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2 Implications of Rising Personal Retirement Saving

James M. Poterba, Steven F. Venti, and David A. Wise

The individual retirement account (IRA) and 401(k) programs were introduced in 1982 to encourage personal saving for retirement.[1] Contributions to IRAs grew rapidly until 1986, when $38 billion was contributed to these accounts. The Tax Reform Act of 1986 curtailed this program, and by 1990 contributions had fallen to only $10 billion. They were only $8 billion in 1994. On the other hand, the 401(k) program has grown unimpeded since 1982. Now contributions to the 401(k) plan alone are greater than contributions to traditional employer-provided defined benefit and defined contribution plans combined. In 1993, 401(k) plan contributions exceeded $69 billion. Approximately 45 to 50 percent of employees were eligible for 401(k) plans in that year, and over 70 percent of those who were eligible to contribute did in fact make contributions.

The increase in personal retirement saving can have important implications for the accumulation of retirement saving for future generations of retirees. Now a large fraction of families approach retirement with virtually no personal financial asset saving. The median of personal financial assets of Health and Retirement Survey (HRS) families—whose heads were aged 51–61 in 1992—was approximately $7,000. This includes all financial assets held outside IRAs, 401(k)s, and related retirement saving accounts. Perhaps half of all families rely almost exclusively on social security benefits for support in retirement.

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1. The IRA program was in fact first introduced for persons without employer-provided pensions in 1974 and was expanded to include all employees in 1981 legislation. The 401(k) program was introduced in 1978 but was not used until IRS clarifying regulations were adopted in 1981.

The spread of 401(k) plans in particular could change this picture substantially. In this paper we simulate the 401(k) assets of future generations of retirees and compare these assets with the social security and other assets of the households who are approaching retirement now.

2.1 Overview of Method

Our goal is to project 401(k) assets of households who will retire 35 or 40 years from now. We direct attention in particular to the cohort that was age 33 in 1993, and will be age 65 in 2025. We compare the projected 401(k) assets of this cohort to the assets of the HRS respondents. We first trace backward to obtain approximate lifetime earnings histories of the HRS respondents. Lifetime earnings are grouped into 10 deciles, assuming that over their careers household earnings were in the same decile. Contributions to 401(k) plans are projected for each lifetime earnings decile. Thus we are able to ask what level of 401(k) assets such families would have accumulated, in 1992 dollars, had they had the same earnings histories as the HRS respondents but different amounts of contributions to 401(k) plans. We base the projections on the past growth in 401(k) participation rates and on the fraction of earnings contributed to the plans. The growth in participation since their inception, however, has been enormous, and simple projections—based on recent increases in participation—are not very meaningful. Therefore, we make what we believe to be plausible inferences about future participation. We actually make three projections. The first projection is for the cohort that was age 25 in 1993. The second is for a younger cohort with higher assumed participation rates. For comparison, the third projection is under the assumption of universal adoption of 401(k) plans.

In section 2.2 we document the growth of 401(k) plans and consider evidence on the amount of contributions as a percentage of earnings. We then describe the foundation for our projections and the method that is used. Finally, we discuss the projections and compare the results with the assets of the current HRS respondents.

2.2 The 401(k) Data and Estimation

2.2.1 The Growth of 401(k) Plans

We first document the growth in 401(k) contributions since the program's inception in 1982. Evidence on employee contributions and employer matching rates is presented in section 2.3. There are two principal data sources for 401(k) eligibility and participation rates. The first is the Survey of Income and Program Participation (SIPP). From the six panels of this survey data can be obtained for 1984, 1987, 1991, and 1993. The second is the Employee Benefits Supplement to the Current Population Survey (CPS). Data for this survey are available for 1988 and 1993. The participation rates assumed in the simulation

analysis rely most heavily on the CPS data, but in discussing the growth in participation we first present data based on the SIPP.

The unit of observation in both the SIPP and the CPS is an individual. We have grouped the individual responses to form families. Unmarried persons are treated as single-person families and spouses are matched to recreate two-person family units. A family is eligible for (or participates in) a 401(k) plan if at least one member of the family is eligible (or participates) in a plan. Since 401(k)s are employer-sponsored saving programs, we restrict the sample to families with at least one member employed. Further discussion of these surveys and the sample definitions are contained in appendix A.

The first panel of table 2.1 shows eligibility rates, participation given eligi-

Table 2.1 **SIPP: Eligibility, Participation Given Eligibility, and Participation Rates by Age and Year**

	Year			
Age	1984	1987	1991	1993
		Eligibility		
25–29	0.089	0.142	0.228	0.406
30–34	0.130	0.169	0.307	0.434
35–39	0.132	0.202	0.354	0.444
40–44	0.151	0.225	0.379	0.461
45–49	0.146	0.203	0.344	0.441
50–54	0.129	0.219	0.359	0.423
55–59	0.152	0.186	0.305	0.377
60–64	0.091	0.151	0.233	0.297
All	0.126	0.185	0.317	0.423
		Participation Given Eligibility		
25–29	0.476	0.498	0.690	0.556
30–34	0.498	0.540	0.729	0.630
35–39	0.469	0.583	0.695	0.630
40–44	0.607	0.673	0.671	0.645
45–49	0.632	0.689	0.683	0.693
50–54	0.674	0.634	0.735	0.684
55–59	0.721	0.716	0.692	0.671
60–64	0.627	0.715	0.746	0.649
All	0.570	0.613	0.700	0.638
		Participation		
25–29	0.04	0.071	0.157	0.226
30–34	0.064	0.091	0.224	0.274
35–39	0.062	0.117	0.246	0.280
40–44	0.092	0.151	0.255	0.297
45–49	0.092	0.140	0.235	0.305
50–54	0.087	0.139	0.264	0.290
55–59	0.110	0.133	0.211	0.253
60–64	0.057	0.108	0.174	0.193
All	0.072	0.113	0.222	0.270

Source: Based on the Survey of Income and Program Participation.

bility, and participation rates by age interval for four years, based on the SIPP data. In 1984, according to these data, 12.6 percent of employees were eligible to contribute to a 401(k) plan; they worked for employers who offered a 401(k) plan. By 1993, over 42 percent were eligible. Eligibility rates are greatest for households with heads aged 40–44; rates are somewhat lower for younger as well as older households. The rates of participation given eligibility increased from 57 percent in 1984 to 70 percent in 1991, as shown in the middle panel of table 2.1. But, according to these data, the conditional participation rate declined to 64 percent in 1993. (The CPS data, discussed below, show a substantial increase in conditional participation, from 62 percent in 1988 to 72 percent in 1993, and we are inclined to doubt the apparent decline based on the SIPP data.) In 1984 and 1987 there was a noticeable increase in conditional participation rates with age, until age 55 or so. By 1991 and 1993, however, the correspondence between age and conditional participation was not very pronounced. Finally, unconditional participation rates, shown in the last panel of table 2.1, increased from about 7 percent in 1984 to 27 percent in 1993.

Eligibility and participation rates are shown by income decile in table 2.2. Earnings deciles are calculated separately for each year, and thus the data are comparable from one year to another. Although eligibility is only moderately related to age, there is a consistent increase in eligibility with earnings decile. For example, in 1993, about 17 percent of households in the lowest decile and almost 60 percent of those in the highest decile were eligible. Conditional participation given eligibility also increases with earnings, although the relationship is not as pronounced as for eligibility. For example, in 1993, 44 percent of household in the lowest decile who were eligible also contributed; in the top decile 77 percent contributed. Combining eligibility and participation given eligibility yields a substantial relationship between participation and earnings, as shown in the last panel of table 2.2.

Eligibility and participation are shown by both earnings decile and age interval in appendix table 2B.1 for 1993. These data show little interaction between eligibility and participation rates by earnings decile and age. Thus the simpler tables for age and earnings separately provide a good summary of the more detailed data.

Table 2.3 shows eligibility and participation rates by age interval based on the CPS data. These data show eligibility rates somewhat larger than the SIPP numbers. According to the CPS data, eligibility increased from 40 percent in 1988 to 50 percent in 1993. These data also show a substantial increase in participation given eligibility, from 62 percent in 1988 to 71 percent in 1993. Furthermore, the increase is apparent for all age groups. A comparable increase in conditional participation rates is shown in table 2.4 by earnings decile. These data show an increase in all but the lowest earnings decile. This is an important result, which suggests an increase in individual retirement saving propensity. It is consistent with the recent findings of Bernheim and Garrett (1996), Bayer, Bernheim, and Scholz (1996), and Clark and Schieber (1996),

Table 2.2 **SIPP: Eligibility, Participation Given Eligibility, and Participation Rates by Earnings Decile and Year**

Earnings Decile	Year			
	1984	1987	1991	1993
	Eligibility			
1st (lowest)	0.035	0.046	0.071	0.166
2d	0.052	0.065	0.152	0.231
3d	0.070	0.108	0.208	0.298
4th	0.082	0.124	0.240	0.37
5th	0.114	0.154	0.305	0.41
6th	0.134	0.179	0.366	0.468
7th	0.143	0.228	0.408	0.525
8th	0.166	0.276	0.444	0.557
9th	0.213	0.322	0.474	0.602
10th (highest)	0.23	0.322	0.481	0.589
All	0.126	0.185	0.317	0.423
	Participation Given Eligibility			
1st (lowest)	0.448	0.524	0.650	0.437
2d	0.616	0.517	0.651	0.483
3d	0.429	0.551	0.629	0.520
4th	0.514	0.561	0.649	0.515
5th	0.463	0.525	0.595	0.570
6th	0.515	0.618	0.671	0.614
7th	0.493	0.592	0.721	0.651
8th	0.584	0.615	0.705	0.68
9th	0.64	0.619	0.749	0.751
10th (highest)	0.692	0.728	0.798	0.777
All	0.570	0.613	0.700	0.638
	Participation			
1st (lowest)	0.02	0.024	0.046	0.072
2d	0.032	0.034	0.099	0.111
3d	0.030	0.060	0.131	0.155
4th	0.042	0.069	0.156	0.191
5th	0.053	0.081	0.181	0.231
6th	0.069	0.111	0.246	0.288
7th	0.070	0.135	0.294	0.34
8th	0.097	0.170	0.313	0.38
9th	0.136	0.199	0.355	0.45
10th (highest)	0.162	0.234	0.384	0.46
All	0.072	0.113	0.222	0.27

Source: Based on the Survey of Income and Program Participation.

who conclude that employer education programs increase saving. It would of course also be consistent with a more general increase in saving propensity over time, although we know of no evidence of such a trend independent from personal retirement saving.

Like the SIPP data, the CPS data show a substantial increase in eligibility

Table 2.3 **CPS: Eligibility, Participation Given Eligibility, and Participation Rates by Age and Year**

Age	Year 1988	1993
	Eligibility	
25–29	0.344	0.461
30–34	0.410	0.515
35–39	0.459	0.521
40–44	0.424	0.546
45–49	0.423	0.531
50–54	0.433	0.487
55–59	0.393	0.450
60–64	0.318	0.413
All	0.404	0.501
	Participation Given Eligibility	
25–29	0.551	0.588
30–34	0.580	0.673
35–39	0.596	0.700
40–44	0.612	0.740
45–49	0.723	0.744
50–54	0.702	0.771
55–59	0.683	0.799
60–64	0.705	0.763
All	0.624	0.708
	Participation	
25–29	0.170	0.241
30–34	0.215	0.318
35–39	0.252	0.344
40–44	0.243	0.373
45–49	0.294	0.375
50–54	0.280	0.350
55–59	0.250	0.336
60–64	0.206	0.286
All	0.232	0.328

Source: Based on the Employee Benefits Supplement to the Current Population Survey.

with earnings, and a noticeable increase in conditional participation with earnings. Thus unconditional participation also increases with earnings decile. Appendix table 2B.2 presents eligibility and participation rates by earnings and age interval jointly for 1993. This table is comparable to the presentation in appendix table 2B.1 based on SIPP data. As with the SIPP data, there appears to be no substantial interaction between age and eligibility or participation rates by earnings decile. Thus the simple text tables provide a reasonable summary of the relationship between age and earnings on the one hand and eligibility and participation rates on the other.

For convenience, the SIPP and CPS eligibility and participation rates for 1993 are compared in table 2.5. Both eligibility and conditional participation

Table 2.4 **CPS: Eligibility, Participation Given Eligibility, and Participation Rates by Earnings Decile and Year**

Earnings Decile	Year 1988	Year 1993
	Eligibility	
1st (lowest)	0.148	0.169
2d	0.227	0.249
3d	0.305	0.363
4th	0.378	0.477
5th	0.386	0.495
6th	0.435	0.529
7th	0.469	0.628
8th	0.527	0.665
9th	0.557	0.712
10th (highest)	0.600	0.715
All	0.404	0.501
	Participation Given Eligibility	
1st (lowest)	0.425	0.357
2d	0.477	0.498
3d	0.540	0.592
4th	0.520	0.625
5th	0.600	0.629
6th	0.593	0.686
7th	0.647	0.757
8th	0.665	0.776
9th	0.673	0.808
10th (highest)	0.773	0.837
All	0.624	0.708
	Participation	
1st (lowest)	0.055	0.052
2d	0.097	0.109
3d	0.146	0.186
4th	0.177	0.272
5th	0.208	0.290
6th	0.243	0.335
7th	0.281	0.446
8th	0.330	0.484
9th	0.358	0.548
10th (highest)	0.437	0.580
All	0.232	0.328

Source: Based on the Employee Benefits Supplement to the Current Population Survey.

rates reported in the CPS are somewhat larger than those reported in the SIPP. The SIPP overall average is 27 percent, and the CPS average is 33 percent. Differences in the wording and ordering of the eligibility and participation questions in the two surveys may account for differences in the results. The survey differences are discussed further in appendix A.

