

Social Security and Risk Sharing: A Survey of Four Decades of Economic Analysis

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Abstract

With looming fiscal pressure from an aging population, policy makers must grapple with the question of how to restore solvency to the Social Security budget. At this crossroads, it seems wise to evaluate the effectiveness of the program in making people better off. Specifically, we survey four decades of economic theory to examine Social Security as a potential solution to underutilized, missing, or incomplete markets. We synthesize and highlight the ways in which the program improves wellbeing through mandatory saving and collective risk-sharing, as well as the ways in which behavioral responses of individuals may unwind or even over-turn the welfare gains of the program.

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1 Introduction

In economics we often teach that governments might want or need to intervene in situations when markets are either incomplete or missing. In the opening chapter of his best-selling *Principles of Economics* textbook, N. Gregory Mankiw states that one of the ten guiding principles of economics is: “Government Can sometimes Improve Market Outcomes.” He goes on to specify that government can improve economic efficiency in the presence of market failures, and that government intervention may also be justified by concerns over equity or equality. One of the largest areas of government intervention in the economy in many countries is the provision of social insurance.¹ In the United States, the largest social insurance program is the Old Age Survivors and Disability Insurance program, commonly referred to as Social Security.

In this survey we view Social Security through the lens of risk sharing. Specifically, we survey papers that address the question: Can Social Security be justified as a solution to incomplete markets or as a mechanism for collective risk sharing? We attempt to synthesize and interpret decades of scientific work on the economics of Social Security, making sure to objectively highlight both the costs and benefits of the program. We do not attempt to summarize *all* of the literature regarding Social Security. We will focus on papers that explore Social Security as a remedy to underutilized and incomplete markets, and like any survey of a literature of this size, we will leave out a number of papers.²

As argued by [Diamond \(1977\)](#), conventionally there are three reasons for Social Security: paternalism (compelling individuals to save), correcting insurance market failures, and redistributing income. For convenience, we note that all three reasons can be viewed through the lens of underutilized or incomplete markets, and this is the language we use throughout our survey. First, mandatory saving can be viewed as correcting underutilized capital markets. Many Americans do not save for retirement at all, which we interpret as evidence that capital markets are potentially underutilized. Second, the difficulty of insuring longevity risk through private markets is typically framed as the result incomplete annuity markets. And third, government redistribution of income can be viewed as insurance against the risk of low lifetime earnings. Private markets do not provide insurance from behind the veil of Rawlsian ignorance, and so it is natural that a government might provide this type of insurance publicly through Social Security.

The size of the Social Security tax rate has doubled since 1960, and it has increased

¹See [Gruber \(2016\)](#) Chapter 12 or [Stiglitz and Rosengard \(2015\)](#) Chapter 16 for a summary of the growing government provision of social insurance.

²We focus exclusively on Social Security retirement benefits, and not on the disability and life insurance aspects of the Social Security program. While these aspects are important, they are beyond the scope of this paper.

by a factor of 10 since the inception of the program in the 1930s. Despite the rapid expansion of the size of the Social Security program, demographic forces are creating political pressure to potentially dramatically increase taxes even further. In the US, birth rates are declining, longevity is increasing, and Baby Boomers are retiring, all of which act to reduce the number of workers who pay into the system relative to retirees who draw out of the system, which requires a tax increase to prevent benefits from falling. Abstracting from an improvement in aggregate productivity, simple back-of-the-envelope arithmetic of a pay-as-you-go Social Security program requires a 50% increase in Social Security taxes collected to prevent benefits from falling as the ratio of workers to retirees declines from 3 to 2.³ The other option would be to let benefits fall by about one-third. The trust fund that is currently used to pay a portion of Social Security benefits is expected to be depleted by the year 2034 according to the 2020 Social Security Trustees Report. Although we can debate about the precision of these estimates and more sophisticated general equilibrium macroeconomic models (that account for microeconomic labor supply and saving responses to demographic shocks) might argue that the crisis is not quite as bad and these simple numbers suggest (Bagchi (2016)), there is little debate that the fiscal outlook is problematic. But because there is no consensus among policy makers about what should be done to restore solvency, it is an opportune time to carefully review the academic literature and evaluate Social Security’s insurance role as policy makers think about whether this is the type of program that should be expanded.

On the surface, Social Security can be justified as a response to underutilized capital markets and missing or incomplete insurance markets. Social Security is commonly believed to increase intra- and inter-generational risk sharing, and thus may improve wellbeing. However, careful economic analysis reveals that behavioral responses to government intervention could weaken or even overturn the welfare gains of the policy. Ultimately, answering the question “does Social Security make people better off?” requires rigorous economic modeling to evaluate the trade-offs introduced by government action. The economics literature has offered detailed but mixed results regarding the efficacy of Social Security in remediating underutilized, incomplete, or missing markets. We do not view this as a failure of the economics literature, but rather as evidence of the complexity of such a large program that (potentially) offers insurance along several margins.

We frame our discussion and summary of the literature through the lens of market underutilization and market incompleteness. First we consider how Social Security may be justified as a response to underutilized capital markets. Then we consider incomplete insurance markets. We consider insurance against longevity risk (often provided via annuities) and insurance against low lifetime earnings (income redistri-

³In a pay-as-you-go program, Social Security benefits per period per retiree are equal to the product of three things—the average taxable wage rate, the Social Security tax rate, and the ratio of workers to retirees.

bution). In all sections, we first articulate the ways in which a relevant market could be incomplete and hence the ways in which government intervention through Social Security could, in theory, be helpful. Then, we highlight that, notwithstanding the underutilization or incompleteness in these markets, Social Security’s ultimate effect on welfare may be limited by the unintended consequences of government intervention.

