A Revenue-Based Approach to Saving Social Security

By Theresa Anderson

Social Security is a politically popular, broad-based social program that pays benefits to workers and/or their dependents upon disability, retirement, or death. Currently, Social Security expenditures exceed revenues. Without intervention, Social Security will have to reduce benefits to 77 percent of the scheduled amount in 2033 and by more in later years. This paper proposes a two-pronged revenue-based approach that would rebalance the Social Security trust fund for at least the next 75 years while improving program equity. The first proposed change is to remove the cap on taxable earnings. The second is to introduce a 7.7-percent “retirement security surtax” on investment income that aligns with the Affordable Care Act’s Net Investment Income Tax. While analysts have previously considered the effect of removing the Social Security tax cap, the expansion of the tax base to investment income is a new solution that has not previously appeared in the literature. The combination of these two approaches should produce a stronger, more equitable system that improves retirement security for all covered workers.

Introduction

Old Age, Survivor, and Disability Insurance—more commonly known as “Social Security”—is the largest government-sponsored social program in the United States. However, Social Security’s current financial model is unsustainable and threatens its continuation. This paper proposes a fiscally progressive solution that would boost program revenues while maintaining the current benefit formula for present and future beneficiaries. The solution has two components: (1) removing the Social Security payroll tax cap and (2) leveraging an additional 7.7 percent tax on certain types of investment income. If passed by Congress, this approach would improve both sustainability and equity in the Social Security system.

This paper first lays out the history of Social Security and the context in which Social Security operates. It then describes the rationale for a revenue-based approach to resolving the funding shortfall. Finally, the paper details the proposed solution and estimates how this new approach would affect Social Security’s long-term solvency.

Social Security

Social Security is an important legacy of the New Deal because of its size and its notable effect on every American’s life. It is the largest government-sponsored social program with annual expenditures of $823 billion for benefits to 58 million American workers (SSA 2014b, 2). About 90 percent of American workers contribute to the Social Security system (SSA 2014a), and the Social Security Administration (SSA) pays
benefits to these workers and/or their dependents upon disability, retirement, or death. SSA determines benefit amounts based on lifetime contributions to the system.

Nearly nine out of 10 (or 38 million) individuals age 65 and older receive Social Security benefits; these benefits represent about 38 percent of income for people in this age group (SSA 2014a). Retired workers receive benefits of up to $2,663 monthly with an average monthly benefit of $1,328 (SSA 2015). This average benefit amount brings a person age 65 or older living alone to 140 percent of the 2014 federal poverty threshold on its own, regardless of any other income that the person may have (Census Bureau 2014). In addition to Old Age Security Income, individuals may receive benefits for disability or for being a dependent or survivor of a Social Security recipient. Social Security Disability Insurance (SSDI) benefits represent a relatively small portion of Social Security expenditures. There are about 8.8 million disabled workers receiving SSDI with an average monthly benefit of $1,165 (SSA 2014a; SSA 2015). An additional 11.1 million Americans receive dependent or survivor benefits; survivors receive average benefits of $1,244 per month (SSA 2014a).

Social Security is available to all workers, and it intends to mimic a pension system instead of a welfare system. This may account for its political popularity, as discussed below. Workers contribute to Social Security through Federal Insurance Contributions Act (FICA) payroll taxes, a tax on earned income (IRS 2015). Employees and employers each contribute 6.2 percent, so the combined total is 12.4 percent of earned income up to an earnings cap (SSA 2015). A taxpayer earning more than this cap in a given calendar year no longer contributes to the Social Security portion of FICA. In 2015, this cap is $118,500 (SSA 2015).

SSA administers the program and tracks its balances through a trust fund. SSA invests the revenue in government bonds, which the government transfers to the Department of Treasury and uses to finance general expenditures. The trust fund is a formalized accounting system that tracks the amount the Treasury owes to SSA for Social Security benefits.