We will compare our simulation results with the assets of the 1992 HRS

Table 2.5 **SIPP and CPS Compared: Eligibility, Participation Given Eligibility, and Participation Rates by Age and by Earnings Decile, 1993**

Age or Earnings Decile	Eligibility		Participation Given Eligibility		Participation	
	SIPP	CPS	SIPP	CPS	SIPP	CPS
Age						
25–29	0.406	0.461	0.556	0.588	0.226	0.24
30–34	0.434	0.515	0.630	0.673	0.274	0.32
35–39	0.444	0.521	0.630	0.700	0.280	0.34
40–44	0.461	0.546	0.645	0.740	0.297	0.37
45–49	0.441	0.531	0.693	0.744	0.305	0.38
50–54	0.423	0.487	0.684	0.771	0.290	0.350
55–59	0.377	0.450	0.671	0.799	0.253	0.336
60–64	0.30	0.41	0.65	0.76	0.19	0.29
All	0.423	0.501	0.638	0.708	0.270	0.33
Earnings decile						
1st (lowest)	0.17	0.169	0.437	0.357	0.07	0.05
2d	0.23	0.25	0.483	0.498	0.111	0.109
3d	0.298	0.36	0.52	0.59	0.16	0.19
4th	0.37	0.477	0.515	0.625	0.191	0.272
5th	0.41	0.50	0.570	0.629	0.231	0.290
6th	0.468	0.53	0.61	0.69	0.29	0.34
7th	0.525	0.628	0.651	0.757	0.342	0.45
8th	0.557	0.665	0.683	0.776	0.381	0.484
9th	0.602	0.712	0.751	0.808	0.452	0.548
10th (highest)	0.589	0.715	0.777	0.837	0.458	0.580
All	0.423	0.501	0.638	0.708	0.270	0.33

Sources: Based on the Survey of Income and Program Participation and the Employee Benefits Supplement to the Current Population Survey.

respondents. The HRS also obtained data on 401(k) participation, but not eligibility, and on 401(k) balances. Because of the way the relevant questions are asked, however, the data on participation may be the least reliable of the three data sources. This issue is discussed further in appendix A. Nonetheless, for the age groups covered by the HRS, the participation rates calculated from the HRS 1992 responses are close to those reported for 1993 in the SIPP, as shown in table 2.6. The HRS rates are also not very different on average from the CPS responses. For households with heads aged 51–61 in 1992, the HRS overall participation rate is 26 percent, which is the same as the SIPP rate for 1993. The CPS participation rate for 1993 is 33 percent.

2.2.2 Contribution and Matching Rates

Participating employees make tax-deductible contributions to 401(k) accounts. Many employers also make matching contributions. The only survey that provides both employee contribution rates and employer matching rates is

Table 2.6 **SIPP and CPS Compared with HRS: Eligibility, Participation Given Eligibility, and Participation Rates by Age and by Earnings Decile, 1993 for SIPP and CPS and 1992 for HRS**

Age or Earnings Decile	Eligibility[a]		Participation Given Eligibility[a]		Participation		
	SIPP	CPS	SIPP	CPS	SIPP	CPS	HRS
Age							
51–55	0.43	0.466	0.67	0.771	0.29	0.334	0.292
56–61	0.35	0.45	0.67	0.776	0.236	0.32	0.22
All	0.391	0.456	0.669	0.77	0.261	0.33	0.26
Earnings decile							
1st (lowest)	0.14	0.115	0.42	0.559	0.06	0.057	0.027
2d	0.20	0.204	0.494	0.655	0.101	0.119	0.093
3d	0.282	0.297	0.611	0.679	0.173	0.175	0.152
4th	0.364	0.416	0.596	0.659	0.217	0.251	0.219
5th	0.388	0.425	0.553	0.712	0.215	0.297	0.228
6th	0.424	0.535	0.635	0.771	0.269	0.368	0.292
7th	0.488	0.609	0.662	0.837	0.323	0.470	0.33
8th	0.488	0.636	0.741	0.812	0.362	0.492	0.37
9th	0.576	0.684	0.791	0.808	0.46	0.531	0.44
10th (highest)	0.561	0.657	0.797	0.862	0.45	0.554	0.45
All	0.391	0.456	0.669	0.773	0.261	0.329	0.26

Sources: Based on the Survey of Income and Program Participation, the Employee Benefits Supplement to the Current Population Survey, and the Health and Retirement Survey.

[a]HRS does not obtain data on eligibility.

the 1993 CPS. Because of nonresponses, however, several assumptions must be made to infer employer matching rates for all employees. Basically, we use the available responses for a given age to impute missing match rates for that age. Further details on these imputations are contained in appendix A.

Employee contribution and employer matching rates are reported in table 2.7. These are earnings-weighted *family* rates, averaged over rates for both members of a two-person family, for example. Based on these estimates, the average family contribution rate of plan participants is 6 percent of family earnings. The average contribution rate of an individual employee is 7.1 percent. The rate increases only mildly with age and shows little relationship to earnings decile. The employer matching rate is 2.7 percent overall and bears little relationship to either age or earnings decile. Based on individuals (rather than families), the employer matching rate is 3.1 percent overall and 4.6 percent among employees that match. Thus the average total family contribution—counting both employee and employer contributions—is 8.7 percent.

Combining the total contribution rates with employee earnings, we obtain dollar contributions, which are reported in table 2.8. Overall, the average combined contribution of plan participants and their employers is $4,467. The aver-

Table 2.7 **Employee Contribution Rates and Employer Matching Rates by Age and by Earnings Decile, 1993**

Age or Earnings Decile	Employee Contribution	Employer Matching Rate	Total Contribution Rate
Age			
25–29	0.056	0.029	0.086
30–34	0.056	0.028	0.084
35–39	0.054	0.025	0.080
40–44	0.059	0.024	0.083
45–49	0.063	0.027	0.090
50–54	0.064	0.025	0.089
55–59	0.069	0.030	0.099
60–64	0.074	0.031	0.106
All	0.060	0.027	0.087
Earnings decile			
1st (lowest)	0.064	0.031	0.095
2d	0.062	0.029	0.092
3d	0.058	0.031	0.089
4th	0.061	0.029	0.090
5th	0.063	0.025	0.088
6th	0.061	0.026	0.087
7th	0.057	0.025	0.082
8th	0.061	0.026	0.087
9th	0.057	0.024	0.080
10th (highest)	0.062	0.030	0.092
All	0.060	0.027	0.087

Source: Based on the Employee Benefits Supplement to the Current Population Survey.

age ranges from $3,040 for the youngest age group to $5,508 for the 55–59 age group. The variation by earnings decile is much greater, as similar contribution rates would imply: the average for the lowest earnings decile is $591 and for the highest decile is $9,399.

Employee contribution and employer matching rates by both earnings decile and age are shown in appendix table 2B.3. Employee and employer dollar contributions are shown in appendix table 2B.4 by both earnings decile and age.

2.2.3 Estimation

The Approach

To understand the assumptions we make to simulate 401(k) assets of future retirees, it is useful to consider a cohort representation of the data. Figure 2.1 shows 401(k) eligibility rates for six cohorts based on SIPP data for 1984, 1987, 1991, and 1993. The cohorts are defined by their ages in 1984, so C27, for example, means the cohort aged 27 in 1984. (In fact, for the purposes of this figure, each cohort is a group of families with heads born in a five-year

Table 2.8 **Employee and Employer Contribution Amounts by Age and by Earnings Decile, 1993**

Age or Earnings Decile	Employee Contribution	Employer Contribution	Total Contribution
Age			
25–29	2,048	992	3,040
30–34	2,468	1,165	3,633
35–39	2,832	1,534	4,366
40–44	3,455	1,444	4,899
45–49	3,700	1,606	5,306
50–54	3,410	1,339	4,749
55–59	3,837	1,670	5,508
60–64	3,451	1,477	4,928
All	3,075	1,392	4,467
Earnings decile			
1st (lowest)	404	186	591
2d	805	363	1,167
3d	1,122	589	1,711
4th	1,522	732	2,254
5th	1,911	731	2,642
6th	2,162	898	3,060
7th	2,394	1,059	3,453
8th	3,113	1,322	4,434
9th	3,612	1,483	5,095
10th (highest)	6,258	3,141	9,399
All	3,075	1,392	4,467

Source: Based on the Employee Benefits Supplement to the Current Population Survey.

interval. So the C27 cohort includes families aged 25–29 in 1984, e.g.) The C27 cohort is identified by the square symbols. The eligibility rate of this cohort was less than 10 percent in 1984, when the cohort was 27 years old (on average), but had risen to almost 45 percent by 1993, when the cohort was 35 years old. A similar increase in eligibility is evident for each of the other six cohorts—C32, C37, C42, C47, C52, and C57. It is also clear that there is a very large "cohort effect": at any age each successively younger cohort has a higher contribution rate than the cohort five years older. This difference is approximately 20 percentage points. For example, 44 percent of the C27 cohort was eligible when this cohort was 35 years old. But the rate was only about 20 percent for the C32 cohort that was age 35 five years earlier. The cross-sectional relationship between age and eligibility can also be identified in the figure; cross-sectional relationships in 1984 and 1993 are shown by the solid lines.

Suppose that we wanted to predict the future 401(k) eligibility of the youngest—C27—cohort. One might be tempted simply to extrapolate the cohort trend to future ages. But it is clear that this could quickly lead to eligibility

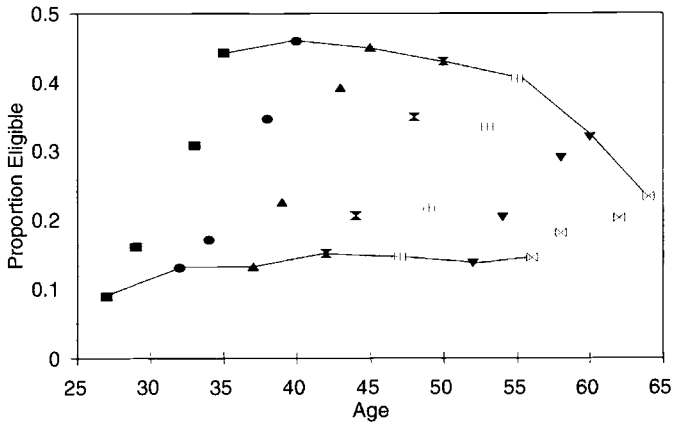

Fig. 2.1 401(k) Eligibility by cohort, 1984, 1987, 1991, and 1993

rates of over 100 percent. On the other hand, it is equally clear that when the C27 cohort reaches age 40 its eligibility rate will be greater than that of the C32 cohort at age 40.

At this point it is useful to revisit the problem of trying to distinguish age, cohort, and year effects. Suppose

$$A = \text{age},$$

$$C = \text{cohort} = \text{age in 1984},$$

$$T = \text{year} = \text{calendar year} - 1984.$$

Then $A = C + T$. In a simple regression, if we relate eligibility to age, cohort, and year, as for example $E = aA + cC + tT$, it is not possible to isolate all three effects. In particular, it is not possible to identify age, cohort, and year effects for each age, cohort, and year. If one of the variables—say age—is parameterized, however, it is in principle possible to identify both cohort and time effects.

We parameterize the relationship between age and eligibility, but we do not try to identify separate cohort and year effects. Instead, we assume that the apparent cohort effects in the figure are time—or year—effects and simply represent the spread of 401(k)s with time. With reference to figure 2.1, this means that we estimate eligibility by allowing the cross-sectional relationship to shift upward over time. In fact, even if both cohort and year effects are estimated, the cohort effects are often not statistically different from zero, and most of the explanatory power comes from the year effects. We give more details of the specification below.