Finally, while this paper does not offer a final recommendation on whether or not taxes should be increased—that is a policy decision that will involve a broad range of considerations—it is important to consider the potential connection between taxation and aggregate economic performance. Government provision of social insurance involves both efficiency-efficiency trade-offs, and also equity-efficiency trade-offs. Social Security may improve efficiency by correcting market failures such as adverse selection, but those interventions themselves may create distortions such as moral hazard (efficiency-efficiency trade-off); Social Security may also increase equity by redistributing resources from the wealthy to the poor, at the expense of reducing efficiency via taxes (equity-efficiency trade-off). Cross-country differences in the size of social insurance programs may reflect differences in preferences regarding equity and efficiency.⁴

We will not examine specific Social Security reform proposals in this paper, as our goal is to evaluate the effectiveness of the current program as a response to underutilized capital markets and incomplete insurance markets. A vast literature explores changes in Social Security taxes and benefits in response to changing demographics such as [Coronado et al. \(1999\)](#), [De Nardi et al. \(1999\)](#), [Coronado et al. \(2002\)](#), [Diamond and Orszag \(2005\)](#), [Bommier et al. \(2011\)](#), [İmrohoroğlu and Kitao \(2012\)](#), [Kitao \(2014\)](#), [Bagchi \(2015, 2016, 2017\)](#), [Pestieau and Racionero \(2016\)](#), [McGrattan and Prescott \(2017\)](#), [Cottle Hunt and Caliendo \(2020b\)](#), and [Sheshinski and Caliendo \(2020\)](#) among many others. Several papers also consider moving towards a fully-funded or privatized Social Security system including [Feldstein \(1996a\)](#), [Samwick \(1998\)](#), [Conesa and Krueger \(1999\)](#), [Huggett and Ventura \(1999\)](#), [Kotlikoff et al. \(1999, 2007\)](#), [Attanasio et al. \(2007\)](#), [Nishiyama and Smetters \(2007\)](#), [Conesa and Garriga \(2008\)](#), and [İmrohoroğlu and Kitao \(2009\)](#), among others. Considerable uncertainty exists about the timing and structure of reform. A growing section of the literature examines the welfare effects of Social Security policy uncertainty, including [Bütler \(1999\)](#), [Gomes et al. \(2012\)](#), [Kitao \(2018\)](#), [Luttmer and Samwick \(2018\)](#), [Caliendo et al. \(2019\)](#), [Nelson \(2020\)](#), and [Cottle Hunt \(2021\)](#). These papers

⁴Many European countries have Social Security programs with tax rates that are twice the size of the US tax rate (e.g., Germany, Greece, Finland, Austria, Slovak Republic, and France) while other European countries have rates that are approximately three times that of the US (Spain, Netherlands, Czech Republic, Italy, and Poland). The performance of high-tax European economies has been lackluster over the last few decades relative to the US, and leading macroeconomists place the blame for their underwhelming performance on high labor income taxes ([Prescott \(2004b\)](#)).

generally find that uncertainty about future Social Security policy makes individuals worse off. Hence, the government may inadvertently create risk—through its own inaction—even though the program is meant to reduce risk. The trade-offs that we analyze in this paper which shape the current system also influence the ways in which reforms could improve or reduce wellbeing. By clearly focusing on the costs and benefits inherent in the current system, we can provide clarity for likely consequences of changes to the program.

2 Underutilized Capital Markets

Many economists and policy makers worry that Americans do not save enough for retirement. The concern is based on casual observation as well as empirical evidence. We probably all know someone who did not seem to save adequately for retirement, and in fact, 4 out of 5 workers in a representative sample of Americans who participated in the 2016 Retirement Confidence Survey say that they are not very confident that they have saved enough to finance a comfortable retirement. And about 1 out of 3 workers report that they are not saving anything at all.⁵ A variety of surveys paint a similar picture of household preparedness for retirement.⁶

Social Security is commonly viewed as a potential solution to the undersaving problem. After all, how would American’s who save nothing for retirement be able to pay their bills if not for their monthly Social Security paycheck? In more technical terms, if capital markets are underutilized in the sense that a significant portion of potential market participants fail to participate in the market, then perhaps Social Security can help in the sense that it could provide the necessary saving for retirement that isn’t provided through the private market. It takes two sides of a market to complete a transaction: even though financial markets and institutions stand ready to provide retirement saving services, households must actively decide to utilize these services.

As additional evidence, note that many Americans are “unbanked” (they do not have a checking, savings, or money market account) or “underbanked” (they have a bank account but also use an alternative financial service product, such as a check cashing service, payday loan, paycheck advance, or similar high-expense products).

⁵An individual choosing not to save is not *necessarily* evidence of suboptimal behavior. For example, it could be optimal for an individual not to save, especially for low wage individuals for whom Social Security benefits replace a large fraction of earnings, which we will discuss later in the paper.

⁶This type of evidence has generated a lot of effort to better educate households through financial literacy initiatives. A prominent example is the work of Annamaria Lusardi at the [Global Financial Literacy Excellent Center](#), as well as efforts to create saving programs intended to boost saving rates by utilizing lessons from behavioral economics as in [Thaler and Benartzi \(2004\)](#)’s Save More Tomorrow plan.

The [Board of Governors \(2020\)](#) Survey of Household Economics and Decisionmaking indicates that 6% of Americans are unbanked and 16% are underbanked.⁷ Access to banking services is not equal across racial groups ([Baradaran \(2017\)](#)), nor across income groups ([Baradaran \(2012, 2015\)](#)). This further suggests that capital markets are underutilized, as many Americans do not access capital markets.

