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Social Security and Two-Earner Households

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Abstract

In the past decades, elimination of the pay-as-you-go system in U.S. has been extensively discussed and studied. Such an elimination would also eliminate the intragenerational redistribution done by the following policies of social security. Due to spousal and survivor's benefit provisions, Social Security system redistributes (mostly) to single-earner married households (not necessarily progressive). Retirement benefits are a concave function of past mean earnings. Hence, the system redistributes from high earners to low earners. Finally, existence of a cap on social security taxable earnings makes the system regressive. This is the first paper that quantifies redistributive, labor supply, and welfare implications of these policies using a general equilibrium life-cycle model. Agents start out as permanently married or single and with education levels and wage profiles, where the latter depend both on education and gender. The household is the decision maker and decides on labor supply of its member(s) and saving. The aggregate production function has as inputs capital and labor aggregated by efficiency. Elimination of these policies results in a 5.5% rise in labor force participation of married females, while increasing aggregate welfare by 0.4%. A majority of households experience positive gains in welfare. Single-earner married households incur large welfare losses (as big as 1.1%), whereas two-earner households with high skilled spouses experience substantial welfare gains (as big as 1.9%).

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1 Introduction

Due to aging of US population, reforming its social security system has been a hot topic for policy makers as well as academic economists in the past decades.[1] Many reform proposals, including elimination of the current pay-as-you-go system, have been widely discussed and studied. Most of the discussions overlook the fact that elimination of the current system will also eliminate the intragenerational redistribution that is built into the system. Implications of eliminating major redistributive policies of social security on labor supply and welfare has been unexplored in the dynamic equilibrium analyses in the macroeconomics and public finance literatures. This paper fills this gap.

Current workers face a flat payroll tax rate up to a cap level of earnings.[2] Monthly benefit entitlement of a retiree, i.e, Primary Insurance Amount (PIA), is a function of average past earnings. The overall system is generally thought to be progressive since this function replaces a larger fraction of past earnings for lower earners than higher earners. However, spousal and survivor's benefit provisions may break this relation between one's past earnings and retirement income.

Existing system gives a married retiree the right to collect the higher of own PIA and the spousal benefit, a provision that is equal to fifty percent of the spouse's PIA. Hence, the system pays retirement income to some individuals who never pay payroll taxes. For instance, a lifelong single-earner married household collects one hundred fifty percent of the PIA of the breadwinner every month upon retirement.[3] In addition, a survivor gets the higher of own PIA and the survivor's benefit, a provision that amounts to one hundred percent of the spouse's PIA. Even though these provisions aid many married households, they potentially discourage labor force participation of secondary earners at young ages by increasing value of non-participation. Moreover, with these provisions, the system leads to

[1] U.S. Social Security System is facing a serious financial imbalance over the next 75 years. Projected OASDI tax collections will only be sufficient to finance about 75% of scheduled annual benefit payments in 2037 through 2084 (Board of Trustees Report 2010).

[2] In 2014, the social security tax rate is 12.4% and the earnings cap is $117,000.

[3] Indeed, when the spousal benefit provision was added to social security law in 1939, one of the explicit aims was to encourage traditional bread winner-home maker households. See Carlson (2005) for development of 1939 amendments to social security system.

an important intragenerational redistribution. The system potentially redistributes to many single-earner married households and to the two-earner households who qualify to get these provisions. Additionally, even though a greater fraction of low earner married households take advantage of spousal and survivor's benefits, these provisions do not necessarily play a progressive role. Since the spousal and survivor's benefits increase with past mean earnings of the primary earner in the household, these rules are regressive among the recipients of these benefits.

The earnings cap is another redistributive policy of the social security. Workers do not pay social security taxes for their earnings in excess of the earnings cap, hence, high earners face a lower marginal tax rate than the others. This policy makes the social security more regressive.

This paper contributes to the literature by addressing the following quantitative questions. What are the macroeconomic and welfare consequences of eliminating these policies, while keeping the pay-as-you go system intact? How much labor supply of different households, in particular, labor supply of married females, respond to this policy reform? Who gains, who loses, and by how much? What kind of an intragenerational redistribution is eliminated? Would a majority of households support such a policy reform?

With these questions in mind, I build and calibrate a general equilibrium overlapping generations model with capital and heterogenous agents. Agents start out as married or single, and their marital status do not change over the life-cycle. After retirement, each agent faces a gender and age dependent mortality risk. Agents have certain education levels and wage profiles, where the latter depend on agents' education and gender. The household is the decision maker and decides on labor supply of its member(s) and saving. The labor supply decision of a married household is a joint decision and involves a labor market participation decision for the female. The households with two earners incur an additional fixed utility cost, where the costs differ across households. Besides income and capital taxes, workers pay social security taxes. As in the current system, PIA of a retiree is determined by a piecewise-linear concave function. Qualifying married households receive the spousal benefit provision, whereas qualifying survivors receive the survival benefit provision. The calibrated model economy closely resembles features of the 2000 U.S. economy. The benchmark economy is consistent with observations on gender wage gap, wage premia

and married female labor force participation across education groups, and the structure of marital sorting. The structure of taxation closely resembles the income taxes paid in 2000.

Eliminating the spousal and survivor's benefits, the progressive calculation of benefits, and the earnings cap all at once raises output by 1.2%, while raising capital by 2.1%, and, labor by 0.7%. Only source of the rise in labor is a 5.5% rise in the labor force participation of married females. Labor supply of workers along intensive margin decreases at a negligible amount. At the same time, aggregate welfare increases by about 0.4%, while a majority of households experience positive welfare gains.

There are substantial changes in labor force participation rate of married females. The changes range between 2%-10.7%. A larger fraction of relatively low skilled married females respond to the policy reform by starting to participate in the labor market.[4]

A substantial amount of redistribution from married households with high skilled spouses to married households with low skilled spouses is eliminated. On average, retirement benefits of married households composed of spouses with less than high school degree decrease by 22.4%, whereas retirement benefits of married households composed of spouses with more than college education increase by 23.2%.

Even though the married households with lowest skilled spouses experience the biggest decline in retirement income, they are not the biggest losers of this policy reform. Married households composed of relatively low skilled females and high skilled males, who are mostly single-earners, incur larger welfare losses (as much as 1.1%). On the other hand the ones with relatively high skilled females, who are mostly two-earners, experience substantial welfare gains (as much as 1.9%). Among single individuals, welfare of relatively high skilled individuals increase (as much as 2.7%), while welfare of very low skilled females decrease (1.2%).

To see where these overall effects are coming form, I evaluate the consequences of eliminating each of the redistributive policies one by one.

The substantial rise in female labor force participation is due to the elimination of the spousal and survivor's benefits. This provision discourages many married females from work at young ages by increasing value of non-participation.

[4] As discussed below, skill type of an individual is assumed to be captured by his/her education.

The gains in aggregate welfare are largely due to the elimination of the spousal and survivor's benefits. Elimination of the progressive calculation contributes negatively to the aggregate welfare, while elimination of the earnings cap slightly increases the aggregate welfare.

Elimination of the spousal and survivor's benefits is the reason why single-earner married households, the ones with high skilled males and low skilled females, experience the larger losses in welfare. Married households with two-earners, the ones with high skilled members, experience large welfare gains because of the elimination of both the progressive calculation of benefits and the spousal and survivor's benefits. Elimination of the latter policy benefits these households due to a general equilibrium effect on retirement benefits. On the other hand, elimination of the cap on earnings increases taxes of high earning individuals. As a result, eliminating this policy has a small negative effect on welfare of married households with highest type males.

