

Myopia and the Effects of Social Security and Capital Taxation on Labor Supply

Louis Kaplow*

Abstract

Myopia is increasingly believed to be a significant determinant of behavior and also plays a central role in justifications for social security and policies toward the taxation of capital. It is important, however, to account for labor supply effects, particularly in light of the preexisting distortion due to labor income taxation. For example, might even actuarially fair social security have the highly distortionary effect of a tax on top of an existing tax (the income tax) because myopic individuals give excessive weight to present levies on earnings that finance distant future benefits? This article analyzes the effect of savings-related policies on labor supply in a model that explicitly incorporates myopic decision-making. Many of the results may seem counterintuitive. In most respects, even with myopia, social security has qualitatively different effects than those of a tax levied on top of an existing tax. Both social security and capital taxation may cause labor supply to rise or fall when individuals are myopic, depending on the curvature of individuals' utility as a function of consumption. Moreover, whatever is the sign of these effects under one assumption about how myopia relates to labor supply decisions, the sign is reversed under the other assumption that is considered. Additionally, some interventions have a first-order effect on labor supply from the outset but others do not, and some labor supply effects rise with the magnitude of the intervention whereas others fall.

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1. Introduction

Economists have long been interested in myopia. See, for example, Strotz (1956). Subsequent researchers have emphasized myopia as an explanation for savings behavior, including notably those features that have been difficult to reconcile with idealized models of life-cycle maximization. See, for example, Laibson (1996, 1997) and the surveys by Bernheim (2002) and Bernheim and Rangel (2007). Empirical work has focused on such subjects as whether individuals' retirement savings are adequate and, relatedly, the existence of and explanation for a significant drop in consumption upon retirement.¹

It is also appreciated that myopic savings behavior may have normative implications. Laibson (1996) estimates that correctives for inadequate savings due to myopia could raise individuals' lifetime welfare to an extent equivalent to almost an additional year's worth of income. Social insurance and tax provisions for retirement savings seem motivated in part by the concern that shortsighted individuals may inadequately provide for themselves. Accordingly, economists' recently increased attention to social security and longstanding interest in optimal capital taxation should be extended to incorporate myopic behavior.

The present study pursues such an inquiry with an emphasis on the implications of myopic savings behavior for labor supply. The subject of labor supply is significant in itself and is especially important in light of the preexisting distortion due to labor income taxation: if savings promotion policies reduce labor effort even modestly, there would be a first-order welfare cost that could exceed the welfare gains from improved consumption allocation, whereas if they raise labor supply, there would be an additional first-order gain. Such effects could significantly alter the optimal strength of savings policies. Although it is true that labor supply in general – and how it may be affected by social security and capital taxation – has been studied extensively, it is important to consider how the analysis changes if it is assumed that savings decisions are myopic.

Regarding social security, if mandatory contributions, typically a function of labor income, are viewed by individuals as an additional tax, labor supply effects should be highly significant because payroll taxes that fund social insurance are of a similar magnitude to income taxes. Following the rule of thumb that distortion is proportional to the square of the tax rate, the total distortion would quadruple. In this regard, it is significant that much quantitative analysis, such as that estimating the deadweight loss of taxation (e.g., that surveyed in Fullerton (1991)), treats payroll taxes that fund social insurance benefits as pure additions to the income tax on labor. This treatment, however, seems problematic because such levies do, at the margin, finance nontrivial benefits. The approach might nevertheless be justified as an approximation by

¹See, for example, Kotlikoff, Spivak, and Summers (1982), Banks, Blundell, and Tanner (1998), Engen, Gale, and Uccello (1999), Moore and Mitchell (2000), Bernheim, Skinner, and Weinberg (2001), Aguiar and Hurst (2005, 2007), Scholz, Seshadri, and Khitatrakun (2006), and Smith (2006). To the extent that most individuals' savings are not substantially deficient, as suggested by Scholz, Seshadri, and Khitatrakun (2006), an important reason (which they highlight) may be the presence of social security and defined-benefit pension plans, themselves advanced, in significant part, as a remedy for shortfalls that would otherwise arise.

invoking myopia. Specifically, even an actuarially fair social security retirement scheme, not in itself a net tax, might be imagined to have effects similar to those of a current tax on labor income if individuals are significantly myopic, for the contributions are extracted from earnings in the present whereas the benefits they finance are in the distant future. But is this logic correct?

This article explores whether myopia indeed implies that the payroll tax has an effect on labor supply similar to that of a tax upon a tax. Although prior theoretical literature, such as Diamond and Mirrlees (1978, 1986), has examined a number of respects in which social security may influence retirement decisions, labor supply during working years has received more limited scrutiny. See, for example, Diamond (2002) and the survey by Feldstein and Liebman (2002).² In particular, it has not been systematically analyzed for the case in which individuals are myopic. Yet this case is a particularly natural one to consider in light of the fact that myopia is thought to provide an important justification for the existence of social security.

Regarding the taxation of capital, it is understood that such taxation serves indirectly as a tax on labor and thus contributes to the distortion of labor supply. To hold the overall level of taxation on labor supply constant, one can examine capital taxation as a form of differential commodity taxation, where different commodities correspond to consumption in different time periods. Atkinson and Stiglitz (1976) showed that, in the presence of an optimal income tax, no differential taxation is optimal when commodities as a whole are weakly separable from labor, with the implication that capital should not be taxed. However, taxes on capital – or, equivalently, differential taxes on future consumption – are ordinarily levied in the future, raising the possibility that they may have less of an effect on the current labor supply of myopic individuals. Perhaps deferred taxation generally, whether substituting a cash-flow consumption tax for a tax on wages as earned or shifting from the taxation of earnings to the taxation of capital, would have a favorable effect on labor supply when individuals are myopic. Relatedly, perhaps the subsidization of capital income (such as preferential treatment of retirement savings), which may otherwise appear attractive as a counterweight to myopic savings decisions, will have an offsetting cost of increasing labor supply distortion. To determine whether these and other conjectures are valid, it is necessary to revisit prior analysis of capital taxation, incorporating myopia explicitly.

This article analyzes the effects of social security and capital taxation (or subsidization) on labor supply in a setting in which individuals' consumption allocation decisions are myopic. Because this is a preliminary investigation of a complex problem, it will focus on a fairly basic model that highlights central issues but abstracts from a number of complications. Consumption decisions are assumed to exhibit a simple form of myopia wherein excessive weight is placed on

²Prior work that examines aspects of the interaction between social security and labor supply – much based on the absence of perfect tax-benefit linkage – includes Auerbach and Kotlikoff (1987), Browning (1985), Burkhauser and Turner (1978, 1985), Gordon (1983), and Moffitt (1987). Important variations in the degree of tax-benefit linkage are utilized (for statistical identification purposes) in Liebman, Luttmer, and Seif (2009) who indicate, for example, that the linkage can be zero (such as in years that are dropped or for a married individual whose benefit is determined entirely by the spouse's earnings) and can exhibit positive discontinuities, notably, when crossing the vesting point. See also Diamond and Köszegi (2003) on myopia and retirement and Feldstein (1985) on myopia, social security, and savings.

first-period consumption. For labor supply, the article considers two cases that are loosely analogous to naive and sophisticated versions of individual decision-making in some of the behavioral economics literature. First, labor supply decisions are assumed to maximize the same myopic behavioral utility function that determines individuals' consumption and savings decisions ("myopic labor supply"). Second, labor supply decisions are assumed to be made with an awareness that consumption will be misallocated due to myopia ("nonmyopic labor supply").