Beginning with [Feldstein \(1985\)](#), there is a large literature that starts with the assumption that people do not save enough on their own according to some metric of ideal saving, and then the researchers asks whether Social Security can improve welfare. For instance, a researcher often builds a behavioral model in which the individual is dynamically inconsistent and therefore ultimately saves less than they had initially planned to save or at least saves less than a benevolent policy maker would recommend that the individual saves. Then the researcher compares welfare in worlds with and without Social Security to establish whether Social Security can improve the wellbeing of individuals who fail to take full advantage of capital markets like they had planned to or like a policy maker believes that they should. The results from this literature are often mixed: under some parameterizations Social Security is welfare improving and in other parameterizations it is not (see [Feldstein \(1985\)](#), [Docquier \(2002\)](#), [İmrohoroğlu et al. \(2003\)](#), [Gul and Pesendorfer \(2004\)](#), [Cremer et al. \(2007, 2008, 2009\)](#), [Fehr et al. \(2008\)](#), [Findley and Caliendo \(2008\)](#), [Kumru and Thanopoulos \(2008\)](#), [Pestieau and Possen \(2008\)](#), [Buccioli \(2011\)](#), [Cremer and Pestieau \(2011\)](#), [Caliendo \(2011\)](#), [Andersen and Bhattacharya \(2011\)](#), [Caliendo and Findley \(2013\)](#), and [Guo and Caliendo \(2014\)](#), among many others).

But this explanation for Social Security is not totally convincing. What is most troubling about this rationale for Social Security is not that there is a lack of evidence that some people save very little, but rather that Social Security is the cure for such undersaving when in fact it might be part of the cause. Recall that papers in this literature typically start with the assumption that people do not save enough on their own, but what if Social Security is part of the reason behind very low saving rates among a portion of the population? Naturally, many people may decide to save very little for retirement in order to rely on Social Security benefits, which are quite generous in the US and replace as much as 90% of pre-retirement wage income for the poorest segment of the population and about 45% of pre-retirement wage income for an individual with average earnings. With Social Security providing relatively generous benefits to low-income earners, theory predicts that these workers would have among the lowest saving rates (for example [Slavov et al. \(2019\)](#), [Blau \(2016\)](#), [Conesa and Garriga \(2008\)](#), and [Kitao \(2014\)](#), among many others). Likewise, there is some empirical evidence suggesting the poor save less than the rich, such as [Dyner et al. \(2004\)](#).

A simple example might help. Suppose in the absence of any Social Security

⁷See also [Barcellos and Zamarro \(2019\)](#) for a discussion of the data.

program an individual making \$1,000 each month would save \$100. If in the presence of a Social Security program with a 10% tax rate—which forces the individual to save \$100—the individual saves nothing on his own, then Social Security is just a wash and isn’t going to help.⁸ Likewise, consider another individual who would save nothing each month in the absence of a Social Security program and further suppose that if we impose a 10% tax on this individual to try to get him to save for retirement, he simply borrows \$100 in response to the tax to keep his spending at \$1,000. If individuals behave in these ways then Social Security doesn’t make any progress as a solution to underutilized capital markets.

In the above example Social Security clearly doesn’t help. Adding the popular element of dynamic inconsistency to the setting—when the paycheck arrives individuals lack the self control to actually save what they had intended to save—does little to change the theoretical result. In the absence of binding borrowing constraints, a dynamically inconsistent individual will unwind any mandatory savings (e.g. [İmrohoroglu et al. \(2003\)](#) and [Caliendo \(2011\)](#)).

The problem can actually be much more severe than we realize. What if the behavioral defect that we typically take as given—be it hyperbolic discounting or hand-to-mouth behavior—is itself caused by the presence of Social Security? In other words, what if irrational tendencies are a luxury that we indulge because we are protected by a safety net? In that case, we cannot logically claim that Social Security solves a problem that it may very well have created.

A large empirical literature estimates the relationship between Social Security wealth (or pension wealth more generally) and private savings. These studies find mixed results. Some find that Social Security wealth crowds out private savings almost one for one; others suggest that Social Security wealth reduces private savings somewhat, but not one for one, so that total household savings (public plus private) increases in the presence of Social Security (see for example, [Feldstein \(1974, 1996b\)](#), [Feldstein and Pellechio \(1979\)](#), [Kotlikoff \(1979\)](#), [Leimer and Lesnoy \(1982\)](#), [Diamond and Hausman \(1984\)](#), [Bernheim \(1987\)](#), [Bernheim and Levin \(1989\)](#), [Gale \(1998\)](#), and [Gustman and Steinmeier \(1999\)](#)).

Whether we think a forced reduction in consumption spending when young is a good thing or a bad thing separates behavioral economists from neoclassical economists. Behavioral economists might argue that individuals save too little and do not act in their own best interest. As a result, individuals can benefit from Social Security because it forces them to restrain their spending when young. Some individuals may not be able to borrow as much as they wish when young, or they may face high interest rates on borrowing. For an individual that is borrowing constrained, the Social Security tax would act to reduce their consumption spending and would therefore move the individual even further away from his or her desired spending level and closer to

⁸Assuming the rate return on private savings is equal to the internal rate of return of Social Security.

what a behavioral economist may view as ideal.