Social Security trust fund expenditures have exceeded revenues since 2010 (SSA 2014b, 53). This shortfall stems from three main factors: demographic shifts, changes in life expectancy, and slowed earnings growth. Demographic shifts have been especially important in causing the Social Security shortfall. While in 1948 the number of working-age persons outnumbered persons age 65 or older by 8.6 to one, the aging of the Baby Boom generation and declining fertility rates have resulted in a proportion of 4.5 working-age persons to each person age 65 or older in 2014. The proportion of the labor force under age 65 to persons age 65 or older decreased from 5.4 to one in 1948 to 3.3 to one in 2014 (data from BLS 2014). Moreover, retirees’ life expectancy has increased steadily, far outpacing increases in the full retirement age. Life expectancy at birth for women increased from 66 years in

1. The Census poverty threshold in 2014 for an individual over age 64 living alone was $11,354 annually. The average benefit of $1,328 multiplied by 12 equals $15,936, which is 1.4 times the poverty threshold.

2. In 1948, there were 92,342 people age 16 to 64 in the civilian, noninstitutionalized population and 57,725 people in the civilian labor force age 16 to 64. There were 10,720 people in the civilian, noninstitutionalized population age 65 or older. By 2014, there were 202,987 in the civilian, noninstitutionalized population age 16 to 64, 147,564 people in the civilian labor force age 16 to 64, and 44,959 people in the civilian, noninstitutionalized population age 65 or older. The data are from the Current Population Survey Labor Force Statistics.
1940 to an estimated 81 years in 2013. Women who reached age 65 in 1940 could expect to live to age 78 while those who reached age 65 in 2013 could expect to live to age 85. Men saw similar increases in life expectancy, though men have a somewhat lower life expectancy than women (SSA 2014b, 90). As a result, lifetime retirement benefits have increased over time. Further, slower earnings growth during the 2007–2009 recession reduced revenue relative to expectations. Estimates indicate that the recession contributed to a $1 trillion loss in trust fund assets, which accelerated the estimated timeline for trust fund exhaustion (Rosnick 2012).

SSA’s most recent estimates show that, under current law, the Social Security program will have to reduce benefits to 77 percent of the scheduled amount in 2033, less than 20 years from now (SSA 2014b, 12). SSA actuaries expect that after 2033, the Social Security program will need to reduce benefits even further to accommodate the continued projected shortfall (SSA 2014b, 12). This decline will likely put financial hardship on beneficiaries and undermine individuals’ long-term savings plans, and it will still fail to resolve the shortfall because it will not change the benefits structure sufficiently to rebalance the trust fund account.

**Focusing on Revenue**

Solvency is defined as “the ability of the trust funds at any point in time to pay the full scheduled benefits in the law on a timely basis” (Goss 2010, 112). SSA makes projections 75 years into the future to determine solvency, and analysts generally assess proposals to balance the system against the 75-year timeline. To make Social Security solvent, the federal government must either raise revenue, lower expenditures, or reform the entire system (such as through privatization or by ending the trust fund structure). Raising revenues appears to be the most politically popular—and therefore politically feasible—of these three options, based on public opinion polling. Raising revenue would also maintain the anti-poverty benefits of Social Security and promote equity in the system (a later section of this paper discusses the meaning and value of equity in more detail). The public supports neither a systemic overhaul nor a major change in expenditures.

Overall, Social Security is very popular, and poll results suggest that the majority of American adults believe that Social Security is worth the cost, depend on it for future economic security, and do not want to rebuild the system completely. A 2014 CBS News poll of a representative sample of all adults found that 78 percent of those who expressed an opinion think that Social Security is worth the cost (Polling Report 2014). In 2014, Gallup polling found that 84 percent of non-retirees who expressed an opinion expect that Social Security will be a source of retirement income; 32 percent expect it will be a major source (Gallup 2014). In 2011, the Pew Research Center asked a representative sample of adults if they think that the Social Security System needs minor changes, major changes, or to be completely rebuilt. Of those who expressed an opinion, only 19 percent think that it needs to be “completely rebuilt,” with 44 percent responding that it needs only “minor changes” and 37 percent seeking “major changes” (Polling Report 2014). In addition, former President George W. Bush’s Social Security privatization campaign in 2005 was unsuccessful.

---

3. Note that in this result and the others that follow, the author recomputed the percentages to exclude from the denominator respondents who did not express an opinion.
Policy Perspectives | Volume 22

despite his substantial investment of time and political capital. This outcome supports the hypothesis of public resistance to changing the structure of the Social Security program (Galston 2007).

