GENERATIONAL ACCOUNTING

Many government programmes transfer resources between different population groups. Programmes to provide retirement and health security levy taxes on workers to finance transfers to retirees. Initiating or expanding such programmes often redistributes wealth across generations by altering their lifetime tax burdens. Although standard budget measures such as national debt and deficits do not fully reflect them, such public intergenerational redistributions could substantially affect different generations' economic choices. Generational accounting measures the size of prospective net tax burdens facing different generations under current government tax and expenditure policies. It also analyses how those fiscal burdens would change under alternative policies.

Before the 1990s, studies of the distributional impact of fiscal policies distinguished between groups according to their income, wealth or consumption at a point in time but not according to their life-cycle stage. Feldstein (1974) first pointed out the possibility of implementing large resource transfers across generations even under balanced government budgets. Nevertheless, notions about the impact of fiscal policies across generations remained limited to a presumed positive association between larger budget deficits and larger tax burdens on future generations.

Auerbach, Gokhale, and Kotlikoff (1991) developed generational accounting, a method for estimating the economic impact of fiscal policy on different cohorts – including future ones – distinguished by birth year and gender. With rapidly aging populations in developed countries and growing costs of social insurance programmes that redistribute resources from younger to older generations, the demand for evaluating the intergenerational effects of government fiscal policies increased considerably. As a result, generational accounting is now used as a fiscal-analysis tool in dozens of countries.

Generational accounting (GA) is a method of estimating *prospective per capita lifetime net tax burdens* that different cohorts would face under existing fiscal policies. 'Prospective' means that fiscal burdens are evaluated over cohorts' remaining lifetimes; 'net tax' means that government transfers are subtracted from taxes; and 'lifetime' indicates that future dollar flows are actuarially discounted back to the present and aggregated into a summary measure of the fiscal burden in present value. Changes in the GAs of different cohorts arising from changes in government tax and spending policies measure fiscal policy-induced changes in those cohorts' lifetime resources.

Generational accounting method

Under current (year t) policies, the present discounted value of the government's projected purchases of goods and services (PVG_t) must be paid for out of the government's current net financial wealth (NW_t), the present value of net tax payments by living generations (PVL_t), and the present value net tax payments by future-born cohorts (PVF_t). In this government intertemporal budget constraint,

$$PVG_t = NW_t + PVL_t + PVF_t, \qquad (1)$$

NW_t is calculated as the sum of past budget surpluses – which would be negative if past budgets mostly accrued deficits. The government's real assets, such as land, roads, buildings and public parks, are not included because that would require inclusion of a compensating term on the left-hand-side of eq. (1) – the rental cost of the services those real assets provide.

For calculating PVL_t, official government projections of annual aggregate taxes and transfers are first distributed across officially projected populations using profiles of tax payments and transfer receipts by age and gender obtained from the latest available micro-data surveys. Per capita taxes and transfers for years beyond the government projection horizon are obtained by growing the terminal year's per capita values at the labour productivity growth rate underlying official aggregate projections.

Next, each living cohort's GA is calculated by actuarially discounting its projected net taxes per capita using cohort-specific mortality projections and an assumed rate of discount. Because fiscal dollar flows are more volatile than returns on government bonds but less volatile than private capital returns, an intermediate rate of interest is used. Multiplying each cohort's GA by its year-t population and aggregating across all cohorts yields PVL_t.

PVG_t is calculated by projecting government purchases of goods and services – such as administrative and judicial services, defence, and infrastructure – at current levels per capita using official population projections, and discounting those amounts back to year t. The term PVF_t in eq. (1) is calculated as a residual.

Both PVL_t and PVG_t are calculated by projecting fiscal flows under unchanged policies. PVL_t equals the present value of net taxes that cohorts alive in year t would pay collectively if their fiscal treatment remained unchanged throughout their lifetimes. PVG_t indicates the size of the bill in present value for providing public goods and services at current levels for ever. To maintain the current fiscal treatment of living generations and current public goods and service levels for ever, the present value cost that future generations must pay equals $PVG_t - PVL_t - NW_t$.

Thus, generational accounting reveals the fiscal burden that future generations collectively face under current government fiscal policies. That burden does not necessarily equal the government's outstanding debt: $-NW_t$.

Estimating per capita fiscal burdens facing future-born generations requires knowing how it would be distributed among them. Generational accounting assumes, hypothetically, an equal distribution of the residual fiscal burden except for an adjustment for productivity growth. If we ignore gender differences for simplicity, the GA facing those born in year $t + 1$ is calculated as

$$GA_{t+1} = (PVG_t - PVL_t - NW_t)(1 + r_{t+1}) / \sum_{s=t+1}^{\infty} N_s[(1+g)/(1+r)]^{s-(t+1)} . \tag{2}$$

Here, r represents the discount rate; g represents labour productivity growth; s represents future cohorts' birth years; and N_s represent their population sizes. In eq. (2), the residual fiscal burden in present value as of period $t + 1$ is divided by the weighted sum of the population of future-born persons with weights based on r and g. The discount rate, r, is included in the weighting scheme to account for the differences in the timing of net tax payments by different future-born cohorts. Such weighting ensures that people born in period $s \geq t + 1$ pay lifetime net taxes that are $(1 + g)^{s-(t+1)}$ times larger than those paid by persons born in period $t+1$.

