonzero discount rates and positive economic growth.

it also shares many of Tabellini's problems. For example, it does not explain why SS programs in the real world systematically induce retirement (through heavy implicit taxes on the old or through mandatory retirement): since Browning views the old as winners in the election, he cannot explain why the winners have to tolerate implicit taxes or forced retirement. In other words, the winning old should not be penalized for working in his model - while in fact they are. The model also fails to explain why SS benefits are an increasing function of past earnings, why SS is financed with special payroll taxes, why retirement age does not increase with the wealth or the life expectancy of a country, or why the benefits per elderly are not related to the share of elderly in the overall population.

An additional theoretical problem with this model is that it is not clear whether Browning's agents should rationally anticipate that a SS program would be continued. Browning's argument does not hold if nonstationary policies come up for election in future period *t*. For example, consider a temporary suspension of SS for one period (we suspend SS today, but we will reinstate the system next period). Those young and middle aged in period *t* gain *T* since they get a period off from paying, and they will still get 2*T* when they become old. Hence, they both vote in favor of a temporary suspension. Although those who are old today lose their pension, 2*T*, and they vote against, temporarily suspending SS still wins the election when run against the policy of continuing SS.

In order to avoid the possibility that future elections temporarily suspend SS thereby withdrawing the support of the current middle aged for continuation, Kotlikoff et al (1988) suggest that each generation is deterred from supporting such a policy because the unborn "threaten" to do the same in response in future periods. In response to this amendment, let us simply mention that, as with other applications of the Folk Theorems, there are a great many sustainable subgame perfect equilibrium and the Kotlikoff et al approach gives little help in choosing one among them. Most importantly, the old are still seen as "winners" from the SS system so it is unexplained why that very system heavily penalizes the old for working.

That voting occurs is crucial for both versions of the voting model. Hence, the models predict that SS policy would be significantly different if citizens did not vote on policy or on the individuals who determine policy, as they do not in nondemocracies. This prediction finds no support in a sizable empirical literature in economics, sociology, and political science. It is difficult to see any differences in the design and amount of SS between the typical democracy and nondemocracy once the level of economic development or the population age distribution is taken into account. Instead, differences in design and amount are found within democracies and within nondemocracies, apparently determined by factors

unrelated to whether or not citizens vote on policy.

It has also been pointed out (eg., the work reviewed by Tullock 1998) that policies are *not* decided by majority rule in the U.S. and most other countries. First, representatives (not policies) are elected in general elections, and sometimes not by majority rule. Second, a policy is not even decided by majority rule among the representatives, who vote instead on a large collection of policies. Third, representatives vote multiple times and clearly trade votes with each other, and by this and other mechanisms intensity of preference can be expressed in ways not possible in the median voter model. Perhaps these are defects of Tabellini's model, but we believe the main tests lie in explaining what policies are adopted by governments rather than the details of how the adoption occurs.

III.B. Time-Intensive Political Competition

Mulligan and Sala-i-Martin (1999a) model a political competition between the young and old. They argue that an important input into the competition for each group is the time allocation of its members. To put their hypothesis simply, groups whose members work less are more successful. One important justification for this assumption is that, if people do not work, then the amount of political issues they have to worry about is smaller so they can concentrate their efforts on “getting a pension or a transfer from the other group”. In other words, retired people are more single minded than non retired workers.

Of course, groups face a free rider problem because an individual member does not fully account for the effects of his time allocation decision on his group's success. If the group could make each individual's decisions collectively and costlessly, each member would work less than he would choose on his own. Mulligan and Sala-i-Martin suggest that such costlessly collective decision making is not available, so, instead, pressure groups favor policies which discourage their members from working. One such policy is government tax and benefit formulas depending on the beneficiary’s work effort. If work effort cannot be observed and hence cannot be used as part of the tax and benefit formulas, then the appropriate policy is to tax earnings -- with more earnings reducing benefits (or increasing taxes) and proxies for productivity (defined to be the ratio of earnings to work effort) such as past earnings increasing benefits.[33] Furthermore, the implicit and explicit tax rates may be as high as 100 percent.

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[33]The use of earnings histories as a proxy for elderly labor productivity also explains why earnings near to retirement count as much or more than earnings early in life, especially relative to a present value

Mulligan and Sala-i-Martin argue that the old lobby has the greater incentive to reduce its members work effort and hence face the highest (implicit) tax rates. One reason for the greater incentive is that the old are less productive than the young. Mulligan and Sala-i-Martin also point out that, while current policy can certainly be changed in the future, a large social security program today makes it at least a little tougher for future governments to have a small program (and easier to have a bigger program). The young know this and hence have less incentive to resist the old and thereby less incentive to lobby for higher implicit tax rates on their members.

As both the result of facing higher implicit tax rates and because they might retire for other reasons, the old enjoy relatively more leisure and, in Mulligan and Sala-i-Martin's model, are net beneficiaries from the political process. Their model thereby explains transfers across cohorts, explicit labor income taxation of the young, implicit labor income taxation of the old, nonlinear and even 100 percent taxes, the dependence of benefits on preretirement earnings, the lack of means-testing, and why programs with stronger retirement incentives are larger. Since the opportunity cost of time is relatively low for the old in a growing economy, the model also explains the positive correlation between SS and economic growth.

Mulligan and Sala-i-Martin also predict that other low wage groups will face relatively high implicit tax rates and, to the extent that lower wages lead to greater leisure, those groups will be net gainers from the political process. However, unlike the old who enjoy relatively little resistance because the young anticipate becoming old, other low wage groups are likely to encounter substantial resistance from their opposition because there is relatively little switching from high wage to low wage groups. Another difference between the old and other low wage groups is an unproductive elderly person may not be poor (because he was productive earlier in life and saved for old age) and thereby able to afford retirement whereas low productivity may be more of a permanent situation in the lives of members of other low wage groups. Hence, while Mulligan and Sala-i-Martin predict some leisure and political success by the poor, more leisure and success is enjoyed by the old.

Mulligan and Sala-i-Martin's model is a pressure group model, as is the model of "Taxpayer Protection" below. Pressure group models are about conflicts among groups, conflicts which we expect to arise regardless of the details of the political institutions within which those conflicts occur. Hence both a weakness and a strength of the pressure group approach is that it does not have much to say about the

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calculation.

details of political activity (this is a weakness) but it can address conflicts arising in a variety of political settings and relate public decisions to economic variables rather than political variables (this is a strength). Related to this, we have entered as a note in Table 1 that the pressure group models of SS are consistent with no systematic difference between SS programs in democracies and nondemocracies.

Suppose a worker were to borrow against his future SS benefits. When he reached old age, he would have a stronger incentive to work than those who did not borrow because the latter give up benefits by working. The former also gives up benefits, but that is the problem of his lender who effectively has purchased those benefits. Because allowing borrowing increases the incentive for the old to work, the old lobby would be against it unless they had another means to discourage their members from working. Furthermore, lenders would be unwilling to lend to a worker using his SS future benefits as collateral unless that worker could also credibly give up his future rights to work.[34]

III.C. Taxpayer Protection

Becker and Mulligan (1998) show that inefficient taxes and subsidies may be an effective way to reduce the size of the government as it reduces the incentives for lobbies and pressure groups to expand public programs. Using this reasoning, one could argue that the seemingly inefficient subsidy schemes we observe in real life SS programs are meant to protect taxpayers from the excessive pressure of those subsidized.

We present here an abbreviated version of the derivation by Becker and Mulligan 1998. Consider a simple model of competition for political power between the young and the old. Assume that the government has a balanced budget, and the political competition results in the young being taxed *T*, to finance equal subsidies to the old. Hence, *T* is the size of the SS program. In order to win the political game, both groups may spend resources (to lobby legislators, influence voters, etc. to persuade them to vote to keep taxes relatively low or subsidies high.) The young spend the amount *Y* and the old spend *O.*

[34]In countries where benefits are reduced continuously with beneficiary earnings, lenders may be willing to lend to workers using the sum of their old age earnings and benefits as collateral since the sum would not reduce with their work decision. Such an arrangement would not work in countries that withhold all benefits from any elderly person who works, even if his earnings fall short of the benefit amount.

Unlike the Mulligan/Sala-i-Martin (1999a) model discussed in the previous section, these resources are not time intensive.

This approach merely assumes a reduced form function F that is the end result of what may be a very complicated process of electoral voting, legislative decisions, executive branch initiatives or perhaps some complicated process of political influence in a non-democratic regime. In this reduced form, the size of the transfer from the young to the old (that is, the size of the SS program) directly depends on the amounts spent by Y and O on gaining political influence:

$$T = \text{Taxes Paid by Young} = \text{Benefits Enjoyed by the Old} = F(O/Y)$$
$$\text{with } F'(O/Y) > 0, \quad F'(O/Y) < 0$$

More pressure by the old increases the size of SS while more pressure by the young decreases it. Both pressures run into diminishing returns. In order to simplify the analysis, we have assumed that it is only the ratio of pressures applied by the two groups that determines the transfer from one group to another.

The Problem for the Young

The number of young is 1-O. The young taxpayers's group chooses their spending in the political game, Y, with the objective of minimizing the total cost of the political process. The total cost has three components. First, if the young end up losing the political battle, they will have to pay F to the old. Second, they will lose the resources spent in the political game, Y. Third, because taxpayers change their behavior in order to reduce tax payments, they will incur in a deadweight cost (dwc). In particular, taxpayers substitute the consumption of untaxed goods for the consumption of taxed goods, reducing their tax liability but leaving them with a consumption bundle which they would not demand in the absence of taxation. Hence, the per member dwc of taxes is itself a function of the amount transferred *per member* $T/(1-O)$. We denote the dwc function by $O(T/(1-O))$ and we assume it to be increasing and nonconcave, $O' \geq 0$, $O' \geq 0$. The tax system and the nature of the economy determine the form of this function.

The young group chooses Y so as to minimize the total cost per group member, taking the total spending of the old, O, as given:

$$\min_{Y} \quad \frac{T}{1-\alpha} + \Delta(T/(1-\alpha)) + \frac{Y}{1-\alpha}$$

where $T = F(O/Y)$. The first order condition for this problem is:

$$\frac{O}{Y^2} F'(O/Y)\,[1 + \Delta'(T/(1-\alpha))] = 1$$

The Problem for the Old

The number of old people is O. The old lobby chooses their spending in political activities, *O*, in order to maximize the difference between the subsidies or SS benefits it receives and the costs it has to pay in order to get these benefits. The subsidies received are equal to *T*. The costs have two components. The first is the direct spending on lobbying, *O*. The second cost is the dwc of the subsidy per group member, which we denote by O. Subsidies also have a dwc because the old change their behavior in order to obtain the subsidy. The most important practical instance of this is the reduction in labor supply. O depends on the amount subsidized *per old*, *T*/O, and we assume O(▾) is increasing and nonconcave, O▾ ▾ 0, O▾ ▾ 0. The subsidy system and the nature of the economy determine the form of the function O.

The problem of the old expressed in per capita (or per group member) terms is

$$\max_{O} \quad \frac{T}{\alpha} - \Sigma(T/\alpha) - \frac{O}{\alpha}$$

where $T = F(O/Y)$. When making their decision, the old take the spending of the young, *Y*, as given. The first order condition for this problem is:

$$\frac{1}{Y} F'(O/Y)\,[1 - \Sigma'(T/\alpha)] = 1$$

We assume that the government budget is determined as a Nash equilibrium of a "game" between the two pressure groups.