Instead, popular opinion calls for maintaining the current benefit structure. A 2013 AP-NORC poll of adults age 50 and over found that 63 percent of those polled who expressed an opinion favor raising the tax cap, while 43 percent support reducing benefits only for seniors with “higher incomes” (Sedensky 2013). An AP-GfK poll conducted in 2012 of a representative sample of all American adults found that 60 percent of those who expressed an opinion prefer raising taxes to support Social Security rather than cutting benefits in the future (Polling Report 2014). A 2011 Pew Research poll of a representative sample of all adults found that 63 percent of those who gave an opinion think that the government should keep Social Security and Medicare benefits as they are instead of modifying them to reduce the budget deficit (Polling Report 2014).

Social Security’s usefulness in combating poverty further supports the revenue-based approach to restoring solvency. According to the Census Bureau and other analysts, Social Security is the most effective anti-poverty program in the United States (Short 2013, 14; Gould 2013). In 2012, it lifted 26 million Americans of all ages out of poverty, based on an estimate that it reduced poverty by 8.5 percent for the U.S. population of 311 million people (Short 2013, 6 and 15). Social Security’s poverty alleviation effect extends beyond the disabled or elderly; poverty is a household-level measurement, and many Social Security recipients live with non-recipients and add benefits they receive to the household income. The added income of Social Security, combined with other income, can lift an entire household out of poverty. The Census Bureau estimated that Social Security reduced poverty for children by 2.0 percentage points, for nonelderly adults by 4.1 percentage points, and for the elderly by 39.9 percentage points in 2012 (Short 2013, 15). SSA’s actuaries have documented that lowering benefits or changing the retirement age—except when these changes would affect only the highest earning beneficiaries—would have a negative effect on poverty rates among the elderly, compared with maintaining scheduled benefits (Springstead 2010, 5; Sarney 2010, 5; Springstead 2011, 7).

Given the lack of support for systemic overhaul and changes in expenditures, approaching revenue rather than expenditures makes sense. Workers have paid into the system expecting certain benefits. They have planned and saved with the existing Social Security benefit structure in mind. Reducing future benefits for current workers is, in a sense, “changing the rules at halftime.”

Valuing Equity

This paper defines “equity” to mean that every qualified person pays into the system and receives their fair share of benefits in accordance with their means and need. Equity is distinct from “equality,” which means everyone puts in and receives the same amount. Equity is the notion behind a progressive tax system, social benefit structures, and all types of insurance.

Although equity has been an explicit goal of the Social Security program since its inception, the system is currently imbalanced. Arthur J. Altmeyer, member and then Chairman of the Social Security Board from the program’s establishment in 1935 to 1946 and the first Commissioner for Social Security until 1953, stated
that Social Security should provide enough to support a family in cases of adversity but not enable anyone to live luxuriously (SSA 1945). Altmeyer’s position shows that the architects of Social Security founded the program on the principle of equity. Benefits are progressive by design: lower-income workers replace a higher proportion of their earnings with Social Security benefits than higher-income workers do (Smith, Toder, and Iams 2003/2004). In other words, recipients replace previous earnings differentially in accordance with their need and their ability to accumulate private savings.

While the benefits structure promotes equity, the tax contribution structure is not currently equitable because it disproportionately burdens low-income Americans. This inequity derives from two sources: (1) the cap on earnings subject to the FICA tax and (2) income composition across the spectrum. As shown in Figure 1, lower-income workers gain a larger share of income from salaries and wages, which are subject to FICA taxes, while higher-income workers gain a larger share of their income from investment income, which maps

**Figure 1: Composition of Income Reported on Tax Returns by Adjusted Gross Income (AGI) in 2012**

Notes:
1. Interest and Dividends includes both taxable and non-taxable interest and all dividends.
2. Other income is the total of state tax refunds, alimony, non-capital asset property, estate and trust, unemployment, foreign-earned exclusion, “other” (see IRS 2014c), gambling, and rent and royalty income.
3. Retirement income includes both the taxable and nontaxable portions of IRA distributions, Social Security benefits, and pensions and annuities (as reported on tax returns).
4. Business income is defined as Schedule C, S-Corporation, partnership, and farm income.
5. Capital gains income is the combination of capital gains distributions reported on Form 1040 and net taxable gains on capital assets reported on Schedule D.

