ABHANDLUNG

Life-cycle effects of social security in an open economy: A theoretical and empirical survey

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Abstract Conventional wisdom views demographic change as a set of exogenous shocks impinging on social security, with the economy treated as a closed system. This contribution argues that demographics is nothing but the aggregate of individual decisions, which are influenced by social security. This claim is supported by both theoretical argument and empirical evidence with regard to decisions over the life cycle, ranging from educational effort, marriage, number of children, divorce, retirement, and effort to extend one's life. Distinguishing the effects of contributions and benefits of social security, these feedback relationships are shown to in the main hamper employment and growth, thus undermining the financial viability of today's social security schemes, with increasing openness of the economy ('globalization') exacerbating problems.

Lebenszykluseffekte der Sozialversicherung in einer offenen Volkswirtschaft: Eine theoretische und empirische Übersicht

Zusammenfassung Demographischer Wandel wird üblicherweise als ein exogener Schock auf die Sozialversicherung einer geschlossenen Volkswirtschaft aufgefasst. Der vorliegende Aufsatz wählt demgegenüber eine andere Sichtweise: Er fasst demographische Entwicklung als Ergebnis individueller Optimierungsentscheidungen

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auf, die von der Sozialversicherung einer Volkswirtschaft beeinflusst werden. Diese Behauptung wird durch theoretische und empirische Evidenz bezüglich des gesamten Lebenszyklus bestätigt – von der Ausbildung, über die Heirat, die Anzahl der Kinder, eine mögliche Scheidung, den Übergang in den Ruhestand und schliesslich den Versuch, ein langes Leben zu erreichen. Dabei wird durchweg zwischen den Beiträgen und den Leistungen unterschieden und gezeigt, wie diese beiden Aspekte der Sozialversicherung Beschäftigung und Wachstum beeinträchtigen können. Diese Effekte gefährden das Gleichgewicht der heutigen Sozialversicherung, wobei die Globalisierung die Gefährdung noch erhöht.

1 Introduction

The conventional view of the relationship between demographic and social security (alternatively, the term social insurance will be used) is that exogenous demographic change has impacts both on the financing and the benefits side of social security. Usually, the economy is treated as a closed system, abstracting from both trade flows and migration of factors of production. If taken into account, these flows tend to be subsumed under 'effects of globalization', which often serve as a scapegoat for the future problems several social security systems are facing.

This contribution purports to propose a radically different view, which however is firmly rooted in economic theory. It recognizes the fact that demographic change is nothing but the aggregate of decisions made by individuals in the course of their life cycle. For example, the low share of young individuals in a population can ultimately be traced to the decision of potential parents not to have children or of actual parents to refrain from having additional children. As will be argued below, this (and other such decisions) may be influenced by social security. Therefore, the vantage point of analysis will be turned around, with emphasis placed on the impact social insurance has on individual decisions, which in the aggregate manifest themselves as demographic change.

The following methodology will be adopted. Throughout, the argument will be couched in terms of a marginal change (i.e. a moderate expansion or curtailment of social security) rather than in terms of two worlds, one with and the other without social security. While comparing two entirely different worlds would provide for sharp contrasts and crisp hypotheses, empirical evidence comes from the analysis of marginal changes of existing systems. In addition, the financing side is always distinguished from the benefits side. For example, an increase of contributions levied by a scheme for the provision for old age (OA) may occur without any adjustment of claims to future benefits, or benefits may be curtailed without a decrease in contributions. For example, in 2003 the Swiss federal government lowered the multiplier used for translating contributions into claims against the public pension system by decree in an attempt at staving off a deficit. Measures of this type cause the taxation element inherent in social security in the interest of redistribution to be enhanced,

since current beneficiaries continue to obtain benefits in excess of the present value of their contributions (Breuer 1999).

In some systems (such as Germany and Switzerland), however, additional contributions paid do result in additional claims against the public OA scheme, at least in principle. For simplicity, this link will be neglected in the analysis, also because it does not exist in social health insurance (HI) and long-term care insurance (LCI), the two other branches of social security that presumably have a connection to decisions with demographic implications (other branches such as unemployment insurance and family allowances are neglected either because their connection to the decisions analyzed here is too weak or because they are less important financially, cf. OECD 1996).