Related Literature –Liebman (2002) is the first paper that attempts to measure the intragenerational redistribution due to the rules of social security. It is a microsimulation exercise that is able to capture all of the heterogeneity available in the data. However, this study fails to account for the behavioral and general equilibrium implications of counterfactual changes in social security rules. Moreover, it is silent about welfare effects of such changes. As I discuss below, eliminating these rules have significant implications on saving and labor supply decisions of households as well as their welfare.

Nishiyama (2010) studies implications of eliminating spousal and survivor's benefit provisions using a general equilibrium model with uninsurable wage shocks. Main differences between this paper and Nishiyama (2010) are: i) it does not model female labor force participation explicitly, ii) it does not study implications of progressivity of benefit calculations and earnings cap and hence does not evaluate all redistributive aspects of social security, iii) it only considers married households and therefore overestimates the general equilibrium consequences of eliminating the provisions. Blau (1997) also investigates the effects of the spousal benefit provision on labor force participation of married women.[5] In order to overcome estimation problems, he assumes away households' saving decisions and labor supply

[5] See also Gustman and Steinmeier (2004), Blau (1998), and Blau(1998).

decisions along hours margin, the progressive calculation of benefits and general equilibrium implications of eliminating the provision.

Distributional consequences of reforming US Social Security has been previously studied by Huggett and Ventura (1999), Conesa and Kruger (1999). None of these papers focus on distributional aspects of social security that affect mainly two-earner households. They focus on heterogenous single-earner agents, hence, can not capture consequences of eliminating spousal and survivor' benefits. However, this paper shows that eliminating these provisions imply a substantial intragenerational redistribution together with substantial effects on female labor supply and welfare.

Finally, the model economy detailed below has many common elements with Kaygusuz (2010), Guner, Kaygusuz, Ventura (2012a), and Guner, Kaygusuz, Ventura (2012b). Additionally, current paper has a better representation of US Social Security, which is critical for the questions posed by this paper.

Rest of the paper is organized as follows. Section 2 details specifics of the model. Section 3 describes the parameterization of the benchmark economy. Section 4 has a detailed description of the reforms that I study together with the findings. Section 5 concludes.

2 A Life-Cycle Model with Two-Earner Households

In this section I lay out the details of a stationary general equilibrium life-cycle model populated with single and married households.[6]

Demographics

The economy is populated by overlapping generations that consists of a continuum of males and a continuum of females. Every period a new generation of individuals is born. The population growth rate is given with n. Agents in this economy live at most J periods. They begin life as workers and retire after the mandatory retirement age j_R.[7] Starting with the last period of working life, an agent faces a positive mortality risk at the end of each

[6] The model economy has many common elements with Guner, Kaygusuz, Ventura (2012a), Guner, Kaygusuz, Ventura (2012b). However, current paper has a a very detailed modelling of social security in contrast to these other papers.

[7] Retirement in this paper is the age at which the agents start collecting retirement income. Agents can always choose not to work at, or before age j_R.

period. In particular a person with gender i, with $i \in \{m, f\}$, faces a survival probability of ρ_{ij} from age j to age $j+1$. Each agent enters economic life as married or single. I assume that a constant fraction ϕ of the newborns are married and the rest are single. There is no divorce or marriage over the life-cycle.[8] Note that, since the survival risk is at individual level, spouses can possibly die at different ages. Moreover, due to the assumption on the values of the survival probability ($\rho_{ij} = 1$ for $j < j_R$), a survivor also is a retiree.

Productive Heterogeneity

Workers differ by their market productivity levels. The productivity of a worker, $e_i(z, j)$, depends on the agent's intrinsic skill type z, age j, and gender i. Skill type z comes from a finite set $Z = \{z_1, z_2, ...\}$. I assume that each agent is born with a particular skill type that does not change over the life-cycle. Moreover, there is no uncertainty about a worker's future productivity.

When z is the skill type of the wife and $\tilde{z}$ is the skill type of the husband, $M(z, \tilde{z})$ denotes the distribution married households by skill types of the spouses. Similarly, $S_i(z)$ denotes the distribution of gender-i single households by skill type. Finally, let $\Omega(z)$ and $\Psi(z)$ denote the distributions of males and females by their types, respectively.[9]

Preferences

In this economy agents value consumption and dislike labor. The utility function for a single person is given with

$$U^S(c, l) = \ln(c) - \theta \frac{l^{1+\frac{1}{\gamma}}}{1+\frac{1}{\gamma}}, \tag{1}$$

where c is consumption, l is labor, γ is the Frisch elasticity of labor supply, and $\theta > 0$ is taste parameter for labor. On the other hand, a married household's utility function is

$$U^M(c, l_m, l_f, q) = 2\ln(c) - \theta \frac{l_m^{1+\frac{1}{\gamma}}}{1+\frac{1}{\gamma}} - \theta \frac{l_f^{1+\frac{1}{\gamma}}}{1+\frac{1}{\gamma}} - \chi(l_f)q. \tag{2}$$

c is consumption, and l_i, $i \in \{m, f\}$, is labor supply. q stands for per period utility cost of joint-work. $\chi(l_f)$ is an indicator function that takes a value of 1 if the female supplies

[8] Allowing for divorce and remarriage in the model would require an extra state variable: the distribution of singles at a given age by all sorts of characteristics. Given the heterogeneity considered in this paper, such an exercise is computationally challenging.

[9] As can be seen from the choice of the notation, I assume that these skill distributions are age invariant.

a positive amount of labor. I assume that husbands who are not retired always work, but wives may choose to stay out of the labor force. Following Cho and Rogerson (1988), I assume that if a wife participates in the labor market then her household incurs a utility cost of $q \in R_+$.[10] The household draws its utility cost at age 1 from a distribution $\Phi()$ that depends on the skill of the husband. Finally, I assume that q is constant over the life-cycle.

Income

Labor earnings, capital income, and retirement benefits are the sources of income. The agents participate in a competitive labor market where w is the wage rate per efficiency unit of labor. Households can save in the form of a risk-free asset and earn a competitive rental rate r. Moreover, I assume that they are born with no assets and are not allowed to borrow. Asset holdings of a deceased household are not rebated back to the agents who are alive (i.e., no bequests). I focus on a steady state equilibrium at which w and r are constant over time.

A j-year old married household ($j \leq j_R$) earns $e_f(z,j)l_f w + e_m(\tilde{z},j)l_m w$ if the spouses work l_f and l_m hours in the market. Moreover, if the household's asset holdings is a units, then the total household income is $e_f(z,j)l_f w + e_m(\tilde{z},j)l_m w + ra$. Similarly, income of a j-year old single agent is the sum of labor earnings, $e_i(z,j)l_i w$, and interest income, ra.

Income of a retired household is the sum of retirement benefit payments and interest income. Below, I describe the social security system in more detail.

Social Security

There is a pay-as-you-go social security system that taxes labor earnings and uses all of the proceeds to pay for the retirement benefits.

Taxable earnings for social security purposes consists only of labor earnings up to $E_{\max} > 0$. For earnings below this cap, a worker faces a proportional social security tax rate τ^p. The social security tax payment of a worker is given with

$$T^p(e_i(z,j)l_i w) = \tau^p \min\{e_i(z,j)l_i w, E_{\max}\}. \tag{3}$$

Henceforth, I will refer to $\min\{e_i(z,j)l_i w, E_{\max}\}$ as social security taxable earnings of an agent.

[10] The utility cost can be interpreted as utility loss due to inconvenience for scheduling and/or less family time with children.