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Dividing the first order conditions of the young and the old, we can obtain an *implicit* formula for the ratio *O*/*Y*:

$$\frac{O}{Y} = \frac{1 - \Sigma'(T/\alpha)}{1 + \Delta'(T/(1-\alpha))}$$

If we use the pressure function, $T=F(O/Y)$, we can rewrite this expression as an implicit function of the size of the social security program, *T*:

$$T = F\left(\frac{1 - \Sigma'(T/\alpha)}{1 + \Delta'(T/(1-\alpha))} \right) \qquad \textbf{(1)}$$

Remember that the details of the tax and subsidy systems determine the shape of the functions O and O, respectively. In particular, less efficient SS benefit formulas mean a larger O▾ for any given amount to be paid to the old. It follows from the formula that less efficient SS benefit formulas decrease pressure applied by the old, decrease the size of SS, and make the taxpayers better off. Hence, we expect the young to favor SS policies with large marginal dead weight costs such as distortions of elderly work decisions.

Another correct prediction of Becker and Mulligan's taxpayer protection model is that government intervention is required to maintain a SS system and that, while older populations have more aggregate spending on the elderly ($dT/d\text{O} > 0$), even small elderly populations may enjoy substantial per capita benefits. Indeed, the model may go too far in this regard because it predicts that benefits per beneficiary *decrease* with the fraction of the population that is old ($d(T/\text{O})d\text{O} < 0$; see Turner 1984 for another proof).

Like any model in which SS benefits decrease with the beneficiary's labor income, it seems natural that lenders would be unwilling to lend to a worker using his SS future benefits as collateral.

Becker and Mulligan can explain why SS transfers might not be lump sum, but notice that the reason taxpayers favor more distortionary transfers is in order to limit the size of the program. This predictions seems contrary to Mulligan and Sala-i-Martin's (1999a) empirical finding that SS programs with the greatest work disincentives are the *larger* rather than the smaller programs in the world.

Another problem is that Becker and Mulligan simply assume that there is a group of net taxpayers. It is not at all clear that the winning group ought to be the elderly. Hence, although this may be a good theory of intergenerational (or inter-group) transfers, it does not explain why the transfers are from young to old rather than from old to young. Becker and Mulligan do not endogenize political group membership and hence have little to say about retirement age (which partitions the population into the young and old groups).

IV. Efficiency Theories of Social Security Compared

The efficiency theories of Social Security identify some market inefficiency and argue that SS is a way to regain optimality by alleviating this inefficiency. We put eight theories in this category: optimal redistribution or risk sharing, human capital spillovers, optimal retirement insurance, prodigal father problem, Keynesian savings extraction, optimal longevity insurance, return on human capital investment, and administrative of scale economies. We now discuss each of these theories and their theoretical and empirical predictions in detail.

IV.A Social Security as Welfare for the Elderly

IV.A.1. Mirrlees' Problem as Optimal Redistribution

The rhetoric surrounding the establishment of SS in the U.S. included discussions of the poverty suffered by the elderly at the time and claims that the main goal of the program was to alleviate poverty among the elderly (Cohen 1972). This theory of SS is based on the idea that the market "fails" to alleviate the poverty of the old (that is, it fails to generate an income/wealth distribution which is "socially acceptable"), and the government steps in to create a SS program that solves this problem. In this sense, public SS is seen as an "optimal" policy program.

In order to focus the discussion, we consider a variant of Mirrlees (1971) model of optimal redistribution that includes old and young citizens. Our main goal is to show what an optimal welfare policy might imply for the nature of benefit formulas and for the amount of intergenerational redistribution in order to compare with real world policies.

As in Mirrlees' model, there are a continuum of consumers indexed by their unobserved labor productivity $w \in [0,\bar{w}]$. Those with productivity w have density $f(w)$ in the population. Government observes each individual's earnings, which is the product of his unobserved effort n and his unobserved

labor productivity w. Each individual has the same utility function $u(c,n)$, where c is the individual's consumption, which is equal to the difference between his earnings wn and his tax liability T. We impose an Inada condition on the utility function so that the marginal utility of consumption becomes infinite as consumption approaches zero.

Our one and only departure from Mirrlees is, in addition to indexing individuals by their labor productivity w, we also index them by their age group $i \in \{o,y\}$ and allow age to be observed by the government.[35] The fraction of the population old is Ω and $(1-\Omega)$ is the fraction young. For simplicity, we assume the functions f and u are the same for young and old. We allow the government to have different preferences for the welfare of the young and old.

The government chooses nonlinear labor income tax schedules $T_y(wn)$ and $T_o(wn)$ to maximize a utilitarian social welfare function (which may place different weights on the young and the old), taking into account each individual's choice of effort in response to the tax schedule and taking into account that government has other revenue needs in the amount $G \geq 0$ per capita.[36] This government program can be conveniently analyzed as a two stage program. In the first stage of its optimal program, the government divides its revenue needs among the two age groups, $G = (1-\Omega)G_y + \Omega G_o$, where G_o is average tax revenue per old person, G_y is average tax revenue per young person. G_y or G_o can be negative, indicating that one group pays less taxes than it receives in subsidies. Given these definitions, the size of the SS program can be computed as $(G-G_o)$ per elderly person and $\Omega(G-G_o)$ per capita.

In the second stage, the government chooses a tax schedule $T_y(\cdot)$ for the young given that the average amount G_y must be collected from the young group and chooses a tax schedule $T_o(\cdot)$ for the old given that the average amount G_o must be collected from the old group. This second stage merely involves two separate solutions to Mirrlees problem (2), which we restate below for the readers convenience:

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[35]As does Mirrlees', our optimal redistribution model ignores the savings link between old and young.

[36]We assume that G is small enough so that the government can afford to allocate nonzero consumption to everyone.

$$W(G_i) = \max_{T_i(\cdot), c_i(\cdot), n_i(\cdot)} \int_0^{\bar{w}} u\left(c_i(w), n_i(w)\right) f(w)\, dw \quad \text{subject to:}$$

$$\int_0^{\bar{w}} T_i(w\, n_i(w))\, f(w)\, dw \geq G_i \qquad (2)$$

$$n_i(w) = \arg\max_{n} u\left(wn - T_i(wn), n\right)$$

$$c_i(w) = wn_i(w) - T_i(wn_i(w))$$

Notice that we have defined $W(G_i)$ to be the value function from Mirrlees' problem which, because we have assumed that the utility and density functions are the same for young and old, is the same *function* for both young and old.

The intercept of the tax schedule is particularly interesting for our purposes, because it denotes the taxes paid by someone who does not work. Because of the Inada condition on the utility function, the optimal intercept will either be negative or it will be the case that the optimal program gives everyone the incentive to work. Notice that the tax schedule's optimal intercept and, to some extent, its optimal shape, depends on the amount of revenue the government demands from the group, G_i, which the government chooses in stage one.

We can now state mathematically the first stage of our optimal welfare problem, in which government divides its revenue needs among the two age groups:

$$\max_{G_o, G_y} \alpha\beta W(G_o) + (1-\alpha)(1-\beta) W(G_y)$$

$$\text{s.t.} \quad \alpha G_o + (1-\alpha) G_y \geq G \qquad (3)$$

where O is the relative weight placed by the government on the utility of the old. Notice that O = ½ means that government places equal weight on the welfare of a young and old person. If O = ½, the symmetry of the problem implies $G_y = G_o$ and $T_y(\cdot) = T_o(\cdot)$. In other words, there is no SS (no transfers from young to old) and tax schedules are the same for young and old.

Social security ($G - G_o > 0$) arises in this model if O > ½ (that is, if the government places more weight on the welfare of the elderly). Furthermore, T_y and T_o are nonnegative and typically positive -

this was one of Mirrlees' main results (see his Proposition 3 and his examples) - so that the labor income of both the young and the old are taxed at the margin. Since both marginal tax rates are positive, the labor income of group i is explicitly (implicitly) taxed as $T_i(0) > (<) 0$.

The model with $\Omega > \frac{1}{2}$ can explain why even small populations of elderly, such as the Union Army veterans or those aged 65+ in the 1920s and 1930s, received at least some transfer from the young. To the extent that lump sum taxes are levied on the young, it can also explain why the old might consume as much or more than the young. Furthermore, assuming that there is a free-rider problem among those who care about the poor, it makes sense that SS would be a government rather than a private-sector program, although how the collective decisions about redistribution are made remains unexplained. Moreover, because economic growth and industrialization can increase the incomes of the young relative to those of the old and thereby increase the need for the government to restore intergenerational equality (Pampel and Williamson 1989, page 26-27), "SS as welfare" can explain why SS is positively correlated with growth.

The welfare view, on the other hand, is inconsistent with a number of facts. For example, it cannot explain why benefits are independent of *asset* income and why they are an *increasing* function of how much the person earned during his working years. Notice that neither of these facts is true for other antipoverty programs like AFDC and Food Stamps. Assuming that labor income responds at least a little bit to implicit tax rates, the welfare view is inconsistent with such heavily used 100% tax rates[37] and inconsistent with the dependence of SS benefits *retirement* rather than *poverty*. Nor can the model explain why little (if any) progressivity is found in SS systems.

The model with $\Omega > \frac{1}{2}$ is consistent with different *marginal* tax schedules $T_y'(\cdot)$ and $T_o'(\cdot)$ for the young and old because the old are wealthier ($G_o<G_y$) and thereby might respond differently to marginal tax rates. However, the Mirrlees model does not say whether group i's marginal tax rates would increase or decrease with G_i and therefore whether greater distortions ought to be imposed on the young or old. In fact, we see nearly all countries imposing greater marginal labor income tax rates on their old. Furthermore, it is unexplained why the old receive greater weight in public decisions, so that this version of the Mirrlees model needs to be combined with a political or ethical theory of $\Omega > \frac{1}{2}$.

Up to here we have assumed that there are no differences between young and old. Could a

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[37]See Mulligan (1998) for a proof. Emmanuel Saez has suggested a proof of an even stronger claim that Mirrlees problem is inconsistent with 100% marginal tax rates faced by anyone.

welfare model explain SS, even in the case of $\theta=½$ if we allow for differences between young and old? Perhaps the utility or the productivity density functions are age dependent, although both are difficult to verify directly (eg., the latter is difficult since many of the old do not work). Suppose $\theta = ½$ and that productivity declines with age. Then, with $G_y = G_o$, the marginal utility of the old is greater and the government has an incentive to levy a lump sum tax on the young to finance a lump sum subsidy for the old. In this way the welfare approach can explain why the intercept of the tax schedule depends on age (with $T_y(0) > T_o(0)$). Through the use of age-dependent lump sum taxes and transfers, the welfare approach may even explain why the bulk of redistribution by SS is across cohorts rather than across (lifetime) productivity classes - even to the point of equalizing incomes across age groups - because age is an observable and exogenous indicator of productivity. However, as with the $\theta > ½$ version of the story, it is difficult to explain why the optimal *marginal* tax schedules are so different for young and old because it is difficult to argue why the old would be so much less responsive to marginal tax rates.[38]

In fact, taxes on the young do not have a significant positive intercept – without which the welfare approach cannot justify equalizing full incomes across age groups. As we pointed out above, those aged 65+ enjoy nearly twice as much leisure while at the same time (in recent decades) commanding a disproportionate share of national income in developed countries.[39] Furthermore, the relative incomes of the elderly may not explain the emergence of SS earlier in the century. Gratton (1996) shows that a decline in the relative income of the elderly does not appear to have preceded the foundation of SS or to have preceded its growth.