Finally, the analysis will follow an individual over a stylized life cycle characterized by an educational phase, marriage, and creation of a family, possible divorce, retirement, and death. This means that certain aspects of work life (such as the length of the work week and duration of unemployment) are disregarded. However, decisions concerning migration are taken into account where appropriate.

2 Educational effort and social insurance

2.1 Financing of social security and educational effort

This section expounds the impact increasing contributions to HI, OA and LCI may have on schooling. From an economic perspective, contributions to HI and LCI are roughly comparable to a tax on labor income. As always, such a tax has a substitution and an income effect. It makes leisure as the alternative to labor income less costly, causing it to be demanded in greater quantity, to the detriment of work (substitution effect). However, the reduction in disposable income occasioned by social security contributions may be important enough to cause individuals with a low labor income to work more rather than less (income effect). These two impacts on lifetime labor supply will be addressed again in a separate section. For the majority of workers in industrial countries, the income effect is unlikely to dominate, resulting in a positive wage elasticity of labor supply. Indeed, a recent German study incorporating life cycle effects finds a wage elasticity of labor supply of 0.6 for women and 0.8 for men (Fenge et al. 2002). Conversely, higher contributions to social security are thus predicted to discourage labor supply.

An expansion of social security therefore is expected to result in a permanent decrease of expected labor income over the life cycle. This has an impact on educational effort as soon as young decision makers consider education not only a cultural enrichment but also an investment. Expected future returns from additional educational effort therefore will be lower, causing some of possible investment on schooling not to occur. One would therefore expect an expansion of social security in the case of HI and LCI to have a negative effect on educational investment. This impact may be mitigated to some extent if vocational training (where usually contributions to

Table 1 Predicted effects of social security's financing on educational effort

	OA	HI	LCI
Education	–	–	–

social security must be paid) is substituted by university studies (where contributions usually are waived).

In the case of OA, the precise nature of the link between contributions and future benefits is decisive (see e.g. Lau and Poutvaara 2006). Köthenbürger and Poutvaara (2006) model a closed economy in which reducing social security contributions encourages investment in human capital. A similar result was obtained by Echevarria and Iza (2006), complemented by a simulation using different parameter values. However, contributions may give rise to claims more than proportionally (as is typical of buildup phases). During this time OA may even serve to increase the rate of return on educational investment and therefore induce additional educational effort. Indeed, such an effect was found by Flam and Risa (1995) in their empirical study. All effects are summarized in Table 1.

Turning to the role of increased globalization and economic openness, social security may induce migration of the labor force. As long as there are differences between countries in terms of contribution rates to OA (compared to benefits), workers may seek to earn their incomes in a country offering them a more favorable benefit-contribution ratio than their home country. Therefore, social insurance in the (less expensive) foreign country may achieve a surplus from migration, while social insurance in the (expensive) home country risks to end up in deficit. However, it was impossible to find empirical evidence of migration of workers induced by social security arbitrage.

2.2 Social security benefits and educational effort

With regard to HI, increased benefits should have an enhancing effect on educational effort. For HI secures access to medical care designed to maintain health status at a level that enables the young to pursue an education at all. Moreover, it reduces the risk of a future health loss that (due to lack of medical care) is so grave as to result in a partial or full loss of labor income, an effect that is of particular value to highly educated individuals.

In most industrial countries, OA benefits guarantee a minimum retirement income regardless of educational effort. In this way, OA causes a reduction of the marginal return to investing into education. However, this impact should be of minor importance at the time of deciding about education since rational individuals will discount benefits of OA heavily as they occur much later (see Table 2). In fact, there is some evidence that the subjective rate of discount is between 6 and 20 percent p.a. (Lawrance 1991; Coller and Williams 1999). On the other hand, OA may encourage the choice of occupations that yield a higher return to education due to increased risk

Table 2 Predicted effects of social security's benefits on educational effort

	OA	HI	LCI
Education	(–)	+	(–)

(Anderberg 2000). With regard to globalization, Poutvaara (2007) constructs a theoretical model with mobile workers who decide about their investment in education. He shows that if the home country offers flat-rate OA benefits, then its workers invest more than in a closed economy because they hold the prospect of moving to the foreign country, where OA benefits increase with income.