Now return to the problem of predicting future eligibility of the C27 cohort in the figure. (When we come to actual simulations, we will in fact work with the C25 and the C15 cohorts.) If 401(k) plans continue to spread, then the 1993

Table 2.9 **Aggregate 401(k) Participants and Contributions, 1988**

	From Form 5500		From CPS		
Year	Participants (millions)	Contributions (billion $)	Eligibility Rate	Participation Given Eligibility	Participation Rate
1988	15.203	39.412	0.380	0.630	0.229
1989	17.337	46.081	–	–	–
1990	19.548	48.998	–	–	–
1991	19.126	51.533	–	–	–
1992	22.404	64.345	–	–	–
1993	23.138	69.322	0.486	0.713	0.332
Percentage change 1988–93	52.20	75.90	28	13	45

Sources: U.S. Department of Labor (1997) and the Employee Benefits Supplement to the Current Population Survey.

relationship between eligibility and age will clearly understate future eligibility of the C27 cohort as it ages. In part this is simply because the program will undoubtedly continue to expand. But, in addition, the 1993 relationship is determined in part by how the past spread occurred. If, for example, the diffusion of plans has been disproportionately in small firms, with younger workers, the cross-sectional relationship would tend to look as it does in the figure. In the 1993 cross section there is a noticeable reduction in eligibility with age. This is much less apparent in the 1984 cross section. Thus we can only use formal estimates as a guide to future patterns. Our approach is to assume that 20 years from now, when members of the C27 cohort will be age 55, their eligibility rate will be x percent higher than the eligibility rate of the cohort that was age 55 in 1993.

To guess at a reasonable value for x, it helps to consider the recent aggregate increase in participants and contributions, as well as the recent increase in eligibility and participation rates, discussed above. These data for 1988–93 are shown in table 2.9. The data on aggregate participants and contributions come from so-called Form 5500 reports.[2] According to these data, the number of participants increased over 50 percent over the five-year period between 1988 and 1993. Employment grew by 4 percent over this period. The CPS data show a 45 percent increase in the participation rate, which together with the 4 percent employment increase is rather consistent with a 52 percent increase in the number of participants. Aggregate contributions increased by over 76 percent, much more than the 52 percent increase in participation. Aggregate earnings

2. The Form 5500 reports tabulate contributions to private sector 401(k) plans. They do not include contributions to related 457 (public sector) or 403(b) (nonprofit) plans, nor do they include contributions to 401(k) plans by public sector employees.

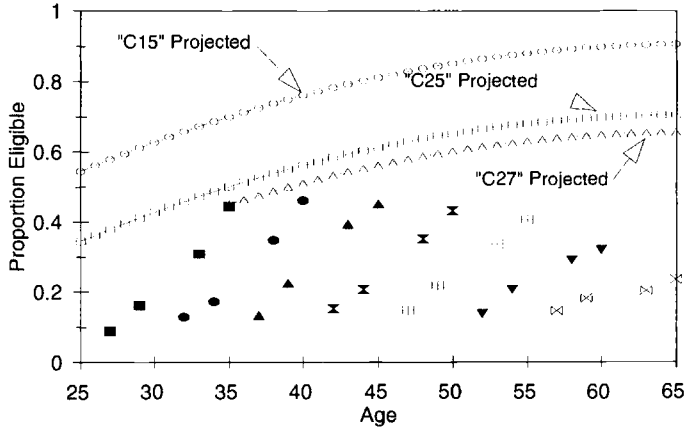

Fig. 2.2 401(k) Eligibility by cohort with illustrative projections

increased about 25 percent over this period, which—together with a 52 percent increase in participation—would imply an increase in aggregate contributions of 77 percent, if the average fraction of earnings contributed did not change. Taken at face value, this comparison suggests that the fraction of earnings contributed may have increased by as much as 1 percent. For the illustration at hand, the most relevant number is the 28 percent increase in the eligibility rate over this recent five-year period.

If the C27 cohort when it is age 55, 20 years from now, will contribute 50 percent more than 55-year-olds contributed in 1993, then the projected C27 eligibility rates would look something like those shown in figure 2.2. For convenience, we make actual projections for the C25 cohort, which is just two years younger than the C27 cohort. In principle, we might suppose that projections for this younger cohort would be somewhat higher than those for the C27 cohort, as depicted in figure 2.2—showing C25 rates .05 higher than the C27 rates. In fact, we make projections for this cohort assuming that when its members are age 55—22 years in the future—they will contribute 50 percent more than 55-year-olds contributed in 1993. We also want to make a reasonable assessment of eligibility rates for younger generations. Suppose that over the subsequent 10 years, the eligibility rate were to increase 20 percentage points (above the C25 rate) but the age pattern remain as shown for the C25 projection. That would yield an eligibility pattern represented by "C15 projected" in figure 2.2. The 20-point increase for cohorts 10 years apart is rather modest compared to the approximate 20-point increase for cohorts 5 years apart in figure 2.1. For future reference, we summarize in table 2.10 the age-year profiles of the cohorts mentioned above.

To check the implications of our cohort eligibility rates—together with contribution rates—against actual 401(k) balances, we will use the cohort data to

Table 2.10 **Age-Year Profiles for C27, C25, and C15 Cohorts**

Cohort	Age in 1984	Age in 1993[a]	Year Will Be 55	Year Will Be 65
C27	27	35	2013	2023
C25	25	33	2015	2025
C15	15	23	2025	2035

[a]Age at the time of the 1993 survey, which is approximated eight years older than age at the time of the 1984 survey.

obtain simulated balances for the HRS respondents. These simulated balances can then be compared to the actual balances of the respondents. The basic method we use, which is described below, is different from the approach used to project for future cohorts, as described above. In this case, the method relies directly on the cohort data as shown in figure 2.1. Thus the method can also be explained with reference to figure 2.1. The HRS respondents were age 51–61 in 1992—or 43–53 in 1984, which is the first year of the SIPP data. Thus their past eligibility rates should be reflected approximately in the C42 and C52 cohort rates shown in figure 2.1. To simulate the HRS respondent balances, we essentially predict their eligibility (and participation) from the past eligibility and participation rates for cohorts in this age range. For example, a person in the HRS sample who was age 60 at the time of the survey (in 1992) is a member of the C52 cohort. The experience of that cohort is used to predict HRS balances for people in that cohort.

In principle, we could go through a similar process for participation given eligibility, and for participation. In practice, we work with the participation rate from the beginning and pass over the decomposition into eligibility and participation given eligibility. We must assume contribution rates of participants, expressed as a fraction of earnings. To make projections like those described above, we use CPS, rather than SIPP, data as a base. Thus it is useful to see the CPS data organized by cohort. Eligibility, participation given eligibility, and participation rates based on these data are shown in figures 2.3, 2.4, and 2.5, respectively.

Fitting Cross-Sectional Age Profiles

As described in the previous section, we do not make projections by direct extrapolation of an estimated model. Rather, the data are used as a base that can be combined with eligibility and participation assumptions to produce future projections. Perhaps the most important reason for fitting the cross-sectional profiles is to estimate the relationship between earnings decile and eligibility and participation. We use a specification of the form

$$Y_{it} = \beta_{1t} A + \beta_{2t} A^2 + \sum_{i=1}^{10} \gamma_{it} D_{it} + \varepsilon_{it},$$

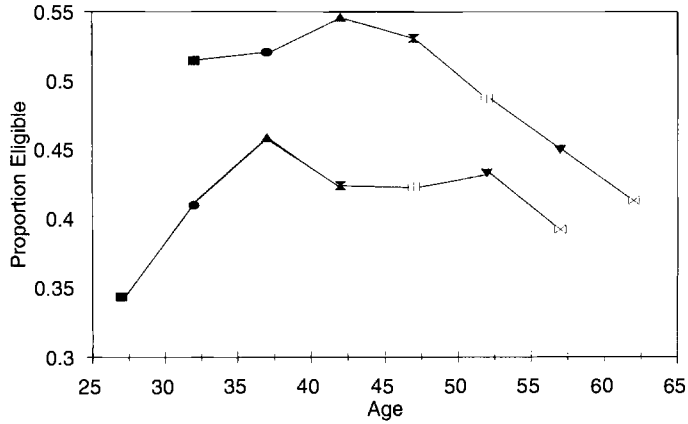

Fig. 2.3 401(k) Eligibility by cohort, 1988 and 1993

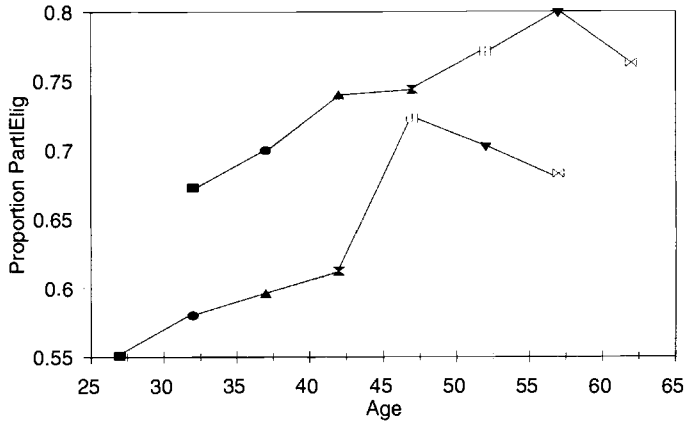

Fig. 2.4 401(k) Participation given eligibility by cohort, 1988 and 1993

where D is an indicator variable indicating earnings decile and A is age. The most important estimates are the γ_{it}, which indicate the effect of earnings decile on Y. We have estimated a probit specification of this form for eligibility, participation given eligibility, and participation. The estimates are reported in appendix table 2B.5.

The estimates, like the tabular data above, show large increases in eligibility, participation given eligibility, and participation with earnings decile. The estimates also suggest that the difference by earnings decile, in eligibility and participation rates, increased between 1988 and 1993. The implied age profiles for the 1st, 4th, 7th, and 10th earnings deciles in 1993 are shown in figures 2.6, 2.7, and 2.8*A* for eligibility, participation given eligibility, and participation, respectively.

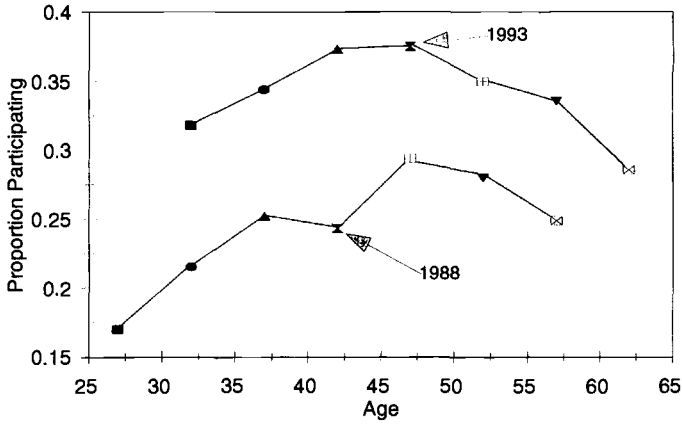

Fig. 2.5 401(k) Participation by cohort, 1988 and 1993

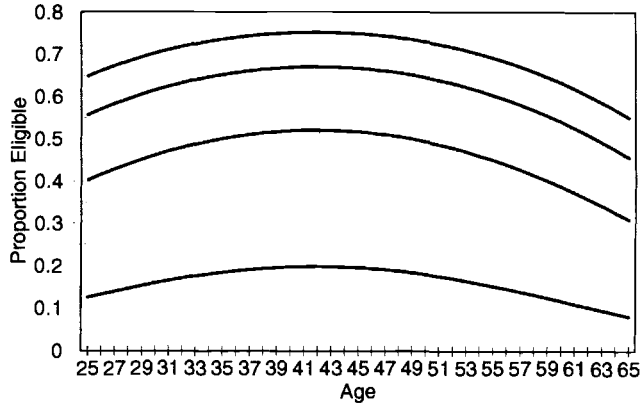

Fig. 2.6 Eligibility fitted 1993 profiles for 1st, 4th, 7th, and 10th income deciles
Note: Lowest curve corresponds to 1st decile, highest curve to 10th decile.

Participation Projections

For the projections in this paper, we assume no change in participation rates given eligibility, and therefore the participation and eligibility rate percentage increases are the same. Thus we discuss projections for participation only. Following the approach outlined above, to project future participation rates for the C25 cohort, we assume that when this cohort is 55 years old (in 2015) it will have participation rates 50 percent higher than the participation rate of the cohort that was age 55 in 1993. We further assume that the participation rate at age 65 will be 5 percent higher than this, that is, 55 percent higher than the participation rate of the cohort that was age 55 in 1993. Figure 2.8*B* is the same as figure 2.8*A* but includes these projections. The projections exhibit a widening difference between the participation rates of high- and low-income

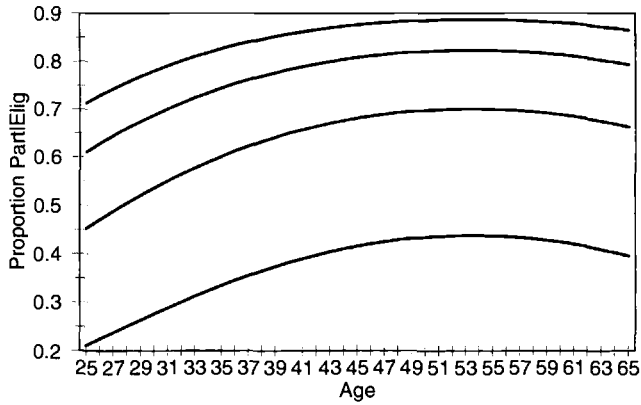

Fig. 2.7 Participation given eligibility fitted 1993 profiles for 1st, 4th, 7th, and 10th income deciles

Note: Lowest curve corresponds to 1st decile, highest curve to 10th decile.