Generational accounts for the United States

By using projections from the Budget of the US government for fiscal year 2005 (with t = fiscal year 2004), applying a five per cent discount rate, and calculating US dollar amounts in constant 2004 dollars, PVG_t is estimated to be $26.8 trillion; NW_t equals −$4.4 trillion; and PVL_t equals 4.9 trillion. That leaves future generations to collectively pay $26.3 trillion.

Table 1 Generational accounts for the United States
(thousands of constant 2004 dollars)

Year of birth	Age in 2004	Male	Female
2005 (future-born)	−1	333.2	26.0
2004 (newborn)	0	104.3	8.1
1989	15	185.7	42.0
1974	30	201.3	30.2
1959	45	67.8	− 54.1
1944	60	− 162.6	− 189.4
1929	75	− 171.1	− 184.1
1914	90	− 65.0	− 69.2

Source: Author's calculations based on data from Gokhale and Smetters (2006).

Table 1 shows GAs for selected US male and female cohorts with t = fiscal year 2004. They exhibit a standard life-cycle pattern: older cohorts face negative GAs – they receive benefits on net – and younger ones face positive GAs. Younger women have smaller GAs than men because of their lower labour-force participation and earnings. Very young cohorts with many years to go before paying taxes face considerably smaller GAs because of discounting. Older women receive larger net benefits in present value than older men despite their lower prior labour-force activity because they live longer and receive social insurance benefits based on their male spouses' earnings. The GA for those born in 2005 (year $t + 1$) equals \$333,200 per capita – considerably larger than that for 2004-newborns.

Lifetime net tax rates and generational balance

Alternatively, fiscal burdens can be represented as *lifetime net tax rates* (*LNTR*) that different generations would face under the given assumptions. For future generations, $LNTRf = GA_s/PVE_s$, for all $s > t$, where PVE_s represents the present value as of period s of projected (pre-tax) labour earnings per capita for the cohort born in period s. Future labour earnings per capita are projected in a manner similar to that used for projecting taxes and transfers. Equation (2)'s distribution rule implies that both lifetime net taxes and lifetime earnings grow at the same rate for successive cohorts, implying that *LNTRf* applies to all future cohorts.

An important generational accounting concept is that of *generational balance*. It is derived by comparing the lifetime net tax rate facing year-t newborns, $LNTR_t = GA_t / PVE_t$, with *LNTRf*. Note that $LNTR_t$ is based on current tax and transfer policies extended throughout the lifetime of year-t newborns whereas *LNTRf* is a hypothetical rate imputed for future generations based on an equal growth-adjusted distribution of the residual fiscal burden across future-born cohorts. A finding of $LNTR_t < LNTRf$ would show current policy as being generationally out-of-balance – one that levies a smaller *LNTR* on current newborns than would be required of future ones on average to balance the government's books. Thus, a policy that is generationally out of balance is also unsustainable.

Calculations based on the GAs shown in Table 1 reveal that US fiscal policy is considerably out of generational balance as of fiscal year 2004. The present value of lifetime earnings for males born in 2004 is estimated to be \$562,000, making $LNTR_{2004}$ equal to 18.5 per cent. For future-born cohorts, *LNTRf* equals 58.2 per cent. Continuing existing tax and spending laws for living generations would require future generations to bear fiscal burdens that are more than three times larger on average.

If current policy is out of generational balance (that is, if $LNTR_t < LNTRf$), GA machinery can also be used to calculate alternative policy changes that would restore generational balance. This exercise reveals the policy trade-offs involved in moving from a generationally out-of-balance policy to one that is balanced.

A large initial generational imbalance requires a large fiscal adjustment. Restoring generational balance to US fiscal policy via income tax hikes would require

average income tax rates to be 39 per cent larger. That is, federal income tax revenues that according to the US Congressional Budget Office (2006) amounted to 8.6 per cent of GDP in 2004 would have to be immediately and permanently increased to 11.9 per cent of GDP. Alternatively, federal discretionary outlays would have to be reduced immediately and permanently by 67 per cent.

Criticisms of generational accounting

Generational accounting has been subject to several criticisms. First, it measures the direct net costs of taxes and transfers but excludes the benefits derived from government public goods and service purchases. If the benefits from some purchases accrue much later, the average GA facing future generations may not accurately reflect their fiscal treatment under current policies. Second, generational accounting does not factor in the costs and benefits from government insurance provision.