Presumably high earnings in the past are some indicator that current productivity is high and, like any other indicator of high productivity, ought to be taxed. Hence, the welfare view cannot explain why benefits are an *increasing* function of earnings prior to retirement (see also Diamond 1977, p. 279). However, we suggest below how a risk sharing interpretation of Mirrlees' problem (2) might justify such a policy.

Increasing health and life expectancy presumably makes poverty less common among the young

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[38]Indeed, Kremer (1998) argues that the young are less responsive so that marginal tax rates should be lower for the old.

[39]It may be that the elderly "deserve" a disproportionate share of national income, but a positive theory must explain *why* they deserve it and *how* they obtain it. Other groups probably also "deserve" an important share of national income but for some reason are less successful at obtaining their fair share than are the elderly.

old (since better health means that they can earn more income), so the "SS as welfare" model predicts falling eligibility among the young old. Roughly speaking, this would translate into a rising government retirement age. Retirement age in the real world, however, has been declining.

In summary, SS benefits depend too much on work, depend too little on asset income, increase too much with lifetime earnings, and (without substantial use of lump sum taxes and transfers) are too generous in the U.S. and Europe to be primarily welfare programs. This is not to say that SS has done nothing to alleviate poverty among the elderly. Our claim is that an antipoverty goal of the program cannot explain its growth, its variation across countries, its size as compared to other welfare programs, the way in which the amount and composition of income determine benefits, or why its benefit formulas generate such strong retirement incentives.

IV.A.2. Mirrlees' Problem as Risk Sharing

The Mirrlees problem (2) has sometimes been interpreted as an optimal risk sharing problem (eg., Fudenberg and Tirole 1991). Others have offered similar risk sharing problems as explanations for SS (eg., Merton 1983). Under this interpretation, SS is an agreement made by among ex ante identical individuals to insure each other against future *unobservable* labor productivity shocks. As an optimal insurance arrangement, ex poste "insurance awards" ("subsidies" in the optimal redistribution interpretation) will vary systematically across ex ante distinguishable groups according to "premia" paid by those groups. Hence, when SS is interpreted as optimal risk sharing, it is easy to understand why those who earned more (and therefore paid more in taxes earlier in their lives) enjoy larger subsidies.[40]

The other puzzles noted above - such as excessive generosity and the prevalence of 100% taxes[41] - still remain under the risk sharing interpretation of SS. In addition, it is also difficult to understand why, as an insurance contract, SS systematically transfers from younger cohorts to older.

IV.B Induced Retirement Enhances Efficiency

It has been argued by Sala-i-Martin (1996) that SS was designed as a way to induce the elderly to

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[40]We have not entered the risk sharing model as a separate column in Table 2; its entry is the same as "welfare for the elderly" with the exception of the "lifetime wage" row.

[41]SS benefits are retirement tested in Merton's (1983) model, but the test does not sacrifice efficiency because retirement is exogenous.

retire, because aggregate GDP is larger if the elderly don't work than if they do. A simple example can be constructed by following Lucas (1988) and supposing that each individual *j*'s productivity $w_j = w(h_j, \bar{h})$ depends positively on his own human capital h_j and on the average human capital in the economy $\bar{h}$, where $\frac{\partial w_j}{\partial \bar{h}} > 0$ and where individual *j* contributes to the average according to how much he works n_i:[42]

$$\bar{h} = \frac{\sum_j n_j h_j}{\sum_j n_j}$$

If, for example, the work decision is discrete ($n_j \in \{0,1\}$) then $\bar{h}$ is the average human capital of those working and does not depend on the human capital of those not working.

In the absence of distortionary taxes and subsidies, the private marginal product of *i*'s labor ($PMPL_j$) is given by.

$$PMPL_j = w(h_j, \bar{h})$$

The social marginal product ($SMPL_j$) of a worker may differ from the private marginal product because when a person with less than average human capital decides to work, he reduces the average human capital of the economy $\bar{h}$ and, as a result, it lowers the productivity of all workers. Hence, the social marginal product is the sum of $PMPL_j$ and person *j*'s effect on the wages of all other members of the economy through his effect on the average human capital.

$$SMPL_j = w(h_j, \bar{h}) + \frac{h_j - \bar{h}}{\sum_i n_i} \sum_i n_i \frac{\partial w_i}{\partial \bar{h}}$$

[42]It is not important that the externality be a linear function of each individual's human capital. What is crucial is that additional work by those with little (much) human capital have a negative (positive) externality.

where the first fraction in the last term is the contribution of *j*'s work to $\bar{h}$ and the second is the sum of the effects on all person's wages when the average human capital is changed. Notice that, since the effect of $\bar{h}$ on *w* is positive, the *PMPL* exceeds *SMPL* for workers with above average human capital and is less than *SMPL* for those with below average human capital ($h_j < \bar{h}$). Hence, without distortionary taxes or subsidies, those with above average *h* have too little incentive to work and those with below average have too much incentive.

To close the argument, Sala-i-Martin (1996) argues that human capital depreciates with age so the elderly tend to have less than average human capital. It follows that the elderly have a negative impact on the productivity of the young. The young, therefore, have incentives to induce the elderly to work less or even retire. This is why SS programs are introduced and why they tend to induce retirement. In other words, it is Pareto-improving for the young to trade money for the jobs of the old.

Imagine that an individual's labor productivity is proportional to his own human capital (holding constant $\bar{h}$) and that $\bar{h}$ increases *w*. That is, imagine that $w_j = h_j \omega(\bar{h})$. The *SMPL* in this case can be written as

$$SMPL_j = w_j + h_j \eta - \bar{h}\eta = w_j + w_j \frac{\eta}{\omega(\bar{h})} - \bar{h}\eta$$

where $\eta = \dfrac{\sum_i n_i h_i \omega'(\bar{h})}{\sum_i n_i}$. We consider three environments in which governments might introduce

policies to realign private and social marginal products: (i) both effort *n* and productivity *w* observed by the government for each individual, (ii) neither effort nor productivity observed, but their product *nw* is observed by the government, and (ii) neither effort nor productivity observed, but a proxy for *w* as well as the product *nw* are observed by the government.

In case (i), it follows that there exists a flat rate *effort tax* and a flat rate *earnings subsidy* that perfectly align social and private incentives for every worker! The optimal effort tax rate Oand optimal earnings subsidy rate O are:

$$\tau = \bar{h}\eta \quad , \quad \sigma = \frac{\eta}{\omega(\bar{h})}$$

In case (ii), taxes can only be a function of earnings (not a function of earnings and effort separately). The optimal earnings tax provides work disincentives for those with low human capital and work incentives for those with high human capital. In other words, the optimal marginal tax rate would decline with earnings (eventually becoming negative), with benefits being paid to those with high and low earnings and taxes paid by those with medium earnings. Marginal earnings tax rates of 100% for those with low earnings are likely to be optimal (Mulligan 1998).

In case (iii), taxes can be functions of both earnings and a proxy for *w*. Since, holding constant earnings, those who the proxy suggests to be more productive are probably working fewer hours, benefits should increase (taxes decrease) with the proxy for labor productivity. For elderly, such a proxy may be earnings when young, which explains why old age benefits increase with earnings when young. This may also explain why, holding constant earnings, implicit earnings tax rates are higher for old than for young.

Under the assumption that government has no direct means of observing an individual's human capital, Sala-i-Martin's model and the time-intensive political competition model can explain why benefits depend mainly on earnings. But other proxies for human capital are available; it seems that governments ought also to use other proxies, such as disability status, IQ, and other variables when in fact they do not include such tests for the reception of public old age pensions.

Sala-i-Martin's model is also consistent with positive correlations between economic growth, retirement incentives, and the size of SS programs. And, as long as emigration is a substitute for remaining at home and working, the model is consistent with payment of SS benefits to emigrating retirees.

Sala-i-Martin's model is one of the few efficiency models including redistribution as part of the optimal policy. The reason is that the elderly have the freedom to hurt the economy (ie., the freedom to work) and have to be paid, so to speak, to give up that freedom. We have therefore entered as a footnote in Table 1 that the cross-firm human capital spillover model is consistent with cross-cohort redistribution.

Increasing the retirement age increases the incentive to work for those at the retirement age (the "young old"). Since, the relative labor productivity of the young old presumably increases with health and life expectancy, it becomes less desirable to induce retirement by the young old and thereby more

desirable to raise the retirement age. In this way, Sala-i-Martin's approach predicts retirement ages to rise with health and life expectancy.

Sala-i-Martin's is an efficiency explanation of the existence and design of SS. Hence some of the shortcomings of this theory are that it does not explain how citizens collectively decide on an efficiency enhancing policy, how political behavior might be different for old and young, how SS might crowd out other government spending, or why other dimensions of government activity - such as regulations and mandates - should also favor the elderly. However, the model can explain why democracies and nondemocracies might have similar SS programs, because efficiency considerations may be similar for democracies and nondemocracies.

A potential problem with Sala-i-Martin's theory of SS is that, in order to justify national public SS programs (rather than industry or firm level pension programs) an economy-wide employment externality must be present, an externality which is currently not well understood. If the Lucas (1988) hypothesis is true that each individual's productivity depends on the economy-wide average productivity, then optimal policy requires negative marginal tax rates for those with productivity well above the average, a prediction inconsistent with common practice of positive marginal tax rates at the top of the earnings distribution.

Lazear (1979) argues that private-sector pensions and mandatory retirement enhance efficiency, but does not explain why pensions and mandatory retirement might be *national* policies, with uniform tax rates, retirement ages and incentives, and a pay-as-you-go system. Nor does efficiency explain why mandatory retirement is nationalized, rather than one of so many other efficiency enhancing private-sector practices.

IV.C Social Security as "Retirement" Insurance

According to the House Ways and Means Committee, the purpose of SS is "to replace income that is lost to a family through the retirement, death, or disability of a worker who has earned protection against these 'risks'." (U.S. House Ways and Means Committee 1996, Section 1, p. 5). Buffer stock private saving when young is one possible way to "insure" against the inability to earn income when old. Another possibility is the purchase of some kind of insurance. The proponents of this theory, however, would argue that there are adverse selection problems: since people have private information on their own health and their ability to earn income at an older age, only the people with a large probability of becoming disabled will sign up for such private insurance programs. It may then be optimal for the government to step in and introduce a mandatory insurance program which may potentially resemble the SS programs

we observe in the real world.

In order to compare an optimal "retirement insurance" program with real world SS programs, we formalize a simple two period version of Diamond and Mirrlees (1978). In each period, able consumers either work or not and enjoy a flow of utility $u(c,0)$ or $u(c,1)$, respectively.[43] All consumers are able to work in the first period of their lives and, during that period, each expects to be "disabled" in the second period with probability π. The government, who administers the retirement insurance (RI), is assumed to be unable to directly observe disability. The assumption of no explicit disability test makes the model a potential explanation for old age pensions rather than the so-called "disability insurance" provided by the U.S. and other governments because only the latter does not rely on the self-reporting of disability (SSA *Handbook* 1997, sections 614-5).[44]

Assuming that, under the optimal RI contract, none of the disabled work, then we can without loss of generality assume that utility is $d(c)$ for the nonworking disabled and $-\infty$ for the working disabled. We also assume that all of the able work under the optimal RI contract.