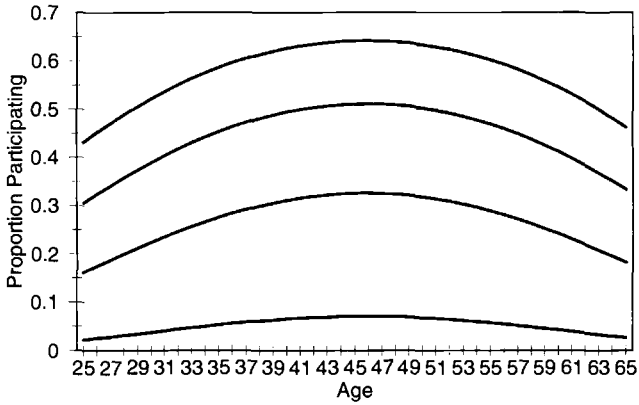

Fig. 2.8A Participation fitted 1993 profiles for 1st, 4th, 7th, and 10th income deciles

Note: Lowest curve corresponds to 1st decile, highest curve to 10th decile

families as they age. We believe such spreading is plausible, but the extent of this dispersion is likely to be one of the most uncertain of the projection features.

We also make projections for the C15 cohort, whose members were 15 years old in 1984. Even looking ahead just 10 years further, however, makes plausible assumptions about future 401(k) participation even more problematic. Thus we think of these projections as representing what the 401(k) accumulation would be if participation were substantially higher than the C25 projections but considerably short of universal coverage. They cannot be taken to be what we believe will happen. These projections are based on the assumption

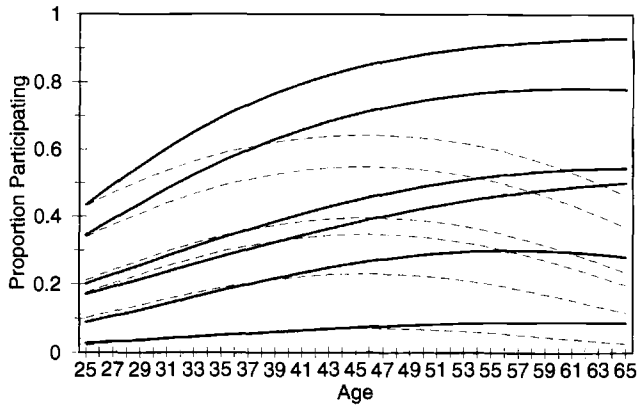

Fig. 2.8*B* C25 participation projections for 1st, 3d, 5th, 6th, 8th, and 10th income deciles

Note: Lowest curve corresponds to 1st decile, highest curve to 10th decile. Dashed lines are participation fitted 1993 profiles for 1st, 3d, 5th, 6th, 8th, and 10th income deciles (cf. fig. 2.8*A*).

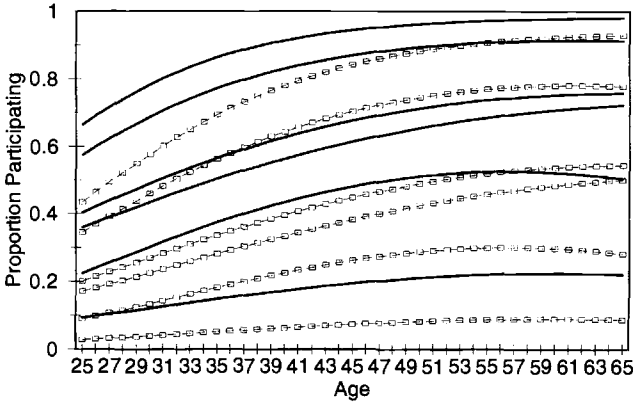

Fig. 2.8*C* C15 vs. C25 participation projections for 1st, 3d, 5th, 6th, 8th, and 10th income deciles

Note: Lowest curve corresponds to 1st decile, highest curve to 10th decile. Dashed, boxed lines are C25 participation projections for 1st, 3d, 5th, 6th, 8th, and 10th income deciles (as in fig. 2.8*B*).

that participation rates for the median wage earner are 20 percentage points greater than the C25 rates. Rates for the highest and lowest decile increase somewhat less than this.[3] Figure 2.8*C* shows the C15 projections in compari-

3. The actual procedure was to add a constant term to the probit equation used to describe the C25 projections that would increase the C25 projections for the 5th and 6th income deciles by 20 percentage points. The same constant term was added to the probit equations for each of the other deciles. The highest deciles do not increase by 20 points because of the upper limit of 100 percent. The lower deciles are increased less than 20 points—because of the properties of the probit functional form—but, relative to the C25 projections, much more than the higher deciles.

son to those for the C25 cohort. Finally, we make projections assuming universal 401(k) participation.

2.3 Projected 401(k) Balances and Comparison with HRS Sample

2.3.1 Wealth of the HRS Respondents

To judge the relative importance of potential 401(k) contributions, we compare projected 401(k) assets of future generations with the current (1992) assets of the HRS sample. The 1992 assets of the HRS respondents when they were age 51–61 are shown in table 2.11, by earnings decile. As is typically true for wealth data, there is a very large difference between mean and median assets, especially for financial assets. For example, the mean of all personal retirement assets is $30,465 and the mean of 401(k) assets is $10,808. The medians are $3,200 and zero, respectively—fewer than half of HRS respondents have 401(k) accounts. The 401(k) projections discussed below are based on averages—for example, estimates of average contribution rates—and thus can only be compared to the HRS means. We do not capture the substantial differences that are likely between mean and median values within earnings deciles. The principle comparison we make is with social security wealth, however, and the means and medians of social security assets do not differ greatly. Social security wealth is evaluated by estimating the accrued wealth at age 65, were the person to work until that age.[4] These accrued levels are converted to 1992 dollars using the Social Security Administration's intermediate forecast of the average annual interest rate provided by the Board of Trustees of the OASDI Trust Fund. For comparability, the projected 401(k) balances discussed below also assume that a person works until age 65. The actual HRS 401(k) balances reported in table 2.11, however, are 1992 balances when the respondents were age 51–61. Personal retirement balances could easily double by the time the respondents attain age 65.

2.3.2 Estimation of Earnings Histories

We need earnings histories to project 401(k) assets of future cohorts of families—like those in the HRS sample, but who have different 401(k) participation rates. We have divided the HRS sample into earnings deciles according to their 1992 earnings. In principle, the social security earnings histories of the HRS respondents can be used to determine average earnings by age within each decile. As discussed by Venti and Wise (1996), however, there is one important limitation to this method: historical earnings are reported only up to the social security earnings limit. Actual earnings in the top two or three deciles may be substantially higher than social security reported earnings.

4. A family's social security wealth is the simple sum of the mortality-weighted present value of each member's benefit stream. We do not consider here the present value for a single family member including survivor benefits.

Table 2.11 **Mean and Median 1992 Assets of HRS Respondents by Earnings Decile and Category**

Earnings Decile	Asset Category							
	Total Wealth	Total Wealth Excluding Social Security	Total Retirement Excluding Social Security	Employer Pension Assets	Total Personal Retirement	Nonretirement Financial	401(k) Assets	Social Security Wealth
	Means							
1st	270,238	208,721	48,841	39,162	9,679	44,964	620	61,517
2d	228,538	154,438	51,117	40,002	11,114	27,692	1,025	74,100
3d	251,170	167,115	44,251	34,394	9,857	27,194	2,648	84,055
4th	269,872	176,423	47,335	36,749	10,586	29,904	2,192	93,449
5th	301,348	199,755	73,276	52,522	20,754	36,609	4,049	101,593
6th	378,252	270,121	97,228	75,745	21,483	45,592	6,366	108,131
7th	415,763	301,077	125,606	94,361	31,245	46,029	11,322	114,686
8th	479,383	354,268	145,595	105,368	40,228	61,423	13,514	125,115
9th	590,440	458,410	177,464	133,091	44,373	84,192	19,767	132,030
10th	1,007,740	864,328	328,495	219,055	109,441	148,277	48,709	143,412
All	415,833	312,441	112,677	82,212	30,465	54,724	10,808	103,392

(*continued*)

Table 2.11 (continued)

Earnings Decile	Asset Category							
	Total Wealth	Total Wealth Excluding Social Security	Total Retirement Excluding Social Security	Employer Pension Assets	Total Personal Retirement	Nonretirement Financial	401(k) Assets	Social Security Wealth
	Medians							
1st	128,615	69,674	0	0	0	5,000	0	55,114
2d	128,744	56,959	2,086	0	0	4,020	0	69,208
3d	169,828	90,500	7,782	0	0	5,000	0	81,383
4th	185,142	95,090	18,000	6,000	0	6,500	0	92,699
5th	247,204	148,500	36,934	10,847	3,200	10,400	0	103,783
6th	285,606	178,685	57,438	32,641	6,000	12,000	0	111,740
7th	341,419	215,422	73,270	42,671	10,000	15,100	0	117,699
8th	380,870	236,560	97,655	51,053	12,000	23,000	0	126,130
9th	471,370	331,019	107,000	61,011	21,900	30,000	0	130,993
10th	749,567	613,061	261,503	17,625	53,000	72,000	0	136,390
All	284,229	175,000	44,010	15,913	3,200	13,000	0	106,808

Note: Social security wealth is calculated for each respondent assuming the respondent works through normal retirement. The calculation reported above is based solely on each respondent's expected benefits. No account is made of spouse survivor benefits. Sample includes families with head aged 51–61, at least one member employed, and having matched social security records.

Because of this limitation of the social security data, we make calculations based on the annual March CPSs, which report earnings well above the social security maximum.[5] This is the procedure we use: (1) We identify earnings deciles, as described above, using the 1992 earnings of each HRS family. (2) Using the annual March CPSs we calculate earnings deciles by age for the years 1964–91. Using published data on median earnings prior to 1964, we extrapolate this series back to 1956. Thus we obtain CPS earnings histories by decile for the years 1956–91. (3) We assign each HRS household to a CPS decile according to the household's 1992 earnings decile. The CPS earnings histories begin at age 25, and a given household is assumed to have been in the same decile since age 25. As described in the next two subsections, we use these earnings profiles, together with projected 401(k) participation and contributions rates and rate-of-return assumptions, to calculate accumulated 401(k) assets through age 65.

2.3.3 HRS 401(k) Assets and Cohort Data

Before projecting the 401(k) accumulation of future cohorts, we first determine the extent to which the current 401(k) balances of HRS respondents appear to be consistent with the SIPP cohort data on participation, together with the CPS data on contributions. While the extent of this correspondence is not necessarily an indicator of the confidence that should be attached to our projections, we are inclined to give more credence to the projections if the cohort data that serve as a basis for our projection assumptions are roughly consistent with the HRS balances with which they can be compared.

When the 401(k) program began in 1982, members of the 1992 HRS sample were 41–51 years old. Suppose that in 1982 these families began to participate in 401(k) plans at rates estimated from the SIPP and to contribute at rates estimated from the CPS. We ask how close simulated balances based on these assumptions are to the actual 1992 balances of the HRS respondents. We first use the SIPP data to estimate participation profiles by age for each of two cohorts from whose members the HRS respondents were drawn: the cohorts whose members were age 51–55 and 56–60 in 1992—at the time of the HRS. The SIPP estimates allow us to predict the probability of participation for each HRS family beginning in 1982, when 401(k)s were first available and when the two HRS cohorts were age 41–45 and 46–50, respectively.

To estimate contributions, we use family earnings histories, derived as described above. Within each earnings decile, beginning in 1982, we randomly assign families to participation status, based on SIPP estimates of participation by age and earnings decile for each of the two cohorts.[6] Based on our estimates

5. The ratio of the CPS maximum to the social security maximum has ranged from a low of just under 2 in 1981 to a high of over 20 in 1964. In 1991 the CPS reported earnings up to a maximum of $200,000; the social security maximum was $53,400 in that year.

6. As a means of estimation, we actually construct a "synthetic HRS" sample of persons aged 41–51 in each of the 10 earnings deciles in 1982. This sample is "aged" through 1992, assigning

from the CPS data, we assume a contribution rate of 8 percent. This is somewhat less that the average rate of 8.7 percent—including both employee and employer matching contributions—estimated for 1993 from the CPS data. There is some evidence that earlier contribution rates were lower than this, as explained in appendix A. In the projections for future cohorts discussed below, we assume a contribution rate of 9 percent.

We calculate accumulated 401(k) balances for three different rates of return: the observed return on corporate bonds in each year, the return on large company stocks in each year, and the return assuming the contributor invests half in bonds and half in stocks. The observed rates of return are compiled from Ibbotson Associates (1997). Some families invest 401(k) assets in money market funds and may obtain returns lower than any of these.