Section 2 examines social security. To isolate the effects of myopia, actuarially fair schemes are considered. Given individuals' myopic consumption decisions, the direct effect of social security's forced-savings feature is to raise welfare (confining attention to policies strong enough to bind but not so strong as to push savings beyond the nonmyopic optimum). When labor supply decisions are myopic, social security may raise or reduce labor supply. There are two competing forces: Labor effort is less attractive because the individual is unable to allocate marginal disposable income in the manner (mis)perceived to be optimal, but it is more attractive because the (mis)perceived deficiency in present consumption raises perceived marginal utility more than the (mis)perceived excess in future consumption reduces perceived marginal utility. Which force is greater depends on the curvature of individuals' utility functions: stronger curvature (here, equivalent to higher risk aversion) makes the latter effect more pronounced, and if it is sufficiently strong, the net effect on labor supply will be positive. In either case, however, as the forced-savings constraint just begins to bind, there is no first-order effect on labor supply even though there is a first-order welfare gain in improved consumption allocation. In this respect, despite the existence of even significant myopia, the social security "tax" does not behave as a tax imposed on top of a preexisting tax (a linear labor income tax in this model): A small pure additional tax, unlike the social security tax here, would have a first-order effect on labor supply and thus on distortion.

Moving to the case in which individuals' labor supply decisions are nonmyopic, the sign of the effect of social security on labor supply reverses. That is, in cases in which the effect on labor supply is negative (positive) with myopic labor supply, it is positive (negative) with nonmyopic labor supply. This difference arises because nonmyopic individuals view social security's forced savings positively, which reverses both the direct effect of social security on the allocation of consumption between periods and the indirect effect on marginal utilities of consumption in the two periods, as will be explained. Additionally, in this case there is a first-order effect of social security on labor supply as the forced-savings constraint just begins to bind, but one that falls as the constraint becomes tighter. In this case, the effect of social security differs greatly from that of a tax upon a tax.

Section 3 analyzes the taxation of capital. It first shows that, as one would expect, capital subsidization opposes the effect of myopia on consumption allocations, which raises welfare. Regarding labor supply, the effects are analogous to those of social security. For myopic labor supply, there is no effect of capital taxation or subsidization on labor supply at the point at which a differential is first introduced. But with nonmyopic labor supply, there is a first-order effect of the same sign and analogous magnitude to that arising under social security's forced savings. This section also considers the implications of heterogeneity in susceptibility to myopia.

Section 4 examines the choice between social security and capital subsidization as remedies for myopia and also considers the relevance of liquidity constraints to the analysis. Section 5 offers concluding remarks.

2. Social Security

2.1. Model

Consider a two-period model in which individuals supply labor, l , in the first period at the wage w and allocate disposable income between consumption, c_1 and c_2 , in periods 1 and 2. Suppose that utility takes the following form:

$$(1) \quad u(c_1, c_2, l) = \frac{c_1^{1-\rho}}{1-\rho} + \delta \frac{c_2^{1-\rho}}{1-\rho} - z(l),$$

where δ is the subjective discount factor and z measures the disutility of labor effort, with $z' > 0$ and $z'' > 0$. (To clarify, δ is taken here to be a real trait of individuals' utility for purposes of assessing social welfare; myopia will be introduced separately below.) The positive constant ρ is the coefficient of relative risk aversion, utility from consumption in each period taking the constant-relative-risk-aversion form (where it is understood that, when $\rho = 1$, utility from consumption c_i is instead given by $\ln c_i$). This functional form further implies that there is a constant elasticity of intertemporal substitution in consumption, equal to $1/\rho$. Individuals are assumed to be subject to a linear income tax with marginal rate t and grant g , and savings earn interest at the rate r , so the budget constraint (before we consider social security or capital taxation) is

$$(2) \quad c_1 + \frac{c_2}{1+r} = (1-t)wl + g.$$

The first-order condition for consumption allocation between the two periods by a nonmyopic individual (which can be determined by solving the budget constraint (2) for c_2 , substituting it into expression (1), and differentiating) is

$$(3) \quad \left. \frac{du}{dc_1} \right|_{l=l^0} = c_1^{-\rho} - \delta(1+r)c_2^{-\rho} = 0 \quad \text{or} \quad \frac{c_1}{c_2} = \left(\frac{1}{\delta(1+r)} \right)^{1/\rho}.$$

The vertical bar and subscript denote that labor supply, l , is held constant at some initial level, l^0 , meaning that the derivative indicates a reallocation of consumption toward the present, holding labor supply constant. Let c_1^* denote the optimal level of first-period consumption by a nonmyopic individual (which can be stated explicitly by simultaneously solving expressions (2)

and (3) for c_1 and c_2).³

To introduce myopia in a simple manner, suppose that, in allocating disposable income between c_1 and c_2 , individuals behave as if they are maximizing the following variant of the utility function given by expression (1):

$$(4) \quad u^M(c_1, c_2, l) = \beta \frac{c_1^{1-\rho}}{1-\rho} + \delta \frac{c_2^{1-\rho}}{1-\rho} - z(l),$$

where the weight on first-period consumption β is taken to exceed 1.⁴ The important point is that individuals' consumption behavior is dictated by their myopic utility function, u^M , which is different from that which defines their actual well-being (1), i.e., that which is relevant for assessing social welfare. This formulation could be taken to represent quasi-hyperbolic discounting, as in Laibson (1996, 1997), for the case of a two-period model, or other forms of myopia.⁵

The first-order condition for consumption allocation by a myopic individual (which, as before, can be determined by solving the budget constraint (2) for c_2 , substituting it into expression (4), and differentiating) is

$$(5) \quad \left. \frac{du^M}{dc_1} \right|_{l=l^o} = \beta c_1^{-\rho} - \delta(1+r)c_2^{-\rho} = 0 \quad \text{or} \quad \frac{c_1}{c_2} = \left(\frac{\beta}{\delta(1+r)} \right)^{1/\rho}.$$

Let c_1^M denote the (perceived) optimal level of first-period consumption by a myopic individual. Comparing expressions (3) and (5), it is clear that $\beta > 1$ implies that the ratio of first- to second-period consumption is greater when individuals are myopic.

³Note that c_1^* and c_1^M , defined below, depend on l through the budget constraint (2). This point is of little consequence because only heuristic use is made of these variables.

⁴It would also be natural to weight the disutility of labor, z , by β because labor is supplied in the first period; however, including such a weight would not materially affect any of the results below. (Specifically, each of the z' and z'' terms in expressions (7), (8), (A5), (A10), and (A11), involving the cases with myopic labor supply, would be weighted by β , but the ultimate expressions of interest would be unchanged; this additional weight on z -related terms would only appear implicitly, in d^2u/dl^2 in the denominator of expressions (9), (10), (16), (A14), and (A15).) Note also that, instead of weighting first-period sources of utility by β , one could weight second-period utility from consumption by a fraction less than one. The results would be nearly identical, the difference between the two formulations being in the cardinalization of utility as function of consumption. (Recall that the discount factor δ does not already reflect such a downward weighting of second-period consumption because δ is taken to be the true subjective discount rate, a feature of the normatively relevant utility function.)

⁵The reader may be aware that it is conventional to embed myopia in a model with at least three periods in order to be able to distinguish empirically between pure time preference and myopia. For present purposes, however, we are *presuming* the existence of myopic consumption allocations across periods and asking instead the implications of the resulting consumption bias for labor supply. Hence, the different parameters in expression (4) for myopia and pure time preference would, in principle, be determined by empirical work estimating a model with additional periods. It will become apparent, however, that this simpler, two-period model is sufficient to generate the central phenomena of interest here.