However, not all young individuals are borrowing constrained. Plenty of young people have access to credit and some young individuals save on their own. In this case, Social Security taxation may just lead to more borrowing among those with access to credit in order to keep spending at desired levels, or it may crowd out private saving among those who intended to save. So even if we accept the premise that people do not save enough on their own in the sense that they fall short of their saving goals, it is not clear that Social Security can help because people may tend to unwind the mandatory saving that is imposed on them.⁹

Neoclassical economists may argue for an even stronger complaint against the behavioral justification for Social Security. Forcing people to save through Social Security is potential disrespectful to consumer sovereignty, especially when there may be logical reasons for why someone has saved very little (beyond Social Security) for their retirement years.¹⁰ Perhaps individuals prefer to spend their income to support family activities or a vacation while their children are young and while they themselves are in good health. Or perhaps parents would prefer to spend their income on adequate housing for their family and rely mostly on Social Security in the later years of life when their children are gone. There are deep philosophical issues at play here and it is worth considering whether the government really should be in the business of deciding how much people should save, especially when saving “too little” doesn’t (directly) hurt anyone else.

Actually, we have to be careful with that last statement. Saving too little could actually hurt others in an important and subtle way. In fact, some economists would argue that without Social Security, people would still save too little because they would “game” the government in the belief that the government would step in and rescue those who failed to save adequately by inventing some form of welfare program. Others who are still working would need to pay the tax to finance the welfare program. So even if the current government decided to eliminate Social Security, there is no guarantee that future policy makers would stick to this plan. This so-called government time-inconsistency problem may very well be a compelling rationale for mandatory saving through Social Security because otherwise we have the problem of some people free-riding by saving nothing when young and gambling that future policy makers will take care of them later in life. At least with mandatory saving, free-riders would be forced to pay for their own retirement benefits. Edward

⁹See Slavov et al. (2019) for a discussion of the literature on Social Security and private savings.

¹⁰For individuals who save optimally, the ultimate welfare effect of Social Security boils down to the efficiency of the economy (in the absence of borrowing constraints and abstracting from longevity risk and wage heterogeneity). If the economy is dynamically efficient (private interest rate exceeds the internal rate of return on Social Security transfers over the life cycle), then forced saving reduces the net present value of the individual’s lifetime income and is strictly welfare reducing. The opposite is true if the economy is dynamically inefficient.

C. Prescott forcefully made this point in a set of Wall Street Journal editorials in 2004 ([Prescott \(2004a\)](#), [Prescott \(2004c\)](#)). Similar arguments have been made in the academic literature as well, as in [Kotlikoff \(1987, 1989\)](#), [Homburg \(2000, 2006\)](#), [von Weizsäcker \(2003\)](#), [Feldstein \(2005\)](#), [Emre \(2007\)](#), [Pestieau and Possen \(2008\)](#) and [Guo and Caliendo \(2014\)](#).

In sum, there is ample evidence indicating that capital markets are underutilized by a significant share of the population. And while Social Security may very well be a sensible remedy, it may also be part of the cause of the undersaving problem to begin with. On the other hand, mandatory saving may solve the government's time inconsistency problem that arises in the absence of Social Security.

3 Incomplete Insurance Markets

3.1 Longevity Risk

An individual making life-cycle saving decisions faces longevity risk. This risk is generally framed as the risk of outliving one's assets. No one knows exactly how long they will live, and this risk can have a significant effect on the welfare of retirees. Imagine an individual who arrives at retirement with enough assets to live comfortably until age 80 but then surprisingly ends up living until age 90 or beyond. With retirement assets already predetermined by past saving decisions and with very few opportunities to return to the labor force late in life, the individual must accept a lower-than-anticipated standard of living during old age. The severity of this problem can be further compounded by late-in-life health and living expenses that are required to sustain life. Annuitization can mitigate the risk of outliving one's assets, since annuities provide a survival contingent income stream in exchange for an up-front payment and are therefore of great worth if priced fairly and under certain conditions (see [Kotlikoff and Spivak \(1981\)](#), [Lockwood \(2012\)](#), [Mitchell et al. \(1999\)](#), [Brown \(2001\)](#), and [Davidoff et al. \(2005\)](#)).

Technically, in a fully rational framework, an individual facing longevity risk will never outlive their assets. Without longevity insurance, however, even the fully rational individual is harmed by longevity risk since they must plan for every possible lifespan, including the possibility of living to be very old. This results in precautionary saving, which is costly from the perspective of the individual. If their lifespan were certain, they could plan to deplete their assets exactly at the end of life. However, facing an uncertain lifespan, they will consume less over the life cycle and pass away with unconsumed assets (see [Yaari \(1965\)](#), [Davidoff et al. \(2005\)](#), and [Sheshinski \(2008\)](#)). Even if the individual has a bequest motive, this is suboptimal, because the size and timing of their bequest depends on their date of death ([Diamond \(2004\)](#)).

Social Security provides benefits as a life annuity. Thus, the government program can be viewed as completing the missing or incomplete private annuity market (see [Diamond \(1977\)](#), [Diamond \(2004\)](#), [Feldstein \(2005\)](#), and [Chetty and Finkelstein \(2013\)](#), among many others).¹¹ Social Security provides protection against the risk of outliving one's assets because it provides benefits as a life annuity that lasts as long as individuals live. The Social Security system is able to make this life annuity payment because on the other end of the spectrum there are people who pay taxes for their entire working period but only collect benefits for a few years before passing away. By paying benefits to those who survive at the expense of those who do not, Social Security is able to hedge longevity risk through mandatory annuitization. [Abel \(1986\)](#) and [Eckstein et al. \(1985\)](#) show that Social Security improves welfare in the presence of adverse selection in the annuity market. [Hubbard and Judd \(1987\)](#) and [İmrohoroğlu et al. \(1995\)](#) also find that Social Security improves welfare with incomplete insurance markets.