The benefits of LCI have two objectives. One is to prevent people from ending up in poverty for the last years of their life, the other, less prominent, to secure their bequeathable wealth. Concerning the first objective, LCI has the same effect as a supplement to OA and should therefore tend to somewhat discourage educational effort. As to the second objective, bequeathable wealth mainly stems from labor income earned over the life cycle. Protection of this wealth adds to its utility and hence should encourage educational effort as a means to create it. However, the predicted impact of LCI is minimal because final wealth will be positive only with a relatively low probability and because there must be relatives and friends worthy of the bequest. Finally, not only are these effects reduced by the respective probability weightings but also by discounting to present value (see Table 2). Not surprisingly, it has proved impossible to find supporting empirical evidence.

Conclusion 1: The financing of the three branches of social security analyzed has a negative predicted overall impact on educational effort beyond the legal minimum. The ambiguous (OA, LCI) or countervailing (HI) influences of benefits are deemed to be too weak to counterbalance the clearly negative ones of contributions.

The macroeconomic importance of this conclusion is evident. If social security should end up discouraging educational effort, it jeopardizes the future competitiveness of a country. With wage rates and employment increasing at a slower pace, this in turn creates problems for the financing of social security. This feedback effect constitutes a first indication that assuming economic growth to be exogenous to social security, as is usual for predicting its financial status, is deficient in that this disregards the effect social insurance itself may have on growth (see e.g. Echevarria and Iza 2006).

3 Marriage and social insurance

3.1 Financing of social security and marriage

Often marriage provides the opportunity for one of the two partners to withdraw from the labor market. This decision is the more likely the smaller the concomitant loss of labor income. Since disposable labor income is reduced by social security contribu-

Table 3 Predicted effects of social security's financing on marriage

	OA	HI	LCI
Marriage	(+)	+	+

tions, nonmarket work becomes more attractive. In most countries, claims to HI and LCI are not affected as long as the working partner continues to pay contributions, while OA benefits are reduced to married couples in most OECD countries to reflect cost saving achieved by jointly living (Table 3 lists the effects). To the extent that mainly the less qualified worker shifts his or her activity into the household, increasing openness of the economy should reinforce this effect. The reason for this is the fact that globalization puts pressure especially on the wage rates of less qualified workers, thus reducing the opportunity cost of withdrawal (most likely women who on average continue to earn a lower wage rate than their male partners, cf. Disney and Whitehouse 2002).

Unfortunately, there does not seem to be empirical evidence regarding these predictions. The closest analogy is income taxation, which also serves to reduce disposable income (without however giving rise to future claims). The effects of taxation on marriage have been the subjects of empirical research. For example, Alm and Whittington (1997) find that the changing tax burden associated with marriage has an effect on the timing of marriage.

3.2 Social security benefits and marriage

Two persons living together in one household benefit from the advantage of risk diversification. Specifically, a minor health loss incurred by one partner can be taken care of by the other without having recourse to medical services. However, HI makes this advantage less decisive by facilitating access to formal medical services. HI could therefore cause marriage contracts not to be concluded or concluded later in life. However, in some countries (such as Germany), HI covers nonactive family members as well without a surcharge. In these countries, this constitutes an advantage that may neutralize or even overcompensate the negative impact HI otherwise would have on marriage.

Similar arguments can be made with regard to OA. In some countries, married women are also covered without an additional contribution. This feature of OA benefits constitutes a definite incentive favoring marriage. Once more however, benefits are far in the future, causing them to be discounted to present value and reducing their impact.