At this point, social security can be introduced into the model. This could be done fairly generally by letting $T^S(wl)$ denote the social security tax on labor earnings that individuals are required to pay in period 1 and $B^S(wl)$ represent the level of social security benefits they receive in period 2, where benefits depend in some fashion on prior contributions. In order to isolate the effects of the forced-savings feature of social security from redistributive and revenue effects, it will be assumed that social security is actuarially fair, i.e., $T^S(wl)(1+r) = B^S(wl)$ for all wl . (In the presence of a tax on labor income, the assumption that social security is actuarially fair is primarily a matter of notational convenience, for any difference between social security taxes and the present value of subsequent benefits at a given income level could instead be understood as a component of the labor income tax.) Note that actuarially fair social security would have no effect on the budget constraint (2), and thus on behavior, if individuals could freely borrow against (period 2) social security benefits and, furthermore, if despite their myopia they fully appreciated the availability of such benefits and had no compunction against borrowing. Thus, social security is only interesting when such borrowing is impossible or otherwise will not occur, as will be assumed throughout.

Accordingly, the (only) effect of social security is to constrain the amount individuals can consume in period 1. For convenience, this upper bound on c_1 will be stated as a fraction of disposable income, so social security policy may be described simply yet completely by χ , the minimum required fraction of savings.⁶ There is now the additional constraint

$$(6) c_1 \leq (1 - \chi)[(1 - t)wl + g].$$

If the constraint is binding, this expression is satisfied as an equality, which in turn for any given level of l dictates the allocation of disposable income between c_1 and c_2 .

If labor supply was unaffected by social security, welfare analysis would be straightforward. Raising χ has no effect until the point at which the constraint (6) begins to bind, i.e., the point at which the level of c_1 that satisfies (6) as an equality just equals c_1^M . As χ is raised further, c_1 will fall. This initially produces a first-order welfare gain because the ratio of first- to second-period consumption is greater with myopia, and raising χ continues to produce such a gain until c_1 just equals c_1^* . In this respect, the forced savings that results from social security can be viewed as a substitute for a commitment technology that myopic individuals

⁶Other formulations of social security could be analyzed, including one in which the bound is a fraction of earnings, wl , and another in which the bound is a fraction of after-tax earnings, $(1-t)wl$ (which differ from disposable income on account of g). For any given tax rate t , these two formulations are equivalent to each other, and the effect of changing the bound differs between the two cases only in magnitude because raising the latter bound (on after-tax earnings) one unit has a smaller effect than raising the former bound (on before-tax earnings) when $t > 0$. Analysis of these two cases yields results qualitatively similar to those of the case considered in the text. Note that including g in the quantity that is subject to forced savings, as is done here, has the effect that forced savings are a constant fraction of disposable income at all income levels, whereas the other formulations would make forced savings a rising fraction of disposable income (because the grant g , exempt from the forced-savings requirement in the alternative formulations, is a greater share of disposable income for lower-income individuals). Alternatively, if the grant payment was divided between the two periods, these two alternative models would be even closer to the present model.

would employ to reduce their level of c_1 if they had the ability to do so.⁷

In subsequent discussion, attention will largely be confined to levels of χ sufficiently high that the constraint binds (for lower values of χ , there is no effect on consumption and thus no effect on labor supply) but not so high as to force c_1 above c_1^* . The question to be explored is whether the effect of raising χ on labor supply reinforces or detracts from (or has no effect on) the welfare gains from forced savings in reallocating consumption between the two periods.

Finally, some choice must be made about how to model labor supply decisions. Currently, myopic behavior is not that well understood, myopia is known to be context specific, and empirical evidence relating myopic consumption and labor supply is limited.⁸ Thus, it seems unwise to stipulate some particular assumption as a universally correct depiction of behavior. Accordingly, two rather different cases will be considered. In the first, which will be called myopic labor supply, individuals' labor supply decisions are taken to be governed by the same myopic behavioral utility function that determines the allocation of consumption between periods. In essence, our myopic individual only knows one utility function.

In the second, referred to as nonmyopic labor supply, individuals are assumed to understand that they will allocate their earnings according to the myopic behavioral utility function, but they also appreciate what their realized utility actually will be (i.e., that such an allocation involves too high a level of c_1). Our first case is akin to what is often described as naive in the behavioral economics literature and that the latter is a form of what is termed sophisticated decision-making. Specifically, sophistication refers to the possibility that individuals lack self-control with regard to particular decisions in certain circumstances – here, the inability to resist the present urge to consume – but they do not lack awareness of this deficiency, or at least this is so at certain “cooler” or more reflective times, when they may be able to make decisions with long-lasting consequences.

Each of these cases may sometimes be realistic, depending on the nature of the labor supply decision in question. For example, decisions about whether to pursue higher education or what occupation to choose might be made nonmyopically: the individual is making long-term plans, in which immediate temptations may not overwhelm the decision. By contrast, individuals at a given moment may forgo an overtime opportunity because of the near-instant gratification generated by going out with friends or home to watch favorite television shows. For simplicity, the analysis to follow will focus on these two pure cases.

⁷For individuals who already can commit to lower levels of c_1 , social security would have no effect until the constraint began to bind on them, i.e., until first-period consumption is forced lower than the level to which they can successfully commit themselves. For simplicity, it is assumed that no private commitment technologies exist.

⁸For example, some individuals employ commitment devices (automatic contributions to retirement accounts, not purchasing types of food they know they will overeat), many fail to borrow (fully or at all) from increased home equity despite their tendency to consume all of their paychecks, and savings behavior may be influenced by modest changes in framing, such as when individuals' contributions to 401(k) plans depend on what contribution, if any, is specified as the default. On the latter, see Madrian and Shea (2001), Choi et al. (2004), and Chetty et al. (forthcoming).

2.2. Myopic Labor Supply

The present assumption is that individuals' labor supply decisions are determined by maximizing utility as defined in expression (4) rather than as defined in expression (1). Keep in mind that these individuals likewise believe that their consumption allocations are also determined by the maximization of expression (4).⁹

When the forced-savings constraint is binding, expression (6), holding as an equality, determines c_1 as a function of l . The value of c_2 as a function of l can be determined by substituting for c_1 in the budget constraint (2), yielding $c_2 = \chi[(1-t)wl+g](1+r)$. The first-order condition for labor supply in this case is

$$(7) \frac{du^M}{dl} = \beta c_1^{-\rho} (1-\chi)(1-t)w + \delta(1+r)c_2^{-\rho} \chi(1-t)w - z' = 0.$$

Differentiating this expression with respect to χ and rearranging terms yields

$$(8) l_\chi = (1-t)w \times$$

$$\frac{\beta c_1^{-\rho} \left\{ 1 - \rho c_1^{-1} (1-\chi)[(1-t)wl + g] \right\} - \delta(1+r)c_2^{-\rho} \left\{ 1 - \rho c_2^{-1} \chi[(1-t)wl + g](1+r) \right\}}{-\rho \beta c_1^{-\rho-1} (1-\chi)^2 (1-t)^2 w^2 - \rho \delta(1+r)^2 c_2^{-\rho-1} \chi^2 (1-t)^2 w^2 - z''},$$

where l_χ denotes $dl/d\chi$. Observe first that each term in braces in the numerator reduces to $1-\rho$ because c_i^{-1} is followed by the expression for the respective c_i . When this common term is factored, what remains is equal to $du^M/dc_i|_{l=l^o}$, as indicated by expression (5). Finally, the denominator can be shown to be equal to d^2u^M/dl^2 (from differentiating expression (7), i.e., for the present case of myopic labor supply). Accordingly, expression (8) simplifies to

$$(9) l_\chi = \frac{(1-\rho)(1-t)w \left(du^M / dc_1 \Big|_{l=l^o} \right)}{d^2u^M / dl^2}.$$