At first glance, it appears mandatory annuitization through Social Security completes a missing market and makes people better off. However, the fuller picture is more nuanced. Yes, Social Security pays benefits as a life annuity, and this by itself tends to make individual better off. But, this benefit comes with a cost—Social Security crowds out private saving, which reduces the bequests that households leave (and receive) in general equilibrium. Together, the benefit of annuitization and the cost of reduced bequests can have either a positive or negative impact on wellbeing.

If an individual has a very strong bequest motive, then they may prefer to not participate in Social Security so all of their savings are transferred to their children when they die, even though they face longevity risk. If life insurance markets were complete, this would be less of a problem, since an individual would be able to unwind any mandatory annuitization by purchasing term life insurance ([Yaari \(1965\)](#) and [Bernheim \(1991\)](#)).¹² However, life insurance markets face problems of adverse selection and asymmetric information, so it may be costly for an individual to unwind the annuitization provided through Social Security.

[Hong and Rios-Rull \(2007\)](#) examine the welfare role of longevity insurance provided through Social Security in a model with families. They find that Social Security reduces welfare by crowding out private savings which reduces both intentional bequests and accidental bequests. They consider four variations of their model. In two economies individuals have access to life insurance, but not annuities, and accidental bequests are either distributed evenly across the economy (their benchmark economy), or accidental bequests are confiscated by the government (their Pharaoh economy). They also consider an economy with life insurance and annuity markets,

¹¹[Mitchell et al. \(1999\)](#) and [Finkelstein and Poterba \(2004\)](#) provide empirical evidence of adverse selection in US annuity markets.

¹²[Bernheim \(1991\)](#) provides a detailed example of how a consumer can perfectly offset the forced acquisition of an annuity by purchasing appropriate term life insurance contracts.

and an economy without either type of insurance. Social Security reduces welfare in all four models by crowding out private savings which reduces the capital stock.

Additionally, even if individuals do not care about leaving money to their children, they still may prefer to live in an equilibrium without Social Security because in that world they themselves will collect more inheritance income from their own parents who would have saved more in the absence of Social Security. In fact, [Caliendo et al. \(2014\)](#), find that the crowding out of bequest income can completely offset the welfare gains from the public provision of longevity insurance through Social Security. This is true even though they assume that individuals have no desire to leave income to their children and individuals have no private option for insuring their longevity risk (annuity markets are completely closed).

[Cottle Hunt and Caliendo \(2020a\)](#) extend the analysis of [Caliendo et al. \(2014\)](#) to a model with wage heterogeneity and find that Social Security can increase or decrease wellbeing. They show that the welfare effect of Social Security depends critically on the level of economic mobility in the economy. If economic mobility is limited and inheritance income is linked to wage income, then the longevity insurance from Social Security is exactly offset by the crowding out of private savings, as in [Caliendo et al. \(2014\)](#).¹³ However, if inheritances are uncorrelated with wage earnings, implying that an individual's earnings are unrelated to the wages and asset holdings of their predecessors, then Social Security actually reduces welfare. This is because the program reduces bequests which are a large source of income for low wage earners in the model. Taken together, these papers suggest the manner in which bequest income is modeled has first-order effects on the welfare gains from longevity insurance through Social Security: the welfare gains can be very large in partial equilibrium models that ignore the impact of Social Security on the crowding out of bequest income (as in [Hubbard and Judd \(1987\)](#)) and can be zero (or worse) in general equilibrium models that account for the transmission of bequest income across generations (as in [Caliendo et al. \(2014\)](#)).¹⁴

The models discussed so far assume that bequest income is realized in a deterministic way. In reality, bequest income is risky, and depends on the assets and age of death of one's parents. [Cottle Hunt and Caliendo \(2021b\)](#) analyze a model in which bequest income is transmitted to the next generation through *explicit linkages*

¹³They find that Social Security improves welfare when economic mobility is limited by redistributing income via a progressive Social Security benefit, but they do not find any welfare gain from longevity insurance.

¹⁴Similarly, [Feigenbaum et al. \(2013\)](#), [Heijdra et al. \(2014\)](#), and [Bagchi and Feigenbaum \(2019\)](#), all show that the welfare gains of (private) annuitization in partial equilibrium models (such as [Yaari \(1965\)](#)) can be completely unwound in general equilibrium. In all three papers, annuitization crowds out private savings, which reduces accidental bequests. This reduction in equilibrium bequest income can make individuals worse off ([Feigenbaum et al. \(2013\)](#)). The reduction in private savings also reduces the capital stock, which can have negative effects in general equilibrium ([Heijdra et al. \(2014\)](#) and [Bagchi and Feigenbaum \(2019\)](#)).

between parents and children, and they find that the longevity insurance provided through Social Security improves wellbeing. This is because Social Security crowds out a risky income source (bequests) and replaces it with a guaranteed income source (Social Security benefits). They show that the welfare gains are even larger if individuals do not properly hedge their longevity risk.

A final but very important point is that mandatory annuitization through Social Security has unintended consequences that spill over into the private annuity market. [Hosseini \(2015\)](#) shows that much of the welfare gains from mandatory annuitization through Social Security are washed out by an increase in the price of private annuity contracts due to adverse selection. Social Security causes those who expect to die the youngest to exit the private annuity market, leaving those with the greatest longevity to purchase private annuity contracts, driving the prices of annuity insurance higher than in a state of the world without Social Security.

In sum, people unequivocally face longevity risk—nobody knows the precise timing of their death—and this complicates saving decisions. Social Security may help by providing longevity risk sharing through mandatory annuitization, and in some models the welfare gains from doing so are very large. However, these welfare gains are diminished and even eliminated entirely in other models that account for the costs associated with mandatory annuitization, namely the reduction in inheritance income and a worsening of adverse selection in private annuity markets.