Individuals may differ in their labor productivity w and their probability of disability π, but these are assumed to be observable. We assume for simplicity that, if there are any consumers of type (w,π), then there are a continuum of them.

The optimal retirement insurance contract can be described by the following planner's problem:

$$\max_{c,c_1,c_0} u(c,0) + \beta\pi d(c_1) + \beta(1-\pi)u(c_0,0) \quad \text{subject to:}$$
$$c + R\pi c_1 + R(1-\pi)c_0 \le 1 + R(1-\pi) \qquad (4)$$
$$u(c_0,0) \ge u(c_1,1)$$

where c is consumption when young, c_1 is the consumption enjoyed by those elderly with $l = 1$, c_0 the consumption enjoyed by the working elderly, β is a discount factor and R an interest rate factor. The first constraint is that the RI be actuarially feasible. The second constraint (the "incentive compatibility" (IC) constraint) is that all of those who are able do not pretend to be disabled, and is assumed to be binding.

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[43]We assume work is "bad": $u(c,0) < u(c,1)$ for all c.

[44]Diamond and Mirrlees (1978, p. 331-2) clearly view the program (4) as modeling SS more generally, including the old age portion.

Diamond and Mirrlees make the additional weak assumption that perfect insurance (ie, $d\blacktriangledown(c_1) = \blacktriangledown u(c_0,1)/\blacktriangledown c_0$) cannot be attained without violating the IC constraint. Since IC requires $c_1 < c_0$, their weak assumption limits the effect of disability on nonworking marginal utility of consumption and limits the degree of substitutability of l for c in the utility function.

The planner's problem above can be decentralized by charging the (self-proclaimed) able old an insurance premium and paying the disabled an insurance award. In other words, SS benefits are paid ONLY to those choosing not to work. Both the premia and the awards are decreasing functions of assets the old accumulated when young, which are added to the principal and interest on savings accumulated when young $(w\text{-}c)/R$ to determine c_1 and c_0. As long as the insurance award is positive, this system implicitly taxes work by the elderly. However, as we see from the incentive compatibility constraint, the implicit tax rate is less than 100%.

We (and Diamond and Mirrlees 1978) assume that the able elderly work under the optimal insurance system. If they did not, then a 100% implicit tax rate could be used to implement the optimal allocation. In this case, every young person knows he will not work in his old age regardless of health status, and there is no need for government or any other insurance to protect him against the "risk" of retirement. In other words, there is no need for government to protect people from "risks" that happen with perfect certainty; the RI model cannot simultaneously explain 100% taxation and government administration of the program.

To see that RI premium and award policies ought to tax savings, consider the familiar first order condition for a consumer who is saving (ie, foregoing c) in the absence of a savings tax[45]:

$$\frac{\partial u(c,0)}{\partial c} R = \beta\left[\pi d'(c_1) + (1-\pi)\frac{\partial u(c_0,0)}{\partial c_0}\right]$$

This first order condition differs from that of the optimal RI program (4), because the only cost of savings considered by the individual saver is the foregone consumption (the LHS above) whereas the planner solving (4) also considers the effect of savings on the incentive compatibility constraint. In particular, savings has an additional *cost* from the point of view of the planner because an able person

[45] The individual program with no taxes would be to chose savings, s, so as to maximize the same utility as in (2) subject to the constraints: $c + s \blacktriangledown 1$, $c_1 \blacktriangledown s/R + 1$, and $c_0 \blacktriangledown s/R$.

with lots of assets is less willing to reveal his ability and more willing to feign disability, not work, and enjoy the RI pension. This additional cost can be seen in the planner's intertemporal first order condition:

$$\frac{\partial u(c,0)}{\partial c} R + \frac{(1-\pi)(\phi-1)}{1+(1-\pi)(\phi-1)}\left[d'(c_1) - \frac{\partial u(c_0,0)}{\partial c_0}\right] = \beta\left[\pi d'(c_1) + (1-\pi)\frac{\partial u(c_0,1)}{\partial c_0}\right]$$

$$\phi = \frac{\partial u(c_1,1)/\partial c_1}{\partial u(c_0,0)/\partial c_0} > 1$$

The second term on the LHS is the additional cost, and the term in square brackets is positive under the weak assumption that perfect insurance is not attainable. $\Phi > 1$ is Diamond and Mirrlees (1978) "moral hazard" assumption and limits the degree of substitutability of *l* for *c* in the utility function. Since saving is less costly for the individual than for the planner, the private individual will tend to oversave. The optimal RI program, therefore, involves taxing his saving.

Most of the same points would apply if we were to use a model of *more* than 2 periods (such as Diamond and Mirrlees (1978), who use a continuous time model) where the optimal program involves all persons - both the able and the disabled - retiring after a certain age a_R. A 100% tax applying to those over age a_R could implement the optimal allocation, but disability involves no risk after age a_R that the government would insure and hence the model fails to explain the ubiquity of *government* payments to those aged a_R and older.

This "retirement insurance" explanation for SS would seem to explain several important design features that are found in programs around the world:

(i) "premiums" are paid by those who have, to date, avoided the retirement "risk" but are still "exposed" to it - the workers

(ii) "benefits" can only be collected when retirement has occurred

(iii) A reserve is maintained, although contemporaneous premiums are the most important source of financing benefits

(iv) premium and award policies implicitly tax the work of the "elderly", although less than 100%

Just as the collection of fire insurance awards is contingent on the destruction of property by fire, so too are retirement benefits contingent on the "destruction of earnings by retirement." Just as private

sector insurance companies finance their payouts with contemporaneous premiums, SS programs are "pay-as-you-go." Benefits received increase with the amount of insurance purchased (ie, premiums paid). And some moral hazard is enough to justify replacement rates that are less than one.

Consider an increase in the probability of disability. And, for the moment, consider the full insurance case (where the government observes disability and thereby solves (4) without the incentive compatibility constraint). In order to remain fully insured, a person facing a higher probability of disability must pay higher premiums. This might raise the aggregate savings rate and lower the rate of return to savings, thereby encouraging people to allocate less consumption to old age (regardless of whether they are it able or disabled in their old age). In this sense, a RI model could lead to a correlation between the fraction of the population disabled and the amount consumed by the disabled (which, in the full insurance case, is the same as the amount consumed by the old able). However, there need not be such a correlation -- perhaps because the rate of return does not decline with the aggregate savings rate, or because insurance is not complete. Even with such a correlation, there may not be a correlation between the fraction of the population elderly and the amount consumed by the disabled because elderly populations may well be healthy populations too. We have therefore entered in Table 2 that the retirement insurance model is consistent with a lack of correlation between the size of the elderly population and benefits per elderly.

The optimal RI theory, however, leaves several questions unanswered. Why is SS, in the real world, contingent on retirement rather than the more fundamental risk - disabilities which make work impossible or extraordinarily difficult? To put it another way, why isn't the old age portion of SS more like a disability insurance program - with a medical exam required for the receipt of old age pensions? One might suggest that such exams are prohibitively costly, although medical exams were used quite effectively in the Civil War pension program (Costa 1998) and are used to administer modern disability insurance programs. Why have most retiring cohorts to date received benefits that exceed the actuarial value of their premiums paid? Why are replacement rates so close to 100% in many developed countries? Given that buffer stock saving is one private sector substitute for insurance, is the gain from insurance as large as the costs of the labor supply distortions? Why are so many governments involved in the retirement or disability insurance business rather than in other insurance businesses? After all, adverse selection problems do not seem to be any more severe than with other risks. A full theory of SS must explain why so many governments provide retirement insurance rather than, say, auto insurance or medical insurance for the nonretirement aged. Finally, if SS is primarily "retirement insurance," why are

the “insurance premiums” of the young used mainly to subsidize the “insurance awards” for the old (this is not true with, for example, life or fire insurance) rather than to pay insurance awards to other young people? This tremendous amount of cross-subsidization does not typically occur in a purely insurance arrangement.

With its emphasis on disability, it also seems difficult for the RI model to explain why government retirement ages have fallen and SS expenditures risen while people have become more healthy. Even as a theory of DI, it seems difficult for the RI model to explain why government disability programs have become increasingly liberal in the definition of disability (Parsons 1991) or why DI programs do not tax assets (House Committee Section 1, 1996; Myers 1993 pp. 54-5).[46]

Like other “efficiency” explanations of SS, this theory does not explain how citizens collectively decide on an efficiency enhancing policy, how political behavior might be different for old and young, how SS might crowd out other government spending, or why other dimensions of government activity - such as regulations and mandates - should also favor the elderly.

IV.D. Labor Market Congestion Theories

A popular European theory of SS argues that jobs need to be redistributed from the old to the young because there is a lot of unemployment or other symptoms of undesirable labor market performance. There are several versions of this idea. One of them is that, because the young are more productive, it is better from an aggregate point of view that the young have these jobs and this is why this policy may be desirable (this argument is similar to Sala-i-Martin’s (1996) theory of SS). Another version would argue that the government may want to follow this policy because high unemployment is politically less acceptable than a high number of “early retirees” (in fact, economic statistics do not count the retired as unemployed, even though they do not work). These two versions are consistent with the fact that SS programs tend to induce retirement since that is its main purpose. The theory is also consistent with no assets test, with the fact that benefits are increasing functions of lifetime wages (it will take a high pension to “bribe” a worker with a high wage out of the labor force) or why proof of disability is not required. They are also consistent with some kind of public intervention and with the fact that SS exists even with small populations of elderly.

Third and fourth versions of the story distinguish the interests of labor from those of capital, and

[46]U.S. DI also treats the disabled as able if they choose to work (House Committee 1996, p. 40).

suggests that early retirement would raise wages and/or lower unemployment by increasing employers' demands for younger workers. These two versions have been formalized in the literature, and we review them below. It turns out that they have a number of common implications, so we enter them as a single "labor market congestion" column in Table 2.

Mulligan and Sala-i-Martin (1999a) suggest that the "labor market congestion" theories are not theories themselves, but are byproducts of another theory of SS and induced retirement. They suggest that the scientific or economic validity of the "labor market congestion" stories is irrelevant. It is just rhetoric, a part of the political pressure applied by the old (the pressure, in turn, is possible because the old are induced to retire) – they are trying to convince a young citizen that SS is in his interest too. Since any one person's influence on policy is negligible, a young person has very little incentive to resist the theories presented to him by the old (eg., by checking whether they are scientifically or economically correct).

IV.D.1. Monopoly Unionism

It has often been argued that labor as a group have an incentive to reduce the aggregate quantity of labor in order to raise wages for workers. Is induced retirement a good way of doing so? To answer this question, consider a simplified version of Mulligan's (2000) model economy where output is produced according to a constant returns production function $F\left(L((1-\theta)L_y, \theta L_o), K\right)$ with three inputs (each with positive marginal products): young union labor $(1-\theta)L_y$, old union labor θL_o, and nonunion inputs K. Nonunion inputs include capital and nonunion labor of various types, but disaggregating the nonunion inputs is not of particular interest here. θ is the fraction of union membership that is old; total union membership is normalized to 1. This function is weakly separable in the union and nonunion inputs; we assume that the aggregator function L is homothetic (see Mulligan 2000 for generalizations). It is important to note that the production function is consistent with different productivity for old and young workers, any degree of substitutability between old and young workers (including perfect substitution), and with any degree of substitutability between union and nonunion factors (including perfect substitution).