The benefit that an agent is *entitled* to, $B(\bar{e}_i)$, depends on the average of her/his past social security taxable labor earnings, $\bar{e}_i$.

$$B(\bar{e}_i) = \begin{cases} \xi_1 \bar{e}_i & \text{if } \bar{e}_i \leq \kappa_1 \\ \xi_1 \kappa_1 + \xi_2(\bar{e}_i - \kappa_1) & \text{if } \kappa_2 \geq \bar{e}_i \geq \kappa_1 \\ \xi_1 \kappa_1 + \xi_2(\kappa_2 - \kappa_1) + \xi_3(\bar{e}_i - \kappa_2) & \text{if } \bar{e}_i \geq \kappa_2 \end{cases} \tag{4}$$

ξ_1, ξ_2 and ξ_3 are all between 0 and 1. This particular functional form is the one that is used by the the current social security system.[11] The past mean earnings of a retiree is calculated as follows.

$$\bar{e}_i = \sum_{j=1}^{j_R} \min\{e_i(z,j) l_i w, E_{\max}\}/j_R \tag{5}$$

A single household collects her/his entitlement as the social security benefit payment. On the other hand, a married household is treated differently. In principle the household *can* receive a retirement benefit that is different than the *sum of the entitlements* of the spouses. The system gives a married person the right to collect the higher of own benefit entitlement and half of the spouse's entitlement. If the person collects the latter she/he is said to collect the spousal benefit. The total benefit payments that the married household receives is given as

$$H(\bar{e}_f, \bar{e}_m) = \max\{B(\bar{e}_m) + B(\bar{e}_f), B(\bar{e}_m) + \frac{1}{2}B(\bar{e}_m), B(\bar{e}_f) + \frac{1}{2}B(\bar{e}_f)\}. \tag{6}$$

A survivor also can collect a retirement benefit that is different than his/her entitlement. The system gives a survivor the right to collect the higher of his/her entitlement and the full amount of the deceased spouse's entitlement. If the agent collects the latter she/he is said to collect the survivor's benefit. The total benefit collection of the survivor can be summarized as

$$D(\bar{e}_f, \bar{e}_m) = \max\{B(\bar{e}_m), B(\bar{e}_f)\}. \tag{7}$$

Income Taxation

Households pay income tax and capital income tax. Income tax that a household pays depends on the household's taxable income and marital status. The taxable income is sum

[11] See http://www.ssa.gov/policy/docs/statcomps/supplement/2000/apnd.pdf for details.

of the labor earnings and the capital income. For simplicity, I assume that benefit payments are exempt from income taxation. Income tax functions for married and single households are denoted by $T^M(.)$ and $T^S(.)$, respectively.

In this economy capital income is subject to double taxation.[12] Besides income taxes, households pay an additional tax for their capital incomes at a proportional rate τ^k.

Technology

There is a single representative firm in the economy which hires capital and labor. Let K denote the aggregate capital and L denote the aggregate labor in efficiency units. The production technology of the firm is

$$Y = K^{\alpha} L^{1-\alpha}, \tag{8}$$

where $\alpha \in (0,1)$ is the output share of capital. The capital depreciates at a constant rate $\delta \in (0,1)$.

Decision Making

In this economy younger households make asset holdings and labor supply decisions, whereas retirees only choose the asset holdings. A married household with age less than j_R chooses the labor supply of the wife both at the intensive and extensive margins. Next, I describe in detail the problems faced by different households in the economy

Single Workers

Consider the problem of a j-year old, gender-i, single worker ($j \leq j_R$). The agent has a skill type z and a units of the asset at the beginning of the current period. Finally, the household observes his/her past mean earnings, $\bar{e}$, before making any decisions.[13] The household chooses consumption, c, labor supply, l, and future asset holdings, a', by solving the following problem.

$$V_{ij}^S(z,a,\bar{e}) = \max_{a' \geq 0,\ l \in [0,1]} U^S(c,l) + \beta \rho_{ij} V_{ij+1}^S(z,a',\bar{e}') \tag{9}$$

subject to

$$c + a' = e_i(z,j)wl + (1+r)a - T^p(e_i(z,j)wl) - T^S(e_i(z,j)wl + ra) - \tau^k ra$$

[12] Additional capital income taxation exists in order to capture the corporate income taxes paid.

[13] One should note that a new born begins life with zero asset holdings and zero past mean earnings.

$$\bar{e}' = \frac{(j-1)\bar{e} + \min\{e_i(z,j)lw, E_{\max}\}}{j},$$

where $\beta > 0$ is the discount factor. Recall that the survival probability, ρ_{ij}, takes values less than 1 for $j \geq j_R$. Finally, the last equation describes the law of motion for past mean social security taxable earnings.

Single Retirees

The problem of a single retired household ($j > j_R$) with the same characteristics is given as

$$V_{ij}^S(z, a, \bar{e}) = \max_{a' \geq 0} U^S(c, 0) + \beta \rho_{ij} V_{ij+1}^S(z, a', \bar{e}),$$

subject to

$$c + a' = (1 + r)a + B(\bar{e}) - T^S(ra) - \tau^k ra.$$

As can be seen from the statement of the problem, $\bar{e}$ for a retiree does not change. It only changes for workers.

Worker Married Households

Now, consider the problem of a j-year old married household with $j \leq j_R$. The wife has a skill type z, and the husband has a skill type $\tilde{z}$. The household holds a units of the asset. Recall that q denotes the utility cost of joint work for the household. Before taking any decisions on current consumption (c), labor supply of the husband (l_m), labor supply of the wife (l_f), and future asset holdings (a'), the household observes the past mean earnings of the husband and the wife ($\bar{e}_m$ and $\bar{e}_f$). The problem of the household can be written as

$$\begin{aligned} V_j^M(z, \tilde{z}, q, a, \bar{e}_m, \bar{e}_f) = \max_{a' \geq 0,\ l_f, l_m \in [0,1]} & U^M(c, l_m, l_f, q) + \beta[\rho_{mj}\rho_{fj} V_{j+1}^M(z, \tilde{z}, q, a', \bar{e}'_m, \bar{e}'_f) \\ & + \rho_{mj}(1 - \rho_{fj}) SVR_{mj+1}(\tilde{z}, q, a', \bar{e}'_m, \bar{e}'_f) \\ & + \rho_{fj}(1 - \rho_{mj}) SVR_{fj+1}(z, q, a', \bar{e}'_m, \bar{e}'_f)] \end{aligned}$$

subject to

$$\begin{aligned} c + a' = {} & e_m(\tilde{z}, j) w l_m + e_f(z, j) w l_f + (1 + r)a - T^p(e_m(\tilde{z}, j) w l_m) \\ & - T^p(e_f(z, j) w l_f) - T^M(e_m(\tilde{z}, j) w l_m + e_f(z, j) w l_f + ra) - \tau^k ra, \end{aligned}$$

$$\bar{e}_i' = \frac{(j-1)\bar{e}_i + \min\{e_i(z,j)lw, E_{\max}\}}{j}, i \in \{m, f\}.$$

$SVR_{ij}()$ denotes the value function for a $j-$year old survivor of gender i. The husband becomes a survivor with probability $\rho_{mj}(1-\rho_{fj})$, whereas the wife becomes one with probability $\rho_{fj}(1-\rho_{mj})$. The last equation describes the law of motion for past mean social security taxable earnings of each spouse.

Retired Married Households

Next, consider the problem of a j-year old retired couple. Only choice variable for the household is the asset holdings for future.

$$\begin{aligned} V_j^M(z,\tilde{z},q,a,\bar{e}_m,\bar{e}_f) = \max_{a'\geq 0} U^M(c,0,0,q) + \beta[\rho_{mj}\rho_{fj}V_{j+1}^M(z,\tilde{z},q,a',\bar{e}_m,\bar{e}_f) \\ + \rho_{mj}(1-\rho_{fj})SVR_{mj+1}(\tilde{z},q,a',\bar{e}_m,\bar{e}_f) \\ + \rho_{fj}(1-\rho_{mj})SVR_{fj+1}(z,q,a',\bar{e}_m,\bar{e}_f)] \end{aligned}$$

subject to

$$c + a' = (1+r)a - \tau^k ra + H(\bar{e}_f,\bar{e}_m) - T^M(ra),$$

where $H()$ is the benefit payment that the household receives (equation 6).