Source: Table 1.4, IRS, Statistics of Income, Publication 1304, July 2014. Figure created by author based on Tax Policy Center style (2003).
Removing the Tax Cap

Currently, the sources of revenue for Social Security are limited to FICA payroll taxes, personal income taxes levied on high-earning beneficiaries, interest earned on the trust fund principal, and small reimbursements from the general fund of the Treasury (SSA 2014b, 41). The FICA tax is the major source of Social Security revenue (SSA 2014b, 41). The cap on Social Security FICA taxes was set at $118,500 for 2015, meaning that FICA was only levied on the first $118,500 earned by an individual worker in that calendar year. This limits the amount of annual income from FICA that the Social Security trust fund could receive from any individual worker, regardless of their earned income, to a maximum of $14,694 in 2015. Benefits, on the other hand, could cost the trust fund up to $31,956 per year for a retiree collecting the maximum benefit (SSA 2015).\footnote{The $14,694 figure represents 12.4 percent of the current payroll cap of $118,500. The maximum annual benefit of $31,956 is the maximum monthly benefit in 2015 of $2,663 multiplied by 12.}

Congress has raised the cap over time, at first manually through legislative action, then, beginning in 1977, automatically with wage growth. The goal in 1977 was for the cap to cover 90 percent of total taxable earnings for all American workers, which it achieved in 1983 (CBO 2013, 141). However, because earnings at the higher end of the income spectrum have grown faster than all earnings, the $106,800 cap in 2011 only covered 83 percent of earnings (CBO 2013, 141). Unlike the NIIT, the retirement security surtax would apply to all qualified income, regardless of taxpayer income bracket.

The higher-income workers who otherwise would have met the payroll cap would receive credit toward their Social Security benefits based on additional contributions beyond the present cap, making their benefit payout higher than it would have been with the cap. However, this proposal does not count contributions from the retirement security surtax toward the computation of benefits, primarily because further analysis would be necessary to determine how that change would affect long-term program solvency and equity.

The Proposed Approach

This paper proposes that the Social Security system can achieve solvency by making two changes to increase program revenue: (1) remove the FICA payroll tax cap and (2) leverage an additional 7.7 percent tax on certain types of investment income. The 7.7-percent tax on investment income could be called a “retirement security surtax,” and it would be levied on the same sources of income as the Affordable Care Act’s Net Investment Income Tax (NIIT). The NIIT increased the tax rate on capital gains, dividends, sale of investment real estate, and sales of interests in partnerships and S-corporations for tax filers above certain income thresholds, which vary by filing status. Unlike the NIIT, the retirement security surtax would apply to all qualified income, regardless of taxpayer income bracket.

The higher-income workers who otherwise would have met the payroll cap would receive credit toward their Social Security benefits based on additional contributions beyond the present cap, making their benefit payout higher than it would have been with the cap. However, this proposal does not count contributions from the retirement security surtax toward the computation of benefits, primarily because further analysis would be necessary to determine how that change would affect long-term program solvency and equity.
exhaustion by six years, while removing the cap altogether would delay exhaustion by 30 years (SSA 2013c; SSA 2013a).

Equally important, simply raising the tax cap to cover 90 percent of earnings would not address the inequity in the contribution structure. Removing the cap is more equitable because all workers would pay an equally proportionate share of their payroll income into the Social Security system. They would also get credit for these additional contributions when they or their family members were eligible to receive benefits. This solution addresses the fact that Social Security has increasingly resembled a welfare system: a larger proportion of contributions and payouts have gravitated toward the lower end of the income spectrum. Raising or removing the tax cap would allow Social Security to mimic a pension system where everyone who pays in gets benefits proportionate to their contributions.

Expanding the Tax Base

There is no fundamental reason why the tax base for Social Security should be limited to labor earnings. Investment income is an untapped income source that could help support the Social Security system. Though this would make Social Security less like a contributory pension system, it is an appropriate change to reflect the shift in the distribution of income away from payroll income and toward investment sources (TPC 2014). As shown in Figure 1, a large portion of income for higher earners comes from non-payroll sources. In 2012, interest, dividends, and capital gains comprised about 10 percent of all income claimed on tax returns (IRS 2014d, Table 1.4). This figure reached 16 percent in 2007, the highest level since 1937 (TPC 2014).