Simulated 401(k) balances through 1992 are shown in table 2.12, by earnings decile, along with the actual reported 401(k) balances of the HRS respondents. On average, the simulated values do not differ greatly from the observed balances reported in the HRS. Using the bond rate of return seems to give the closest match. Even the simulated balances by earnings decile are typically not far from the HRS reported balances. This exercise must necessarily be tentative. By assuming a different contribution rate, for example, we would realize a different correspondence between simulated and reported values. As a basis for judgments about the future, the results help to give some credence to short-run projections, but future behavior could be very different from reasonable expectations based on historical trends. For example, contribution rates could be substantially different from 1993 rates.

2.3.4 401(k) Assets of Future Generations

Taking the lifetime earnings described above to be the actual past earnings of the HRS families, we estimate what they would have accumulated in a 401(k) had they had the participation rates that we project for the C25 and the C15 cohorts, and had there been universal 401(k) coverage. (The members of the C25 cohort were age 33 in 1993, and the members of the C15 cohort were age 23 in 1993.) As above, we suppose that once contributions begin they continue until retirement, at age 65. Within an earnings decile, we probabilistically assign persons to a beginning participation age, as discussed in the previous subsection. So, for example, say the projected participation rate at age 25 is 35 percent. We randomly assign a fraction .35 to begin at that age. If the projected rate at age 26 is 35.5 percent, we randomly assign .005 to start contributing at

families to participate and contribute to a 401(k) at rates determined by the estimates from the SIPP and the CPS. The estimated age-participation profiles are used to determine which sample members contribute in 1982 and in subsequent years. Once a family contributes, we assume the family continues to contribute in subsequent years. Thus, if the estimated participation rate for a particular age and earnings decile is 10 percent in 1982, we randomly assign 10 percent of the families to begin contributing in 1982. If the probability is 11 percent in 1983, then another 1 percent are randomly chosen to begin contributing in that year.

Table 2.12 **Mean Simulated and Reported HRS 401(k) Balances**

Earnings Decile	HRS Observed	Simulated		
		Bonds	50/50	S&P 500
	All Families			
1st	620	248	266	284
2d	1,025	869	931	993
3d	2,648	2,104	2,262	2,418
4th	2,192	3,475	3,740	4,002
5th	4,049	4,992	5,376	5,753
6th	6,366	7,855	8,466	9,067
7th	11,322	11,232	12,113	12,980
8th	13,514	16,291	17,581	18,851
9th	19,767	23,542	25,425	27,280
10th	48,709	34,555	37,275	39,955
All	10,808	10,516	11,344	12,158
	Contributor Families			
1st	21,693	2,923	3,135	3,343
2d	9,893	7,775	8,337	8,888
3d	14,116	13,062	14,044	15,010
4th	11,747	18,057	19,436	20,793
5th	15,387	23,307	25,098	26,861
6th	37,219	29,694	32,001	34,273
7th	33,735	37,103	40,012	42,876
8th	39,505	46,126	49,778	53,375
9th	49,877	59,354	64,101	68,777
10th	95,199	85,493	92,224	98,853
All	42,271	42,310	45,638	48,915

age 26, and so forth. And, once a family starts to contribute, we assume participation will continue in subsequent years. Some will never be assigned to participation status.

We assume a family contribution rate (including employee plus employer contributions) of 9 percent, based on CPS rates for 1993 discussed above. Our intention is that the C25 projection in particular be a conservative estimate of what actual participation is likely to be. The C15 projection may also be conservative, but that is harder to judge.

For each of the projections, we assume three different rates of return: the average rate of return on corporate bonds since 1926 (6 percent), the average rate of return on the Standard and Poor's (S&P) 500 over the same period (12.7 percent), and the rate of return assuming that a person is invested half in bonds and half in the S&P 500.

The results for these three projections are reported in table 2.13. As indicated above, our estimates of historical participation and contribution rates,

Table 2.13 **Projected Mean 401(k) Assets by Cohort, Rate of Return, and Earnings Decile, Plus 1992 HRS 401(k) and Age 65 Social Security Wealth**

Earnings Decile	401(k)	Social Security Wealth	Cohort 25			Cohort 15			Universal Coverage		
			Bond	50/50	S&P 500	Bond	50/50	S&P 500	Bond	50/50	S&P 500
1st	620	61,517	950	1,798	3,628	2,395	4,651	9,628	14,805	30,771	68,016
2d	1,025	74,100	5,360	10,023	20,001	11,080	21,365	44,037	39,404	80,923	177,665
3d	2,648	84,055	11,937	22,237	44,419	20,901	40,267	83,286	57,762	117,340	255,793
4th	2,192	93,449	21,651	40,307	80,848	34,393	66,423	138,213	74,497	149,579	323,179
5th	4,049	101,593	28,544	52,493	104,283	44,721	85,280	175,645	91,051	180,471	385,935
6th	6,366	108,131	38,669	71,104	141,321	57,726	109,535	224,829	107,786	211,260	447,924
7th	11,322	114,686	59,815	110,672	221,511	80,512	153,324	316,185	125,877	244,385	513,988
8th	13,514	125,115	77,702	143,218	286,004	99,724	188,596	386,876	148,264	284,878	594,106
9th	19,767	132,030	102,627	187,939	373,204	127,541	239,432	488,196	179,757	341,624	705,768
10th	48,709	143,412	153,852	276,406	540,450	188,657	346,466	693,668	255,144	473,216	957,672
All	10,808	103,392	50,111	91,620	181,567	66,765	125,534	256,056	109,435	211,445	443,005

Note: Social security wealth balances are calculated for each respondent assuming the respondent works through normal retirement. The HRS 401(k) assets are at the time of the survey in 1992. Both are reported in 1992 dollars. The calculation reported above is based solely on each respondent's expected benefits. No account is made of spouse survivor benefits. The sample includes families with head aged 51–61, at least one member employed, and having matched social security records. Projections use 1926–96 average rates of return on bonds and the S&P 500.

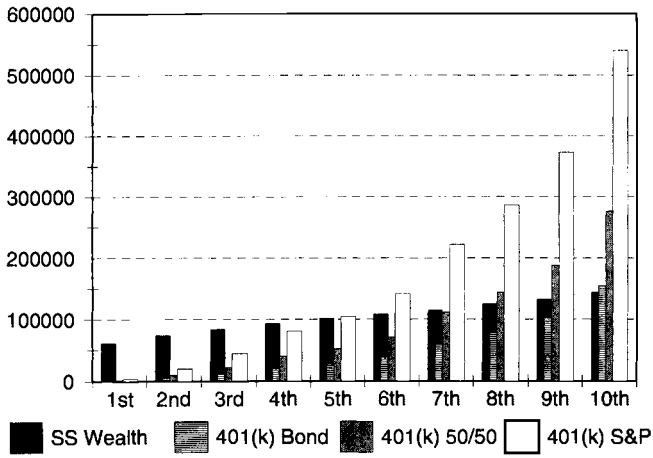

Fig. 2.9*A* Projected 401(k) assets and social security wealth by cohort and earnings decile: C25 projections

and thus our projections, are based on means. The comparable HRS 401(k) and social security assets, shown in the first two columns of the table, are also means. The 401(k) assets, however, are accumulated tax free; taxes would be paid when funds are withdrawn. No tax will be paid on most social security benefits.

The C25 projections yield 401(k) assets at retirement ranging from $50,111 to $181,567, depending on the rate of return. These levels are very large relative to average social security wealth of $103,392 and are much larger than the HRS respondent mean 401(k) balance of $10,808 in 1992, when the respondents were age 51–61. Under the C15 assumptions, the means range from $66,765 to $256,056. Universal coverage would yield mean 401(k) balances at age 65 ranging from $109,439 to $443,005, depending on the rate of return.

For each projection, however, the ratio of projected 401(k) to social security wealth varies a great deal depending on lifetime earnings. Perhaps the easiest way to see this is by looking at figures 2.9*A* through 2.9*C*, which show projected 401(k) assets and social security wealth by earnings decile for each of the projections. Because the C25 projections assume continued very low participation rates in the lowest income deciles, the 1st and 2d deciles accumulate very little in 401(k) assets, no matter what the rate of return. Beginning with the 3d decile, however, 401(k) assets at retirement would likely be substantial relative to social security wealth, and for families with incomes above the median 401(k) balances would be likely to exceed social security wealth. (The increase in social security wealth with earnings is very small once earnings exceed the 4th earnings decile. Thus it is not surprising that saving based on a

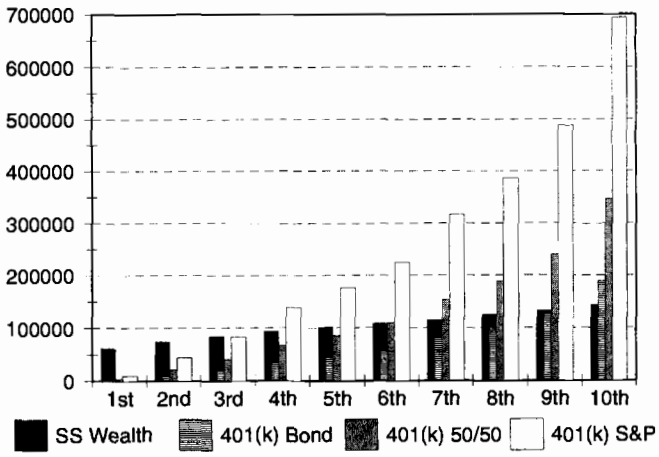

Fig. 2.9*B* **Projected 401(k) assets and social security wealth by cohort and earnings decile: C15 projections**

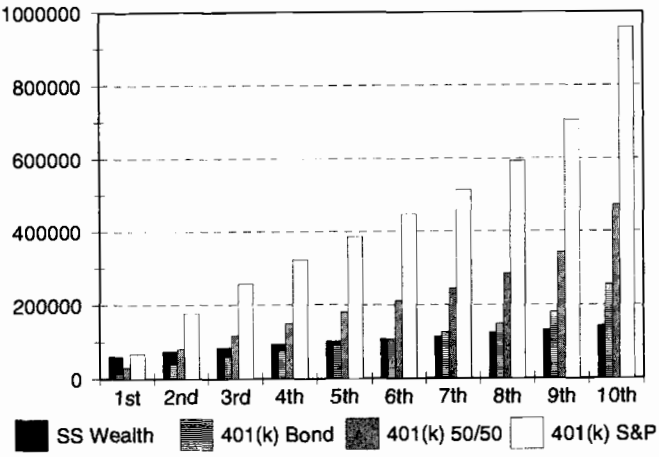

Fig. 2.9*C* **Projected 401(k) assets and social security wealth by cohort and earnings decile: Universal projections**

percentage of income would exceed social security wealth at higher income levels.)

The C15 projections imply substantially large 401(k) assets, relative to social security wealth, for the lower earnings deciles. Under these projections, even the families in the 2d decile could accumulate 401(k) assets that could be an important fraction of social security wealth. Universal coverage could yield 401(k) assets that would exceed social security wealth in every lifetime earn-

ings decile. And 401(k) assets would almost surely represent an important share of social security wealth even in the lowest decile.

As emphasized above, however, the projected differences in participation rates by earnings decile could well be far from realized experience, even if the average participation rates are realistic. Our sense is that the current C25 projections underestimate future 401(k) participation by low-income households. There seems to be no way to convincingly narrow this uncertainty. Of course, simulating results under alternative assumptions could provide further information about the implications of different rates of participation dispersion by earnings decile.

2.3.5 Risk

A concern about individual retirement saving is the risk associated with fluctuations in the rate of return. Of course there are important risks associated with conventional employer-provided pension plans and government programs such as social security as well, but they may be more difficult to evaluate. We can, however, provide an empirical measure of the rate-of-return risk associated with private saving accounts. To do this, we have calculated the asset accumulation that would been realized under the C25 assumptions, but based on the range of actual returns from 1926 to 1996. We calculate the asset accumulation that would have resulted over each 40-year career: the first beginning in 1926 and the last beginning in 1956. We do this for each of the investment options used above: bonds, the S&P 500, and half and half. This is very similar to the procedure followed by MaCurdy and Shoven (1992) to explore the returns on stock versus bond investments through TIAA-CREF.

The results are shown in figure 2.10. The median accumulation from stock investment is almost four times as large as the median return from bond investment. Yet the relative range of accumulations is much greater for bonds than for stocks. The largest bond accumulations are about four times as large as the smallest. The largest stock accumulations are about twice as large as the smallest accumulations. Put another way, a bond investor counting on the median could end up with half that much or twice that much. On the other hand, a stock investor counting on the median could end up with one-third less or one-third more than the median. Indeed, of the 31 possible 40-year careers since 1926, the *lowest* stock accumulation is about the same as the *highest* bond accumulation!

Whether this suggests high or low risk is a matter of opinion. It does not seem large relative to job change or job loss risk associated with defined benefit pension plans, for example. Job change could easily lead to benefits less than half of benefits that would result from a lifetime career in the same firm. Samwick and Skinner (1995) conclude that defined contribution plans are less risky than defined benefit plans because they depend on average earnings over the entire career rather than over the last few years of employment.