Finally consider the problem of a j-year old survivor with a units of asset holdings.

$$SVR_{ij}(z,q,a,\bar{e}_m,\bar{e}_f) = \max_{a'\geq 0} U^S(c,0) + \beta\rho_{ij}SVR_{ij}(z,q,a',\bar{e}_m,\bar{e}_f)$$

subject to

$$c + a' = (1+r)a + D(\bar{e}_f,\bar{e}_m) - \tau^k ra - T^M(ra)$$

where $D(\bar{e}_f,\bar{e}_m)$ is the retirement benefit of the survivor.

Discussion

Given the model economy described above, it can be argued that availability of the spousal and survivor's benefits provision discourages labor force participation for most married women. Its presence increases the value of non-participation in labor force. Hence, an elimination of this policy is likely to increase participation rate of females. The beneficiaries of this policy are life-long single-earner married households and some qualifying

two-earner households.[14] The households who can not enjoy this policy are most life-long two-earner households with relatively high earning females, and all single households. Hence, this policy mainly redistributes from relatively high earning two-earner households and single households to (mostly) life-long single-earner households. Thinking that most single-earner married households are relatively low earners, this policy might seem as a progressive tool. However, it is not necessarily as such. Among the recipients of the spousal and survivor's benefits, the benefit collections increase with average earnings of primary earners. Therefore, an elimination of this policy is likely to hurt most single-earner married households with relatively high earning husbands and relatively low earning wives.

The progressive calculation of social security benefits is a tool that redistributes from high earning households to low earning households. An elimination of this policy alone, will increase the retirement income of high earning individuals and decrease the retirement income of low earning individuals. As a response to such a change, a low earner individual is likely to increase his/her labor supply and savings, whereas a high earner individual is likely to decrease his/her labor supply and savings. Such a change is likely to hurt a low earner, and benefit a high earner.

On the other hand, the cap on social security taxable earnings works as a regressive tool. Earnings above the cap are not taxed for social security purposes. While keeping other policies intact, an elimination of this policy is likely to hurt relatively high earning individuals, since they will start facing higher marginal tax rates for their earnings. On the other hand, such a change will benefit others through general equilibrium effects.

The spousal and survivor's benefits, progressive calculation of benefits, and earnings cap have different implications on behavior of different households and result in non-trivial redistributions. Using the parameterized model, below I investigate the quantitative implications of these policies.

[14] A two-earner household collects the spousal and survivor's benefits if the retirement benefit of the wife is less than fifty percent of the husband's benefit, or the wife is a survivor and her benefit is less than the husband's benefit.

3 Parameter Values

In this section I summarize the calibration strategy and discuss parameter values that I use to simulate the model economies. Tables 1-4 report the values of these parameters.

Demographics

The model economy is calibrated to the U.S. economy in 2000. U.S. Census data are used unless stated otherwise.[15] Length of a period is set to be 10 years. Age 1 in the model corresponds to ages between 25 and 34. Agents live at most 7 periods ($J = 7$) and retire after age 4 ($j_R = 4$). Since all agents die at the end of final period, the probability of survival to the 8^{th} period is set as 0 ($\rho_{i7} = 0$). Recall that agents in the model face mortality risk only at or after age j_R. Hence, ρ_{ij} is 1 for all $j < j_R$ for $i \in \{m, f\}$. The remaining survival probabilities are constructed using data from Social Security Administration's publication (see Table 4). The population rate, $n = 0.105$, is consistent with the long-run average of U.S. population growth rate (corresponds to an annual growth rate of 1%). As a result, the fraction of retirees in the model economy at any given date is about 18.9%, whereas it is 19.2% in the data.[16] Since 74 percent of people between ages 25 and 64 are married in the data, ϕ is chosen to be 0.74.

Skills and Endowments

I assume that a skill type is represented by education in the data. Moreover, I assume five skill types corresponding to the educational attainment levels of less than high school education (<hs), high school degree (hs), some college education (sc), college degree (col), and more than college education (col+).

In order to construct the distributions of households by education, I consider the sample between ages 25 and 64. First, I find the distribution of married households by education of the spouses (as shown in Table 1). One can observe the well known fact about assortative mating from this table. Spouses in most married households have similar educational

[15] Source: Census data tabulated by IPUMS-USA, Minnesota Population Center, University of Minnesota (www.ipums.org).

[16] In particular, 19.2% of all of the individuals older than 25 years of age are the ones who are older than 65 in the 2000 U.S. data.

attainment levels.[17] Next, I find the distribution of males by education and the distribution of females by education independent of marital status ($\Omega(z)$ and $\Psi(z)$). Using the following accounting identities, I construct the distribution of gender-i single households by education.

$$S_m(z) = \Omega(z) - \sum_{\tilde{z}} M(\tilde{z}, z)$$

$$S_f(z) = \Psi(z) - \sum_{\tilde{z}} M(z, \tilde{z})$$

Labor market productivity levels are constructed using 2000 Census data. I consider the individuals who are older than 25 and younger than 64.[18] I divide the sample into subgroups by age, gender and skill type of individuals. First, I find average weekly wages by dividing total annual wage and salary income to total weeks worked for each subgroup. Then, I normalize them with the mean weekly wage for the entire sample to find the relative market productivity levels. Table 2 reports these productivity values.

Two features of this table are worth noting. First, as documented in Olivetti (2006), age-earning profiles for females are much flatter than the ones for males. Second, as Eckstein and Nagypál (2004) document, there are significant differences between earnings of people with post-college education and college education.

Production Technology

There are 2 parameters to be determined on the production side of the model. I set the capital share α to be 0.343 and the depreciation rate δ to be 0.432 (annualized value is 0.055). These values are consistent with a notion of capital that includes fixed private capital, land, inventories, and consumer durables. Altogether, this implies an annual capital to output ratio of about 2.93.[19]

Social Security System

[17] The level of marital sorting by education has been quite high and constant from 1940 until 1980s, but has increased since then. See Mare and Schwartz (2005) for changes in assortative mating by education from 1940 to 2003.

[18] I exclude those who are not full-time workers, or are self-employed, or are unpaid workers, or earn less than half of the minimum wage per hour. These restrictions are in line with the ones in Katz and Murphy (1992).

[19] See Guner, Kaygusuz and Ventura (2012) for details.

As described in Equation 4, monthly benefit entitlement in the law is calculated with a progressive formula. As the average indexed monthly earnings (AIME) of a retiree increases, the marginal benefit entitlement decreases. In 2000, first \$531 of AIME is multiplied with 0.90. If applicable, next \$2671 of AIME is multiplied with 0.32. Finally, the part of AIME that exceeds \$3202 is multiplied with 0.15. Accordingly, I set $\xi_1 = 0.90$, $\xi_2 = 0.32$, and $\xi_3 = 0.15$ (see Equation 4). Next, I normalize the bend points (which are monthly levels) with one twelfth of mean household income of U.S. in 2000.[20] For benchmark calculations, I multiply these normalized numbers with the mean household income in the benchmark model to determine the bend points κ_1 and κ_2. The values of these parameters are also reported in Table 4.

Maximum taxable labor earnings for social security purposes in 2000 is \$76,200 (annual). In line with the previous calibration strategy, I normalize this cap with mean household income for 2000. Again, I multiply this normalized number with the mean household income that comes out of the model in order to parameterize $E_{\max}$. Finally, the social security tax rate, $\tau^p = 0.096$, is the one that balances the social security budget.