To interpret this expression, note first that the denominator must be negative at the individual's optimum from the second-order condition for labor supply (and it can readily be shown to be strictly negative for all l in any event). Second, observe that the presence of the

⁹It is analytically uninteresting to examine the case when individuals do not expect social security to be binding on themselves because there would be no effect on labor supply, keeping in mind that attention is focused on the case in which χ is not set so high as to force c_1 below c_1^* . The absence of analytical interest does not mean that this case cannot be of practical interest. If individuals did behave in this alternative manner, social security would raise welfare through improved consumption allocation, and no further analysis would be required to take into account effects on labor supply.

term $du^M/dc_1|_{l=l^0}$ in the numerator indicates that, as the constraint just begins to bind, the effect on labor supply (in whichever direction it may be) will be zero. As the constraint becomes tighter (as χ increases once the constraint binds), $du^M/dc_1|_{l=l^0}$ becomes (more) positive. The reason is that this derivative reflects myopic individuals' *perceived* marginal utility from raising c_1 rather than their actual marginal utility from doing so. When the social security forced-savings constraint is binding, c_1 is less than what myopic individuals would choose, so the perceived marginal utility of raising c_1 would be positive. Accordingly, l_χ is negative (positive) – i.e., tightening the forced-savings constraint reduces (increases) labor supply – if $\rho < 1$ ($\rho > 1$).

The intuition for this latter result can be understood by decomposing two effects, indicated respectively by the “1” and the “ $-\rho$ ” in the leading term $1-\rho$. A direct effect arises from augmenting forced savings. When labor supply decisions reflect the same myopia as do individuals' first-period consumption allocation decisions, forcing an incremental reallocation of consumption toward period 2 is viewed as undesirable. Hence, the perceived return to labor effort falls. An indirect effect is due to changes in relative marginal utilities of consumption in the two periods. As χ is increased, the consumption reallocation toward period 2 changes the marginal utility of consumption in each period, making it higher in period 1 and lower in period 2. Because first-period rather than second-period consumption is perceived as too low, the reallocation changes the (perceived) marginal utility of consumption more in the first period than in the second. (Stated precisely, the third derivative of utility as a function of consumption is positive, so the magnitude of the second derivative is greater when consumption is (perceived to be) low, as it is here in the first period, than when it is high, as in the second period.) When the curvature of the utility function is low, $\rho < 1$ – i.e., the elasticity of intertemporal substitution is high, $1/\rho > 1$ – this latter effect is less than the direct effect due to consumption being perceived to be less-well allocated between the two periods, so the overall perceived marginal benefit of increasing labor effort falls. (As will be discussed momentarily, this case roughly corresponds to that in which the labor supply curve is upward sloping.) However, when curvature is high, $\rho > 1$, the latter effect dominates, so labor effort rises. In other words, when $\rho > 1$, the fact that social security makes earnings seem less attractive due to forced consumption misallocation is outweighed by the fact that the forced reduction in c_1 increases the perceived marginal value of first-period consumption, which can only be raised, partially restoring it to its unconstrained level, by working more. When $\rho < 1$, this latter effect is present but insufficient to outweigh the direct reduction due to the perceived misallocation of consumption. These results may be summarized as follows:

Proposition 1: When individuals' consumption allocation and labor supply decisions are subject to myopia, the effect on labor supply of tightening the social security forced-savings constraint is:

- (a) zero as the constraint just begins to bind, but thereafter is nonzero (unless $\rho = 1$) and
- (b) negative, if $\rho < 1$, and
- (c) positive, if $\rho > 1$.

The welfare implication in case (b), in light of the fact that there is a significant pre-existing labor supply distortion is that the optimal degree of forced savings may be significantly less than would be optimal on consumption allocation grounds alone. By contrast, in case (c), we have an

additional first-order welfare gain from forced savings, supplementing that which motivates these policies, which favors greater forced savings, ceteris paribus.

Further illumination regarding the difference between the social security “tax” (the amount paid in period 1, as a function of wl , to fund consumption in period 2) and the income tax (also a positive function of wl) can be gleaned by comparing l_χ to l_t . For the latter, differentiate expression (7) with respect to t , rearrange terms, and make some substitutions to yield

$$(10) \quad l_t =$$

$$\frac{(1-\rho)w[(1-\chi)\beta c_1^{-\rho} + \chi\delta(1+r)c_2^{-\rho}] + \rho wg[(1-\chi)^2\beta c_1^{-\rho-1} + \chi^2\delta(1+r)^2c_2^{-\rho-1}]}{d^2 u^M / dl^2}$$

To compare l_t to l_χ , focus initially (and primarily) on how the first term in the numerator on the right side of expression (10) compares to the numerator of the right side of expression (9). The term in brackets in the first term of (10) is positive, as is the value of $du^M/dc_1|_{t=0}$ in (9) (when considering the range in which the constraint is binding). Likewise, the leading factors both have the term $1-\rho$, so they also have the same sign. However, the terms in brackets themselves are quite different. Raising t reduces consumption in both periods (by $1-\chi$ and χ in periods 1 and 2, respectively), whereas raising χ reduces consumption in the first period while increasing it in the second (see expression (5) for $du^M/dc_1|_{t=0}$). As noted when interpreting expression (9), the effect of the latter is nil at the point at which the constraint just begins to bind and rises thereafter, so the effect of the constraint is in this respect qualitatively different from that of a tax levied on top of a tax. Observe that this difference persists even when myopia is significant. The reason is that myopic individuals do not have a higher marginal utility in period 1 once they have optimally – from their perspective – adjusted their levels of consumption. At that point, they value increments to c_1 and to savings equally.¹⁰ In conclusion:

Remark 1: When individuals’ consumption allocation and labor supply decisions are subject to myopia, the effect on labor supply of tightening the social security forced-savings constraint is qualitatively different from that of increasing the existing income tax rate.

¹⁰Another distinction between l_t and l_χ is due to the second term in the numerator of expression (10), which has no corresponding component in expression (9): Raising t pertains only to earned income and not to the grant component g of the linear income tax, so the income effect is adjusted accordingly. As a result, there will be a range of ρ somewhat in excess of one for which l_t is negative even though l_χ for the myopic case is positive. See Chetty (2006) on how unearned income influences the values of ρ for which labor supply is upward sloping. Note that, in the present problem, despite myopia, it can be shown that labor supply is affected analogously by changing t and by changing w , just as in the standard problem; that is, $l_t = -wl_w/(1-t)$.

2.3. Nonmyopic Labor Supply

Assume now that individuals' labor supply decisions are nonmyopic (recall the examples of higher education and occupational choice) even though their consumption decisions are myopic. Specifically, suppose that individuals choose labor supply to maximize utility as defined by expression (1) rather than expression (4), but these labor supply decisions take into account that, when it comes time to decide upon consumption, the allocation will be given by expression (5), except to the extent constrained by social security, expression (6).¹¹

The analysis of this case is straightforward from the above derivation, although the conclusions differ. The first-order condition for labor supply is now

$$(11) \quad \frac{du}{dl} = c_1^{-\rho} (1 - \chi)(1 - t)w + \delta(1 + r)c_2^{-\rho} \chi(1 - t)w - z' = 0.$$

This is identical to condition (7) for the case of myopic labor supply except that $\beta = 1$. Differentiating this expression with respect to χ , rearranging terms, and making substitutions analogous to those used previously yields

$$(12) \quad l_\chi = \frac{(1 - \rho)(1 - t)w \left(\frac{du}{dc_1} \Big|_{l=l^o} \right)}{d^2u / dl^2}.$$

This condition is deceptively similar to expression (9) for the case of myopic labor supply, but it is importantly different because, in the numerator, $du^M/dc_1|_{l=l^o}$ from expression (5) is replaced by $du/dc_1|_{l=l^o}$ from expression (3), i.e., the effect on *nonmyopic* utility from raising c_1 . When consumption decisions are anticipated to be myopic, and assuming that χ is in the range in which there is still overconsumption in period 1, the value of $du/dc_1|_{l=l^o}$ is negative (whereas $du^M/dc_1|_{l=l^o}$ was positive) because, on account of myopia, c_1 has been raised past the point at which the nonmyopic first-order condition for consumption is satisfied.