With regard to LCI, the notable fact is that the married spouse provides the major part of long-term care (Schneekloth and Potthoff 1993). With LCI, these informal services tend to be substituted by formal ones provided in homes and by professional service providers. Thus, LCI serve to somewhat undermine the motivation for marriage (its effects again occurring far in the future). Some preliminary evidence refers

Table 4 Predicted effects of social security's benefits on marriage

	OA	HI	LCI
Marriage	(+) [0 also possible]	– [(+) also possible]	–

to the United States and a proposal to extend Medicaid to cover families with two rather than one parent present (Yelowitz 1998). Moreover, teenage marriages and pregnancies out of wedlock are found to be more frequent when public support (such as Aid for Mothers with Dependent Children, AFDC) is substantial in comparison to obtainable labor income (Bernstam and Swan 1986). These benefits would be lost if parents were to marry or live jointly in a household. Table 4 shows the considered effects of social insurance benefits on marriage. An opening of the economy probably would not have an additional impact, and there are no empirical studies investigating these additional effects.

Conclusion 2: The financing side of social insurance creates incentives in favor of marriage, while the benefits have mixed predicted effects. OA benefits favor married couples, while HI and LCI tend to have weak negative effects on marriage.

On the whole, social security may have an impact on the civilian status of a population. This impact likely has limited influence on economic development, with the exception of an increase of the aggregate cost of health care because of a further growth of the number of single-person households, who have to rely to a greater extent on the benefits of HI and LCI than married individuals (Zweifel and Breyer 1997, ch. 11.2).

4 Number of children and social insurance

4.1 Financing of social security and number of children

Additional contributions to be paid to social security (HI, OA, and LCI) reduce disposable income over a major part of the life cycle. One possibility of neutralizing this reduction is to keep the number of children low or to refrain from having children. A negative relationship between social insurance and the number of children (who originally were a source of security in the family) has been theoretically argued by Felderer (1992). Empirical evidence has been provided by Cigno and Rosati (1996), showing that in England, Germany, Italy and the United States expansions of OA coverage were linked to a reduction in birth rates. However, other branches of social insurance not considered here might encourage having children. For example,

Table 5 Predicted effects of social security's financing on the number of children

	OA	HI	LCI
Children	–	–	–

German unemployment insurance, the replacement rate increases from 65 to 75% of the previous wage when there are children (Hujer and Schneider 1989). Table 5 summarizes the effects of financing on children.

Economic openness is predicted to reinforce this negative relationship because children constitute an impediment to mobility, making it more costly for parents to migrate in an attempt to avoid an unfavorable benefit-contribution ratio of social insurance. However, there do not seem to exist empirical studies concerning such a reinforcement effect.

4.2 Social security benefits and number of children

Again, the different branches of social insurance need to be distinguished. In principle, children increase the risk of incurring medical expenditures. By covering this cost to a great extent, HI mitigates this risk, thus encouraging larger families.

With regard to OA, there is potential substitution between support provided by children to their retired parents and the benefits of OA. An expansion of OA quite likely causes a reduction of support provided by children (Table 6). The evidence comes mainly from developing countries where children still importantly contribute to the livelihood of their parents (Lillard and Willis 1997; Swidler 1986). More recently, Ehrlich and Kim (2007) have analyzed a panel of 57 countries covering 33 years. They find that birth rates are negatively related to OA benefits, holding constant the gender ratio, net growth of marriages, female labor force participation, and the gender ratio of educational attainment among others.

While marriage partners provide most informal long-term care, children (especially daughters) are an important source as well. To the extent that social insurance provides financial support for formal services, substitution again is likely to be triggered, causing children to curtail their provision of services. However, this effect usually lies far in the future at the time of marriage, and the likelihood of LTC is still low (although increasing, see Strüwe 1996, Schmähl and Rothgang 1996), causing them to be second-order.