Income Tax and Capital Income Tax

I borrow the income tax functions from Guner, Kaygusuz and Ventura (2014). The effective income tax function for married households is given as

$$T^M(income) = [0.085 + 0.058 \log(\widetilde{I})]income,$$

and the one for single households is given as

$$T^S(income) = [0.105 + 0.034 \log(\widetilde{I})]income$$

where $\widetilde{I}$ is household income normalized by mean household income of US.

Finally, I estimate the capital income tax rate to proxy the corporate income tax payments. Between 1987 and 2000, corporate income tax revenue was approximately 1.92 percent of GDP. Given the assumptions on the production technology, a 9.7 percent capital income tax rate replicates this share.

Preference Parameters

[20] Mean household income in 2000 is \$57,135 (from Census).

There are three preference parameters to be set. These are θ, γ and β. The choice of Frisch elasticity of labor supply, γ, is based on available estimates. For married women, Blundell & MaCurdy (1999) reports a range of estimates from 0.5 to 1, for males, MaCurdy (1981) finds a range from 0.10 to 0.40 and Altonji (1986) finds a range from 0 to 0.35. I assume that $\gamma = 0.4$.

Given the values of other parameters, the choice of labor parameter, θ, targets the hours worked per worker in the 2000 U.S. Census data. A worker on average spends about 40.1% of his/her available time for labor.[21] Finally, the discount factor β results in a steady-state capital to output ratio that is consistent with the data (see Table 4).

I assume that the utility cost of joint work, q, is distributed according to (flexible) gamma distribution with parameters λ_z and μ_z. The pdf of the gamma distribution is given as

$$q^{\mu_z - 1} \frac{e^{-\frac{q}{\lambda_z}}}{\Gamma(\mu_z)\lambda_z^{\mu_z}}$$

where z is the type of the husband, and $\Gamma()$ is the Gamma function.

Using Census data, I calculate the employment-population ratio of married females between ages 25 and 54 for each of the educational categories defined earlier.[22] Table 3 shows the participation rates of married females by types of households for 2000 U.S. economy. The aggregate labor force participation is 69.3%. The choice of λ_z and μ_z reproduces the participation rates of women who are married to type$-z$ men as close as possible. For instance, the benchmark values of λ and μ for high school graduate men imply participation rates that are consistent with the ones reported in the second row of Table 3. This calibration strategy allows me to exploit the information contained in the differences in the labor force participation of married females as their own wage differ by education.

4 Quantitative Analysis

Current paper aims to quantify the implications of eliminating above mentioned policies on welfare of households and some aggregate variables. For this purpose, I evaluate four

[21] I consider people who are between 25 and 54. On average a person works about 2005 hours annually. I assume that 5000 hours is the total amount of time available for work per year.

[22] I exclude all individuals who are in the armed forces from my sample.

hypothetical changes to US Social Security system using the parameterized model described above. In all of the hypothetical environments the pay-as-you-go structure is kept in place. First, I eliminate the spousal and survivor's benefits, the progressive calculation of benefits, and the cap on social security taxable earnings all at once. Then, I eliminate each of these policies one by one to see where the overall effects are coming from. All of these exercises are revenue neutral in terms of income tax collections. This is achieved by an additional linear income tax if needed. Moreover, in all of these hypothetical economies budgets of social security systems are balanced. The analyses made below make comparisons between steady states.

First exercise eliminates the spousal and survivor's benefits, the progressive calculation of benefits, and the cap on earnings simultaneously. The social security tax rate is kept unchanged ($\tau^p = 0.096$). The function that is used to calculate benefit entitlement (Equation 4) is replaced with

$$B(\bar{e}_i) = 0.4389\bar{e}_i.$$

Hence, the progressive calculation of benefits is replaced with a linear benefit function. Note that the value of the slope of the new benefit function balances the social security budget. Moreover, the social security tax function, $T^p()$ (Equation 3) is replaced with

$$T^p() = \tau^p e_i(z, j) l_i w.$$

Hence, cap on social security taxable earnings is eliminated. Finally, the spousal and survivor's benefits are eliminated. Equations 6 and 7 are replaced with

$$H(\bar{e}_f, \bar{e}_m) = B(\bar{e}_m) + B(\bar{e}_f)$$

and

$$D(\bar{e}_f, \bar{e}_m) = B(\bar{e}_j) \tag{10}$$

for a person with gender $j \in \{m, f\}$. Such a change implies that every retiree collects his/her entitlement as the retirement benefit.

Implications of these changes on aggregate variables are reported in Table 5 on column titled 'All'. The biggest change is on labor force participation rate of married females; it goes up by 5.5%. Output increases by 1.2%, while capital and labor increase by 2.1% and 0.7%,

respectively. Changes along intensive margin of labor supply are very small. Moreover, wage rate per efficiency unit of labor changes very slightly.

How does this policy reform affect different households? Table 6 answers this question. Panel A of this table shows how the retirement benefit collections of different married households change after the policy reform. Households composed of spouses with the lowest skill types experience the biggest decline in the benefit collections. (<hs,<hs) households experience a 22.4% decline in retirement benefits. On the other hand, (col+,col+) households experience a 23.2% increase in retirement benefits. The change in benefits gets larger as the type of either spouse increases. Hence, eliminating these policies eliminates a redistribution from married households with relatively high type spouses to the ones with low type spouses.

Households respond to the policy reform by changing their behavior. As Panel B of the same table shows, labor force participation increases substantially for many types of married households. The changes range from 2% to 10.7%. Larger response comes from married households with relatively lower type females.

The consequences of the reform on welfare of different households are shown in Panel C of Table 6. Among married households, the ones with relatively low type females experience welfare losses, whereas the ones with relatively high type females experience welfare gains. The policy change hurts (col+,<hs) households the most. Their welfare on average decreases by about 1.1%. On the other hand, (col+,col+) married households experience a welfare gain of 1.9%. Note that more of the losing married households are single-earners, whereas more of the winning ones are two-earners (see Table 3).

Most types of single households experience welfare gains. Single males with a (col+) type gain as much as 2.7%, whereas (<hs) females incur a 1.2% welfare loss. Gains in welfare increase as the type of a single household increases. At the aggregate level welfare increases by 0.4% (Table 7).

The main findings of this exercise can be summarized as follows. Eliminating the spousal and survivor's benefits, the progressive calculation of benefit, and the earnings cap have substantial effects on female labor force participation, whereas the effects on the hours of workers are small. Majority of households experience gains in welfare, while aggregate welfare goes up. More of the married households composed of low type females and high type males, i.e, single-earners, incur substantial welfare losses. Contrary happens for households with

females of high types, the ones who are more likely to be two-earners. Next, these policies are eliminated one by one to see where the overall effects are coming from.

Eliminating the Spousal and Survivor's Benefit

First, the spousal and survivor's benefits are eliminated, while keeping the progressive calculation, and the cap on earnings untouched. Each individual receives his/her entitlement as the retirement benefit. Benefits of all retirees are scaled up by 8.9% to achieve a balance in the budget of social security system. The social security rate is kept at the benchmark value.

As discussed earlier, eliminating the spousal and survivor's benefits affects mostly single-earner households. From the data we know that female labor force participation declines as the type of the female decreases (Table 3). Hence, more of these households collect spousal and survivor's benefits. In addition, the amount of this provision increases with the type of the male. As a result, married households with low type females and high type males experience the largest losses in retirement benefit collections. Panel A of Table 8 shows that (col+,<hs) married households experience a 25.1% decline in retirement benefits. As a result, females of such households respond by entering to the labor force. For these households, the participation rate of females increases by 11.1%, while at the aggregate level it goes up by 4.7% (Table 5, column 'Spousal and Survivor's Benefit'). In addition, the participation rate increases by more than 5% for many types of married households. Panel C reports the steady-state welfare implications of this exercise. Majority of households gain from the elimination of the provisions, while some married households incur welfare losses due to the loss of the spousal and survivor's benefits. On the other hand, since the equilibrium benefit payments are larger, there are positive welfare effects on the households who do not collect the provisions in the benchmark economy. These are either single households, or two-earner married households with relatively high type females. Welfare gains are as large as 1.3%, and welfare losses are as large as 1.3%. Due to the general equilibrium effect on retirement incomes, the singles experience welfare gains ranging between 0.8-1%. At the aggregate level welfare of households increases by about 0.7%. Note that this amount is larger than the case where all policies are eliminated (see Table 7).