3.2 Lifetime Earning Risk

Labor income can be difficult to predict. Households can receive negative income shocks throughout the life cycle. In an [Arrow and Debreu \(1954\)](#) model, it is possible to insure against this risk by writing state-contingent claims to income. However, in real life and most macroeconomic models, it is not possible to trade state-contingent income streams.¹⁵ In addition, some individuals have significantly higher earnings than others, in every period of the life cycle. In a model for example, if wages are heterogeneous but completely exogenous and deterministic, an individual faces ex-ante risk of drawing a low wage. Of course, in real life, wages are likely neither completely exogenous nor deterministic; however, exogenous factors such as one's zip code or the earnings or material status of one's parents could contribute to an individual's lifetime earnings ([Chetty and Hendren \(2018a,b\)](#), and [Chetty et al. \(2018\)](#),

¹⁵It is possible to hedge certain types of income risk (for example, a farmer and the owner of a golf course could enter into a rain-related trade to hedge each other's risk of too little to too much rainfall), but it not possible to hedge *all* income variations. This type of market incompleteness was first modeled by [Huggett \(1993\)](#) in an endowment economy, [Aiyagari \(1994\)](#) in a production economy, and [Huggett and Ventura \(1999\)](#) in an overlapping generations economy. An individual may also face uninsurable aggregate income risk due to macroeconomic variations such as productivity shocks as in [Krusell and Smith \(1998\)](#), which we will discuss in a separate section.

2019)). Private contracts do not exist for this type of insurance because it is not possible to sign an insurance contract before this exogenous factor is realized (i.e., before birth or before some early age).

To the extent that some income differences may reflect differences in opportunities or the result of exogenous shocks that are difficult to insure in private markets, an argument can be made for risk sharing through Social Security. Social Security is a progressive program that provides much higher replacement rates for the poor than for the rich. Social Security replacement rates are approximately 3 times higher for very low income workers than for workers at the earnings cap. If individuals are risk averse—which is the traditional assumption in economic theory—then individuals would want to purchase fair insurance against income risk before learning their income realizations over the life cycle. The progressivity of Social Security benefits can be viewed as this type of insurance arrangement.

Income redistribution is often discussed as a motivation for Social Security, in and of itself (as in [Diamond \(1977\)](#)). Some level of income redistribution is socially desirable under a variety of social welfare functions given the assumption of diminishing marginal utility of consumption (see, for example, [Piketty and Saez \(2013\)](#)). In this survey we view redistribution through the lens of incomplete insurance markets. There is no private insurance market for lifetime earning risk, and so redistributive government programs like Social Security can be viewed as a public provision of that insurance.

[Cottle Hunt and Caliendo \(2020a\)](#) show that the redistribution provided through Social Security is especially valuable when if economic mobility is limited. Specifically if low wage individuals inherit bequests from low wage predecessors and high wage individuals inherit bequests from high wage predecessors, then Social Security can improve ex-ante wellbeing by transferring wealth from high wage individuals to low wage individual. The program still reduces equilibrium bequest income, but low wage individuals are still better off because they would have received a small bequest in the absence of Social Security.¹⁶

[Nishiyama and Smetters \(2007\)](#) examine the welfare effects of partially privatizing Social Security. They find that reducing the size of Social Security improves welfare if wage risk is perfectly insurable. However, if wages are subject to uninsurable idiosyncratic shocks, then privatizing Social Security reduces welfare by reducing risk sharing. This is true even taking into consideration general equilibrium feedback from changes in savings.¹⁷ In a similar vein, [Huggett and Ventura \(1999\)](#) and [Huggett](#)

¹⁶However, in the same paper, Social Security reduces welfare in the presence of economic mobility (as described in the previous section).

¹⁷It is worth mentioning that bequest income is uncertain in [Nishiyama and Smetters \(2007\)](#); only a small fraction of individuals receive bequests and ex ante everyone is equally likely to receive bequests. They explain that the crowding out of private savings would be larger if bequests were

and Parra (2010) consider the risk-sharing role of Social Security in models with idiosyncratic wage risk. The papers explore different reform options and both suggest that changes to Social Security could improve welfare by providing more income redistribution.

Social Security can provide insurance against low life time earnings. But this insurance might come at a steep price. If Social Security taxation causes individuals to work fewer hours to escape the tax and if Social Security retirement benefits cause individuals to save less for retirement—both of which are the standard predictions of mainstream macroeconomic models, then Social Security will depress aggregate labor supply and aggregate capital accumulation which will in turn act as a drag on GDP (Prescott (2004b)). Of course, insurance typically does come at a cost—not just the tax (as with public insurance) or the premium (as with private insurance)—because it may incentivize individuals to make different decisions when they are insured, and often erodes the welfare gains from insurance (İmrohoroğlu and Kitao (2012) and Bagchi (2016)).

Additionally, despite the potential benefits of income redistribution through Social Security, the progressivity of the program may be more limited than the benefit earning rule implies because of differential mortality risk (income and survival are positively correlated). Liebman (2002) and Coronado et al. (2002, 2011) show that redistribution between income groups in the same cohort is modest empirically. The same result can be true theoretically as well. Sheshinski and Caliendo (2020) show that increasing longevity for the rich compared to the poor unwinds much of the progressivity of Social Security benefits. However, Bagchi (2019) shows that the optimal level of Social Security progressivity is largely insensitive to wealth-dependent mortality risk. This is because while a more progressive benefit earnings rule provides increased insurance for individuals with low lifetime earnings, these individuals also discount old age consumption the most because of their low survival probabilities. These two effects roughly offset each other, leading to nearly identical optimal benefit earning rules with and without differential mortality. Moreover, as Feldstein (2005) explains, the general equilibrium effects of Social Security increase capital earnings and decrease wages which shifts income towards the wealthy who are more likely to own capital.