With migration between open economies children who live abroad have reduced value to potential parents. Indeed, Schrieder and Knerr (2000) find evidence suggesting that once children have left their native community in Cameroon, the amount of money remitted to their parents is low unless they stand to receive a bequest. This means that parents' efforts at influencing or even controlling children's behavior become costly and often ineffective. This is even more true when children know that thanks to OA and LCI there is no threat of their parents' spending their last years of life in poverty. Moreover, LCI helps securing their inheritance at any rate. Given

Table 6 Predicted effects of social security's benefits on the number of children		OA	HI	LCI
	Children	(–)	+	(–)

these difficulties, the incentive to have children at all is weakened even more (Lindbeck, Nyberg and Weibull 1999).

Conclusion 3: Both contributions and benefits of social insurance are likely to cause a substitution of children by social security benefits, thus reducing population growth.

5 Divorce and social insurance

As a rule, the effects of social insurance on divorce should be the mirror image of those on marriage.

5.1 Financing of social security and divorce

When considering dissolving the marriage, the partner concerned frequently must take into account that she will have to return to work. The more contributions to social insurance reduce disposable income from work, the less attractive this alternative becomes. This implies that the financing side of social insurance may stabilize marriage (an effect which may be viewed critically, see e.g. Estes 2004). Table 7 summarizes the effects.

5.2 Social security benefits and divorce

Having HI makes it easier for singles to cope with sickness because HI enables them to rely on formal medical care with little if any out-of-pocket payment. As to OA, pensions of married couples usually fall short of the double of the pension of a single person in most industrial countries, reflecting the cost savings achievable by jointly living in a household (Disney and Johnson 2001). The closer the equivalence of differences in pensions and costs of living, the more OA benefits are neutral with regard to divorce. It is the LCI benefit that lowers the cost of divorce. Since singles rely less on unpaid long-term care services provided by the marriage. Thus, this serves to reinforce the effects of HI, which has already been found to facilitate singly living (see Table 8).

Studies relate the increase in the number of single older women since 1950 in the United States to the expansion of OA benefits (Costa 1999). This result probably has little to do with the openness of the economy (as in the case of the marriage decision, see the pertinent section above).

	OA	HI	LCI
Divorce	–	–	–

Table 7 Predicted effects of social security's financing on divorce

Table 8 Predicted effects of social security's benefits on divorce		OA	HI	LCI
	Divorce	(–)	+	+

Conclusion 4: While contributions to social insurance create an incentive to avoid divorce, its benefits work in favor of divorce. The effects of the latter presumably outweigh the former.

However, an increase of the divorce rate induced by social insurance should not have much of an impact on the economy because it also causes the rate of labor participation to increase. In fact, one-third of the increase of female participation rates in the United States during 1960 to 1980 can be explained by the increase of divorce rates; moreover, women in marriages at risk work more hours than do others (Johnson and Skinner 1986). This increase of labor supply could even enhance growth at the macroeconomic level, giving rise to a positive feedback on the financing of social insurance. On the other hand, singles are more likely to claim benefits especially of HI and LCI (Klein 1996), so the overall impact of this feedback may well be unfavorable. In other words, since the so-called biological rate of return of pay-as-you-go social security importantly depends on the rate of growth of the active population (Aaron 1996), its effect on divorce tends to jeopardize the financial equilibrium of social insurance in the long run.

6 Retirement and social insurance

6.1 Financing of social security and retirement

An important motive for deferring retirement is the prospect of earning extra labor income. However, to the extent that contributions to social insurance do not create well-defined individual claims (HI, LCI), they make deferral less attractive while encouraging earlier retirement. In the case of OA, additional contributions usually do found claims to future benefits. Where this is not the case, workers tend to retire early (Boldrin et al. 1997). This makes the expected impact of OA benefits on labor supply ambiguous (for the role of future claims in the context of unemployment insurance, see Atkinson and Micklewright 1991), however, their expansion on the whole seems to have contributed to earlier retirement (Viebrok 1997). Table 9 summarizes the effects.

Table 9 Predicted effects of social security's financing on retirement		OA	HI	LCI
	Early Retirement	0 [+ also possible]	+	+

In the context of globalization, this effect is but reinforced because the portability of benefits increases the choice of locations for life in retirement. Being very recent, these tendencies have not yet been empirically studied.