An immediate implication is that l_χ now has the same sign as $1 - \rho$ rather than the opposite sign. That is, as more savings are forced, labor supply will rise (fall) if ρ is less (greater) than 1. As before, the phenomenon has two components. First, when χ is increased, earnings are better allocated, which encourages labor effort. Because the labor supply decision is taken to be rational, the value of social security – as a substitute for a device making it possible for individuals to commit to consume less – is positive in fact and is perceived as such. On the other hand, as χ is increased, the reduction in consumption misallocation changes the marginal utility of consumption in each period, making it higher in period 1 and lower in period 2. Because of the curvature of utility as a function of each period's consumption, the latter effect is greater. When $\rho < 1$ (which, recall, roughly corresponds to the case of upward sloping labor supply), this

¹¹One could also consider the possibility that myopia is not anticipated when choosing labor supply, but then social security would have no effect on labor supply because the constraint would not be expected to bind.

latter effect is less than the direct effect due to consumption being better allocated between the two periods, so the overall marginal benefit of increasing labor effort rises. However, when $\rho > 1$, the latter effect dominates, so labor effort falls.

Another difference between the present case and that with myopic labor supply is that, there, $l_\chi = 0$ as the forced-savings constraint just began to bind, whereas here this is not true: At that point, the marginal gain from consumption reallocation toward the future, which is taken into account in individuals' labor supply decisions, is at its greatest, and thus forced savings affects labor supply nontrivially (except when ρ or β is close to 1) from the moment the constraint begins to bind. This factor and, accordingly, the effect of forced savings on labor supply will equal zero not when the constraint just begins to bind but rather when χ reaches the point at which the magnitude of forced savings just equals its optimal (nonmyopic) level, i.e., when $c_1 = c_1^*$. If χ were increased further, $\partial u / \partial c_1$ would reverse sign, becoming positive, and the sign of l_χ would reverse from whatever it had been when χ was lower. These results may be summarized as follows:

Proposition 2: When individuals' consumption allocation decisions are subject to myopia but their labor supply decisions are not, the effect on labor supply of tightening the social security forced-savings constraint is:

(a) nonzero (unless $\rho = 1$) as the constraint just begins to bind and thereafter – until consumption equals the nonmyopic optimum, at which point the effect is zero, after which it reverses from what is described in (b) and (c) – and in this initial range is

(b) positive, if $\rho < 1$, and

(c) negative, if $\rho > 1$.

In addition, juxtaposing the results for the cases of myopic and nonmyopic labor supply further reinforces the sense in which the effect of social security on labor supply differs from that of raising the marginal tax rate t on labor income. The fact that the sign of the effect on labor supply from tightening the forced-savings constraint (whatever it might be) is opposite for myopic and nonmyopic labor supply decisions most clearly demonstrates that social security is qualitatively different. (Note that the reversal in sign applies independently to each of the two effects, the direct effect on the (perceived) allocation of consumption and the indirect effect due to the curvature of the utility function.) Additionally, in each case, the magnitude of the effect is determined differently. For myopic labor supply, the initial marginal effect is zero – whereas adding a small ordinary tax on top of a preexisting tax has a first-order effect – and it grows in magnitude as the constraint tightens. For nonmyopic labor supply, the effect on labor supply (in whichever direction) is initially first-order and tends to fall (rather than rise) as more savings is forced, reaching zero when forced savings equal the nonmyopic savings optimum (after which the sign of the effect reverses from whatever it was).

As previously noted, an important part of the explanation for these differences between forced savings and taxation is that, even with significant myopia that leads to substantial overallocation of disposable income to c_1 , the result of the misallocation is an increase in the actual and perceived marginal utility of c_2 , sufficiently so that, at the unconstrained myopic optimum, the individual is indifferent between reallocations of consumption between the two

periods. Hence, forcibly reallocating some consumption to period 2 does not act at all like a tax, at least initially, in the myopic labor supply case and is viewed as a benefit (rather than as a cost, as with a tax) in the nonmyopic labor supply case. Although the magnitude of these effects changes as the constraint tightens, they do not immediately vanish. In conclusion:

Remark 2: When individuals' consumption allocation decisions are subject to myopia but their labor supply decisions are not, the effect on labor supply of tightening the social security forced-savings constraint is qualitatively different from that of increasing the existing income tax rate.

3. Taxation of Capital Income

3.1. Model

This section uses the same two-period model used in section 2 to analyze social security. The only difference is that, instead of introducing a constraint (6) on first-period consumption, differential commodity taxation will be examined. As in standard models of commodity taxation, suppose that the government can impose a tax τ_i on each of the commodities c_i (corresponding to consumption in each period). For convenience, let $\theta_i = 1 + \tau_i$ denote the tax-inclusive price facing consumers. Accordingly, the budget constraint (2) can be rewritten as

$$(13) \theta_1 c_1 + \frac{\theta_2 c_2}{1+r} = (1-t)wl + g.$$

Although it is conventional to think of a tax on capital income as applying to the interest rate r , the present formulation is equivalent and eases exposition. (If the second term on the left side of (13) was written instead as $c_2/[1+r(1-\tau_r)]$, where τ_r was the tax rate on interest, one could let $\theta_1 = 1$ and $\theta_2 = (1+r)/[1+r(1-\tau_r)]$, which produces expression (13) as the budget constraint.)

Because we wish to focus on the effect of differential commodity taxation on consumption, utility, and labor supply, abstracting from effects on the overall level of taxation, it will be useful to consider a particular policy experiment: As θ_2 is increased, it is assumed that θ_1 is decreased to keep the present value of revenue raised from commodity taxation constant, under the hypothetical assumption that labor supply is unchanged.¹² Furthermore, it will be convenient to follow the practice in much of the literature on optimal commodity taxation of focusing on local effects, in particular, raising θ_2 from a starting point at which $\theta_1 = \theta_2 = 1$.¹³ Under these assumptions, to determine the required adjustment to θ_1 , one can differentiate an

¹²Instead of adjusting θ_1 , one could adjust the tax system parameters, t and g , and derive analogous results, for it is familiar that changing the overall level of commodity taxes – keeping consumer price ratios, here θ_1/θ_2 , constant – is equivalent to changing the level of labor income taxation. Holding t constant and making all the adjustments through the θ_i 's has the virtue of keeping clear both that the overall level of taxation is fixed and, relatedly, that the only change involves the relative taxation of consumption in each period.

