Financial and Political Sustainability for Social Security Financing: What Options Do Countries with Mature Pay-As-You-Go Systems Have?

John A. Turner
Pension Policy Center
September 2012

Financial and Political Sustainability for Social Security Financing: What Options Do Countries with Mature Pay-As-You-Go Systems Have?

This paper extends the Samuelson (1958) and Aaron (1966) framework for analyzing pay-as-you-go social security financing. It uses the extended framework to analyze the conditions for financial sustainability in pay-as-you-go social security systems when the payroll tax rate cannot be raised because of political feasibility and the old-age dependency rate is increasing. It also considers issues of political sustainability. A social security benefit formula or automatic adjustment formula that is financially sustainable may not be politically sustainable.

Introduction

While a number of countries have converted their social security systems to include defined contribution plans, many countries retain traditional pay-as-you-go systems. Because of population aging, these systems are under stress. Countries are questioning whether they can afford to maintain the generosity of their social security old-age benefits. Advocates of defined contribution plans have criticized traditional pay-as-you-go systems as being financially unsustainable.

Since the late 1990s, starting with an innovative reform in Sweden, a growing number of countries have reformed their traditional social security systems to include automatic adjustment mechanisms. A number of different adjustment mechanisms have been developed. At least twelve countries have adopted life-expectancy indexing of benefits or automatic adjustments tied to social security insolvency. Both types of reforms provide automatic adjustment mechanisms for sustaining the solvency of social security systems, but most of them do not assure solvency over the long run, requiring additional adjustments. The contribution of this paper is to develop an adjustment mechanism as part of the benefit formula or part of an automatic adjustment mechanism that is sustainable over the long run.

This paper addresses the options that countries have when they reach the point that because of political infeasibility they can no longer raise the payroll tax rate that finances social security benefits. It examines the features required for financial sustainability of a social security benefit formula or of an automatic adjustment mechanism. It then addresses the issue of political sustainability. A benefit formula or automatic adjustment mechanism that is financially sustainable may not be politically sustainable, requiring further adjustments beyond those required for financial sustainability.

Automatic Adjustments

When social security benefit formulas are not financially sustainable over the long term, countries can adjust social security either ad hoc or through an automatic adjustment mechanism. Ad hoc adjustments tend to be large, infrequent and unpredictable. They tend to be made due to a crisis, and often with little lead time between the enactment of the adjustment and the date that it becomes effective (Turner 2007). The short lead time gives workers little time to adjust their savings and labor supply.

Increasingly, countries are adopting automatic adjustment mechanisms (Turner 2011). At least twelve countries have adopted life-expectancy indexing of benefits or automatic adjustments tied to social security insolvency. Automatic adjustments are generally small, frequent, and predictable-- all desirable features. Automatic adjustments are transparent. It is clear how adjustments will be made and who will bear what costs when an adjustment occurs. Automatic adjustment processes reduce the problem of political risk, which is the problem that workers and retirees do not know in advance how the political system will resolve problems of social security insolvency.

Automatic adjustment mechanisms, however, while a step in the right direction of attempting to maintain sustainability, are not necessarily financially sustainable. If they are not consistent with the fundamental principles of sustainability explained in the next section, they will eventually need to have further adjustments.

Requirements for Financial Stability in Social Security Financing

The basic conditions for financial sustainability of pay-as-you-go social security systems were developed by Samuelson (1958) and extended by Aaron (1966). A pay-as-you-go social

security system, with a fixed contribution rate and constant labor force participation rates, is sustainable if the growth in total benefits equals the growth in the total wage bill, which equals the sum of the growth rate of real wages and the population growth rate.

The mathematics of pay-as-you-go systems clarifies the role of indexing in social security with respect to both economic and demographic changes. It indicates what type of benefit formula or automatic adjustment mechanism is needed to maintain sustainability of social security financing.

With a pay-as-you-go social security system, the total benefits paid out in a year equal the total payroll tax payments received. That relationship can be expressed in equation 1 as a budget constraint, where B is average benefits in real terms, N is the total number of beneficiaries, t is the payroll tax rate (or contribution rate), w is the average real wage, and L is the number of workers.

$$BN = twL \qquad (1)$$

That budget constraint can be rewritten in terms of percentage changes over time, where E is the percentage change operator (technically, the derivative of the natural logarithm).

$$E(BN) = E(twL) \qquad (2)$$

Equation 2 indicates that for social security to continue to maintain financial balance, the growth rate in total real benefit payments must equal the growth rate in total real payroll tax payments.