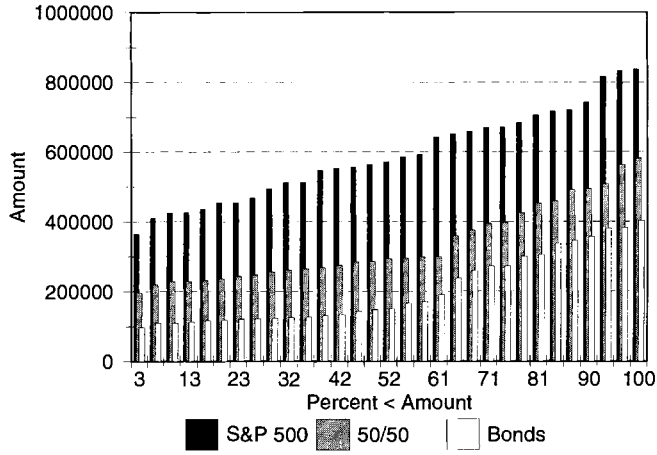

Fig. 2.10 Wealth distribution by investment

Persons who started work in 1956 are now receiving social security benefits that are much higher than they would have received under 1956 social security provisions. In many countries, it is likely that future social security benefits will be much less than those provided under current legislation. Perhaps the issue is not that some forms of preparation for retirement are risky while others are not, but rather how future retirees might best gain maximum returns on average while protecting themselves against very bad outcomes.

2.4 Conclusions

We have projected the accumulation of 401(k) assets at retirement for the cohort that was 25 years old in 1984 and the cohort that was 15 years old in 1984. The C25 projections are based on what we hope are plausible assumptions about future 401(k) participation rates. Indeed, our intention is that these projections be conservative and thus likely to underestimate realized contributions. The C15 projections are further from historical rates but we hope are also based on plausible assumptions about potential future participation. We are, however, more uncertain about the correspondence between projected rates and actual realized contributions for the C15 cohort; actual participation could easily exceed or fall short of these projections. For comparison, we have also made projections assuming universal 401(k) coverage.

In each case, the accumulation of 401(k) assets is large compared to current wealth at retirement. Because a large fraction of current retirees depend almost entirely on social security benefits for support in retirement, we have compared future 401(k) assets to social security wealth. Our C25 projections suggest that when this cohort reaches retirement age—they will be 65 years old in 2025—their average 401(k) assets are likely to exceed their average social security

assets. But the projections also suggest that relative to social security wealth, 401(k) assets will vary a great deal with lifetime earnings. While this is surely true, we are quite uncertain about the exact magnitude of the variation by earnings decile. The projections suggest that the lowest earnings decile may have very little in 401(k) assets. But for families with lifetime earnings above the lowest two or three deciles, 401(k) assets are likely to be a substantial fraction of social security wealth. For families with lifetime earnings above the median, 401(k) assets could exceed social security wealth, and this would almost surely be true for families in the top four earnings deciles.

Universal 401(k) participation would likely yield 401(k) assets at retirement greater than social security wealth for all but the lowest lifetime earnings decile, and possibly for the lowest decile as well. The intermediate C15 projections yield 401(k) accumulations that could represent a substantial fraction of social security wealth for lifetime earnings histories as low as the 2d decile. Thus we believe that 401(k) assets will almost surely be an important component of the retirement wealth of future generations of retirees and could be the dominant component for a large fraction of them.

Appendix A
Data

The three principal data sources used in the analysis are the Survey of Income and Program Participation (SIPP), the Current Population Survey (CPS), and the Employee Benefits Supplement to the CPS. The unit of observation in each of these surveys is the person. For the present analysis we have grouped the individual data to obtain data for family units, by matching married partners in the sample. A family is included in the sample if it meets the following criteria:

- Head aged 25–65
- At least one family member employed
- Earnings available for both family members

A family participates (or is eligible) if at least one member participates (or is eligible). Based on the CPS data, the 401(k) contribution and the employer matching contribution are both calculated at the person level and then aggregated to obtain family amounts. Details on each of the samples are presented below.

CPS

We use the May 1988 and April 1993 surveys. Several missing data issues had to be addressed.

1. *Rates of 401(k) participation and eligibility.* These data come from two questions asked of currently employed workers. Respondents are first asked if they participate. If they answer "no" or "don't know" (DK) they are then asked if their employer offered a 401(k) plan. Of the respondents who said they did not participate in a 401(k), 11.5 percent did not know if their employer offered such a plan. We have chosen to treat these DK responses as missing data for the eligibility calculations only. One consequence is that the sample used in "participant" calculations will exceed the sample used for "eligible" calculations. Also, since information on eligibility is only missing for nonparticipants (all participants are eligible), it is likely that the conditional participation rate is biased upward.

2. *The percentage of gross pay contributed to a 401(k):* In both years slightly over 25 percent of the 401(k) participants failed to answer this question. To impute these missing amounts we calculated a table of percentage of gross pay contributed by five-year age intervals from the nonmissing observations. This table was used to impute the missing observations.

3. *The employer match percentage (1993 only):* Respondents were asked, "If you were to contribute $100 to this plan, how much would your employer contribute?" About 65 percent of the sample provided a dollar amount; another 17 percent indicated that their employer matched but could not provide an amount. The remaining 17 percent of the sample failed to answer the question. To impute dollar amounts for all participants we tabulated dollar amounts by five-year age intervals for the 65 percent of the sample providing a complete answer. If a respondent indicated that his or her employer matched but could not provide an amount, we imputed an amount using the mean by age interval from the distribution of matching amounts greater than zero. If a respondent failed to answer the question we imputed the amount from the distribution of matches including zero match rates.

SIPP

We used data from the 1984, 1985, 1986, 1990, 1991, and 1992 panels of the SIPP. Since the SIPP panels are overlapping we are sometimes able to obtain data for a single time period from more than one panel. The panels that were used, the survey wave within each panel, and the interview months corresponding to each panel are shown in table 2A.1. There are approximately 28 months separating the 1984 and 1987 interviews. In the cohort analyses we treat this interval as a two-year period. The 1984–91 interval is assumed to span six years. The 1984–93 interval is assumed to span eight years.

SIPP versus CPS

The SIPP responses imply eligibility and participation rates somewhat below those found in the CPS (see table 2.5 in the text). The difference may be due in part to the more inclusive wording of the 401(k) questions in the CPS. The SIPP asks:

Table 2A.1 **SIPP Panels**

Panel	Wave	Interview Months
1984	4	September–December 1984
1985	7	January–April 1987
1986	4	January–April 1987
1990	4	February–May 1991
1991	7	February–May 1993
1992	4	February–May 1993

> Does your employer offer a 401(k) or thrift plan? Such a plan allows employees to defer part of their salary and not have to pay taxes on the deferred salary until they retire or withdraw the money.

If the respondent answers "yes," then the following question is asked:

> Do you participate in this plan?

As noted above, the CPS reverses the order and inquires about participation first (1993 version):

> Some retirement plans allow workers to make tax-deferred contributions to the plan. For example, you might choose to have your employer put part of your salary into a retirement savings account and then you don't pay earnings taxes on this money until you take it out or retire. These plans are called by different names, including 401(k) plans, pre-tax plans, salary reduction plans, and 403(b) plans. Do you participate in a plan like this?

If the respondent answers "no" or "don't know," then:

> Does your employer *offer* you a plan like this? [emphasis in original]

HRS

The HRS does not inquire about eligibility for a 401(k) plan. It does ask about participation. All employed persons are asked if they are "included in any such pension, retirement, or tax-deferred plan with [their] employer." If yes, they are asked to distinguish between defined benefit ("benefits are usually based on a formula involving age, years of service, and salary") and defined contribution ("money is accumulated in an account for you") type plans. If they indicate coverage by a defined contribution plan, they are prompted to distinguish between 401(k) and non-401(k) plans. For a number of reasons some respondents were able to indicate coverage by a defined contribution plan but could not distinguish between a 401(k) and a traditional defined contribution plan. We treat these respondents as not participating in a 401(k) plan. The principal categories of defined contribution plan types are "thrift or savings," "401(k), 403(b), or SRA," "profit sharing or ESOP," and "other." It is perhaps unclear to the respondent whether the "thrift or savings" category includes 401(k)-type plans. We have included them as 401(k) plans.

Appendix B

Table 2B.1 **SIPP: Eligibility, Participation Given Eligibility, and Participation Rates by Earnings Decile and Age in 1993**

	Age								
Earnings Decile	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All
				Eligibility					
1st (lowest)	0.245	0.171	0.156	0.154	0.179	0.130	0.119	0.115	0.166
2d	0.250	0.262	0.234	0.252	0.205	0.208	0.209	0.131	0.231
3d	0.275	0.293	0.304	0.339	0.336	0.317	0.255	0.192	0.298
4th	0.374	0.330	0.376	0.430	0.404	0.391	0.367	0.204	0.370
5th	0.329	0.403	0.463	0.454	0.432	0.417	0.361	0.277	0.405
6th	0.416	0.445	0.499	0.516	0.524	0.471	0.444	0.363	0.468
7th	0.436	0.568	0.515	0.590	0.595	0.524	0.481	0.398	0.525
8th	0.506	0.583	0.623	0.610	0.555	0.572	0.472	0.369	0.557
9th	0.548	0.644	0.613	0.659	0.623	0.625	0.533	0.439	0.602
10th (highest)	0.610	0.616	0.628	0.587	0.543	0.583	0.538	0.497	0.589
All	0.406	0.434	0.444	0.461	0.441	0.423	0.377	0.297	0.423

				Participation Given Eligibility					
1st (lowest)	0.353	0.534	0.404	0.533	0.393	0.432	0.554	0.235	0.437
2d	0.417	0.527	0.526	0.507	0.428	0.476	0.463	0.440	0.483
3d	0.409	0.510	0.490	0.483	0.611	0.566	0.207	0.487	0.520
4th	0.540	0.414	0.481	0.510	0.554	0.577	0.603	0.563	0.515
5th	0.535	0.519	0.556	0.620	0.675	0.629	0.506	0.354	0.570
6th	0.500	0.574	0.623	0.636	0.689	0.632	0.659	0.649	0.614
7th	0.557	0.642	0.623	0.681	0.693	0.717	0.635	0.708	0.651
8th	0.567	0.691	0.676	0.670	0.756	0.764	0.708	0.711	0.683
9th	0.662	0.747	0.756	0.726	0.809	0.795	0.802	0.822	0.751
10th (highest)	0.677	0.782	0.779	0.795	0.856	0.803	0.793	0.820	0.777
All	0.556	0.630	0.630	0.645	0.693	0.684	0.671	0.649	0.638
				Participation					
1st (lowest)	0.086	0.091	0.063	0.082	0.070	0.056	0.066	0.027	0.072
2d	0.104	0.138	0.123	0.128	0.088	0.099	0.097	0.057	0.111
3d	0.113	0.150	0.149	0.164	0.205	0.179	0.183	0.094	0.155
4th	0.202	0.137	0.181	0.219	0.224	0.226	0.221	0.115	0.191
5th	0.176	0.209	0.257	0.281	0.291	0.262	0.183	0.098	0.231
6th	0.208	0.256	0.311	0.328	0.361	0.298	0.293	0.236	0.288
7th	0.243	0.365	0.321	0.402	0.412	0.376	0.306	0.282	0.342
8th	0.287	0.403	0.421	0.408	0.420	0.437	0.334	0.263	0.381
9th	0.363	0.481	0.464	0.478	0.504	0.497	0.427	0.360	0.452
10th (highest)	0.413	0.482	0.489	0.466	0.465	0.468	0.426	0.408	0.458
All	0.226	0.274	0.280	0.297	0.305	0.290	0.253	0.193	0.270

Source: Based on the Survey of Income and Program Participation.