Table 5 shows the changes in aggregate variables with this exercise. Mainly because of a 4.7% rise in participation of married females, aggregate labor increases by 0.8%. The loss of

the spousal and survivor's benefits leads many married households to increase their savings. As a result, aggregate capital increases by 1.8%. Hence, aggregate output increases by about 1.1%. Changes in hours of workers are very small.

These findings suggest that the spousal and survivor's benefits discourage a large number of married females from labor force participation. Moreover, these provisions have a significant redistributive role together with substantial welfare implications. The redistribution is *from* most two-earner households (the ones with high type females) and singles *to* single-earner married households and to few two-earner households.[23] Elimination of these provisions results in welfare gains for the majority of households.

Eliminating the Progressive Calculation of Benefits

Next exercise eliminates the progressive calculation of benefits, while keeping the spousal and survivor's benefits and the cap on earnings intact. Equation 4 is replaced with

$$B(\bar{e}_i) = 0.3784\bar{e}_i.$$

The social security tax rate in the benchmark economy is unchanged, and the slope of the new benefit function balances the social security budget. Figure 1 illustrates the two benefit functions. All else equal, with the new benefit function, the retirees with relatively low amount of past mean earnings get lower income, whereas the ones with relatively high past mean earnings get higher income. Such a change eliminates a redistribution from high earners to low earners.

Panel A in Table 9 shows the percentage change in aggregate benefit collections of married households by skill types. The pattern one gets out of this table is that married households with high skilled males get significantly higher retirement incomes, whereas the ones with low type males and low type females get significantly lower retirement incomes. The latter observation is not surprising since this exercise eliminates a progressive feature of social security. For households with high skilled husbands and low skilled wives, the big rise in retirement income might look puzzling. This follows from the fact that most of these households collect the spousal and survivor's benefits. The benefit collection of the entire

[23] A two-earner household can be elibigle for spousal benefit as long as benefit entitlement of the secondary earner is less than fifty percent of the entitlement of the primary earner. Moreover, the survivor of the household can be eligible for the suvivor's benefit as long as the secendary earner's entitlement is less than the entitlement of the primary earner.

household increases at the rate of the husband's benefit entitlement (which gets even larger due to the elimination of the progressivity).

A further observation is that the elimination of the progressive calculation increases the gap between the wives' and husbands' benefit entitlements for households where the husbands are the higher earners. As a result, more females are discouraged from labor force participation as the spousal and survivor's benefits become more appealing. Panel B of Table 9 reports the resulting changes in the participation rates of married women. The participation rates of females decline for many households. However, the effects are not as significant as the case when the spousal and survivor's benefits are eliminated.

Panel C of this table reports the steady state welfare consequences of this exercise. For most households skill type of the husband determines whether a married household gains or loses from the change. Welfare gains of marred households with highest type males range between 1.4-2.1%, whereas for households with low type spouses, (<hs,<hs), welfare losses are as large as 1.7%. Single women with low skills experience a 2.3% decline in welfare, whereas high skilled single men experience a 1.4% improvement in their welfare. At the aggregate level welfare of households decreases by 0.3% (Table 7).

Column 'Progressive Calculation' in Table 5 shows the effects of this exercise on aggregate variables. The effects are relatively smaller. Due to combination of a small positive effect on hours of workers, and a small negative effect on participation of females, aggregate labor does not change. Since relatively low earning households experience declines in retirement incomes, they increase their savings. As a result aggregate capital increases by 0.6% and this leads to a 0.2% rise in total output.

The findings from this exercise can be summarized as follows. A redistribution from relatively high earning households to low earning households is eliminated with the elimination of the progressive calculation of benefits. Even though aggregate variables do not change much, some households are affected significantly from the elimination of this policy. As discussed above, welfare implications of this exercise are severe for some households.

Eliminating the Cap on Social Security Taxable Earnings

Final exercise eliminates the cap on social security taxable earnings, while the other policies are kept intact. The social security tax rate is the one in the benchmark economy. In order to balance the budget, the benefit entitlements of each agent (given with Equation

4) are scaled down by 0.8%. In contrast to the benchmark economy, the workers who earn in excess of the cap level of earnings now face a higher marginal tax rate, however, in return get a higher retirement benefit. Latter happens because past mean earnings are no longer bounded by the earnings cap, hence, there is no longer a cap on benefit entitlements.

Panel A in Table 10 shows how the hours of workers compare to their counterparts in the benchmark economy.[24] As expected, (col+) married men who earn above the earnings cap lower their hours significantly due to a higher marginal tax rate. On average, (col+) married men decrease their hours by about 2.6%. Moreover, women who are married to (col+) men increase their hours by about 0.8%. This outcome is a result of within household reallocation of hours with response to a higher marginal tax rate faced by the high earner. Single (col+) males also decrease their labor hours (1.4%). Welfare implications, which are relatively small, are shown in Panel B of Table 10. Adverse welfare effects of higher taxes for high earners are dampened by the fact that these agents are receiving higher benefits. Aggregate welfare increases by 0.1%, while a majority of households gain from this change (Table 7).

Table 5 shows how aggregate variables respond to this policy exercise. The changes are not large. Since an elimination of the cap on earnings increases benefits collected by high type individuals, aggregate capital decreases by 1.1% as the savings of such households decline. There is a small decline in aggregate labor (0.3%), while aggregate output declines by 0.5% percent.

Discussion

From these exercises the following findings emerge. Eliminating the spousal and survivor's benefits, the progressive calculation of benefits, the cap on earnings all at once leads to a substantial rise in labor force participation of married females, and substantial welfare gains for majority of households. Welfare of married households composed of relatively low type females and high type males, i.e, the ones who are mostly single-earners, decrease. On the other hand, welfare of married households with relatively high type females, i.e, the ones who are mostly two-earners, increase. Among single individuals, welfare of relatively high type individuals increase while welfare of lowest type females decrease. In addition,

[24] Since the effects along the intensive margin are much more significant, I do not report how the participation of females change.

a significant redistribution *from* married households with relatively high type spouses and high type single households *to* married households with low type spouses and low type single households is eliminated.

First, I find that the rise in female labor force participation is mainly due to the elimination of the spousal and survivor's benefits. This provision discourages many married females from work by increasing value of non-participation.

Second, the gains in aggregate welfare are largely due to the elimination of the spousal and survivor's benefits. As Table 7 shows, largest gains in aggregate welfare are achieved when only this provision is eliminated. Elimination of the progressive calculation contributes negatively to the aggregate welfare, while elimination of the earnings cap slightly increases aggregate welfare.

Third, elimination of the spousal and survivor's benefits is the reason why single-earner married households, the ones with high skilled males and low skilled females, experience the larger losses in welfare. Married households with two-earners, the ones with high skilled members, experience large welfare gains because of the elimination of both the progressive calculation, and the spousal and survivor's benefits. Elimination of the latter policy benefits these households due to a general equilibrium effect on retirement benefits. On the other hand, elimination of the cap on earnings increases taxes of high earning individuals. As a result, eliminating this policy has a small negative effect on welfare of married households with highest type males.