¹³In the present setting, analysis of further deviations would require recalibration of the revenue-neutral tax adjustment ($d\theta_1/d\theta_2$) to account for the extent of the change in c_1 .

expression for (the present value of) commodity tax revenue, which is $(\theta_1 - 1)c_1 + (\theta_2 - 1)c_2/(1+r)$, with respect to θ_2 , set it equal to zero, and evaluate the result at $\theta_1 = \theta_2 = 1$, which yields

$$(14) \frac{d\theta_1}{d\theta_2} = -\frac{c_2}{c_1(1+r)}.$$

3.2. Analysis

The effect of social security on consumption in each period and thus on the welfare of myopic individuals, ignoring effects on labor supply, was immediate. The effect of differential commodity taxation is not as analytically straightforward – and the analysis is relegated to the appendix – but the bottom line is simple and intuitive:

$$(15) \frac{dc_1}{d\theta_2} = \frac{c_2}{\rho(1+r)}.$$

As we would expect, c_1 rises more in response to an increase in θ_2 the smaller is the curvature of the utility function, ρ (which, as noted, is the coefficient of constant relative risk aversion; also $1/\rho$ indicates the elasticity of intertemporal substitution). When individuals are myopic it is optimal with regard to intertemporal consumption allocation to reduce θ_2 from its benchmark level, i.e., to employ a capital subsidy, in order to induce a decrease in first-period consumption, which is too high relative to what would be ideal according to the normative utility function (1).

Next we examine how the desirability of taxing or subsidizing capital is influenced by labor supply effects. Following the approach used when analyzing social security, it is first assumed that individuals choose labor supply to maximize myopic utility, expression (4), and that they are aware that their consumption decisions are myopic as well.¹⁴ The analysis, which is fairly involved, appears in the appendix. The result can most conveniently be expressed as

$$(16) l_{\theta_2} = \frac{-\left(\frac{1-\rho}{\rho}\right)\left(\frac{(1-t)wc_2}{y(1+r)}\right)\left(\frac{du^M}{dc_1}\Big|_{l=l^o}\right)}{d^2u^M/dl^2},$$

where $y = (1-t)wl+g$, disposable income, as given on the right side of the budget constraint (13). Because individuals' (myopic) first-order condition for consumption is satisfied, it follows that $l_{\theta_2} = 0$. This result is as one would expect: As one just begins to raise θ_2 (and lower θ_1 as

¹⁴Unlike in the case of social security, it would not be analytically trivial to consider the alternative assumption that individuals are myopic when choosing labor supply but do not anticipate being myopic when choosing consumption. If one followed the subsequent derivations, mutatis mutandis, it would be seen that the same result obtains (in sharp contrast to the case with social security).

indicated by expression (14)), starting from $\theta_1 = \theta_2 = 1$, the resulting change in the allocation of consumption has no first-order effect on myopic individuals' (perceived) utility; hence, the return to labor effort is unaffected. This result is analogous to that for social security when the constraint just begins to bind. (Compare expressions (16) and (9).) Accordingly, we can state:

Proposition 3: When individuals' consumption allocation and labor supply decisions are subject to myopia, raising the relative tax rate on second-period consumption (i.e., in a constant-revenue manner) has no effect on labor supply at the point of no differential taxation.

We next consider the case in which individuals' labor supply decisions are nonmyopic: they choose labor effort to maximize expression (1) rather than expression (4).¹⁵ Analysis of this case closely parallels that in the appendix for myopic labor supply, as the note here explains, and hence is not repeated.¹⁶ The result is

$$(17) \quad l_{\theta_2} = \frac{-\left(\frac{1-\rho}{\rho}\right)\left(\frac{(1-t)wc_2}{y(1+r)}\right)\left(du/dc_1|_{l=l^o}\right)}{d^2u/dl^2}.$$

Expression (17) differs from expression (16) because we now have the *nonmyopic* derivative of utility with respect to c_1 in the numerator. Because of myopia in the actual choice of consumption, this derivative is negative (individuals' initially are overconsuming in the first period) – until c_1 is reduced to c_1^* . Because the denominator is also negative, the sign of l_{θ_2} will be the same as that of $\rho-1$. The interpretation is the same as in the case of social security with nonmyopic labor supply. The direct effect of raising θ_2 , i.e., of taxing capital (second-period consumption) is to worsen the already distorted consumption allocation, which reduces the return to labor effort. (This corresponds to the “-1” in $\rho-1$.) The indirect effect is that, as the distortion worsens, there is a further drop in the marginal utility of first-period consumption and rise in the marginal utility of second-period consumption. The latter effect is larger and, if $\rho > 1$, exceeds the direct effect, causing labor supply to rise.

If differential commodity taxation is to be employed as a partial remedy for myopia, a capital subsidy would be contemplated. This would increase labor supply when $\rho < 1$ and decrease labor supply when $\rho > 1$. This is the same result as with tightening the social security forced-savings constraint in the case of nonmyopic labor supply. Indeed, a comparison of expressions (17) and (12) indicates that they are nearly identical. The opposite signs are due to the fact that raising the social security contribution requirement (raising χ) reduces c_1 whereas raising θ_2 increases c_1 . The other differences in the numerator reflect different scaling due to the

¹⁵If their myopic consumption choices are unanticipated, a small change in capital taxation has only a second-order effect on their consumption allocation, so labor supply is unaffected, just as was true with myopic labor supply.

¹⁶Specifically, expressions (A5) through (A14) would be unaltered except for the fact that the β 's in expressions (A5), (A10), (A11) and (A14) would be replaced by 1 's. There are also β 's implicit elsewhere, in particular, in the definition of Ω ; these remain unaffected because they indicate consumption myopia.

differences in the policy experiments.¹⁷ Therefore, we have:

Proposition 4: When individuals' consumption allocation decisions are subject to myopia but their labor supply decisions are not, raising the relative tax rate on second-period consumption (i.e., in a constant-revenue manner) has a nonzero effect on labor supply (unless $\rho = 1$) at the point of no differential taxation, which is

- (a) negative, if $\rho < 1$, and
- (b) positive, if $\rho > 1$.

3.3. Heterogeneity

It is plausible to suppose that individuals vary in their susceptibility to myopia. Such differences might be reflected in myopia per se (the level of β) as well as in their ability to employ commitment strategies to offset the effects of myopia. For simplicity, suppose that there are two types of individuals, some myopic (to the same degree) and some not. Such heterogeneity implies that there will be a tradeoff in determining the optimal tax (subsidy) on capital. Beginning with the case in which there are no labor supply effects, a small capital subsidy will produce a first-order utility gain to the myopic but no first-order loss to the nonmyopic. As the subsidy rises, the extent of the gain to the former group will fall, and there will be an increasing first-order loss to the latter. Hence, the optimal subsidy will reflect a balance between these considerations.

Labor supply has already been examined for individuals exhibiting consumption myopia. For those who do not, it is clear that there will be no first-order effect of a small degree of capital subsidization on labor supply. The reasoning parallels that in subsection 3.2 for myopic labor supply by myopic consumers: Because the initial effect on reallocating consumption is second-order, the return to labor is unchanged. Hence, regarding a small capital subsidy, the only labor supply effects will be attributable to myopic consumers with nonmyopic labor supply, so any adjustment for labor supply effects would be weighted by their fraction in the population.

In a complete optimal income taxation analysis, one would also have to take into account distributive effects due to heterogeneity. Specifically, nonmyopic individuals will, ceteris paribus (for a given ability and earnings level) be better off than myopic individuals. This difference in well-being may seem to favor some redistribution from the nonmyopic to the myopic, and since the former save more than the latter, capital taxation rather than subsidization (or perhaps less subsidization than otherwise would be optimal) may be in order. This difference in utility levels is relevant, however, only to the extent that the social welfare function is strictly concave in utilities. For a utilitarian social welfare function (and, to a degree for others, short of maximin), it is differences in marginal utilities of consumption between the nonmyopic and

¹⁷In expression (17), $c_2/\rho(1+r)$ equals $dc_1/d\theta_2$, as indicated by expression (15), reflecting the fact that, when capital taxation is changed, individuals are induced to adjust consumption (to an extent that depends on the elasticity of intertemporal substitution and the level of consumption subject to tax). The only other difference between expressions (17) and (12) is the y in the denominator of the numerator in expression (17). This reflects that χ , the forced-savings minimum for social security, is applied to income as a whole; see expression (6).

myopic that count. For further analysis, see Kaplow (xxxx).