This proposal requires that investment income as defined by the NIIT be taxed at 7.7 percent, an amount that would likely ensure long-term Social Security solvency. This would be in addition to current taxes on these income sources. The Internal Revenue Service (IRS) presently taxes interest and ordinary dividends as regular income, but they are not subjected to FICA payroll taxes (IRS 2014a, 5 and 20). The IRS taxes capital gains, also called “qualified dividends,” at a lower rate, between 0 and 20 percent, depending on a variety of factors (IRS 2014a, 20).

The NIIT provides an income definition and structure upon which the government could build this new proposed retirement security surtax. As mentioned, the NIIT taxes capital gains, dividends, sale of investment real estate, and sales of interests in partnerships and S-corporations for tax filers above certain income thresholds (IRS 2014b). The current NIIT helps offset the costs of the Affordable Care Act, which provides subsidized health insurance coverage to all Americans. Adding the retirement security surtax to the NIIT is logical: if the Affordable Care Act is successful at improving health and decreasing mortality due to age and disability, then it is appropriate that extra funds from the same tax source offset the cost of supporting retired and disabled workers throughout the remainder of their lives.

Effect of the Proposal on Solvency

SSA has analyzed the effect of removing the tax cap but has not considered the effect of expanding the tax base. Taken alone, removing the tax cap and giving credit to workers for those additional contributions would delay trust fund exhaustion until 2063 (SSA 2013a). The proposed

---

5. The author attributes the seed of this idea to Stoker (2014).
7.7-percent retirement security surtax would further improve equity and would restore solvency in the system, as described next.

Table 1 calculates how these changes would affect the Social Security trust fund. In 2011, payroll income subject to FICA taxes (i.e., covered earnings) totaled $5.45 trillion (SSA 2012, 202), value b in the table. Total payroll income was $6.06 trillion in that same year, value a (TPC 2014). At a 12.4 percent tax rate, the taxable base produced $666.9 million in revenue for Social Security in 2011 (SSA 2012, 153), value c. If the tax cap did not exist in 2011, an additional $609.4 billion would have been added to the base on top of the $5.45 trillion already covered, value c. The tax on this expanded base, totaling $75 billion—value f—would increase Social Security revenue by 11.3 percent, value i. The NIIT base equaled $1.186 trillion in 2014, value d. Adding a 7.7-percent tax on the NIIT base would have increased Social Security revenue an additional 13.7 percent, value j, for a total combined increase of 25.0 percent, value k.

This combination of interventions should make Social Security solvent throughout the next 75 years. This assessment is based on SSA actuarial estimates that increasing the payroll tax to 15.3 percent on the current base, while providing benefit credit for additional earnings taxed, would make the program solvent for over 75 years (SSA 2013b). If the 15.3 percent tax rate were in effect in 2011, it would have raised $833.24 billion in revenue. The present policy proposal, without an earnings cap and a 7.7-percent retirement security surtax would further improve equity and would restore solvency in the system, as described next.

Table 1: Calculations of the Effect of Proposed Policy Changes on Social Security Revenue ($, millions)

<table>
<thead>
<tr>
<th>Total Payroll Income</th>
<th>Social Security Tax Base</th>
<th>Additional Income from Removing Tax Cap</th>
<th>NIIT Base</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base</td>
<td>a) $6,055,389</td>
<td>(a − b) = c) $609,389</td>
<td>d) $1,186,400</td>
<td></td>
</tr>
<tr>
<td>Revenue</td>
<td>(approx. b * .124) = e) $666,900</td>
<td>(c * .124) = f) $75,564</td>
<td>(d * .077) = g) $91,351</td>
<td>(e + f + g = h) $833,816</td>
</tr>
<tr>
<td>Percent Increase in Revenue</td>
<td>(f/e) * 100 = i) 11.3%</td>
<td>(g/e) * 100 = j) 13.7%</td>
<td>(i + j)/e) * 100 = k) 25.0%</td>
<td></td>
</tr>
</tbody>
</table>

Qualifications

There is always uncertainty values in this computation, which are based on values in 2011, but earlier estimates of the NIIT base are not available, since the tax did not go into effect until 2013. The author calculated this my multiplying the 2011 Social Security tax base by 15.3 percent.
when projecting future sources of income, as well as the resource needs of a large and complex social program. However, it is likely that the revenue estimate generated here is conservative. As the economy continues to recover and investment income grows, tax revenue will likely increase further. On the other hand, there may be behavioral changes in response to shifting incentives introduced by higher tax rates, such as gaming behavior that shifts income toward sources taxed at a lower rate, creates tax shelters, or moves business out of U.S. tax jurisdiction. These types of behavioral changes are difficult to predict.