6.2 Social security benefits and retirement

With regard to HI, the following effect is to be expected theoretically. Since utilization of medical care entails minimum out-of-pocket expense, other impediments become decisive. These impediments are the opportunity costs associated with travel and waiting time. Their importance has been documented e.g. by Leu and Doppmann (1986, cited in Zweifel and Breyer (1997), ch. 4.4). In retirement, these time costs lose relevance. By retiring, individuals benefit from lower opportunity costs. Conversely, an expansion of HI arguably encourages earlier retirement (Table 10), which permits the insured to have unfettered access to medical care.

The connection with OA is more direct as OA benefits serve to mitigate the loss of income that would go along with retirement. Moreover, early retirement almost without exception does not entail an actuarially fair reduction of benefits. This of course cannot but increase the incentive to retire from active life. In the case of Germany, Börsch-Supan and Schnabel (1997) as well as Siddiqui (1997) were able to show the expected effect; for the case of Switzerland, see Baldenweg-Bölle (1998), ch. 7; for the Netherlands, see Heyma (2004); for the U.S., see Burtless (1986).

Migration as part of increased openness presumably reinforces these effects in two ways. First, by spending time abroad, workers get to know different legal systems and lifestyles, which serves to widen their choice of locations for retirement. And among those additional locations, there may be one that makes early retirement particularly attractive. Second, provided the elderly are successful in having contribution rates increased rather than their pensions curtailed, high-wage earners are predicted to go elsewhere (Leers et al. 2003).

This train of thought also establishes a connection with educational effort (see above). Increasingly, this effort does not occur in schools but during professional activity. The earlier expected retirement, the shorter the payback period to educational investment, and the less therefore the incentive to invest. This is the conclusion reached by Jensen et al. (2004), who then compare retirement benefits to old-age benefits (which are paid regardless of employment status), with old-age benefits clearly inducing longer learning. However, there does not seem to be empirical evidence relating to a reduction of continued training caused by earlier retirement.

Turning to LCI, the need for long-term care usually occurs at a time when the child (usually the daughter) is approaching retirement herself. With less LCI cover-

Table 10 Predicted effects of social security's benefits on retirement

	OA	HI	LCI
Early Retirement	+	+	–

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age, many daughters presumably would choose retirement in order to have time for providing support to their parents. With ample LCI coverage, they tend to continue work. Supporting empirical evidence has been found for the United States by Ettner (1995) as well as Wolf and Soldo (1994). Therefore, LCI may work against a tendency to quit the work force. However, this effect is limited to those still rare cases where at least one elder in fact becomes a long-term care patient. Therefore, on the whole the likely effect of social insurance is to encourage early retirement.

Conclusion 5: The financing of social insurance makes early retirement attractive. The benefits of health insurance (HI) and old age provision (OA) have the same effect, whereas long-term care insurance (LCI) may weakly encourage deferred retirement. On the whole, the three branches of social insurance analyzed tend to reduce labor supply at higher ages.

As noted already in the context of Conclusion 1, this constitutes another instance where the impact of social security on aggregate labor supply and hence income likely is unfavorable, creating the potential for negative feedback that on the long run may drive social insurance schemes into deficit.

7 Life expectancy and social insurance

7.1 Financing of social security and life expectancy

Admittedly individuals cannot choose their time of death. However, they certainly can undertake efforts that influence their remaining life expectancy by investing in prevention and medical care. In each individual case, early death may occur in spite of these efforts; however, at the level of entire populations, such effects are discernible (Frech and Miller 2001; Zweifel et al. 2005). Therefore, the argument proceeds as though everyone had influence on his or her time of death.

Since most individuals nowadays live to retirement, contributions to OA are a fixed cost once they are retired. As such, they do not have any relevance for efforts to increase life expectancy. As to the financing of HI and LCI, contributions do not increase with age (in spite of a growing risk that would call for an adjustment if they were risk-based as in commercial insurance). However, even private insurers fail to fully adjust HI premiums to this risk (Herring and Pauly 2001). This fact implies that as far as HI and LCI are concerned, the marginal cost of living another year is a constant; the financing side of social insurance thus is predicted to have no influence on efforts to increase remaining life expectancy (see Table 11), and there is no empirical evidence for such an influence.