These two criticisms indicate that generational accounting is not a 'utility measure' of the impact of fiscal policies on different generations. However, dynamic simulation studies suggest that changes in GAs correspond reasonably well to welfare gains and losses arising from policy changes.

Third, generational accounting ignores dynamic economic responses when estimating policy adjustments for restoring generational balance. However, its 'static' estimates constitute lower bounds of the required adjustments. For example, increasing income taxes would normally reduce labour supply and require a larger tax hike to achieve generational balance.

Fourth, to qualify as 'budget concepts' fiscal measures must show the implications of keeping policies unchanged. However, the generational balance measure employs a hypothetical policy for future generations. Gokhale and Smetters (2003) provide alternative fiscal and generational imbalance measures that do not involve hypothetical policies.

Fifth, generational accounting discounts future fiscal flows using a common discount rate whereas taxes and transfers may be subject to different degrees of policy and economic uncertainties. And sixth, it may be appropriate to use different discount rates for different cohorts because they face different risks. However, generational accounting studies include sensitivity analyses under alternative assumptions, including alternative discount rates.

Final remarks

It is important to note that generational accounting tracks only the redistributive impact of government fiscal policies. It does not include the impact of private bequests and *inter vivos* gifts. In theory, private intergenerational transfers may substantially or fully offset government transfers. However, the weight of evidence, at least for the United States, suggests that such offsets are quite small.

A chief lesson from the generational accounting literature is that the frequently cited aggregate cash-flow measures of fiscal policy – such as the size of national debt

and annual budget deficits – are uninformative and, indeed, may mislead policymakers about the true distributional and economic implications of current fiscal policies and policy changes.

To the extent that traditional deficit and debt measures miss significant policy-induced intergenerational redistributions – with potentially large effects on agents' economic choices such as consumption and labour supply – generational accounting calculations can provide useful information to policymakers and the public.

Generational accounting is also likely to prove useful in further economics and public-policy research. For example, generational accounts could be combined with other elements of wealth – human, non-human and private pension wealth – on a cohort basis to estimate whether changes over time in the cohort-distribution of resources are related to changes in cohort saving and labour force participation. Generational accounts could also be used to calculate changes in the degree of cohort wealth annuitization for examining the extent of insurance against uncertain longevity.

In many countries, government programmes for providing insurance to the public against various types of economic risks are financially unsustainable. Uncertainty about prospective changes in taxes and transfers for correcting those fiscal imbalances constitute a major source of risk for households. Analyses using generational accounting may help in better understanding the extent to which government fiscal policies mitigate or exacerbate the economic risks facing different generations.

Jagadeesh Gokhale

See also **aging populations; public debt; public finance**

Bibliography

Auerbach, A., Gokhale, J. and Kotlikoff, L. 1991. Generational accounts: a meaningful alternative to deficit accounting. *Tax Policy and the Economy* 5. Cambridge, MA: MIT Press and the NBER.

Auerbach, A., Gokhale, J. and Kotlikoff, L. 1994.Generational accounting: a meaningful way to evaluate fiscal policy. *Journal of Economic Perspectives* 8(1), 73–94.

Congressional Budget Office. 2006. Historical Budget Data, 26 January, Table 4. Online. Available at http://www.cbo.gov/budget/historical.pdf, accessed 28 June 2006.

Diamond, P. 1996. Generational accounting and generational balance: an assessment.

National Tax Journal 49, 597–607.

Feldstein, M. 1974.Social Security, induced retirement, and aggregate capital accumulation. *Journal of Political Economy* 82, 905–26.

Gokhale, J., Kotlikoff, L. and Sabelhaus, J. 1996. Understanding the postwar decline in U.S. saving: a cohort analysis. *Brookings Papers on Economic Activity* 1996(1), 315–407.

Gokhale, J. and Smetters, K. 2003. *Fiscal and Generational Imbalances: New Budget Measures for New Budget Priorities*. Washington, DC: American Enterprise Institute Press.

Gokhale, J. and Smetters, K. 2006. Fiscal and generational imbalances: an update. *Tax Policy and the Economy*, vol. 20, ed. J. Poterba. Cambridge, MA: MIT Press and the NBER (forthcoming).

Kotlikoff, L. and Fehr, H. 1996/97.Generational accounting in general equilibrium. *Finanzarchiv* 53, 1–27.

Kotlikoff, L. 1997. Reply to Cutler's and Diamond's views on generational accounting. *National Tax Journal* 50, 303–14.

Index terms

aging populations

budget deficits

consumption

fiscal burden

fiscal policy

generational accounting

generational balance

gifts

government intertemporal budget constraint

inheritance and bequests

intergenerational transfers

income taxes

labour productivity

labour supply

labour-force participation

lifetime net tax rates

national debt

redistribution of income and wealth

risk

saving

sensitivity analysis

social insurance

wealth