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ABSTRACT

Traditional economic theory predicts that an unfunded public pension system can be justified on the basis of its ability to provide intergenerational transfers, and also for its ability to provide partial insurance against mortality and labor income risks. In this paper, I demonstrate that the quantitative importance of these traditional roles depends on how the pension system distorts households' labor supply decisions. Using a general-equilibrium life-cycle consumption model calibrated to the U.S. economy, I show that these distortions can be large enough to erase much of the traditional welfare gains from Social Security. I also find that this fact is robust within the range of labor supply elasticities usually encountered in the macroeconomic literature.

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1. Introduction

Traditional economic theory predicts that an unfunded public pension system can be justified on the basis of its ability to provide intergenerational transfers, and also for its ability to provide insurance against risks that may otherwise be uninsurable. When the economy is dynamically inefficient, the internal rate of return in such a pension system exceeds the market rate of return on physical capital, thereby making the public pension a better “investment” than private saving. When households face uncertain lifetimes and imperfect annuity markets, the pension system can partially substitute for annuities and provide some measure of insurance against the risk of out-living one's savings. Finally, the implicit link between work–life income and the pension benefits can also provide partial insurance against unfavorable shocks to labor income that one might experience during the work life.

Starting with [Abel \(1985\)](#) and [Hubbard and Judd \(1987\)](#), a number of studies have examined the importance of these traditional roles in justifying the size of U.S. Social Security. Using a model with mortality risk and closed annuity markets, both [Abel \(1985\)](#) and [Hubbard and Judd \(1987\)](#) find a welfare-improving role for Social Security, but [Hubbard and Judd](#)

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(1987) find that these welfare gains are significantly reduced or even eliminated if borrowing constraints are introduced into the model. İmrohoroğlu et al. (1995) also examine the optimality of Social Security in a life-cycle economy with mortality risk, missing annuity markets, idiosyncratic employment risk, and borrowing constraints. Calibrating the model to match some key features of the U.S. economy, they find that the optimal social security arrangement features a replacement rate of 30% and a tax rate of 6.1%. While these studies do not arrive at a consensus regarding the optimal size of Social Security in the U.S., they all examine this question in a framework that ignores a key factor: the distortionary effect of Social Security on labor supply decisions.

However, there is a considerable evidence that tax-and-transfer programs, in general, have quantitatively important effects on household labor supply. Prescott (2004) demonstrated that differences in marginal tax rates alone explain most of the differences in labor supply within the advanced industrial economies (the G-7 countries).¹ Rogerson and Wallenius (2009) extend this result to an overlapping-generations environment where households choose both the fraction of lifetime spent in employment, and also the fraction of the period time endowment spent working while employed. Studies that specifically look at the effect of social security programs on labor supply include Ortiz (2014) and Wallenius (2009). Ortiz (2014) finds that differences in the institutional features of social security programs account for 90% of the differences in employment to population ratios at ages 60–64 in the OECD. Similarly, Wallenius (2009) finds that the cross-country differences in social security programs account for 35–40% of the differences in aggregate hours worked between the U.S., and Belgium, France, and Germany.

In this paper, I demonstrate that in an economy with rational life-cycle permanent-income households, the quantitative importance of the traditional welfare-improving roles of an unfunded public pension system depends on how the pension system distorts households' labor supply decisions. The payroll tax for the pension system increases the marginal tax rate on labor income, and therefore has a negative impact on the fraction of lifetime spent in employment, and also on households' labor hours over the life cycle. I show that these distortionary effects can be large enough to erase much of the traditional welfare gains from the pension system. I also find that this result is quite robust: within the range of labor supply elasticities generally encountered in the macroeconomic literature, the optimal tax rate for the pension system is considerably lower once these distortions are accounted for.

To examine this issue, I construct an overlapping-generations macroeconomic model with incomplete markets, an unfunded public pension system that closely mimics U.S. Social Security, and households that experience two types of risk: mortality risk and labor income risk. Social Security provides partial insurance against these risks, because households do not have access to private insurance markets.² Households in the model also face a progressive labor income tax schedule similar to the U.S., and they are allowed to choose when to start collecting Social Security benefits. Factor markets in the model are competitive, firms maximize profit, and the government provides public goods and Social Security. I calibrate this model to match some key features of the U.S. economy, such as overall capital accumulation, pattern of labor supply over the life cycle (both with respect to labor force participation and hours per week), the income distribution, and the share of government expenditures in GDP.

Using this calibrated model, I compute the payroll tax for Social Security rate that maximizes average ex-ante expected utility, and then I examine how that rate changes as I account for the household-level labor supply distortions. Specifically, I compare the optimal payroll tax rates under two different experiments: (i) holding household labor supply decisions fixed at the baseline level, and (ii) allowing household labor supply decisions to adjust to the changing tax rates. I find that for the baseline calibration, Social Security does have a small welfare-improving role in the model economy: holding household labor supply constant, expected utility is maximized at the payroll tax rate of 3.2%. However, this welfare gain is completely eliminated when I allow labor supply to respond to Social Security: the optimal payroll tax rate in this case is 0%. Therefore, I find that the distortions to households' labor supply decisions are large enough to erase all the traditional welfare gains from Social Security.

Because the distortions in labor supply, both in terms of the fraction of lifetime spent in employment, and also the hours over the life cycle conditional on participation, are largely determined by a household's labor supply elasticity, I repeat the above two experiments for a different baseline calibration of the model in which labor supply is relatively inelastic. Even in this case, I find that accounting for the labor supply distortions yields an optimal payroll tax rate that is considerably lower: only two-thirds of the optimal rate when these adjustments are not accounted for. Therefore, the quantitative importance of the labor supply distortions appears to be robust with respect to the underlying labor supply elasticity values.

Starting with Auerbach and Kotlikoff (1987), notable studies in the dynamic pension reform literature, such as De Nardi et al. (1999), Nishiyama and Smetters (2005), Conesa and Garriga (2008), and Kitao (2014), have all used models that account for the effect of social security programs on labor supply. Most notably, İmrohoroğlu and Kitao (2009) show that the effects of Social Security reform on aggregate labor supply are invariant with respect to households' labor supply elasticity. They find that even though reforms under different values of labor supply elasticity lead to different allocations of hours over the life cycle, the aggregate effects are very similar. Nishiyama and Smetters (2008) appears to be the only study to

¹ Other studies that arrive at a similar conclusion include Ohanian et al. (2008) and Rogerson (2008).

² Because the unit of the current model is a household, I abstract from any intra-household risk-sharing effects of Social Security, which may be significant. It is well known that female life expectancy is higher than male life expectancy, and also that Social Security benefits paid to a household are adjusted if there are surviving dependents. Additionally, Guner et al. (2012) find marked differences in how male and female labor supply responds to tax policies. Taken together, these factors can have important consequences for household labor supply, which I ignore in the current model.

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