The union cares about the utility u_y of a representative young union member, the utility u_o of a representative old union member according to the quasiconcave "welfare function" W:[47]

[47]The utility functions u_y and u_o have the usual properties: increasing in consumption, decreasing in labor, and concave.

$$W\left(\alpha u_o(c_o, L_o), (1-\alpha) u_y(c_y, L_y), \alpha\right)$$

where c_i is the average consumption of a union member of type i ($i = o,y$). W is increasing in its first two arguments and includes as special cases the utilitarian objective ($W = \theta u_o + (1-\theta)u_y$), and welfare functions that weight one age group more heavily than another. The utility functions u_y and u_o can be different for young and old workers.

At this point, we could consider an efficient redistribution from capital to labor, but this would of limited empirical interest to a student of Social Security, because that redistribution does not have to distort the quantity of labor (see, for example, Leontief 1946, or MaCurdy and Pencavel 1986). As an alternative, and for the sake of argument, we follow much of the literature on union behavior and suppose that the division of output *between* union and nonunion factors is determined under competitive conditions: factors are paid their marginal product. In this situation, unions may support public policies that raise the marginal product of labor, and (perhaps) lower the marginal product of nonunion factors.

In order to describe the kinds of policies a union might support, we first describe the set of allocations that are efficient from the union's point of view, subject to the constraint that factors are paid their marginal product. Mathematically, those allocations are described by the following program:[48]

$$\max_{c_y, c_o, L_y, L_o, L} W\left(\alpha u_o(c_o, L_o), (1-\alpha) u_y(c_y, L_y), \alpha\right)$$

$$\text{s.t.} \quad \alpha c_o + (1-\alpha) c_y \le L\,G(L)$$

$$L = L\left(\alpha L_o, (1-\alpha) L_y\right)$$

where G is the marginal product of L ($\partial F/\partial L$). Notice above that solutions to the problem depend only on the production technology through the "inverse labor demand function" $G(L)$.

We assume that the union's preferred allocation of labor is strictly positive for both types of

[48]For simplicity, it is assumed that none of the union members own any of the nonunion input K. The main result– that the marginal tax labor income rates that are optimal from the perspective of a monopoly union should not depend on age – does not depend on this assumption.

workers and that the program above is sufficiently concave (see Mulligan 2000 for generalizations). Two of the first order conditions for the monopoly union's problem relate a type *i* union member's marginal rate of substitution (*MRS*) to his marginal product of labor w_i:

$$MRS_i = \frac{-\partial u_i/\partial L}{\partial u_i/\partial c} = G(L)\frac{\partial L}{\partial(\alpha_i L_i)}\left(\frac{\partial[LG(L)]/\partial L}{G(L)}\right) = w_i(1-\tau) \quad i = y, o$$

The allocation optimal from labor's point of view drives a wedge (1-O) between each union worker's *MRS* and his marginal product *w*. Furthermore the optimal wedge has O= 1/O, where Ois the elasticity of labor demand. This is the well-known policy (Dunlop 1944; Lewis 1963, p. 32; Rees 1989, p. 67) of the monopoly union: reducing the supply of labor increases the return to labor and can make labor better off, even as it reduces aggregate efficiency and payments to other factors. From this point of view, we have a rough understanding of why labor unions might support public policies that distort the supply of labor, such as minimum wage regulations and occupational licensing.

What is relevant for our study of retirement, however, is that *the optimal wedge is the same (in percentage terms) for all types of union labor*.[49] In other words, if the optimal policy from labor's point of view involves reducing its young member's incentive to work by Opercent, then the optimal policy involves the same Opercent reduction in elderly incentives to work. Notice that our derivation is perfectly consistent with:

- different labor supply elasticities for young and old
- different derived labor demand elasticities for young and old
- any degree of substitution in production between old and young workers
- any degree of substitution in production between labor and nonunion factors
- a welfare function that weights old and young workers differently

More specifically, the monopoly unionism model might demonstrate why unions would prefer policies that reduce the supply of labor to those that do not, but it also implies that unions would prefer policies that distort all types of labor the same to policies like the SS programs around the world that differentially distort elderly labor. When elderly labor is distorted more, the model implies that, holding fixed *L* and

[49]Readers may recall a similar result, due to Diamond and Mirrlees (1971), that a benevolent social planner optimally taxes intermediate inputs at a uniform rate.

thereby union and nonunion incomes, consumption can be reallocated to the old and leisure reallocated to the young in such a way to make both young and old better off without making the nonunion factors worse off. We show below how the a labor market search model can have many of the same implications as "monopoly unionism," except that it permits the possibility that work by the elderly is optimally taxed more.

IV.D.2. Labor Market Search Facilitated by Retirement

Consider Bhattaacharya, Mulligan, and Reed's (2001) extension of the standard one-period Mortensen (1982) - Pissarides (2000) search model. There are two groups of agents: workers and firms. Workers are heterogeneous in exactly two dimensions. First, some workers are matched with an employer and some are unmatched. We refer to workers that begin the period matched with employers as "old" workers and the initially unemployed as "young" workers, and their population shares as Θ and $(1-\Theta)$, respectively. Second, workers also differ in their nonpecuniary costs of working. To be specific, we let Θ_j represent the cost of working for worker *j*. One may interpret this cost as the opportunity cost of working in terms of lost leisure time. These costs of working may vary across cohorts. The cost of working for old workers is described by the cumulative distribution function, $F_o(\Theta)$, while the cost for young workers is described by $F_y(\Theta)$. Both distributions have a lower support of 0. One interesting case has old workers having a higher value of leisure time than young workers, so that $F_y(\Theta) \blacktriangledown F_o(\Theta)$. We let the productivity of each match be given by *p*. When worker *j* is matched with a firm, and work occurs, the total surplus created is $p - \Theta_j$.

Worker-firm matches are made in one of two ways. First, matches are part of the initial conditions for so-called "old" workers. Second, a young worker can be matched with a firm, or a unmatched firm with a young worker, by "search." Job search costs *s* for each worker and, for simplicity, worker search costs nothing for firms. Jobs searchers and firms with vacancies are brought together according to a matching technology *M*. The matching technology, $M(U,V)$, denotes the aggregate number of matches as a function of the aggregate number of searchers *U* and aggregate number of vacancies *V*. The matching technology is assumed to be stochastic and undiscriminating – namely, all searchers enjoy the same ex ante probability of a match $m = M/U$ and all employers posting a vacancy enjoy the same ex- ante probability of a match M/V. Since the matching technology exhibits constant returns to scale, we let $m = m(\Theta) = M(1, V/U)$ where $\Theta = V/U$ is the number of vacancies per worker and therefore may be viewed as the degree of labor market tightness.

Initial worker-firm matches can be dissolved, in which case there is no social surplus associated with the initial worker. Bhattaacharya, Mulligan, and Reed (2001) interpret this situation as "retirement," with the retiree consuming leisure and his former employer participating in the aforementioned matching process by posting his vacancy. They point out that the search technology *m* captures the often expressed idea that the labor market has frictions, and that more retirement reduces unemployment. In this sense the model labor market is inefficient and, of course, it would be nice if public policy could eliminate these search frictions. But perhaps a more practical question is whether public policy can improve the operation of the labor market, taking as given the "technology" *m* for matching job vacancies with the unemployed.

With this in mind, define an efficient allocation in this economy as the aggregate surplus-maximizing list of retirees, job searchers, and firms posting vacancies, given the economy's matching technology and the costs of searching. An efficient allocation involves: (a) all unmatched employers posting their vacancies, (b) retirement for the initially matched workers with high nonpecuniary costs of work (relative to the others initially matched),(c) job search among the initially unmatched workers with low nonpecuniary costs of work (relative to the others initially unmatched), and (d) all new job matches occur through the matching technology *m*.

Suppose that the government can observe whether a worker is matched and producing, and levies a tax T_o on (or, if $T_o < 0$, pays a subsidy to) each old person, regardless of his retirement status, and a tax T_y on each young person. The government pays B_o to (or, if $B_o < 0$, taxes) old nonworkers (aka, retirees) and B_y to young nonworkers. An equilibrium allocation given these policies is a list of young searchers and retirees such that: (i) the government budget constraint balances, (ii) the retiree with lowest nonpecuniary work cost is, together with his original employer, indifferent between remaining employed and retiring (in which case benefit B_o is collected and a vacancy is created), and (iii) the job searcher with highest nonpecuniary work cost is indifferent between the employment benefit and the expected proceeds from search. Bhattaacharya, Mulligan, and Reed (2001) show that there exist policies such that the equilibrium allocation is efficient, but these policies may involve taxing retirement rather than subsidizing it.

Some versions of the model imply that an efficient equilibrium can be supported with a positive subsidy to the old, but Bhattaacharya, Mulligan, and Reed (2001) argue that the amount the subsidy is much less than real-world government retirement subsidies. This is primarily because an efficient allocation reflects the negative effect on matches per vacancy of an additional vacancy, an effect the empirical search literature suggests to be strong. The social security rhetoric, on the other hand, ignores

this effect, over-emphasizing the admittedly beneficial effects of an additional vacancy on those searching for jobs. In short, many societies excessively induce retirement by the elderly, at least from the standpoint of efficiency as understood in standard search models. Further, the search models do not explain why SS has grown so much in countries where unemployment does not appear to be a large problem (the United States being a primary example).

IV.E. Social Security as Solution to the Prodigal Father Problem

A widespread theory is that SS takes care of the elderly because some of them engaged in prodigal behavior when they were young and did not save enough to support themselves later in life. There are two versions of this theory.

IV.E.1. Myopic Prodigality

The first version assumes that *parents were not looking forward enough when they were young.* According to this version, people make "mistakes" when they are young and they save too little. Diamond (1977) suggests several possible "reasons" for this: (i) people may lack the information necessary to judge their needs in retirement; (ii) people may be unable to make effective decisions about long-term issues because they are not willing to confront the fact that one day they will be old; and (iii) they may simply fail to give sufficient weight to the future when making decisions so, in essence, they may act "myopically". As a result, it may be desirable for the government to act paternalistically and force citizens to save the appropriate amount.[50]

Diamond (1977) suggests that the solution to the prodigal father problem is a fully funded program, and one that need not be administered by the government. We believe that the solution may involve a pay-as-you-go program since, when the program is first created, it is too late to force the first old generation to save and (presuming society still wants to help the poor old) revenue is immediately Vneeded to pay them. However, this reasoning cannot explain why even the richer members of the initial

[50] Other proponents of the first version include Feldstein (1985). Bodie and Merton (1992) refer to the second version of the prodigal father problem as the "free-rider" problem.

old generation would receive subsidies.[51] As a forced savings program, it may explain why benefits are not means-tested - the program is not designed to redistribute, just to ensure people leave some of their resources for their old age. Feldstein (1985) suggests that, as opposed to the SS programs used in practice, the optimal solution to the prodigal father problem involves means-testing and a low level of retirement benefits.

Any efficiency consideration which is solved by a forced savings plan would, assuming the forced savings plan is the solution chosen by the public sector, predict a relationship between benefit per elderly and the fraction elderly only to the extent that the rate of return to savings falls with the stock of capital. Hence we note in Table 2 that the prodigal father theory is consistent with a lack of relationship between the share of the population over age 65 and benefits per elderly.