Finally, for relatively high type single households welfare gains are mainly due to the elimination of the spousal and survivor's benefits, and the progressive calculation. While elimination of the former makes all single households better off due to general equilibrium effects, elimination of the latter favors high type single individuals by directly increasing their retirement benefits. On the other hand, welfare losses of lowest type single females due to the elimination of the progressive calculation outweighs the gains from elimination of the spousal and survivor's benefits.

5 Conclusions

Quantitative consequences of eliminating the pay-as-you-go system in US has been explored extensively in the literature. This is the first that paper studies the quantitative implications of eliminating the (intragenerational) redistributive policies of social security without eliminating the pay-as-you-go feature of the system using a general equilibrium life-cycle model. The findings of the paper have crucial policy implications. Contrary to common perception, the redistribution currently being done by the system is mostly favoring "traditional" single-earner American households. This redistribution is significantly hurting many single households and two-earner married households with highly productive spouses. Moreover, the spousal and survivor's benefits discourage labor force participation for many married females. Eliminating these policies increases aggregate welfare, while a majority of households experience positive welfare gains.

Table 1: Distribution of Households by Education, Conditional on Marital Status and Gender

	Married Households						Single Households		
	Female								
Male	<hs	hs	sc	col	col+	Total		Male	Female
<hs	6.93	4.26	2.33	0.39	0.17	14.09	<hs	15.24	16.60
hs	3.27	13.49	7.32	1.82	0.65	26.54	hs	26.69	26.48
sc	1.8	7.47	13.61	4.3	1.52	28.71	sc	29.52	31.64
col	0.39	2.35	5.73	7.52	2.56	18.55	col	18.70	15.44
col+	0.17	0.87	2.57	4.33	4.17	12.11	col+	9.84	9.88
Total	12.56	28.44	31.56	18.36	9.07	100	Total	100	100

Note: For married households, entries show the fraction of households with corresponding levels of educational attainments of spouses. For single households, entries show the fraction of individuals with corresponding educational levels.

Table 2: Labor Market Productivity Levels, by Type, Age, and Gender

	Male					Female				
Age	<hs	hs	sc	col	col+	<hs	hs	sc	col	col+
25-34	0.536	0.754	0.867	1.182	1.509	0.449	0.551	0.652	0.928	1.220
35-44	0.635	0.896	1.097	1.550	1.988	0.419	0.621	0.774	1.051	1.438
45-54	0.666	0.955	1.174	1.646	2.061	0.449	0.642	0.788	1.066	1.372
55-64	0.729	0.958	1.209	1.705	2.294	0.529	0.620	0.815	1.140	1.364

Note: Entries show the productivity levels of males and females by age and education calculated using 2000 Census data. The values are constructed using weekly wages for each type (see text for details).

Table 3: Labor Force Participation of Married Women, 25-54 (%)

	Female				
Male	<hs	hs	sc	col	col+
<hs	41.2	62	71.5	77.4	69.2
hs	49.6	67.4	77.2	83.7	85.5
sc	50.1	67.9	74.8	82.9	88.4
col	49.1	63.6	68.7	73.2	83.2
col+	43.6	57.3	62.1	63.5	78.7

Note: Each entry shows the labor force participation (%) of married females ages 25-54, calculated from 2000 Census data.

Table 4: Parameter Values

γ	0.4	ρ_{f4}	0.818
β	0.835	ρ_{f5}	0.592
θ	25.5	ρ_{f6}	0.206
α	0.343	ρ_{m4}	0.728
δ	0.432	ρ_{m5}	0.456
ϕ	0.74	ρ_{m6}	0.122
κ_1	0.112 of mean income	τ^p	0.096
κ_2	0.673 of mean income	ξ_1	0.90
$E_{\max}$	1.33 of mean income	ξ_2	0.32
τ^k	0.097	ξ_3	0.15
n	0.105		

Note: Entries show the values of the parameters used for the benchmark economy.

Table 5: Eliminating Redistributive Policies of Social Security

	All	Spousal & Survivor's Benefit	Progressive Calculation	Earnings Cap
Hours/Worker (Male)	-0.2	-0.2	0.2	-0.2
Hours/Worker (Female)	-0.2	-0.3	0.3	0.0
LFP of married women	5.5	4.7	-0.7	-0.1
Output	1.2	1.1	0.2	-0.5
Capital	2.1	1.8	0.6	-1.1
Labor	0.7	0.8	0.0	-0.3
Wage	0.5	0.4	0.2	-0.3

Note:Entries show the effects of changing the policies of U.S. Social Security System on selected variables across steady states (%). The entries under the column titled 'All' shows the effects of removing the spousal and survivor's benefits, the progressive calculation of benefits, and the earnings cap simultaneously. Similarly, the column titled 'Spousal & Survivor's Benefit' shows the effects when only the spousal and survivor's benefits are eliminated. The column titled 'Progressive Calculation' shows the effects of eliminating the progressive calculation of benefits. The column titled 'Earnings Cap' shows the effects of eliminating the earnings cap on social security taxable earnings (see the text for details).

Table 6: Eliminating All - Spousal and Survivor's Benefit, Progressive Calculation, and Earnings Cap

Panel A
% Change in Benefits, Married

	Female				
Male	<hs	hs	sc	col	col+
<hs	-22.4	-21.1	-10.7	-4.3	4.9
hs	-22.9	-16.9	-9.9	0.0	8.6
sc	-19.0	-13.7	-9.5	2.1	11.5
col	-10.0	-5.1	-0.8	6.1	14.3
col+	2.8	6.0	10.5	17.0	23.2

Panel B
% Change in LFP, Married

	Female				
Male	<hs	hs	sc	col	col+
<hs	7.1	9.5	4.9	2.5	3.2
hs	10.7	7.8	6.7	2.4	2.1
sc	7.0	5.9	5.2	3.0	2.0
col	2.2	3.7	3.5	2.5	2.1
col+	8.1	9.2	8.9	6.0	4.4

Panel C
% Change in Welfare

	Married					Single		
	Female						Male	Female
Male	<hs	hs	sc	col	col+			
<hs	-0.6	0.1	0.8	0.8	1.4	<hs	-0.2	-1.2
hs	-0.6	0.1	0.9	1.0	1.5	hs	0.7	-0.2
sc	-0.9	-0.2	0.3	1.2	1.6	sc	0.9	0.2
col	-0.9	-0.3	0.2	0.9	1.5	col	2.0	0.9
col+	-1.1	-0.5	0.2	1.2	1.9	col+	2.7	1.6

Note: Entries show the percentage change in the certain variables across steady states when the spousal and survivor's benefits, the progressive calculation of benefits, and the earnings cap are eliminated at once. Panel A shows the changes in aggregate benefit collections by types of married households, Panel B shows the changes in married female labor force participation by types of married households, and Panel C shows the percentage change in welfare by types of married and single households.

Table 7: Aggregate Welfare

	All	Spousal&Survivor's Benefits	Progressive Calculation	Earnings Cap
Change in Welfare (%)	0.4	0.7	-0.3	0.1

Note:Entries show the effects of changing the policies of U.S. Social Security System on aggregate welfare across steady states (%). The entries under the column titled 'All' shows the effects of removing the spousal and survivor's benefits, the progressive calculation of benefits, and the earnings cap simultaneously. Similarly,the column titled 'Spousal & Survivor's Benefit' shows the effects when only the spousal and survivor's benefits are eliminated. The column titled 'Progressive Calculation' shows the effects of eliminating progressive calculation of benefits. The column titled 'Earnings Cap' shows the effects of eliminating the earnings cap on social security taxable earnings (see the text for details).