In sum, individuals face lifetime earning risks due to idiosyncratic shocks that occur through the life cycle and due to exogenous factors that contribute to earnings. The progressivity of Social Security benefits redistributes income towards those with low lifetime earnings, and thus provides partial insurance against these risks. However, the program may be less progressive than it seems due to differential mortality risk,

distributed evenly among the population. Although they do not speculate on the matter, it is possible that the crowding out that would occur with uniform bequests could be large enough to unwind the welfare gains associated with Social Security.

and the taxes used to fund Social Security benefits cause distortions in factor markets that can erode the welfare gains of the redistribution.

3.3 Aggregate Risk

Our analysis thus far has focused on the ways in which Social Security can provide insurance against *idiosyncratic* risks when markets are incomplete or underutilized. Another important strand of the literature examines the welfare role of Social Security in providing insurance against *aggregate* risks in the presence of incomplete markets. For example, if labor and capital income are subject to aggregate risk, such as productivity shocks, then the government could improve wellbeing by pooling risk across generations. Social Security can also be viewed as a response to capital income risk. Social Security benefits are not subject to the same shocks as capital income and thus could protect an individual from losing their retirement savings in the stock market. The idea of protecting retirees against the volatility of the capital market is a common political motivation for Social Security.¹⁸

Pay-as-you-go pensions transfer income from working generations to retirees. The specific details on how (or if) benefits or taxes are adjusted in response to aggregate shocks can transfer risk between generations. For example, in response to a negative macroeconomic shock, the government could keep benefits to retirees the same by adjusting taxes. This would shift risk towards working generations. Conversely, the government could shift risk towards retirees by adjusting benefits in response to aggregate shocks. In practice, the U.S. Social Security system shifts some aggregate risk to retirees by indexing initial benefits to current wages.¹⁹ Olovsson (2010) shows that intergenerational risk sharing could be improved if Social Security benefits were tied even more closely to aggregate shocks. Shiller (1999) and Bohn (2009) also show that optimal intergenerational risk sharing would shift risk towards the old, rather than towards the young. In a similar vein, Krueger and Kubler (2006) ask if the adoption of a Social Security system can improve welfare in an economy with aggregate productivity risk. They find that Social Security improves welfare in a partial equilibrium setting by transferring labor income risk to retirees. However, the welfare results are completely reversed in general equilibrium (for most parameterizations) because Social Security crowds out private savings, which reduces capital, output, and wages. We ask a related question in a recent paper (Cottle Hunt and Caliendo (2021a)). We show that Social Security does *not* protective safety net against rare

¹⁸For example, during the 2004 presidential election cycle, candidate John Kerry criticized President George W. Bush’s plan to partially privatize Social Security on the grounds that such action “would leave beneficiaries unacceptably vulnerable to volatility in the financial markets.” See Krueger and Kubler (2006) for a discussion.

¹⁹An individual’s benefit depends on their 35 highest years of labor income and are indexed to the average wage level two years prior to the year of eligibility.

episodes of sudden and significant destruction of private wealth such as the Great Depression.

[Harenberg and Ludwig \(2019\)](#) model both aggregate and idiosyncratic income risks. They find that the total welfare benefit from insurance against both risks is greater than the sum of the benefits from insurance against the isolated risks. In their model, Social Security provides insurance against idiosyncratic risk through intragenerational redistribution (due to the progressivity of benefits), and insurance against aggregate risk through intergenerational transfers of labor income (the Social Security benefit fluctuates with changes in labor income). Social Security continues to crowd out private savings in their model, but the effects of crowding out are not sufficient to overturn the positive welfare role of Social Security.

Likewise, there is significant variation in public pension tax rates across OECD countries, ranging from a low of 5% in Australia to a high of 36% in Italy. While intuitive explanations for these differences emphasize a variety of historical, social, and cultural factors, [De Menil et al. \(2016\)](#) argue that variation in the underlying economic conditions across countries explains much of the variation in tax rates. The basic idea is that governments improve welfare through risk sharing by setting Social Security tax rates at low levels in countries where wages grow slowly and are volatile, while setting Social Security taxes rates at high levels in countries where the return on private saving is low and volatile. Their model enriches the textbook Social Security model by articulating a link between the optimal size of Social Security and the volatility of factor prices.

4 Trends in the literature

Taking a broader view of the Social Security literature as a whole, we notice four main trends over time in the areas of (i) privatization, (ii) reform as a response to demographic changes, (iii) behavioral justifications of the program, and (iv) inequality and income redistribution.

First, there has been a clear trend in the literature regarding Social Security privatization (moving from an unfunded pay-as-you-go pension system to a fully funded system). This literature has been motivated both by academic inquiry and also by political and social trends. During the 1990s and early 2000s, there was a clear political focus on privatizing Social Security in the United States. For example, George W. Bush made Social Security privatization a key focus of his administration following his re-election in 2004. Around that time, many academic papers also focused on privatization and the potential welfare effects ([Feldstein \(1996a\)](#), [Samwick \(1998\)](#), [Conesa and Krueger \(1999\)](#), [Huggett and Ventura \(1999\)](#), [Kotlikoff et al. \(1999, 2007\)](#), [Attanasio et al. \(2007\)](#), [Nishiyama and Smetters \(2007\)](#), [Conesa and Garriga \(2008\)](#),

and [İmrohoroğlu and Kitao \(2009\)](#)). Privatization received less political focus following the 2007-2008 financial crisis, and the number of papers addressing the topic as also declined.