IV.E.2. Rational Prodigality

The second version of the theory seems to be exactly the opposite: *parents were forward looking to such an extent when they were young* that they anticipated not only their needs for retirement, but how their children and others in society would react to those needs (eg., Laitner 1988). In particular, they expect society to aid them in desperate situations (eg., poverty) even when those situations are self-induced. For example, society may feel it intolerable to have destitute elderly citizens around. Realizing this, some younger people may not bother to save for their old age, knowing they will be "bailed out".[52] The result is less than Pareto optimal because the prodigal young are not equating their willingness to delay consumption to the social marginal rate of transformation (ie, to the interest rate).

One way to solve the time inconsistency problem and achieve a Pareto optimal allocation is to force citizens to save when they are young and give them the resources back when they are old, a scheme whose steady state would look something like Social Security with resources being taken from the young and payments being made to the old.

In both versions of the prodigal father problem, the young are against the adoption of a forced

[51]In other words, the solution to the prodigal father problem should either be fully funded (with no payments to the initially old generation) or payments to the initially old should be means tested.

[52]The young would anticipate being bailed out even if the government and family members insist they will not to help any elderly who engaged in prodigal behavior, because such claims fail to be credible when made by those who care about the welfare of the elderly.

savings program. In the first version, the young have their own (short-sighted) way of doing things - and it doesn't involve saving for retirement. In the second version, a forced savings program hurts the initial young and helps the unborn because prodigality is the way the young steal from the unborn (even though the former benefit from the prodigality less than it costs the latter). Since the initial old presumably do not care whether the young are forced to save for their old age, forced savings would face a lot of political opposition; neither prodigal father model can explain why forced savings would be the outcome of political processes and why they would not abolished.

There is another solution to the rational prodigal father problem which is both efficient and Pareto improving upon no program. It is the forced savings program above *plus* a transfer from the unborn to the initial young. The sum of these two would be a pay-as-you go system, with an initial generation receiving more in (present value) benefits than it paid in taxes in order to compensate it for giving up its prodigality. Later generations are willing to give up their prodigality because they don't have to finance the prodigality of earlier generations. Hence, the two prodigal father models predict that SS is largely unfunded. It also explains why fully funded systems are often unfunded by the political process.[53]

Finally, none of the versions of the prodigal father model explain why SS induces retirement while at the same time not means-testing benefits.

IV.F. Misguided Keynesian

Thomas Sargent (in Feldstein 1998, p. 306) suggests that SS was created to purposefully reduce national savings in a moment in which aggregate demand was low (the Great Depression) and, following the Keynesian prescription, consumption needed to be stimulated. The point is based on the belief that SS programs tend to reduce national savings (see, for example, Feldstein 1998). This theory is consistent with the fact that SS is usually run by the government. Keynesianism also explains why proof of disability is not required.

If the Keynesian explanation is modified by assuming that policy-makers are wrong to believe in Keynesianism (as Sargent 1998 suggests), then forced savings can improve welfare in the long run.

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[53]There are two ways to modify the model to predict a funded system. One is to allow there to be two types of young: one prodigal and the other saving for retirement and expected to aid the prodigal type. In this case, the second type delivers the political support for the forced savings (this is the model of Mulligan and Philipson 2000). Another modification is to replace short-sightedness by the young with a self-recognized lack of self-control (we owe this point to David Laibson).

If life expectancy grew or workers increased their demand for early retirement, the Keynesian policymaker might decrease the government retirement age in order to counteract the corresponding increase in private savings. This is a prediction consistent with real world SS policy and, as we show above, one that few (if any) other theories can explain.

Unlike many of the efficiency models, redistribution from young to old is efficiency enhancing (because it reduces savings) in the Keynesian analysis. We have therefore entered as a footnote in Table 1 that the Keynesian model is consistent with cross-cohort redistribution.

On the adverse side, this theory encounters problems in explaining the strong retirement incentives generated by SS (which, presumably, tend to increase savings, Feldstein 1974). Nor can discouraging savings explain why so many countries give special treatment to retirement savings or why some SS programs began as funded systems (such as Chile's original SS program, Germany's original program, one of the original French programs, the first U.S. SS law passed in 1935 and Sweden's first system). In addition, this theory offers no explanation as to why benefits are not means tested, why SS is financed with payroll taxes rather than with the regular budget.

Can the misguided Keynesian model explain the positive correlation between economic growth and the size of SS? If the causality is to be from economic growth to SS, it seems the answer must be "no". Why would the Keynesian policy-maker in a rapidly growing economy be the most intent on discouraging savings? Perhaps the causality is the other way around - Keynesian policy makers help their economies grow by discouraging savings? This may be the case, but is inconsistent with Sargent's version of the story in which Keynesianism is misguided (ie, the policy makers believe that savings is bad for growth when in fact it is not).

IV.G. Social Security as Longevity Insurance

This argument concerns uncertainty about the length of life. In few other personal decisions can uncertainty play a greater role. Kotlikoff and Spivak (1981) suggest that risk averse older individuals might be willing to give up as much as one half of their resources in order to gain access to an actuarially fair annuity. In principle, the existence of uncertainty does not imply that government intervention is essential. The capital market may offer appropriate instruments (private annuities). However, if individuals have substantial private information about their health (and, therefore, their mortality), a private annuities market will encounter adverse selection problems. Hamermesh (1987) suggests that this explains why government run mandatory SS programs are efficiency enhancing: participation in an

annuities market must be compulsory (if there are to be annuities at all) because individuals have private information about their mortality.

Obviously this theory can explain why the SS is run by the government and why it is mandatory. The theory is also consistent with the fact that benefits are increasing function of lifetime earnings, the fact that they are usually paid as annuities, or that proof of disability is usually not required (since the program has nothing to do with disabilities).

The theory has problems explaining why governments are so heavily involved in longevity insurance but not other forms of insurance. Moreover, if SS were solving adverse selection problems in private sector insurance markets, why do governments so often give citizens *choices* about when to retire and start taking the annuity? Some governments even allow citizens to opt out of the annuity and take lump sums upon retirement! We also mention in Mulligan and Sala-i-Martin (1999b, Section I.U) that there is little evidence for adverse selection in private life insurance and annuities markets.

Most importantly, this theory does not explain why SS induces retirement. It is interesting that implicit taxes on the elderly are an even more prevalent feature of SS than is it's annuity feature. Examples of countries inducing retirement but not requiring full annuitization are Bahrain, Egypt, and Mexico's new system (U.S. SSA *Programs* 1995).

Since the longevity insurance model does not predict induced retirement, the government retirement age in the model is $\blacktriangledown$ (here we think of the government retirement age as the age where retirement inducements begin). Hence, the theory does not offer predictions for changes over time in the government retirement age.

IV.H. Government Economizes on Administration Costs

Diamond (1993) and others have suggested that SS serves the purpose of private pension plans, but is administered by the government because the government enjoys the greatest economies of scale in administration costs. So, like private pension benefits, SS benefits are earnings tested,[54] not asset tested, increasing in lifetime contributions, and are paid to emigrants and the institutionalized. And like private pension plans, retirement ages have not risen over time.

Diamond's hypothesis implies that the reduced administration costs outweigh costs of the "one-

[54]To be complete, it needs to be explained why private pensions encourage retirement. See Lazear (1979) for one attempt to do so.

size-fits-all" rules (eg., same retirement age) which permit the reduction in administration costs. One crucial implication of this theory is therefore whether in fact government administered plans have lower administrative costs. We point out in Mulligan and Sala-i-Martin (1999b, section I) that a substantial quantity of American private pension money is subject to less administration costs than those of SSA, although perhaps those private pensions are not representative of the pensions administered by the government.

Even if private pension managers *would* administer pensions for the entire labor force in a more costly way than SSA, it does not follow that government administration is preferable. As long as workers are rational and private pension management is a competitive market, the cost argument for government administration requires that private pension managers *cannot* administer pensions for the entire labor force as cheaply as SSA. Revealed preference says that workers are better off under private pension systems for which the low SSA costs are feasible, even though they system may in fact incur greater costs. The reason pension managers would choose a more costly administrative method is in response to their customer's demands to do things in a more costly way.

Furthermore, the theory cannot explain why SS is mandatory or why SS redistributes across cohorts. Nor can Diamond's hypothesis explain why governments do not impose one-size-fits-all in so many other markets such as automobiles, breakfast cereal, or personal computers.

IV.I. Return on Human Capital Investment

Payroll taxes typically provide the vast majority of revenue for SS expenditures. It seems that the old generation has a stake in the earning power of the working age generation: the more the workers earn, the more revenue obtained from taxing payroll at a given rate, and the more revenue available for subsidizing the old. Based on this observation, it has been suggested (eg., Pogue and Sgontz 1977, Becker and Murphy 1988) that Social Security is nothing more than a dividend paid to the old for human capital investments they made when the current workers were of schooling age. And these observers have pointed out that governments are also involved in educational investments - investments which have grown over time together with public pensions.

We formalize this view of Social Security, derive some implications of it, and compare those implications to the facts about Social Security. Each generation lives three periods in our illustrative model. Time is indexed $t = 1,2,3,....$ Generations are indexed $t = -1, 0, 1, 2, ...$ according to the time period in which they lived the first third of their life. Generation t has P_t members. Human capital

investments are made during the first period of life ("youth"). Wage income of a generation t worker is w_t during the middle period. For simplicity, we assume that people work only in the middle period of life.

Each generation t invests in the human capital of generation t+1, owning an α_t interest, for all $t \geq 0$. "Dividends" on this investment are $\alpha_t w_{t+1} P_{t+1}$, and the government forces the young to pay the dividend to the old. Let α_t denote the fraction of generation t's labor income made as an investment in generation t+1's human capital, so the aggregate investment by generation t is $\alpha_t w_t P_t$. The dividend rate α_t depends on the amount invested, the relative cohort size, and other variables according to the technology for human capital investment.

With the exception of generation 0, each working generation provides two sources of funds to the system: a labor income tax at rate α_t to pay the dividends to earlier investors and funds for investment in the next generation. If the funds for investment were obtained as a tax (there may or not be a reason in this model why participation in the system would be compulsory - see below) then the two payments by generation t workers might be merged into a single labor income tax payment at rate τ_t:

$$\tau_0 = \alpha_0$$

$$\tau_t = \alpha_t + \delta_{t-1} \quad , \quad t > 0$$

Notice that the initial working generation did not enjoy investments made by the previous generation and hence pay only investment funds at rate α_0 into the system. Hence tax rates are lowest for the initial working generation (as long as α is not falling too rapidly over time), although $\tau_t > 0$. If the system were terminated, tax rates would also be low for the final generation because they have only to pay back the previous generation but not to invest in the next.

Presumably, the claim by Pogue, Sgontz, Becker, and Murphy that SS is a vehicle for human capital investment, does not preclude the use of an individual accounts system. In other words, the system could be run by giving any individual member of generation t a share of the old age dividends $\alpha_t w_{t+1} P_{t+1}$ according to the amount he contributed during his working years toward investments in the young. The rate of return on those contributions is:

$$r_t^{ss} = \ln \frac{\delta_t w_{t+1} P_{t+1}}{\alpha_t w_t P_t}$$

We believe it is worthwhile to distinguish two versions of the human capital model of SS, even though only one has been discussed in the literature. The first assumes $r_t^{ss} \blacktriangledown r$, for all t where r is a market rate of return of on investments of similar risk. The second assumes $r_t^{ss} < r$.

