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SOCIAL SECURITY IN THEORY AND PRACTICE (II): EFFICIENCY THEORIES, NARRATIVE THEORIES, AND 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? Mulligan and Sala-i-Martin (1999) document several of the internationally and historically common features of social security programs, and explore "political" theories of Social Security. This paper discusses 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", the "prodigal father problem", the "misguided Keynesian", the "optimal longevity insurance", the "government economizing transaction costs", and the "return on human capital investment". We also analyze four "narrative" theories of social security: the "chain letter theory", the "lump of labor 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, and may decrease it.

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There is a lot of talk about reforming old age Social Security (hereafter SS). Two important questions come to mind. First, is reforming SS desirable? That is, will the reform improve welfare for a significant number of people? 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 rate of return, but keeps the elderly working! Since any reform evaluation implicitly assumes a positive theory of SS, our task in this paper and a companion 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 sustainable? In particular, is a "fully funded" system sustainable? Is 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 (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 answer the question of whether reforms are sustainable, we also need to have a positive theory of SS. 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 and a companion paper (Mulligan and Sala-i-Martin 1999b) is to identify such a positive theory or theories of SS. The companion paper documents a number of "facts" about SS programs

[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.

around the world and about government spending on the elderly in general. We suggest there that SS theories can be grouped into three categories: Political, Efficiency and Narrative theories, and derive implications of the political theories.

In the first section of this paper we derive implications of efficiency theories of SS. In section II we discuss four narrative theories. Section III derives some implications for reform in the light of each of the efficiency and political theories. Perhaps surprisingly, those theories most consistent with the empirical regularities are those in which forced savings is a rather undesirable policy, even in the long run.

For convenience, we reproduce here the summary Table 2 displayed in the companion paper. This Table is a useful guide to comparing various efficiency theories. We refer readers to the companion paper's Table 1 for an analysis of some of the common implications of efficiency theories, and how they compare with those of the political theories.

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

I. 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.

I.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 $w \in [0,\overline{w}]$. 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.[2] α is the population fraction old and $(1-\alpha)$ 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

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

has other revenue needs in the amount $G \geq 0$ per capita.[1] 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, $G = (1-\alpha)G_y + \alpha G_o$ 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 $\alpha(G-G_o)$ 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 (1), which we restate below for the readers convenience:

$$
\begin{aligned}
W(G_i) \equiv \max_{T_i(\cdot),\, c_i(\cdot),\, n_i(\cdot)} & \int_0^{\bar{w}} u\big(c_i(w), n_i(w)\big) f(w)\, dw \quad \text{subject to:} \\
& \int_0^{\bar{w}} T_i(w n_i(w)) f(w)\, dw \geq G_i \qquad (1) \\
n_i(w) &= \underset{n}{argmax}\; u\big(w n - T_i(w n), n\big) \\
c_i(w) &= w n_i(w) - T_i(w n_i(w))
\end{aligned}
$$

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 foryoung 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:

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

$$\max_{G_o, G_y} \alpha\beta W(G_o) + (1-\alpha)(1-\beta) W(G_y)$$
$$\text{s.t.} \quad \alpha G_o + (1-\alpha) G_y \geq G \tag{2}$$

where β is the relative weight placed by the government on the utility of the old. Notice that $\beta = ½$ means that government places equal weight on the welfare of a young and old person. If $\beta = ½$, 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 $\beta > ½$ (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 $\beta > ½$ 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[4] 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

[4]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.

SS systems.

The model with $\beta > \frac{1}{2}$ 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.

Remember that the creation of SS is not predicted by this model unless we have $\beta = \frac{1}{2}$. Hence, to the extent that $\beta > \frac{1}{2}$ is needed to derive accurate SS implications from the Mirrlees model, the welfare approach leaves unexplained why the old receive greater weight in public decisions. In this case the Mirrlees model needs to be combined with a political or ethical theory of $\beta > \frac{1}{2}$.

Up to here we have assumed that there are no differences between young and old. Could a welfare model explain SS, even in the case of $\beta=\frac{1}{2}$ 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 $\beta = \frac{1}{2}$ 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 $\beta > \frac{1}{2}$ 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.

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 in Mulligan and Sala-i-Martin (1999b, Section I), those aged 65+ enjoy sources of income that are quite comparable to those of younger people while at the same time enjoying nearly twice as much leisure (see Figure 1 in that paper). It appears that, including other sources of income and in kind transfers such as medical care and housing assistance, the aged 65+ age group commands a disproportionate share of national income in developed countries.[5]

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[5]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.

The relative incomes of the elderly may not explain the emergence and growth of SS. 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 (1) might justify such a policy.

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

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

The Mirrlees problem (1) 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.[6]

[6]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.

The other puzzles noted above - such as excessive generosity and the prevalence of 100% taxes[7] - 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.