Table 2B.2 **CPS: Eligibility, Participation Given Eligibility, and Participation Rates by Earnings Decile and Age in 1993**

	Age								
Earnings Decile	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All
				Eligibility					
1st (lowest)	0.20	0.196	0.123	0.216	0.209	0.115	0.097	0.138	0.169
2d	0.24	0.214	0.304	0.254	0.303	0.181	0.257	0.181	0.25
3d	0.234	0.442	0.355	0.461	0.421	0.339	0.344	0.220	0.363
4th	0.445	0.502	0.488	0.552	0.519	0.484	0.380	0.259	0.477
5th	0.417	0.481	0.566	0.559	0.529	0.501	0.389	0.409	0.495
6th	0.479	0.480	0.592	0.522	0.593	0.623	0.432	0.474	0.529
7th	0.622	0.669	0.613	0.662	0.629	0.581	0.618	0.553	0.628
8th	0.591	0.634	0.657	0.768	0.683	0.727	0.614	0.606	0.665
9th	0.649	0.759	0.770	0.718	0.691	0.670	0.753	0.614	0.712
10th (highest)	0.686	0.738	0.744	0.745	0.734	0.682	0.617	0.70	0.72
All	0.46	0.515	0.521	0.546	0.531	0.487	0.450	0.41	0.50
				Participation Given Eligibility					
1st (lowest)	0.22	0.320	0.399	0.412	0.248	0.394	0.703	0.641	0.357
2d	0.21	0.439	0.418	0.659	0.548	0.712	0.777	0.363	0.498
3d	0.376	0.528	0.581	0.532	0.762	0.733	0.672	0.788	0.592
4th	0.487	0.505	0.659	0.654	0.713	0.726	0.671	0.740	0.625
5th	0.554	0.578	0.639	0.590	0.691	0.659	0.735	0.766	0.629
6th	0.592	0.677	0.650	0.684	0.743	0.698	0.794	0.806	0.686
7th	0.597	0.737	0.786	0.804	0.779	0.849	0.845	0.755	0.757
8th	0.677	0.742	0.792	0.821	0.781	0.787	0.835	0.814	0.776
9th	0.677	0.805	0.818	0.866	0.846	0.887	0.80	0.78	0.808
10th (highest)	0.779	0.828	0.759	0.925	0.865	0.847	0.928	0.83	0.837
All	0.588	0.673	0.700	0.740	0.744	0.771	0.799	0.76	0.71

				Participation					
1st (lowest)	0.03	0.052	0.044	0.078	0.051	0.041	0.061	0.076	0.052
2d	0.039	0.083	0.120	0.156	0.136	0.119	0.170	0.061	0.109
3d	0.074	0.200	0.184	0.205	0.288	0.204	0.205	0.159	0.186
4th	0.188	0.228	0.292	0.323	0.370	0.326	0.231	0.180	0.272
5th	0.211	0.240	0.355	0.305	0.358	0.312	0.295	0.245	0.290
6th	0.247	0.306	0.366	0.342	0.417	0.382	0.312	0.354	0.335
7th	0.362	0.474	0.433	0.480	0.480	0.475	0.466	0.378	0.446
8th	0.369	0.431	0.503	0.603	0.496	0.538	0.516	0.422	0.484
9th	0.412	0.600	0.598	0.580	0.556	0.581	0.568	0.443	0.548
10th (highest)	0.504	0.594	0.546	0.668	0.628	0.548	0.564	0.569	0.58
All	0.241	0.318	0.344	0.373	0.375	0.350	0.336	0.286	0.33

Source: Based on the Employee Benefits Supplement to the Current Population Survey.

Table 2B.3 **Employee Contribution and Employer Matching Rates by Earnings Decile and Age in 1993**

Earnings Decile	Age								
	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All
				Employee Contribution Rate					
1st (lowest)	0.065	0.057	0.043	0.075	0.072	0.061	0.067	0.075	0.064
2d	0.064	0.086	0.054	0.052	0.063	0.060	0.056	0.106	0.062
3d	0.060	0.054	0.055	0.051	0.064	0.062	0.062	0.070	0.058
4th	0.049	0.060	0.051	0.069	0.059	0.072	0.061	0.071	0.061
5th	0.061	0.058	0.059	0.056	0.070	0.070	0.076	0.063	0.063
6th	0.061	0.056	0.056	0.055	0.059	0.065	0.085	0.074	0.061
7th	0.049	0.053	0.051	0.054	0.053	0.066	0.076	0.075	0.057
8th	0.056	0.056	0.054	0.061	0.066	0.066	0.059	0.090	0.061
9th	0.054	0.048	0.054	0.057	0.064	0.055	0.074	0.066	0.057
10th (highest)	0.059	0.058	0.056	0.062	0.067	0.062	0.068	0.073	0.062
All	0.056	0.056	0.054	0.059	0.063	0.064	0.069	0.074	0.060
				Employer Matching Rate					
1st (lowest)	0.054	0.028	0.018	0.029	0.035	0.025	0.021	0.046	0.031
2d	0.120	0.037	0.021	0.023	0.025	0.024	0.022	0.005	0.029
3d	0.032	0.031	0.023	0.026	0.033	0.031	0.044	0.041	0.031
4th	0.026	0.032	0.028	0.025	0.030	0.039	0.027	0.026	0.029
5th	0.029	0.033	0.023	0.019	0.019	0.028	0.028	0.021	0.025
6th	0.032	0.030	0.022	0.020	0.019	0.024	0.041	0.029	0.026
7th	0.026	0.029	0.025	0.022	0.023	0.021	0.028	0.034	0.025
8th	0.031	0.029	0.024	0.022	0.027	0.028	0.021	0.033	0.026
9th	0.024	0.024	0.020	0.026	0.027	0.015	0.034	0.020	0.024
10th (highest)	0.026	0.022	0.037	0.030	0.033	0.027	0.030	0.044	0.030
All	0.029	0.028	0.025	0.024	0.027	0.025	0.030	0.031	0.027

				Total Contribution Rate					
1st (lowest)	0.120	0.085	0.061	0.104	0.107	0.086	0.089	0.120	0.095
2d	0.184	0.124	0.075	0.075	0.088	0.083	0.078	0.111	0.092
3d	0.092	0.086	0.079	0.077	0.098	0.093	0.106	0.111	0.089
4th	0.075	0.092	0.079	0.095	0.089	0.111	0.088	0.097	0.090
5th	0.091	0.092	0.082	0.075	0.090	0.097	0.104	0.084	0.088
6th	0.093	0.086	0.078	0.075	0.078	0.089	0.126	0.104	0.087
7th	0.075	0.082	0.076	0.076	0.076	0.087	0.104	0.108	0.082
8th	0.087	0.085	0.078	0.082	0.093	0.094	0.080	0.123	0.087
9th	0.078	0.072	0.074	0.082	0.090	0.070	0.108	0.086	0.080
10th (highest)	0.085	0.080	0.093	0.093	0.100	0.089	0.099	0.117	0.092
All	0.086	0.084	0.080	0.083	0.090	0.089	0.099	0.106	0.087

Source: Based on the Employee Benefits Supplement to the Current Population Survey.

Table 2B.4 **Employee and Employer Contribution Amounts by Earnings Decile and Age in 1993**

Earnings Decile	Age								
	25–29	30–34	35–39	40–44	45–49	50–54	55–59	60–64	All
				Employee Contribution					
1st (lowest)	233	286	258	538	673	315	511	338	404
2d	532	886	722	847	946	781	711	784	805
3d	738	879	1,122	1,124	1,436	1,226	1,248	872	1,122
4th	835	1,277	1,327	1,925	1,730	1,916	1,537	1,272	1,522
5th	1,307	1,551	1,847	1,897	2,525	2,243	2,296	1,515	1,911
6th	1,584	1,765	2,030	2,187	2,491	2,569	3,088	2,079	2,162
7th	1,398	1,965	2,248	2,538	2,705	3,126	3,338	2,774	2,394
8th	1,990	2,516	2,786	3,396	4,008	3,759	3,088	3,939	3,113
9th	2,446	2,632	3,400	3,936	4,822	3,803	5,123	4,132	3,612
10th (highest)	3,708	4,915	5,872	7,430	7,842	6,760	8,091	7,012	6,258
All	2,048	2,468	2,832	3,455	3,700	3,410	3,837	3,451	3,075
				Employer Contribution					
1st (lowest)	188	87	116	246	343	132	163	205	186
2d	955	404	288	364	365	324	287	36	363
3d	388	506	470	565	749	631	815	541	589
4th	426	688	718	706	868	1,025	659	513	732
5th	603	884	728	663	684	872	855	491	731
6th	836	939	812	776	795	964	1,584	822	898
7th	760	1,071	1,101	1,056	1,149	1,009	1,218	1,255	1,059
8th	1,101	1,284	1,249	1,226	1,680	1,575	1,084	1,421	1,322
9th	1,065	1,308	1,270	1,777	2,001	1,029	2,380	1,192	1,483
10th (highest)	1,643	1,879	4,567	3,311	3,867	3,043	3,660	3,759	3,141
All	992	1,165	1,534	1,444	1,606	1,339	1,670	1,477	1,392

				Total Contribution					
1st (lowest)	421	373	373	784	1,016	447	674	543	591
2d	1,487	1,290	1,010	1,210	1,311	1,104	998	820	1,167
3d	1,127	1,385	1,593	1,690	2,185	1,858	2,063	1,413	1,711
4th	1,261	1,965	2,046	2,631	2,598	2,940	2,195	1,785	2,254
5th	1,909	2,435	2,575	2,560	3,209	3,115	3,151	2,006	2,642
6th	2,420	2,704	2,842	2,964	3,286	3,533	4,672	2,900	3,060
7th	2,158	3,036	3,350	3,594	3,855	4,135	4,556	4,029	3,453
8th	3,090	3,800	4,034	4,622	5,688	5,334	4,173	5,360	4,434
9th	3,511	3,940	4,670	5,713	6,823	4,833	7,503	5,325	5,095
10th (highest)	5,351	6,794	10,439	10,741	11,709	9,803	11,751	10,771	9,399
All	3,040	3,633	4,366	4,899	5,306	4,749	5,508	4,928	4,467

Source: Based on the Employee Benefit Supplement to the Current Population Survey.

Table 2B.5 **Parameter Estimates for Eligibility, Participation Given Eligibility, and Participation**

Variable or Earnings Decile	Eligibility		Participation Given Eligibility		Participation	
	Estimate	*T*-Statistic	Estimate	*T*-Statistic	Estimate	*T*-Statistic
Age 1988	0.09	8.84	0.05	3.09	0.10	9.06
Age 1993	0.087	9.43	0.086	6.05	0.113	12.08
Age squared 1988	−0.103	8.81	−0.043	2.22	−0.104	8.35
Age squared 1993	−0.104	9.70	−0.080	4.84	−0.124	−11.41
1988 Deciles						
1st	−2.839	−13.44	−1.498	−4.20	−3.713	−16.21
2d	−2.539	−12.11	−1.377	−3.92	−3.412	−15.08
3d	−2.301	−11.01	−1.219	−3.51	−3.165	−14.10
4th	−2.103	−10.06	−1.274	−3.68	−3.038	−13.56
5th	−2.079	−9.97	−1.075	−3.10	−2.917	−13.07
6th	−1.953	−9.37	−1.100	−3.18	−2.803	−12.57
7th	−1.871	−8.95	−0.962	−2.78	−2.696	−12.06
8th	−1.721	−8.26	−0.899	−2.61	−2.547	−11.44
9th	−1.645	−7.90	−0.887	−2.58	−2.471	−11.11
10th	−1.535	−7.37	−0.552	−1.61	−2.257	−10.17
1993 Deciles						
1st	−2.678	−13.704	−2.444	−8.04	−4.071	−20.092
2d	−2.400	−12.328	−2.095	−6.98	−3.683	−18.382
3d	−2.065	−10.671	−1.853	−6.22	−3.335	−16.820
4th	−1.777	−9.162	−1.759	−5.94	−3.050	−15.418
5th	−1.730	−8.949	−1.746	−5.91	−2.992	−15.162
6th	−1.645	−8.505	−1.592	−5.40	−2.862	−14.522
7th	−1.387	−7.187	−1.359	−4.65	−2.571	−13.088
8th	−1.291	−6.675	−1.323	−4.50	−2.478	−12.608
9th	−1.149	−5.957	−1.188	−4.07	−2.309	−11.776
10th	−1.148	−5.935	−1.076	−3.67	−2.235	−11.373

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Comment

Sylvester J. Schieber

In their paper, Poterba, Venti, and Wise use a disparate set of data and methods to estimate the implications of the growth in 401(k) savings for the retirement security of various cohorts of current workers. The paper is so packed with information that it is difficult at times to keep track of everything that is happening at specific points in the story and how each particular piece of information fits into the whole.

The authors begin by developing an analysis of the growing prevalence of participation in 401(k) plans from 1984 through 1993. They develop the story line in pieces, first looking at growth in coverage, then growth in participation rates given coverage, and finally participation rates across the whole workforce. They then proceed to apply measured contribution rates to estimate contributions. Finally, they accumulate contributions under a set of investment scenarios to project the potential accumulation of 401(k) retirement savings for workers currently at or near the beginning of their careers.

While the authors present their coverage and participation data in a series of numerical tables, looking at it graphically gives a better visual perspective on what has been occurring in the world they are attempting to describe. Figures 2C.1*A*, 2C.1*B*, and 2C.1*C* are simply plots of the data points from the top, middle, and bottom panels, respectively, of the authors' table 2.1.