In addition, some have argued that the government should not tax investment gains because low taxes encourage re-investment (Moore and Silva 1995; Gingrich and Renwick 2009). However, the nonpartisan Congressional Research Service, which informs Congress on policy issues, finds that lower capital gains taxes have little effect on savings behavior or economic growth based on empirical analyses (Hungerford 2010). This suggests that gaming behavior and declines in investment may not be a serious concern.

**Effect of the Proposal on Higher-Income Earners**

Not only does the proposed solution help the poor and those who rely on Social Security as a primary support during retirement, it may also have a positive effect on middle- and high-income earners. Higher earners, who would contribute more to the Social Security system and receive credit for payroll contributions above the current cap, would be able to count on higher benefits upon retirement. Survey data suggest that many high earners have not saved adequately to maintain their standard of living after retirement. In 2010, 11 percent of households in the top quartile of earnings and 28 percent in the second-highest quartile did not have retirement accounts at all (Rhee 2013, 10). Analysis of a different data source shows that in late 2011, 28 percent of individuals who lived in households with the top quartile of earnings did not have any retirement savings (Saad-Lessler and Ghilarducci 2013, 5). Individuals in this category who did have savings had saved an average of $137,149 total, with a median of $90,000 (Saad-Lessler and Ghilarducci 2013, 5). The median is substantially lower than pre-retirement annual income for that top quartile, and it is equivalent to less than three years of the current maximum Social Security Benefit, though female life expectancy after age 65 is 20 years (SSA 2014b, 90). Additional guaranteed Social Security benefits would be an important income source for higher-income workers who did not save sufficiently for retirement, and it would help them maintain their standard of living.

Even having a retirement account does not mean that one’s future is secure. Fluctuations in the stock market can have an important negative effect on wealth and savings. In the 2007–2009 recession, households in higher income deciles were more likely to experience a decline in wealth, some losing 50 percent or more (Gustman, Steinmeier, and Tabatabai 2012, 58). The safety net that a broader Social Security system would create may boost workers’ willingness to take financial risks, which some argue leads to economic growth (Dionne 1999; Chetty and Looney 2006).

**Conclusion**

Though funding shortages currently threaten Social Security, there are many potential solutions to
the “crisis.” The proposal outlined here would improve programmatic equity and ensure solvency by increasing revenues while maintaining scheduled benefits. All workers—regardless of income bracket—would have a fair opportunity to contribute to and receive benefits from the system in line with their means. This proposal would move the program closer to its goal of providing income security to our nation’s workers and their families. It would also potentially support risk-taking and economic growth. As Altmeyer stated, “if we remove the haunting fears of poverty, neglected ill-health, and destitution from our people—we will release them from bonds that hold them back, we will stimulate them to even greater enterprise and individual initiative” (SSA 1945). That is, income security leads to enterprising behavior that can bolster the national economy. This is something that nearly everyone, regardless of political inclination, would likely support.

References


Theresa Anderson is a second-year doctoral student at the Trachtenberg School, where she is concentrating in program evaluation. Previously, she completed her Master of Public Policy at the Trachtenberg School, concentrating in social policy analysis methods. During the day, she is a Research Associate in the Income and Benefits Policy Center at the Urban Institute, where she conducts evaluations of social programs and does other policy research related to education and workforce development. She was previously a Social Science Analyst at the US Department of Agriculture’s Economic Research Service, where she analyzed the interaction between food assistance and Unemployment Insurance during the economic recession. She has also worked as a Research Assistant at the George Washington Institute of Public Policy and as a Legal Assistant at the Legal Aid Society of DC, where she helped low-income clients with housing issues.

This article was developed out of a course taught by Robert Stoker. The author acknowledges and thanks Joseph Cordes for his substantive input into this article and Rebecca Duberstein, Anne Kruse, and Christine Mellen for their editorial input. The author is also grateful to Joe Rosenberg of the Urban-Brookings Tax Policy Center for providing data on the tax base for the Net Investment Income Tax. Finally, the author would like to thank Barbara Anderson and Arun Rajmohan for their intellectual and moral support.