In an individual accounts system with $r_t^{ss} \blacktriangledown r$, contributions $\Theta_t w_t P_t$ to the system could be voluntary. However, payment of dividends $\Theta_t w_{t+1} P_{t+1}$ may have to be compulsory (ie, the young may need to be forced to keep their repayment promise). Hence, the first version of the human capital model of SS explains why at least some "contribution" to the SS program is compulsory.

Since $r_t^{ss} \blacktriangledown r$ for all t, all generations benefit from SS and it would not be said that SS redistributes across cohorts. Of course, government expenditures on education must, according to the human capital model of SS, be taken into account when it is determined whether SS redistributes across cohorts. The "generational accounting" by Kotlikoff (1992) and followers take educational spending (and other government spending) into account and show how governments have redistributed from young to old cohorts (see also Auerbach et al 1999, p. 77). Hence, the first version of the human capital model of SS is inconsistent with the vast amount of intergenerational redistribution by government.

The second version has $r_t^{ss} < r$ for some t (especially large t) so contributions $\Theta_t w_t P_t$ to the system must be compulsory. If they were voluntary, no worker would contribute because other investments offer better rates of return. If $r_t^{ss} < r$ because too many subsidies were paid to the initial old, then it would be said that SS redistributes across cohorts. Hence, the second version of the human capital model of SS explains compulsory SS and is consistent with SS's redistributing across cohorts. However, it does not explain why the redistribution is from young to old rather from old to young or between other groups. The system is efficiency reducing in the case $r_t^{ss} < r$, so it needs to be explained why the system exists at all.

Since both versions of the model view old age pensions as a return on investment, neither explain why retirement is required to receive those returns. After all, companies pay dividends and interest – and even governments pay interest and principal on their bonds – without inquiring as to the labor market status of the equity- or bond-holder.

V. Narrative Theories

Some theories of SS have been frequently discussed, but not analyzed systematically in the literature. Since there are not mathematical models in the literature for us to derive implications, and the narrative theories are not obviously "political" or "efficiency", we analyze those theories separately here

and do not enter any implications in either Table 1 or Table 2. We entitle the narrative theories: "Chain Letter," "Monopoly Capitalism," and "Nearly rational policy". We hope our discussion of one or more of the narrative theories might intrigue a reader enough for him to develop a systematic mathematical analysis of it.

V.A. Social Security as Chain Letter

Some people argue that SS is like a Ponzi-type chain letter, by which the first generation of elderly takes a pension T from the young, and "promises" that the future generations will pay the money back with some positive rate of return (Friedman 1972, Romer 1994): each generation believes that it is a good idea to pay SS taxes because, by continuing the chain letter, later generations will pay even more taxes to fund benefits. There are two versions of the chain letter model, one narrative and the other from the literature on "dynamic inefficiency."

To see how this would work, consider first the case when the rate of return to private capital investment is $r > 0$ and there is no growth. The first generation of elderly gets a lump sum pension $T > 0$ which is financed, say, with a lump sum tax on the currently young. The "plan" is that each subsequent generation will receive a pension of the same size when old, financed with lump sum taxes on the existing young. Obviously the first generation of elderly wins T since they do not pay any taxes. The second and all subsequent generations will lose rT (which is the opportunity cost of not investing the taxes in the real market, which yields a rate of return r). Note that the present value of all these losses from now to infinity is equal to $(rT)/r=T$. In other words, the gains for the first generation are paid by the losses of all future generations. Notice that, because the first young will not buy this proposal, SS will never get started under these conditions.

In order to make it a "good deal" for the initially young, the initially old would have to "promise" a rate of return larger than r. Let us call this rate of return $r^{ss} > r$. Since the economy does not grow, this can only be achieved by taxing the future young a larger fraction of their income. Obviously, this promise cannot be made ad infinitum because there will be a generation for which the SS taxes will be larger than their entire income. Hence, with probability one there will be a generation that will stop contributing to this pyramid and the generation before that will suffer heavy losses. Backward induction suggests that rational agents will not start playing this Ponzi game so the theory needs to be completed with some assumption of irrational expectations (or perhaps expectations of irrational expectations). Even though we made the argument under the assumption that the growth rate of the economy is zero, it should be

clear that the need to raise taxes continuously (and, therefore, the necessity for the chain letter to eventually collapse) would apply if the growth rate, O, is smaller than the interest rate, r.[55] In other words, Ponzi games of this sort would not arise in dynamically efficient rational expectation economies.

One problem with this theory is that it fails to explain why private-sector chain letters are so much less successful than SS. Another problem is that it does not explain why retirement is induced by the SS system. Finally, these theories face a theoretical problem of enforcement: why do the young believe that the Ponzi Scheme will still be in place when they become old? Sure, the current elderly "promise" that it will be in place, but how can they commit the future young to play the game (especially given that the future young are not even born yet!).

A second version of the "chain letter" theory points to a literature showing how dynamic models of savings and investment need not guarantee that the no-government competitive equilibrium is dynamically efficient. For example, the overlapping generation model of Diamond (1965) show that the competitive equilibrium may entail "excessive" capital accumulation. When this inefficiency occurs, the real interest rate is less than the aggregate growth rate of the economy (which is the sum of the rates of population growth and technological progress). Under these circumstances, the introduction of a public PAYG pension scheme can be seen as an instrument unanimously beneficial. A private pension scheme delivers a rate of return equal to the interest rate, r. If we let the growth rate of the economy be given by O, then the implicit rate of return of a PAYG public SS is O. If the economy is in the dynamically inefficient region, then $O > r$ so a PAYG SS system delivers a superior rate of return. Samuelson (1958) shows that a SS system of this type can lead the economy to the golden rule steady state[56].

A central question is not whether dynamic inefficiency is theoretically possible but whether it is empirically relevant. Since we observe that SS programs have been created all over the world throughout the XX century, one would have to show that dynamic inefficiency is pervasive.

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[55]This differs from the political model of Browning (1975) discussed in section I.A, where SS could be implemented with the votes of the old and the middle aged, even if it was promised that the SS program would grow at a rate less than r (in which case, the young would lose from SS but would be outvoted in an election).

[56] In essence, the literature of SS as a chain letter parallels the literature on rational bubbles. Tirole (1982) shows how rational bubbles cannot exist in infinite horizon models (which deliver dynamically efficient solutions) and Tirole (1985) shows that they may arise in OLG models with dynamically inefficient solutions.

Not only do both versions of the chain letter theory fail to explain why SS induces retirement or why SS is financed with payroll taxes, but these two important facts are excluded from the calculus of the model. To see this, notice that the present value calculations above assume that the old value at T a pension in the amount T. If the taxes and transfers were not lump sum, then there would be distortions which need to be taken into account in the computations of the rates or return. One of the basic results from public finance is that those subsidized typically value their subsidy less than the subsidy costs because *they change their behavior* in order receive to the subsidy or in order to receive a larger one. Since some of the elderly are retiring earlier than they would in the absence of SS, the average valuation by the elderly of a pension in the amount T is less than T, with the difference being the "deadweight cost" of the subsidy. The opposite is the case for the young: rather than valuing their tax dollars T in the amount T, they value it at more than T because they change their behavior in order to avoid additional taxes. Given that the SS chain letter has distortionary tax and benefit formulas, participation in the chain letter only makes sense if r^{ss} is enough greater than r to justify the deadweight costs of the taxes and subsidies.

V.B. Monopoly Capitalism

It has been suggested that government transfers occur in order to pacify beneficiaries, preventing them from (say) revolting against the state. This argument has been applied to Social Security in the neo-Marxist literature on "monopoly capitalism" (eg., Piven and Cloward 1971, Olson 1982; Pampel and Williamson 1989 survey this literature on their pp. 29-34), where it is said that capitalists want to force old workers out of their jobs because the old workers are less productive than young workers. The unemployed old are a political threat to the state, so payments are made to them by the government so that they might be pacified. In these two dimensions, the monopoly capitalism approach is quite similar to the time intensive political competition model of Mulligan and Sala-i-Martin (1999) and the human capital model of Sala-i-Martin (1996): the old, rather than the young, receive substantial payments from the state and those payments are contingent on labor force status rather than poverty. Furthermore, both approaches assume and important link between labor force status and political influence. In sharp contrast with Mulligan and Sala-i-Martin, the monopoly capitalism approach may even predict that the old should be paid even more if they emigrate because presumably emigrants are less of a threat to the government than are angry residents.

We refer to the monopoly capitalism theory has a "narrative theory" because we are unaware of a mathematical presentation of the theory, an attempt to explain cross-country differences in Social

Security, an attempt to explain how capitalists act monopolistically, or even a derivation of several refutable empirical implications.[57]

V.C. Sub-but-Nearly-Optimal Policy Response to Private Pensions

Private pension plans are also associated with rules encouraging or mandating retirement (eg., Lazear 1979, Kotlikoff and Wise 1987). If these alone cause enough people to retire, then perhaps it is not a big deal if a public SS program provides an additional retirement incentive. Nor, the argument goes, would it be a big deal if the government were to mimic private pension plans in other dimensions such as choice of retirement age or use of the payroll tax.

We are unaware of a mathematical model exposing this narrative theory. Even supposing that the theory is logically correct, it needs four ingredients in order to explain the main facts about SS:

(i) a theory of why private pensions induce retirement

(ii) a theory of why older generations are the beneficiaries of SS

(iii) a theory of why the same sub-but-nearly-optimal policies are adopted by so many governments

(iv) private pensions must affect enough people that public pensions are affecting mainly people who already retire because of private pensions

The first ingredient is easily found (eg., Lazear 1979), although it is beyond the scope of this paper to evaluate the empirical validity of the Lazear and other explanations for private sector rules inducing retirement. We show how a theory of why the old are the beneficiaries (rather than the young, the poor, or some other group) is difficult to derive. Since there are so many nearly-optimal policies which could be pursued by governments (eg., very heavy taxes on goods few people consume), we are unaware of an explanation why nearly every government in the world would adopt a particular one - encouraging retirement among those who (according to the theory) would retire anyway.

Item (iv) also finds limited support, since quite a number of U.S. SS beneficiaries are not private pension recipients (Diamond 1977, Table 1) and private pensions also fail to cover a number of European workers (Torrey and Thompson 1980). With so many people not on private pensions and without a justification for public retirement inducements, it seems that a SS benefit decreasing with the recipient's

[57]Cawson (1985), Pampel and Williamson (1989) criticize the monopoly capitalism literature on these grounds.

labor income is quite far from optimal.

VI. Implications of the Theories for Reform

VI.A. A Forced Savings Plan

Consider a forced savings "reform" of SS like the Kotlikoff and Sachs (1998) Personal Security System (PSS). From the point of view of the positive theories above, the main provisions of the plan are:

(i) the elderly are no longer given incentives to retire

(ii) benefits are effectively means tested, where "means" is determined according to income during working life

(iii) eventually the old will consume more relative to the young than they would under the current system (according to Kotlikoff-Sachs projections)

(iv) some taxes paid by the young are used to pay the old and the rest are invested in physical capital markets

(v) benefits for the initial old are effectively reduced, because a consumption tax is used to finance the transition

For the sake of argument, our analysis begins with the supposition that any change the reformers intend to be permanent are actually permanent.