Table 8: Eliminating the Spousal and Survivor's Benefist

Panel A
% Change in Benefits, Married

	Female				
Male	<hs	hs	sc	col	col+
<hs	-1.6	1.2	6.5	5.4	3.9
hs	-9.6	-4.2	0.4	7.5	6.7
sc	-14.1	-7.6	-3.7	6.5	7.2
col	-22.7	-17.0	-13.5	-5.8	-0.8
col+	-25.1	-21.0	-16.7	-7.8	-1.3

Panel B
% Change in LFP, Married

	Female				
Male	<hs	hs	sc	col	col+
<hs	7.8	6.0	1.8	-0.4	-0.3
hs	9.6	6.8	4.6	1.4	-0.2
sc	8.3	6.1	4.6	2.6	0.6
col	3.5	4.3	3.6	2.5	1.8
col+	11.1	9.2	8.0	5.0	3.0

Panel C
% Change in Welfare

	Married					Singles		
	Female						Female	Male
Male	<hs	hs	sc	col	col+			
<hs	1.3	1.2	1.2	0.6	0.4	<hs	0.9	1.0
hs	0.6	1.0	1.2	1.1	0.6	hs	0.9	0.9
sc	-0.1	0.4	0.8	1.3	1.0	sc	0.9	0.9
col	-1.4	-0.8	-0.5	0.2	0.6	col	0.8	0.9
col+	-1.3	-0.8	-0.4	0.3	0.7	col+	0.8	0.8

Note: Entries show the percentage change in the certain variables across steady states when only the spousal and survivor's benefits are eliminated. Panel A shows the changes in aggregate benefit collections by types of married households, Panel B shows the changes in married female labor force participation by types of married households, and Panel C shows the percentage change in welfare by types of married and single households.

Table 9: Eliminating the Progressive Calculation

Panel A
% Change in Benefits, Married

	Female				
Male	<hs	hs	sc	col	col+
<hs	-19.3	-22.1	-17.8	-10.2	5.3
hs	-9.6	-10.7	-12.3	-10.0	1.7
sc	2.3	-1.5	-4.7	-6.4	1.5
col	23.5	24.2	20.7	13.8	13.2
col+	33.8	33.8	33.8	29.4	26.8

Panel B
% Change in LFP, Married

	Female				
Male	<hs	hs	sc	col	col+
<hs	-0.4	1.8	2.4	2.8	4.9
hs	-1.1	-1.2	-0.4	0.8	2.1
sc	-0.4	-1.7	-1.5	-0.3	1.3
col	-0.9	-0.9	-1.1	-1.1	-0.4
col+	-0.9	-0.8	-0.8	-1.7	-1.0

Panel C
% Change in Welfare

	Married					Single	
	Female					Male	Female
Male	<hs	hs	sc	col	col+		
<hs	-1.7	-1.2	-0.8	0.0	1.3	<hs	-1.3	-2.3
hs	-0.8	-0.9	-0.9	-0.5	0.5	hs	-0.7	-1.4
sc	0.1	-0.2	-0.5	-0.5	0.3	sc	-0.4	-1.0
col	1.6	1.5	1.2	0.8	0.7	col	0.8	-0.4
col+	2.1	2.1	2.0	1.6	1.4	col+	1.4	0.3

Note: Entries show the percentage change in the certain variables across steady states when only the progressive calculation of benefits are eliminated. Panel A shows the changes in aggregate benefit collections by types of married households, Panel B shows the changes in married female labor force participation by types of married households, and Panel C shows the percentage change in welfare by types of married and single households.

Table 10: Eliminating the Earnings Cap

Panel A
% Change in Hours/Worker

	Married		Single	
	Male	Female	Male	Female
<hs	0.2	-0.1	0.0	0.0
hs	0.0	0.2	0.0	-0.4
sc	0.1	-0.1	0.4	0.0
col	0.1	0.1	0.3	0.0
col+	-2.6	0.8	-1.4	0.2

Panel B
% Change In Welfare

	Married						Single	
	Female						Male	Female
Male	<hs	hs	sc	col	col+			
<hs	0.1	-0.1	0.1	0.2	0.2	<hs	0.0	0.0
hs	0.3	0.1	0.2	0.2	0.2	hs	0.3	0.0
sc	0.1	0.1	0.1	0.0	0.1	sc	0.0	0.1
col	0.2	0.2	0.2	0.2	0.2	col	0.1	0.1
col+	-0.5	-0.4	-0.3	-0.2	-0.1	col+	-0.1	0.0

Note: Entries show the percentage change in the certain variables across steady states when only the earnings cap is eliminated. Panel A shows the changes in hours per worker by types of married and single individuals, and Panel B shows the percentage change in welfare by types of married and single households.

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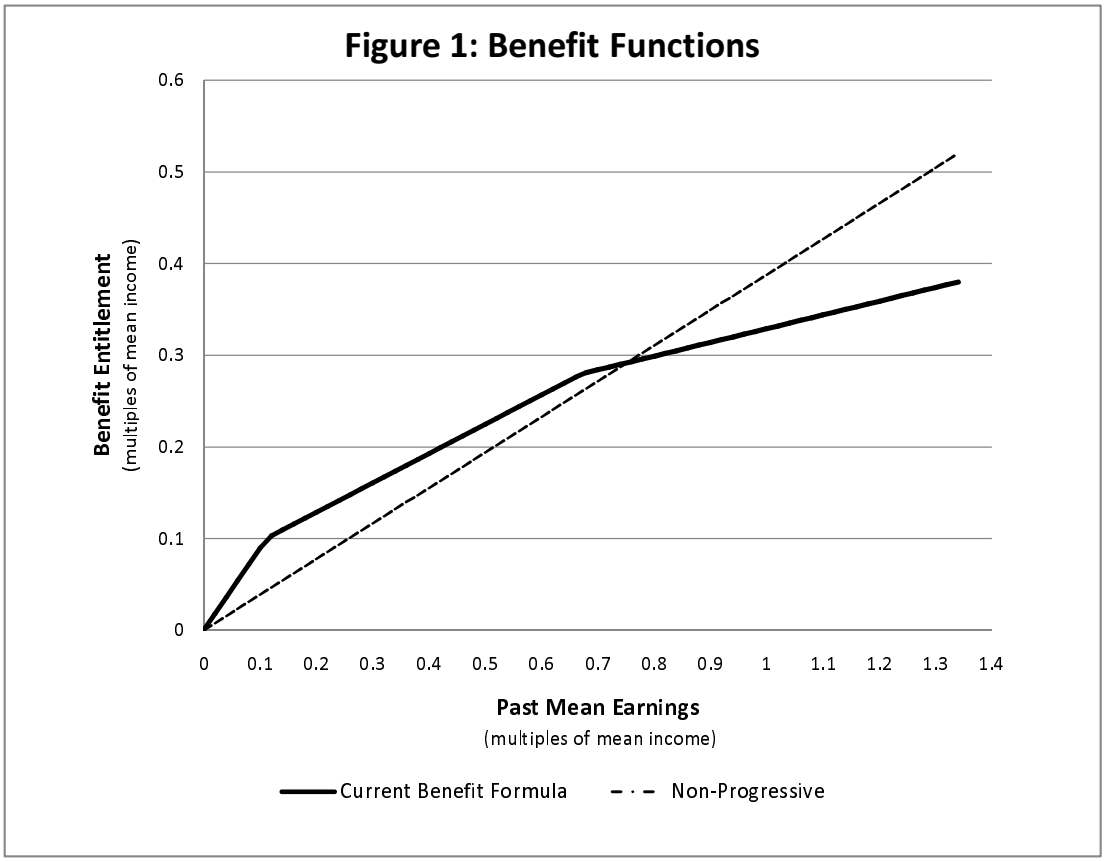
Figure 1: Benefit Functions
Benefit Entitlement
(multiples of mean income)
0.6
0.5
0.4
0.3
0.2
0.1
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
Past Mean Earnings
(multiples of mean income)
Current Benefit Formula
Non-Progressive