4. Discussion

4.1. *Social Security versus Capital Subsidization*

Consider the choice between the use of social security and capital subsidization as remedies for myopia. In the case in which all individuals suffer equally from myopia, the two policies are quite similar. Social security forces additional savings whereas capital subsidization induces it. One could compare regimes that were scaled so as to have the same effect on first-period consumption, in which case the direct welfare effect with regard to improved consumption reallocation would be the same. Likewise, labor supply effects would be similar. (Recall, for example, the comparison of expressions (12) and (17) for the case of nonmyopic labor supply; the only difference is due to scaling, which is taken here to be equalized.)

The more important case involves heterogeneity, for example, the previously noted situation in which some individuals are (equally) myopic and others are not. Social security, in the range considered, improves consumption allocations for the former group (and has the aforementioned effects on labor supply) and has no effect on the latter because the forced-savings constraint is not binding for them. By contrast, capital subsidization reduces first-period consumption of both groups. For the nonmyopic, this consequence is distortionary (once the subsidy becomes strictly positive). There would also be effects on labor supply, the direction depending on the curvature of the utility function.

It is also interesting to consider the combined use of social security and capital subsidization. As the social security constraint becomes tighter, capital subsidization would tend to become less desirable: The favorable inducement for the myopic would become less important, but the distortion of the nonmyopic would remain. Additionally, if capital subsidization were already employed, the effect of social security would be nil until the now-later point at which the forced-savings constraint begins to bind on the myopic.

4.2. *Liquidity Constraints*

The possibility that some individuals are liquidity constrained, especially when young, is relevant to the consideration of myopia, forced savings, and capital taxation. See, for example, Hubbard and Judd (1986, 1987). Although liquidity constraints are moot in the present model because all lifetime income is earned in the first of the two periods, they could emerge as important in a natural extension with multiple periods of work.

The effect of liquidity constraints on consumption misallocation depends on individuals' true utility functions, their myopia, and the way liquidity constraints bind. For the myopic, liquidity constraints might increase utility by reducing overconsumption in early years. If liquidity constraints force consumption to be too low, however, social security's forced-savings constraint can only hurt. It would be binding if earnings in early years are low relative to lifetime income and borrowing is limited. As a consequence, it may be desirable to defer forced-

savings requirements until individuals are at a stage at which earnings are greater and consumption needs are lower, mirroring optimal retirement savings patterns of nonmyopic individuals.

Capital subsidization would not induce further reductions in early consumption of liquidity-constrained individuals. Indeed, capital taxes or subsidies – imposed as a function of unearned income – would be irrelevant for individuals who neither borrow nor save (and who would not be induced to do so by the tax or subsidy). It would be possible to differentially tax consumption in different periods (tax rates could depend on age); then higher taxes in early years and lower taxes in later years would reduce early consumption, which would be detrimental for liquidity-constrained individuals.

The analysis of labor supply, the focus here, is affected by liquidity constraints in a straightforward manner. Regarding individuals for whom the constraints are binding, neither social security nor capital subsidization affects consumption; hence, labor supply is unaffected as well. For individuals not bound by liquidity constraints, the effects of such policies on labor supply are as analyzed previously.

5. Conclusion

This article offers a preliminary analysis of the effects of social security and of capital taxation on labor supply in a model in which individuals exhibit myopia in their allocation of consumption over time. The questions are important given the belief that myopia may significantly influence individuals' decision-making and that myopia has a central role in justifying social security and policies toward the taxation of capital. Moreover, as noted in the introduction, estimates of the deadweight loss of taxation often include social security taxes while ignoring benefits, a treatment that might have been imagined to be a plausible approximation if individuals are highly myopic.

The effect of social security on labor supply was seen to depend on the curvature of individuals' utility functions and also on whether or not labor supply decisions reflect an appreciation that consumption decisions will be myopic. Interestingly, although the sign of labor supply effects depends on the same parameters in each of the two cases regarding labor supply myopia, the effects are reversed in the two cases on account of the fact that the desirability of social security in reallocating consumption across periods is perceived in an opposite fashion. Furthermore, for myopic labor supply, the social security forced-savings constraint has no effect at the margin when it just begins to bind, but for nonmyopic labor supply, the effect is first order – although decreasing as the constraint becomes tighter. In many respects, the social security “tax” does not have the properties of a tax levied on top of a preexisting tax (here the labor income tax), even though individuals' myopia leads them to overweight the present, when the social security tax is levied, relative to the future, when actuarially fair benefits are paid.

Capital taxation contributes to the distortion of consumption allocations due to myopia, making capital subsidization appealing. Raising capital taxation shifts taxation from the present to the future in this paper's model (in which revenue raised at a given income level is held

constant). In light of individuals' myopia, one might have expected capital taxation to be attractive on this account, yet it does not reduce labor supply distortion in any straightforward manner. Capital subsidization improves myopic individuals' consumption allocations, and its effects on labor supply turn out to be quite similar to those of social security and thus depend on the curvature of individuals' utility as well as on whether labor supply decisions are myopic.

In both settings, counterintuitive results are explained in significant part by the fact that even myopic individuals are assumed to engage in optimization. Their consumption allocations do not imply a preference for present consumption at the margin because their myopia has already skewed consumption toward the present until the point at which the individuals are indifferent to marginal adjustments. Social security's forced-savings requirement, as it begins to bind, and capital taxation each influence consumption allocations beginning from that point.

This investigation suggests a number of avenues for further inquiry. As section 4 notes, allowing additional periods of labor supply, nonconstant wage profiles, and liquidity constraints would complicate the welfare analysis, as does heterogeneity (briefly explored in subsection 3.3, with regard to capital taxation). In addition to comparing the welfare effects of social security and capital taxation (subsidization) on myopic individuals, other policies such as the structure of retirement plans could be examined.

It is also important to explore the implications of other behavioral assumptions. Bernheim (1994), Diamond (2004), and others suggest that retirement savings may be suboptimal because of the sheer complexity of retirement planning and individuals' inexperience. To analyze this problem, it would be necessary to define more precisely the structure of individuals' errors in order to examine the effects of social security, capital taxation, or other policies on labor supply and welfare.¹⁸ In this setting, it might be supposed that some individuals would save too little and others would save too much; the latter may be unaffected by social security but be further distorted by capital subsidization.

It would also be instructive to introduce uncertainty regarding future earnings and health status. In addition to influencing the analysis of the labor supply effects of social security retirement schemes and capital taxation, it would also be appropriate to investigate other forms of social insurance, such as for unemployment and disability. One might expect myopia to operate similarly because these sorts of social insurance programs, like social security retirement systems, tend to impose a present tax on earnings in order to finance future benefits, albeit state-contingent ones.¹⁹ Of course, additional features would be introduced as well.

Finally, the present analysis suggests avenues for empirical investigation. Study of the

¹⁸One specific possibility is that some individuals underestimate and others overestimate the benefits generated by their payroll contributions (see Liebman and Luttmer 2011, 2012), in which case social security acts like a labor income tax on the former and a subsidy on the latter. Or individuals might not appreciate marginal effective tax rates and respond instead to average tax rates. See Liebman and Zeckhauser (2004).