VI.B. Reform Evaluated According to Efficiency Theories

According to the efficiency models, SS is designed the way it is in order to enhance efficiency. An extreme version of this view is that SS is fully optimal, in which case changing the design of Social Security cannot increase welfare unless technology has changed (rendering obsolete policies which were once efficiency enhancing). "Fully optimal" means that welfare has already been maximized!

A less extreme efficiency view is that each provision of SS enhances welfare – welfare would be reduced if any of the provisions were eliminated – but that further welfare gains are possible by quantitatively revising some provisions. For example, one may suppose that efficiency is enhanced when the government encourages retirement, but that many governments have gone too far in this direction.

The proposed reform completely eliminates retirement incentives. The "cross-firm human capital", "optimal retirement insurance", "welfare for the elderly," and the search version of "labor market congestion" models all call for retirement incentives, so this particular reform provision is welfare reducing. The reform does help those who are "poor" in terms of lifetime earnings – a potential benefit

under the "welfare" view – but the removal of the earnings test and the raising of retirement incomes are movements away from progressivity. We therefore enter in Table 2 that reform decreases welfare in these three models.

According to the "return on human capital investment" model, payments to the old are a return on past investments. Paying less to the old than promised (via the sales tax), looks like a capital levy in the model and may be efficient to the extent that the reform does not produce the expectation of future capital levies. Or it may be that the old were being paid more than they promised, in which case the reform is a movement towards greater efficiency. However, the provision (iv) seems to divert funds from human capital investment which is just the opposite as suggested by the "return on human capital investment" model with $r_t^{ss} < r$; we record in Table 2 that reform reduces welfare in the model.

Public pensions are very near substitutes for private pensions in the administrative scale economies model, with the former preferred because the government enjoys lower transactions costs. Diamond (1993) suggests that many privatization proposals will forego the administrative economies, so our Table 2 indicates that reform reduces welfare in the administrative scale economies model. It should be pointed out that Kotlikoff and Sachs (1998) suggest that their plan would retain the low administrative costs of their system. Even so, reform would still decrease welfare in the administrative scale economies model because the current system is a close substitute for private pensions (probably closer than the PSS system, since both the current and private systems encourage retirement) and, we presume, private pensions are designed the way workers want them to be designed.

An even weaker efficiency view is that some provisions of SS enhance welfare while other provisions decrease it, with a net effect of welfare enhancement. This may be true, but in this case the efficiency model no longer serves as a positive theory of the inefficient provisions. Before proposing and evaluating a reform of those provisions, we believe that it is necessary to have a positive theory of them. Nevertheless, this view must be adopted if we are to analyze reform in the prodigal father, longevity insurance, or misguided Keynesian models because these three models explain relatively little about the design of actual SS programs.

There is no role for induced retirement in the prodigal father and longevity insurance models. Indeed, eliminating the retirement test and mandating purchases of annuities seems like the exact solution suggested by the prodigal father and longevity insurance models. These models say less about the desirability of fully funding the program, but our Table 2 records a welfare increase of reform in these models.

Encouraging savings is a bad idea in the Keynesian model, but Sargent (1998) argues that the Keynesian model is simultaneously incorrect and a motivator of policy. Assuming that PSS's encourage savings (they may not if they encourage enough work during old age), they improve welfare in Sargent's "Misguided Keynesian" view.

A positive theory can provide a framework for evaluating reform, but it can also be used to determine whether reform plans are credible. In particular, the elimination of induced retirement occurs under the PSS plan but is undesirable according to the "cross-firm human capital", "optimal retirement insurance", "welfare for the elderly", the search version of "labor market congestion," and "administrative cost" efficiency models. Hence, these models suggest that provision (i) of the PSS system is unlikely to be implemented or to remain implemented. The "welfare for the elderly" model also suggest that a SS program will not provide much more consumption for the old than enjoyed by the young, because the model emphasizes redistribution from rich to poor.

Eliminating induced retirement is credible in the prodigal father model, since induced retirement serves no efficient purpose. Pareto optimal allocations are feasible in the model regardless of whether the system is fully funded or not. However, as discussed in our Section I.D, full funding benefits the unborn at the expense of the living, and is anticipated to have little political support. Nor does the prodigal father model offer much reason to expect a SS program to remain fully funded into the indefinite future.

VI.C. Reform Evaluated According to Political Theories

SS reform looks better from the point of view of the political theories because the outcome of redistribution need not be efficient, although the political theories may question the political feasibility of SS reform. We review in some more detail below how SS reform may enhance efficiency according to each of the theories assuming, for the moment, that the SS reform would be feasible in spite of the political forces emphasized by the theories.

Induced retirement is, in a sense, used for rent-seeking in the time-intensive political competition model. Successfully eliminating induced retirement would thereby reduce rent seeking and increase aggregate efficiency. However, through an income effect on the elderly, forced savings increases leisure and political activity by the elderly. An income effect on the young decreases their leisure, while a substitution effect (because labor income taxes are used to finance the forced savings) increases it. The net effect of the PSS plan may well be greater rent-seeking, more intergenerational redistribution, and less aggregate efficiency. Table 2 therefore records an ambiguous effect of reform in the time-intensive

political competition model.

Induced retirement serves neither an efficiency nor a political purpose in the voting models, so eliminating it enhances efficiency. Kotlikoff and Sachs (1998) also plan to reduce the amount of intergenerational redistribution (with the consumption tax in the short run and forced savings in the long run), which also tends to increase efficiency.

Holding constant the amount of redistribution, induced retirement reduces efficiency in the taxpayer protection model. However, the model also suggests that induced retirement reduces the amount of redistribution, and less redistribution enhances aggregate efficiency. It is therefore ambiguous whether a reform eliminating induced retirement enhances efficiency.[58]

All of the political approaches view redistribution as an equilibrium outcome, and cannot be eliminated merely with a "plan." The international history of SS systems that begin as fully funded, and then become unfunded through a series of legislation changes, illustrate this point. Fundamental political reform, not just plans to change tax and expenditure policy, is probably needed to reduce the amount of redistribution. Unfortunately, we and previous authors have not yet used the positive political theories to derive political reform proposals that might enhance the political feasibility of SS reform.

Efficiency and political approaches have different implications and hence can be distinguished on the basis of observations. As Table 1 suggests, we believe that some of the key observations – SS spending crowds out other government spending, that the old often consume more than the young, and SS redistributes across cohorts -- are consistent with political theories but typically inconsistent with efficiency theories. In our view, the available observations give the most credence to the political approaches and most credence to the view that SS reform must also include political reform in order to be effective.

VII. Conclusions

In this paper we introduce a number of facts about and theories of SS. Some of the facts and theories have been individually reported in previous studies, while others are original (or substantially extended here). Of course, one of the more consistent and quantitatively important factual findings is that SS redistributes across cohorts. But we report some other findings that are much less recognized, but

[58]See Becker and Mulligan (1998) for a quantitative analysis of the tradeoffs between efficient policy and redistribution.

hardly less robust or less relevant for evaluating positive theories: that SS benefits are paid in a way that induces a beneficiary's retirement but does not depend on his asset income, that the old consume as much or more than do the young, and that similar programs are found in democracies and nondemocracies.

We show how these and other facts are important for distinguishing among the theories and derive some predictions of the theories for reform. No single theory fits all of the empirical findings, but there are three of them that may be consistent with the more robust and important findings: time-intensive political competition, cross-firm human capital spillovers, and "economizing on transactions costs." Those theories offering favorable evaluations of a reform plan like that proposed by Kotikoff and Sachs (1998), seem to be least consistent with the empirical findings.

Public Finance evaluations of social security reform often find reform to be welfare improving. Why are we more sanguine? Part of the explanation is that public finance assumes from the outset that policy embodies some mistakes and makes no attempt to explain the source of those mistakes. Part of the explanation may also be that analysts implicitly believe those theories in which intergenerational transfers are undesirable.[59] In either case, we point out that the vast majority of SS programs in the world have a lot of features in common, features which are inconsistent with a number of positive theories of SS. Is it that policymakers all over the world are making the same mistakes decade after decade? Or are economists missing other important economic, political, and social forces creating and sustaining SS?

We point out two important areas for future research. The first is empirical work verifying and refuting those facts we have shown to be crucial for distinguishing among positive theories. Second, relatively few explanations for the induced retirement provisions of SS are available so there is a demand for additional explanations. One source of additional explanations may be to combine two or more of the theories presented here. With 12 or more theories on the table, there are at least 66 ways to combine them two at a time; we await further evidence and reaction from readers before examining combinations of theories.

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[59]Some may also believe national savings is inadequate for other reasons so that a fully funded system improves upon an otherwise equivalent unfunded system for reasons unrelated to the existence of SS.

Table 1: Distinct Implications of Political and Efficiency Models of Social Security

Legend
Y consistent with theory
N inconsistent with theory
na no prediction from theory

observation	consistent with: Political?	Efficiency?
The theory provides a relationship between SS and collective decision-making	Y	na
no difference between democracies and nondemoc	N†	Y
SS "crowds out" other government spending	Y	N
old consume as much or more than young	Y	N/na
SS redistributes across cohorts (from younger to older)	Y	N*
government regulation increasingly favors the elderly‡	Y	N

†except pressure group models

*except Cross-firm Human Capital Spillover, Labor Market Congestion (search version), and Misguided Keynesian

‡this observation is probably the least well documented

Table 2: More Facts, Theories of Social Security, and Implications for Reform

Positive Theories:	Political				Efficiency							
Legend Y consistent with theory N inconsistent with theory na no prediction from theory **Social Security in Practice**	rational median voter	time-intensive political competition	taxpayer protection	welfare for the elderly	cross-firm human capital spillovers	optimal DI/"retirement" insurance	solution to labor market congestion	solution to prodigal father problem	Misguided Keynesian	optimal longevity insurance	Economizing on Transaction Costs	return on human capital investment
Old Age Benefit Formulas												
a declining function of labor income	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N
often involve 100% labor income tax rates	N	Y	Y	N	Y	N	N	N	N	N	Y	N
nonlinear tax rates, but some taxation of even very high labor income	N	Y	na	Y	N	na	na	na	N	N	Y	N
no asset tests	N	Y	N	N	Y	N	Y	N	N	N	Y	N
an increasing function of lifetime wage	N	Y	na	N	Y	Y	Y	N	N	Y	Y	Y
proof of disability usually not required	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
usually paid as annuity	Y	Y	na	na	na	na	na	Y	na	Y	Y	N
sometimes paid as lump sum	N	N	na	na	na	na	na	N	na	N	na	Y
retirement age not rising w/ health, life expect	N	na	na	N	N	N	N	na	Y	na	Y	Y
Other												
SS a government program	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	N
SS financed with payroll taxes	N	Y	N	N	Y	Y	Y	N	N	Y	Y	N
SS "crowds out" other government spending	Y	Y	Y	Y	N	N	N	Y	Y	N	N	N
benefit per elderly unrelated to elderly pop. share	N	na	N	na	N	Y	na	Y	na	na	Y	N
benefit per elderly increasing w/ elderly pop. share	Y	na	Y	na	Y	N	na	N	na	na	N	N
even small elderly populations benefit	N	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y
size (+) correlated with retirement incentives	N	Y	N	na	Y	Y	Y	N	na	na	N	N
size (+) correlated with economic growth	Y	Y	na	Y	Y	N	na	N	N	na	na	Y
it is difficult to borrow against future SS benefits	N	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N
LR Welfare Effect of Forced Savings	+	?	?	-	-	-	-	+	+	+	-	-

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