Second the intensity of focus on reform has grown proportionally with the urgency of reform due to changing demographics. While economists have been writing about Social Security reform for decades, the intensity seems to have picked up in the last few years as the demographic changes that will necessitate change loom ever closer (among many others, see [De Nardi et al. \(1999\)](#), [Diamond and Orszag \(2005\)](#), [İmrohoroğlu and Kitao \(2012\)](#), [Kitao \(2014\)](#), and [Bagchi \(2015, 2016\)](#) and the references therein). The concern over if and when the government will take action has created its own sub-literature examining the welfare cost associated with the uncertainty of Social Security benefits from an empirical ([Luttmer and Samwick \(2018\)](#)) and theoretical point of view ([Bütler \(1999\)](#), [Gomes et al. \(2012\)](#), [Kitao \(2018\)](#), [Caliendo et al. \(2019\)](#), [Nelson \(2020\)](#), and [Cottle Hunt \(2021\)](#)).²⁰

Third, the behavioral economics revolution brought a renewed focus to the Social Security literature, as the program provides a useful vehicle to test how policy recommendation change when we move away from neoclassical models. Of course, there are many other settings in which economists can explore the policy implications of behavioral models, but Social Security is one of the more popular policies for exploring this question. The first paper in this subfield is [Feldstein \(1985\)](#), who shows that the program confers large welfare gains if households are myopic and do not save for retirement. The number of behavioral papers began to grow following [Laibson \(1997\)](#) and the quasi-hyperbolic model developed in the paper such as [İmrohoroğlu et al. \(2003\)](#) and [Diamond and Köszegi \(2003\)](#). Behavioral economics also offers several possible justifications for Social Security as a response to short-sightedness ([Findley and Caliendo \(2009\)](#), [Cremer and Pestieau \(2011\)](#)), limited computational ability ([Caliendo and Findley \(2013\)](#)), impatience ([Gul and Pesendorfer \(2004\)](#), [Caliendo \(2011\)](#), [Guo and Caliendo \(2014\)](#)), or other behavioral biases (see [Findley and Caliendo \(2008\)](#) for a survey).

The final trend in the Social Security literature is an increased focus on inequality and redistribution, mirroring the broader social and cultural focus on remediating inequality that has arisen in the last decade. Social Security is not the only government policy that aims to redistribute income and reduce inequality; other government programs such as progressive taxation or social programs targeted at low income households are more direct avenues for intratemporal redistribution of income. Social Security is an intertemporal program that can (attempt to) reduce intratemporal in-

²⁰The bottom line is that nobody knows for sure what their Social Security benefits will be until they arrive in the mail, and many young workers believe the government is going to totally default on Social Security benefits and pay them absolutely nothing ([Dominitz et al. \(2003\)](#)). A recent Pew Survey found that nearly half (48%) of Americans under the age of 50 believe that the government will not be able to pay Social Security benefits *at all* ([Parker et al. \(2019\)](#)).

equality only indirectly. However, given that Social Security does redistribute wealth in practice, several papers have explored its role in reducing inequality (see [Cremer et al. \(2008, 2009\)](#), and [Cremer and Pestieau \(2011\)](#)). [Cottle Hunt and Caliendo \(2020b\)](#) propose Social Security reforms that are Rawlsian in nature, and [Sheshinski and Caliendo \(2020\)](#) develop reforms that maintain the progressivity of Social Security in light of the increasing longevity gap between the rich and poor.

5 Conclusion

It is possible to view Social Security as a response to underutilized capital markets and incomplete insurance markets. The program pools longevity and lifetime earning risk across generations, as well as possibly increasing retirement preparedness by forcing saving. However, to fully understand the effectiveness of this risk sharing, it is critical to consider the behavioral responses of individuals to the government program. Four decades of theoretical and quantitative economic models have added key insights that would be missed by a simple surface-level analysis. So far, the literature has found mixed results regarding Social Security's ability to improve wellbeing through mandatory saving and risk sharing.

We cite evidence that capital markets, annuity markets, and lifetime earning risk-sharing markets are incomplete. Mandatory saving through Social Security could be a remedy to incomplete or underutilized capital markets; many Americans do not save at all for retirement, which we interpret as underutilized capital markets. The mandatory saving feature of Social Security could be a solution to this market failure (or market underutilization); however, the empirical and theoretical evidence suggests the program itself might reduce saving.

The difficulty of insuring longevity risk through private markets is typically framed as the result of incomplete annuity markets. Thus, the annuity benefits of Social Security are a clear response to a private market failure; however, the welfare gains of mandatory annuitization through Social Security might be completely offset by welfare losses associated with reduced private inheritances.

Lastly, the progressive benefit earning rule of Social Security redistributes income providing insurance against low lifetime earnings. Private markets do not provide insurance from behind the veil of Rawlsian ignorance, and so it is natural that a government might provide this type of insurance publicly through Social Security. However, the program may be less redistributive than it seems on the surface and the taxes used to finance the program distort labor supply and consumption/saving choices and have general equilibrium consequences for capital accumulation.

We have attempted to summarize the main themes from four decades of economic theory regarding Social Security and risk sharing. While it is possible the program

improves wellbeing through mandatory savings and collective risk sharing, it is also possible that the behavioral responses of individuals unwind or even over-turn the welfare gains of the program. The realized welfare effects of the program are heterogeneous and whether or not an individual is better off as a result of the program depends on factors such as material status, income-level, and life-expectancy.

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