¹⁹The labor supply effects of political uncertainty of the sort measured by Dominitz, Manski, and Heinz (2003), concerning whether future benefits will be paid, would be quite different. Specifically, individuals might treat the perceived future deficiency as an additional tax on labor supply and also be induced to over-save.

effects of taxation on labor supply sometimes treat social security taxation as cumulative with explicit labor income taxation, whereas analytically they should have qualitatively different effects. Given that the payroll taxes that finance social security are of a similar magnitude to labor income taxes, it is important to test whether and how their effects on labor supply differ. Moreover, the effects of both social security and capital taxation (subsidization) depend on whether or not labor supply is myopic in the same fashion as is consumption. This subject, however, has not been substantially explored. Empirical work on myopia has tended to focus on ultimate intertemporal decisions such as savings rather than on intermediate decisions like labor supply, the return to which depends on such subsequent choices. Furthermore, the results here assume that non-neoclassical behavior takes a particular form (one consistent with quasi-hyperbolic discounting, which has received some empirical support), but alternative consumption behavior may have different implications for labor supply.²⁰

Four points seem clear: Myopia and related behavior may be empirically significant; such behavior is central to the analysis of social security and capital taxation, among other policies; labor supply considerations are likewise consequential; and, finally, myopia has important implications for labor supply. Taken together, these factors suggest that additional research in this area is warranted.

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²⁰One might study, for example, whether the sort of behavior documented by Madrian and Shea (2001), Choi et al. (2004), and Chetty et al. (forthcoming), wherein different default specifications for retirement plans lead to substantial changes in savings behavior, has similar implications for labor supply as do changes in social security.

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Appendix: Capital Taxation

Consumption: To determine the first-order condition for consumption allocation by a myopic individual, we can use the budget constraint (13) to solve for c_2 , which equals $[(1-t)wl+g-\theta_1c_1](1+r)/\theta_2$, substitute into expression (4) for perceived utility of the myopic consumer, and differentiate:

$$(A1) \left. \frac{du^M}{dc_1} \right|_{l=1^0} = \beta c_1^{-\rho} - \frac{\theta_1}{\theta_2} \delta (1+r) c_2^{-\rho} = 0 \quad \text{or} \quad \frac{c_1}{c_2} = \left(\frac{\theta_2}{\theta_1} \frac{\beta}{\delta(1+r)} \right)^{1/\rho}.$$

This condition, in turn, can be differentiated with respect to θ_2 (for compactness of notation, in this appendix primes denote derivatives with respect to θ_2):

$$(A2) \left. \frac{d^2 u^M}{d\theta_2 dc_1} \right|_{l=l^0} = -\rho\beta c_1^{-\rho-1} c_1' - \delta(1+r)c_2^{-\rho} \left[\frac{\theta_2 \theta_1' - \theta_1}{\theta_2^2} \right]$$

$$- \rho \frac{\theta_1}{\theta_2} \delta(1+r)^2 c_2^{-\rho-1} \left[\frac{\theta_2(\theta_1 c_1' + c_1 \theta_1') + [(1-t)wl + g - \theta_1 c_1]}{\theta_2^2} \right] = 0.$$

To simplify, use the fact that we are evaluating this derivative at $\theta_1 = \theta_2 = 1$, that θ_1' is given by expression (14), that c_2 is determined by the budget constraint (13), and make use of the first-order condition (A1), allowing us to state

$$(A3) c_1' = \frac{\beta c_1^{-\rho-1} [(1-t)wl + g]}{\rho\beta c_1^{-\rho-1} + \rho\delta(1+r)^2 c_2^{-\rho-1}}.$$

As expected, $c_1' > 0$, as the numerator and denominator of expression (A3) are both positive (the denominator is the negative of $d^2 u^M / dc_1^2$). Noting the existence of partially common factors and making further use of the first-order condition (A1) and the budget constraint (13), this can be further simplified to

$$(A4) c_1' = \frac{c_2}{\rho(1+r)}.$$

Myopic Labor Supply: The first-order condition for labor supply in this case is

$$(A5) \frac{du^M}{dl} = \beta c_1^{-\rho} \frac{dc_1}{dl} + \delta c_2^{-\rho} \frac{dc_2}{dl} - z' = 0.$$

To determine the dc_i/dl 's and for subsequent analysis, it is useful to introduce some additional notation. Let $y = (1-t)wl + g$ (disposable income, as given on the right side of the budget constraint (13)), and let Ω equal the right side of the latter expression in (A1), which implies that Ω will also equal c_1/c_2 . One can solve expressions (13) and (A1) simultaneously, which yields

$$(A6) c_1 = \frac{y}{\theta_1 + \theta_2 / \Omega(1+r)}, \text{ and}$$

$$(A7) c_2 = \frac{y}{\theta_1 \Omega + \theta_2 / (1+r)}.$$

Therefore,

$$(A8) \frac{dc_1}{dl} = \frac{(1-t)w}{\theta_1 + \theta_2 / \Omega(1+r)} = c_1 \frac{(1-t)w}{y}, \text{ and}$$

$$(A9) \frac{dc_2}{dl} = \frac{(1-t)w}{\theta_1 \Omega + \theta_2 / (1+r)} = c_2 \frac{(1-t)w}{y}.$$

Accordingly, expression (A5) can be rewritten as

$$(A10) \frac{du^M}{dl} = \left[\beta c_1^{1-\rho} + \delta c_2^{1-\rho} \right] \frac{(1-t)w}{y} - z' = 0.$$

To find how labor supply is affected by changing θ_2 , we can differentiate as follows:

$$(A11) \frac{d^2 u^M}{d\theta_2 dl} = \left[\beta c_1^{1-\rho} + \delta c_2^{1-\rho} \right] \left(\frac{-(1-t)^2 w^2 l_{\theta_2}}{y^2} \right)$$

$$+ \left(\frac{(1-t)w}{y} \right) \left[(1-\rho) \beta c_1^{-\rho} c_1' + (1-\rho) \delta c_2^{-\rho} c_2' \right] - z'' l_{\theta_2} = 0.$$

(Recall that primes denote derivatives with respect to θ_2 , except for z'' .) Differentiation of expressions (A6) and (A7) with respect to θ_2 , making appropriate substitutions, allows one to determine that

$$(A12) c_1' = \frac{(1-t)w c_1}{y} l_{\theta_2} + \frac{c_2}{\rho(1+r)\theta_1}, \text{ and}$$

$$(A13) c_2' = \frac{(1-t)w c_2}{y} l_{\theta_2} - \frac{c_2}{\rho \theta_2}.$$

Evaluating these expressions at $\theta_1 = \theta_2 = 1$, one can see that the second terms in each simply indicate the effect of raising θ_2 when labor supply was held constant. (For example, compare expressions (A12) and (A4).) The first terms depict the effect of raising θ_2 on labor supply multiplied by the corresponding marginal expenditure shares. If one now substitutes using expressions (A12) and (A13) in expression (A11) and rearranges terms, the result is

$$(A14) l_{\theta_2} = \frac{- \left(\frac{1-\rho}{\rho} \right) \left(\frac{(1-t)w c_2}{y(1+r)} \right) \left[\beta c_1^{-\rho} - \delta(1+r)c_2^{-\rho} \right]}{d^2 u^M / dl^2}.$$

The term in square brackets is simply the first-order condition for myopic individuals' consumption allocation decisions, $du^M/dc_1|_{l=l^0}$, from expression (5). Therefore,

$$(A15) l_{\theta_2} = \frac{- \left(\frac{1-\rho}{\rho} \right) \left(\frac{(1-t)w c_2}{y(1+r)} \right) \left(du^M / dc_1|_{l=l^0} \right)}{d^2 u^M / dl^2}.$$