For countries where the payroll tax rate t is fixed, having reached the maximum level considered politically acceptable, the constraint becomes

$$E(BN) = E(wL) \qquad (3)$$

Equation 3 indicates that the growth rate in total real benefit payments must equal the growth rate in total real wages, which is consistent with Samuelson (1958) and Aaron (1966). This constraint can be disaggregated into the growth rates in its component parts.

$$E(BN) = E(w) + E(L) \qquad (4)$$

This expression gives the Samuelson (1958) and Aaron (1966) result that for a sustainable pay-as-you-go system the growth rate in total benefits equals the growth rate of real wages plus the growth rate of the labor force. The growth rate in total real benefits can be also be disaggregated.

$$E(B) + E(N) = E(w) + E(L) \qquad (5)$$

Thus the growth in average benefit payments plus the growth in beneficiaries must equal the growth in real wages plus the growth in the labor force.

This constraint for the growth rate for total real benefit payments can be rewritten as the constraint for the growth rate of average real benefits per beneficiary.

$$E(B) = E(w) + E(L) - E(N) \qquad (6)$$

Equation 6 indicates that to maintain solvency, the growth rate in average real benefits per beneficiary must equal the growth rate in real wages plus the difference between the growth rate

in the labor force and the growth rate in beneficiaries. In most countries, because of population aging, the growth rate in beneficiaries exceeds the growth rate of the labor force. While the labor force is continuing to grow in the United States, in some countries in Europe its growth rate is close to zero. In a few countries, such as Japan, the growth rate of the labor force is negative, with the size of the labor force declining.

Changes in the ratio of beneficiaries to covered workers (the old-age dependency ratio) play a key role in social security financing in pay-as-you-go systems. The ratio of beneficiaries to covered workers acts like a "price" for benefits, meaning the amount the average worker must pay in social security taxes to raise the average benefit level by one dollar (Turner 1984). For example, when there are 10 workers for every social security beneficiary, a dependency ratio of 0.10, it costs each worker $0.10 to provide one dollar of benefits to each beneficiary. By contrast, when there are two workers for every beneficiary, a dependency ratio of 0.50, it costs each worker $0.50 to provide a dollar of benefits. Thus, as the dependency ratio rises with population aging, the "price" of providing social security benefits (technically, a shadow price) also increases.

Some countries use the ratio of beneficiaries to workers as a parameter of their automatic adjustment mechanism. The pay-as-you-go constraint can be rewritten to illustrate the logic behind that choice.

$$E(B) = E(w) - E(N/L) \qquad (7)$$

Equation 7 indicates that a sustainable social security program would have benefits growing at the rate of real wage growth less an adjustment for the rate of growth in the old-age

dependency ratio. Equations 6 and 7 are different expressions of the fundamental equation for constructing a sustainable automatic adjustment mechanism or benefit formula. Mechanisms or benefit formulas that are not consistent with those equations will not be sustainable over the long run.

Sweden has been a leader in the use of automatic adjustment mechanisms for social security sustainability (Turner 2011). The growth rate in real benefit level equals the growth in real wages, less an adjustment for increases in life expectancy. The Swedish system would be both less complicated and more stable over time if the growth rate in benefits had been set at the rate of growth of real wages less the rate of growth in the old-age dependency ratio. Because its system is not constructed to be consistent with equation 6, it is not assured of financial sustainability over long time periods, and further adjustments will be required.

Many countries, such as the United States, are seeking to maintain the generosity of their social security benefits. The current demographics of an increasing old-age dependency ratio plus the economics of a fixed payroll tax rate dictate that the social security replacement rate must fall. It is not possible to maintain the current generosity of social security with an increasing old-age dependency ratio and a fixed payroll tax rate. This conclusion derives from the pay-as-you-go budget. With the labor force growing slower than the number of beneficiaries and the payroll tax rate fixed, the growth rate in real benefits must be less than the growth rate in real wages for a pay-as-you-go system to maintain its financial balance. As equation 8 shows, this implies that the replacement rate (B/w) must fall over time.

$$E(B/w) = E(L) - (EN) \qquad (8)$$

The social security budget constraint limits countries' social security options. If countries have decided that they will not raise the social security payroll tax rate, their choices are further limited. Because of falling birth rates and increasing life expectancy at older ages, the number of beneficiaries is growing faster than the number of workers. In this situation, the social security budget constraint indicates that countries have no choice—they must reduce the generosity of social security benefits relative to wages. With a fixed early retirement age, this means that the replacement rate—the ratio of benefits to wages—must fall. Benefit formulas and automatic adjustment mechanisms that are not consistent with this constraint will ultimately fail to be sustainable.