I.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 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 i's productivity $w_i = w(h_i, \bar{h})$ depends positively on his own human capital h_i and on the average human capital in the economy $\bar{h}$, where $\frac{\partial w_i}{\partial \bar{h}} > 0$ and where individual i contributes to the average according to how much he works n_i:[8]

$$\bar{h} = \frac{\sum_i n_i h_i}{\sum_i n_i}$$

If, for example, the work decision is discrete ($n_i \in \{0,1\}$) 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 ($PMPL_i$) is given by.

$$PMPL_i = w(h_i, \bar{h})$$

The social marginal product ($SMPL_i$) 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

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

[8]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.

sum of $PMPL_i$ and person i's effect on the wages of all other members of the economy through his effect on the average human capital.

$$SMPL_i = w(h_i, \bar{h}) + \frac{h_i - \bar{h}}{\sum_j n_j} \sum_j n_j \frac{\partial w_j}{\partial \bar{h}}$$

where the first fraction in the last term is the contribution of i'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 ($h_i < \bar{h}$). 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 $w_i = h_i \omega(\bar{h})$. The *SMPL* in this case can be written as

$$SMPL_i = w_i + h_i \eta - \bar{h} \eta = w_i + w_i \frac{\eta}{\omega(\bar{h})} - \bar{h} \eta$$

where $\eta = \frac{\sum_j n_j h_j \omega'(\bar{h})}{\sum_j n_j}$. 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 τ and optimal earnings subsidy rate σ 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.[9] 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).[10]

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:

$$\max_{c,c_1,c_0} u(c,0) + \beta\pi d(c_1) + \beta(1-\pi)u(c_0,0) \quad \text{subject to:}$$
$$c + R\pi c_1 + R(1-\pi)c_0 \le 1 + R(1-\pi) \qquad (3)$$
$$u(c_0,0) \ge u(c_1,1)$$

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. Diamond and Mirrlees make the additional weak assumption that perfect insurance (ie, $d'(c_1) = \partial u(c_0,1)/\partial c_0$) 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

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

[10]Diamond and Mirrlees (1978, p. 331-2) clearly view the program (3) as modeling SS more generally, including the old age portion.

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[11]:

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

This first order condition differs from that of the optimal RI program (3), because the only cost of savings considered by the individual saver is the foregone consumption (the LHS above) whereas the planner solving (3) 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 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:

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

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

[11] 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: $c + s \le 1$, $c_1 \le s/R + 1$, and $c_0 \le s/R$.

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 (3) 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).[12]

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.

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

I.D. 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.

I.D.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.[13]

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 needed to pay them. However, this reasoning cannot explain why even the richer members of the initial old generation would receive subsidies.[14] 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.

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[13] 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.

[14] 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.

I.D.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".[15] 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 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

[15]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.

funded systems are often unfunded by the political process.[16]

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

I.E. 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.

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

[16]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 1999). 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).

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).

I.F. 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 ∞ (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.

I.G. 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,[17] 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-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.

I.H. 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.

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

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 δ_t interest, for all $t \geq 0$. "Dividends" on this investment are $\delta_t w_{t+1} P_{t+1}$, 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 δ_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 δ_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 $\delta_t w_{t+1} P_{t+1}$ 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 $r_t^{ss} \geq r$, 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 $r_t^{ss} \geq r$, contributions $\alpha_t w_t P_t$ to the system could be voluntary. However, payment of dividends $\delta_t w_{t+1} P_{t+1}$ 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 $r_t^{ss} \geq r$ 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. 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 $\alpha_t w_t P_t$ 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.

II. 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 of this and the companion paper. We entitle the narrative theories: "Chain Letter," "Lump of Labor," "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.

II.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, γ, is smaller than the interest rate, r.[18] 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 γ, then the implicit rate of return of a PAYG public SS is γ. If the economy is in the dynamically inefficient region, then $\gamma > r$ 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[19].

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.

Not only do both versions of the chain letter theory fail to explain why SS induces retirement or why SS

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[18]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).

[19] 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.

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.

II.B. Lump of Labor

A popular European theory of SS argues that jobs need to be redistributed from the old to the young in a world where there is a lot of unemployment. The story may run as follows: suppose that there is involuntary unemployment (due to some imperfection in the labor market, or to excessive regulation, or to the existence of powerful unions, etc.). The government may wish to take some of the jobs currently done by citizens of "near retirement age" in exchange for a SS pension, and give them to the young.

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) efficiency 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). A third version of this story would say that unions favor this policy because the fundamental difference between a young unemployed and a retired old is that the unemployed person "searches" for jobs and, as a results, contributes to downward wage pressure.

Obviously this story is 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. The model is also consistent with some kind of public intervention and with the fact that SS exists even with small populations of elderly.

However, the model does 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). Nor does it explain why the government pays the old not to work rather than paying the young, women, teenagers, or some other group. More work also needs to be done to demonstrate the reasons for "involuntary unemployment" and to show what they imply for the design of SS.

Mulligan and Sala-i-Martin (1999) suggest that the "lump of labor" theory is not a theory itself, but a byproduct of another theory of SS and induced retirement. They suggest that the scientific or economic validity of the "lump of labor" story 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).

II.C. 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.[20]

II.D. 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 in this and the companion paper 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 labor income is quite far from optimal.

III. Implications of the Theories for Reform

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

III.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.

III.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", and "welfare for the elderly" 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 $r_t^{ss} \geq r$; 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", 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.

III.C. Reform Evaluated According to Political Theories

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 reform.

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.[21]

All of the political approaches view redistribution is an equilibrium outcome, and cannot be eliminated merely with a "plan." Fundamental political reform, not just plans to change tax and expenditure policy, is probably needed to reduce the amount of redistribution.

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

Efficiency and political approaches have different implications and hence can be distinguished on the basis of observations. 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.

IV. Conclusions

In this and a companion paper (Mulligan and Sala-i-Martin 1999b), we introduce a number of facts about and theories of SS. We show how the facts are important for distinguishing among the theories and derive some predictions of the theories for reform. We find a few theories offering favorable evaluations of a reform plan like that proposed by Kotikoff and Sachs (1998), but those theories are least consistent with the facts. Other theories suggest that the plan reduces welfare and/or that the plan is not possible without political reform.

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.[22] 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 11 or more theories on the table, there are at least 55 ways to combine them two at a time; we await further evidence and reaction from readers before examining combinations of theories.

[22]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.

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