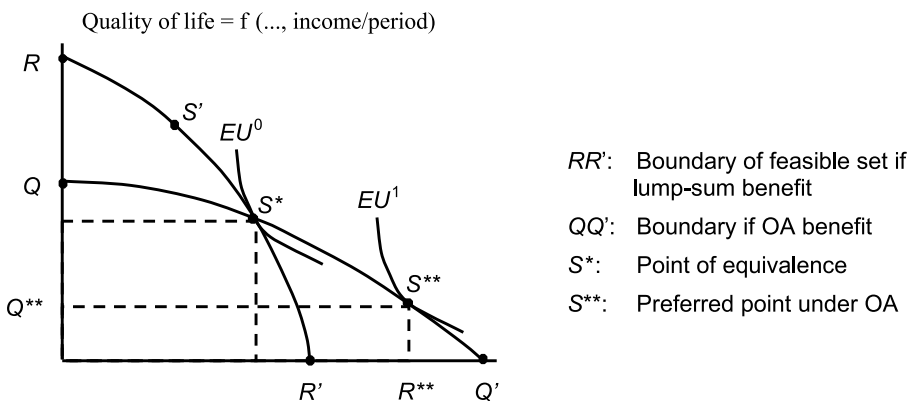**Table 11** Predicted effects of social security's financing on life expectancy

	OA	HI	LCI
Life Expectancy	0	0	0

7.2 Social security benefits and remaining life expectancy

Since OA benefits are paid as a regular income rather than a lump sum capital, longer life does not entail a reduced quality of life (due to fewer resources available per period). The contrast can be seen by comparing OA with a private life policy that pays a capital to survivors at a specified age. If beneficiaries had to live off this capital for the remainder of their lives, they would be constrained to spend less per period to balance an increase in longevity, causing a decrease in the quality of life. Longer remaining life expectancy would thus entail a financial sanction that is absent from current OA systems.

Figure 1 illustrates the argument. The curve RR' symbolizes the boundary of attainable combinations of remaining life expectancy and quality of remaining life years (determined at least in part by income per year) if a private insurer paid out a capital at age 60 (say). It indicates that more life years can only be had at the cost of a sacrifice in terms of quality of life. By way of contrast, the boundary QQ' symbolizes a typical public OA system, which guarantees an annual pension regardless of the number of years lived. As a matter of fact, the beneficiary needs to live another year to receive the OA benefit. On the other hand, preferences are represented by indifference curves that show a certain level of expected utility (EU). What Fig. 1 shows is that while the individual seems to be indifferent between RR' and QQ' at point $S*$, in fact he or she would opt for $S**$ on QQ' if given a choice, since $EU_1 > EU_0$. However, this choice goes along with a higher life expectancy $R**$ (compared to that pertaining to point $S*$) and a lower quality of life. Also note that a transition to a point like S' (associated with reduced remaining life expectancy) is excluded if $S*$ was an initial optimum. Thus, the prediction is that current public pension systems encourage people to strive for a long life.

As to HI, it has the property of decreasing the price of medical care at the time of utilization, including those that serve to increase life expectancy. In the same vein, LCI subsidizes services that improve the quality of life, usually when time of death

Fig. 1 The predicted effects of a fixed-income vs. a lump-sum pension system

Table 12 Predicted effects of social security's benefits on life expectancy		OA	HI	LCI
	Life Expectancy	+	+	+

is near. The majority of beneficiaries have financial reserves that would last only for a short stay in a nursing home. Without LCI coverage, they would soon suffer a big reduction in quality of life that would undermine their interest in prolonging life. Therefore, the easing of the trade-off between longevity and quality of life noted in the case of OA is even more marked in the case of LCI.