Political Sustainability

A social security benefit formula or automatic adjustment formula that is financially sustainable may not be politically sustainable. In particular, the requirement that the replacement ratio or benefit generosity level decline over time may eventually cause benefits to fall to a level of generosity that is not politically acceptable.

While the benefit formula of equation 7 is sustainable in a budgetary sense, it implies a declining replacement ratio over time, and thus may not be sustainable over long periods in a political sense. Further adjustments may be needed to maintain the generosity of social security benefits, such as gradually increasing the early retirement age over time. Such an adjustment may be justified as life expectancy and health at older ages continue to improve, while the percentage of the workforce with physically demanding jobs is declining. Such an adjustment, however, would need to take into consideration the needs of workers unable to continue working due to unemployment, the physical difficulty of their work, or their own health. A number of countries have made this change. However, this change can penalize workers who are no longer

able to work – often those at the lower end of the income scale whose jobs are low skilled or have involved physical labor.

Conclusions

This paper extends the Samuelson (1958) and Aaron (1966) framework for analyzing pay-as-you-go social security financing. The social security pay-as-you-go budget constraint can be analyzed to determine the properties of sustainability for social security programs, either through the structure of their benefit formulas or through automatic adjustment mechanisms. When countries have reached the point where further increases in the payroll tax rate are no longer politically feasible, the implications for the generosity of social security benefits are clear. With increasing old-age dependency ratios, the generosity of benefits, as measured by the replacement ratio, must decline. This decline can be offset by increasing the age of eligibility for benefits.

This paper develops a benefit formula for pay-as-you-go social security programs that will assure solvency over the long run. The proposed benefit formula automatically adjusts to economic and demographic changes in a way that is stable and sustainable. The paper demonstrates that for a country that has reached its maximum acceptable social security payroll tax rate, a social security system with a benefit formula that sets the growth in average real benefits over time equal to the growth in the real wage minus the growth in the old-age dependency ratio will be sustainable with respect to demographic and economic fluctuations. Social Security programs, such as that in the United States, which set the rate of growth of real benefits per beneficiary equal to the rate of growth of real wages, which maintains a constant replacement rate over time, will not be sustainable over the long run. Similarly, the benefit

formula in Sweden, which sets the growth rate in benefits as equal to the growth in real wages, less an adjustment for increases in life expectancy, will generally not maintain solvency. While the Swedish system comes closer to a sustainable benefit formula than does the United States, it would be improved in terms of sustainability by adjusting the growth in benefits for the real wage minus the growth in the old-age dependency ratio.

While the proposed benefit formula is sustainable in a budgetary sense, it implies a declining replacement ratio over time, and thus may not be sustainable in a political sense over long periods. Further adjustments may be needed to maintain the generosity of social security benefits, such as gradually increasing the early retirement age over time as life expectancy and health at older ages continue to improve, while the percentage of the workforce with physically demanding jobs is declining. Such an adjustment, however, would need to take into consideration the needs of workers unable to continue working due to unemployment, the physical difficulty of their work, or their own health.

Since the late 1990s, starting with an innovative reform in Sweden, a growing number of countries have reformed their social security systems to include automatic adjustment mechanisms. A number of different adjustment mechanisms have been developed. At least twelve countries have adopted life-expectancy indexing of benefits or automatic adjustments tied to social security insolvency. Both types of reforms provide automatic adjustment mechanisms for sustaining the solvency of social security systems, but most of them do not assure solvency over the long run, requiring additional adjustments. The contribution of this paper is to develop an adjustment mechanism as part of the benefit formula that is sustainable over the long run.

References

Aaron, Henry J. 1966. “The Social Insurance Paradox.” *Canadian Journal of Economics and Political Science* 32: 3, pp. 371-374.

Samuelson, Paul A. 1958. “An Exact Consumption-Loan Model of Interest With or Without the Social Contrivance of Money.” *Journal of Political Economy* 66, 467-82.

Turner, John A. 2011. *Longevity Policy: Facing Up to Longevity Issues Affecting Social Security, Pensions, and Older Workers*, W.E. Upjohn Institute for Employment Research.

Turner, John A. 1984. Population Age Structure and the Size of Social Security. *Southern Economic Journal* 50 (April): 1131–1146.

Turner, John A. 2007. “Social Security Pensionable Age in OECD Countries: 1949-2035.” *International Social Security Review* 60 No. 1 (2007): 81-99.