The authors note the clear pattern of coverage growth shown in figure 2C.1*A*. The picture makes it clear that the growth was consistent both across time and across age groups. The authors also note the growth in participation given coverage during the early years, and the confusing story in the 1993 Survey of Income and Program Participation (SIPP) data, contradicted by the Current Population Survey (CPS) data analyzed separately. The graphic story in figure 2C.1*B* shows that the early growth in participation given coverage occurred at lower age levels, with little variation over the whole period in

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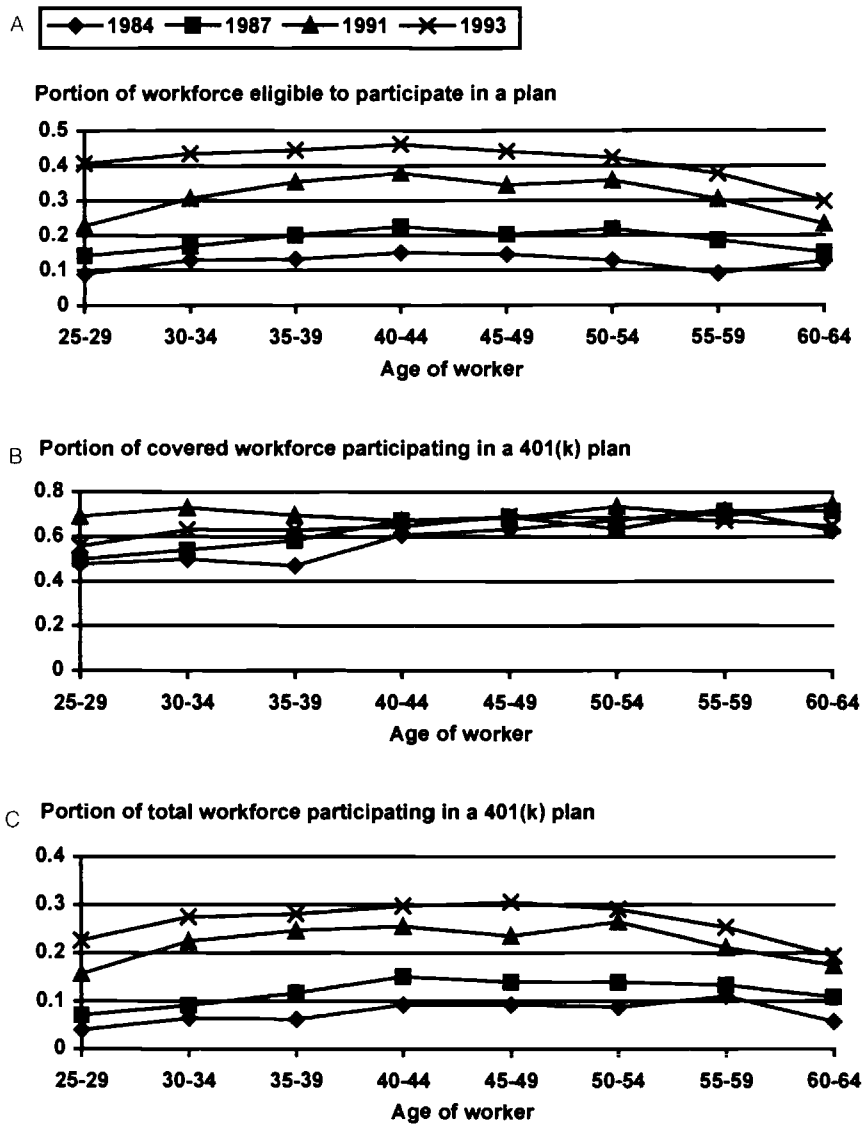

Fig. 2C.1 401(k) Coverage and participation by age and year

Source: Survey of Income and Program Participation as reported in table 2.1.

Note: (*A*) Percentage of workers covered by 401(k) plans. (*B*) Percentage of covered workers participating in a 401(k) plan. (*C*) Percentage of all workers participating in 401(k) plans.

participation rates of those over age 40 once they were offered the opportunity to participate in a plan. The combination of the evolving pictures shown in figures 2C.1*A* and 2C.1*B* make it quite clear that the growth in overall participation rates during the period shown in figure 2C.1*C* was more largely driven by the increases in coverage than the increases in participation once coverage was offered. This is an important point to keep in mind for later.

In table 2.2 of the paper and the discussion around it, the authors go through the same regimen as in table 2.1, except that they look at coverage and participation by earnings decile. Plotting those data results in a moving picture that is essentially the same as that shown in the age-based figures, so it is not repeated here. The one piece that the earnings perspective adds is that participation given coverage reported in the 1993 SIPP was substantially below that reported in the 1991 survey for the bottom 40 percent of the wage distribution, was somewhat less than but not as much so for the next 30 percent, and was equivalent for the top 30 percent.

After the discussion of the growing levels of participation in 401(k) plans, the authors turn to a discussion of estimation techniques that serve as the basis for the assumptions used in projecting future levels of benefits that might be provided by the system. They begin by looking at future potential increases in coverage under 401(k) plans. Here they are troubled by the profiles that are reflected in their figure 2.1 because older workers do not seem to have made the same kind of coverage gains as younger ones, and because workers in later years have much lower coverage rates than their younger counterparts. The authors hypothesize that the 1993 profile might look the way it does because "the diffusion of plans has been disproportionately in small firms,with younger workers." This hypothesis has major implications for the results found in the paper, given subsequent assumptions about pension coverage growth used to project the potential effect of 401(k) plans on future retirement income.

An alternative explanation for the 1993 profile of 401(k) coverage reported in figure 2.1 might be that the early initiation of 401(k) plans took place in firms that provided relatively generous retirement benefits in general. Those firms and their generous retirement plans encouraged the early retirement of workers in their mid- to late 50s during the late 1980s and early 1990s. As workers in their late 50s and early 60s with these generous retirement packages retired, they left behind a smaller number of similarly aged counterparts working for less generous firms, many of which had not yet sponsored a 401(k) plan. In essence, it is likely that the retirement of those with early 401(k) coverage drove down the coverage rate among the age group in question because those continuing to work had never had coverage. If this same phenomenon continues into the future, and I suspect that those with significant retirement savings in the future (i.e., mainly those covered by retirement plans) will continue to retire earlier than those without such savings (i.e., mainly those not covered by such plans), then the authors' hypothesis that the 1993 profile will not represent the future profile is simply wrong.

In their projections, the authors "assume" that each succeeding cohort of workers will have higher coverage rates at any attained age than earlier cohorts had achieved by that age. For example, they assume that workers aged 25 in 1993 will have higher coverage rates when they are age 55 than the 55-year-old cohort had in 1993. They assume that participation rates given eligibility are constant over time and thus that overall participation rate increases are driven by increased coverage. Following these general conditions, they assume that when the cohort of workers aged 25 in 1993 reaches age 55 it will have a participation rate that is 50 percent higher than that of the 55-year-old cohort in 1993 and that this cohort's participation rate will continue to grow until its members reach age 65.

The implicit assumption here is that we will continue to realize significant increases in 401(k) coverage rates. According to CPS tabulations in the paper, the coverage rate of 55-year-olds in 1993 was approximately 45 percent. To get the kind of growth that the authors are assuming, the coverage rate for 25-year-olds in 1993 would have to grow at a rate of 1.4 percent per year for 30 years. I have reservations about this growth assumption and its implications for personal retirement saving for two reasons.

First, the growth in 401(k) plans during the 1980s partly reflected the shift from defined benefit to defined contribution plans. In some cases there was a direct substitution of one type of plan for another. In many, the shift was a more subtle curtailment of a defined benefit plan as the 401(k) was offered. In 1993, 61 percent of the active participants in 401(k) plans worked for an employer that sponsored another retirement plan; 82 percent of them were in 401(k) plans with more than 1,000 active participants, while fewer than 3 percent were in plans with less than 100 active participants (U.S. Department of Labor 1997, 50). The explicit and implicit shifting from defined benefit to defined contribution plans has been mostly a large-employer phenomenon. At some juncture, both types of shifting will decline because of the saturation of 401(k) plans in large firms. To the extent that it has gone on thus far, it has not necessarily resulted in an increase in retirement saving but more likely a change in the way we are doing it.

Second, I believe that continued expansions in 401(k) coverage that represent new retirement savings are likely to be harder and harder to achieve in the future. Between 1984 and 1993, the number of 401(k) plans in operation grew from 17,303 to 154,527. Over the same period, the number of active participants in these plans grew from 7.5 million to 23.1 million (U.S. Department of Labor 1997, 95). The result was a steady decline in the number of active participants per plan over the period (shown in fig. 2C.2), indicating that the new plans added each year were smaller and smaller. Of the increase in the number of 401(k) plans offered during 1993, 86 percent of them were the sole plan being offered by the sponsor, and of these, 88 percent had fewer than 100 active participants (U.S. Department of Labor 1996, 47; 1997, 49). The recent growth in 401(k) plans has largely been a small-employer phenomenon, and it generally represents new coverage. The big ones have largely been harvested

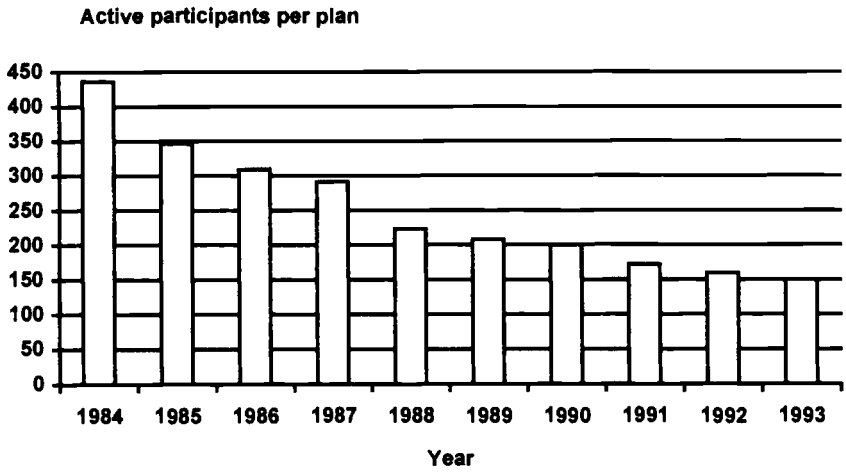

Fig. 2C.2 Average number of active participants in 401(k) plans for selected years
Source: U.S. Department of Labor (1997, 95).

already, and it will be increasingly difficult to get smaller employers to offer plans in the future at rates that will continue to drive up coverage rates significantly. The rate of growth of the number of active participants in 401(k) plans slowed from 19.2 percent per year from 1984 to 1988 to 7.5 percent per year from 1989 to 1993. It is likely that the rate of growth of coverage will continue to decline.

Beyond the underlying assumptions about future coverage and participation rates, there are other assumptions that have a significant bearing on the final projections in the paper that are worthy of comment. In simulating asset accumulations, the assumption is that once a household begins to contribute to a 401(k) plan it will continue to contribute until retirement age. This may not be a serious problem in projecting mean accumulations for cohorts of workers, but it does fail to take into account the considerable variation in participation that must occur among lower wage workers from year to year or the leakage in retirement savings that occurs as workers terminate employment early in their careers and take cash distributions that are used for preretirement consumption. This could be particularly important for variations in accumulations across the income spectrum.

The accumulation projections are developed using three alternative portfolios. In some recent work that I have done with a colleague we explored the variation in 401(k) asset allocations at three different wage levels by workers in their 20s, 30s, 40s, 50s, and 60s. The results are shown in table 2C.1. While this is a cross-sectional distribution of investment patterns, there is no reason to believe that it is not reflective of the investment patterns of workers across their life cycles to the extent that they spend their lives in a particular segment

Table 2C.1 **401(k) Asset Allocation by Age and Wage Level of Plan Participants (percentage of assets invested in equities)**

	Age of Participant				
Annual Wage	20s	30s	40s	50s	60s
Less than $15,000	68.1	65.1	57.8	49.0	35.6
$35,000–$45,000	72.1	66.2	61.4	56.0	46.0
$60,000–$75,000	84.0	76.1	69.9	65.6	56.2

Source: Gordon P. Goodfellow and Sylvester J. Schieber, "Social Security Reform: Implications of Financial Market Risk for Individual Accounts and the Distribution of Benefits," paper presented at the 1997 Pension Research Council Symposium, Wharton School, University of Pennsylvania, 12 May 1997.

of the wage spectrum. The more conservative investment style of lower wage workers, especially if it persists over the whole life cycle, suggests that they will tend to end up with asset accumulations toward the pure bond investing end of the projections while their higher wage counterparts will end up further along the spectrum toward the mixed or pure stock portfolios.

Another issue that the projections fail to account for is net rates of return that take into consideration the costs of investing. Access Research, Inc., estimates that current asset levels in 401(k) plans in mid-1997 stand at approximately $865 billion and that the annual administrative fees for both record keeping and asset management for the year will be $6.7 billion, or 77 basis points (Wuelfing 1997). While these fees are not borne by the participants in all cases, in many cases they are. My impression is that the trend is toward having the participants bear these costs.

Having been fairly critical of various aspects of this work, I want to close by saying that the goal being pursued here is a worthy one. The voluntary defined contribution system is relatively new, and it is impossible to judge its potential contribution to retirement security of today's workers by looking at current retirees or workers close to retirement. This effort is to be applauded in having begun to project the implications of the 401(k) system for workers who will be exposed to a full lifetime of the opportunity that it provides.

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