The prediction that current OA systems increase remaining life expectancy was tested by Philipson and Becker (1998). Using information about retired employees of U.S. government, they distinguished groups according to their claims to future benefits. The group with the lowest expected benefits, amounting to less than US$ 1,000 a year, had 40 percent survivors at the age of 80 whereas the group with the highest, 63 percent. Clearly, it is inappropriate to attribute the entire difference to the incentives that emanate from the prospect of a higher OA benefit. Federal employees of the top group, being more educated and earning higher incomes, presumably would have had a higher remaining life expectancy even without the incentive of the OA benefit. Finally, these effects have little to do if at all with the degree of openness of an economy, mainly because they do not depend on the choice of residence in the country or abroad. Conclusion 6 summarizes Tables 11 and 12.

Conclusion 6: Whereas contributions to social security (HI, OA, LCI) do not have an impact on longevity, clear incentives to prolong life emanate from benefits, which are conditioned on survival without exception. This effect is reinforced when the three branches of social security are considered in combination.

Current institutional design not only of HI but also of the other branches of social security could therefore have at least some impact on the aging of population. Individuals profit considerably from not having to bear the risk of excessive remaining life expectancy. When deciding about contributions to social security, policy makers need to account for these effects lest they jeopardize the financial equilibrium of the system.

8 Concluding remarks

In this contribution, demographic change was not viewed as predetermined but endogenous, i.e. the consequence of individual decisions over the life cycle. The three branches of social security considered (health insurance HI, old age provision OA, and long-term care insurance LCI) have been found to influence individual decisions at several stages of the life cycle. The findings of this paper are summarized in Table 13. The entries show that in the majority of cases, decisions are modified in a way as to lower labor supply and hence long-run economic growth, resulting in a reduction rather than increase of future contributions to social security. While many

of the theoretically predicted impacts have not been systematically tested to this date, there is at least preliminary evidence supporting some of them. However, this evidence is not firm enough to permit estimation of a net effect where social security contributions and benefits have opposing impacts, e.g. divorce.

Table 13 Overview of theoretically predicted effects on life-cycle decisions

Decision	Effects of OA, HI, LCI Contributions		Benefits		Globalization	
	Theory	Evidence	Theory	Evidence	Theory	Evidence
Educational effort	– on wage	n.a.	+/– on wage		reinforcing	n.a.
Marriage	– on LS	(✓)	+/– on LS	(✓)	none	n.a.
Children	+ on LS		(+) on LS	(✓)	reinforcing	n.a.
	– on future LS ✓					
Divorce	– on LS	n.a.	+ on LS	(✓)	none	n.a.
Retirement	– on LS	(✓)	– on LS	✓	reinforcing	n.a.
Life expectancy	0 on LS, 0 on RLE		0 on LS, + on RLE		none	n.a.
		(✓)		(✓)		

Note: *LS*, labor supply; *RLE*, remaining life expectancy; *(✓)*, (some) confirming evidence; *n.a.*, not available

Clearly, the relationships expounded here are important also for private insurance. However, private insurance differs from social security in three aspects. First, private insurers make less favorable risks pay higher premiums, thus providing them with an incentive to improve their risk profile. Second, private insurers are very much aware of moral hazard, i.e. the changes in behavior induced by the very conclusion of an insurance contract. For example, many of them write policies in HI with cost sharing or with limited choice of physicians and hospitals (managed care options) in order to limit moral hazard effects. Third, the contracts written by private insurers do not have (at least under conditions of competition) the degree of homogeneity that characterizes social security, where homogeneity even is an objective in itself. Therefore, their incentive effects are not as bundled and unidirectional as those emanating from social security.

An important finding is that globalization, i.e. the transition to more open economies, tends to exacerbate the negative feedbacks an expansion of social security may have on economic growth. Systems run into problems sooner mainly because some of those who can benefit from increased mobility seek to avoid the financial burdens imposed on them by social insurance. In sum, the life-cycle effects of social security in open economies serve to constrain policy makers in their pursuit of the redistributional goals they have traditionally been seeking to attain.

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