Real Effects of Inflation through the Redistribution of Nominal Wealth: Technical Appendix*

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1 Overview

This appendix describes a data set of US nominal positions assembled for our paper "Real Effects of Inflation through the Redistribution of Nominal Wealth." We construct expected future nominal payment streams for different sectors of the U.S. economy, as well as age and wealth groups of households. Our sectoral data is based on the Flow of Funds Accounts from 1952 to 2002. For groups of households, we rely on the 1989 and 2001 Survey of Consumer Finances. We explicitly trace out indirect nominal positions held through equity or investment intermediaries. We also use the payment stream data to compute the market value of nominal positions under different scenarios for inflation expectations.

The appendix is organized as follows. Section 2 lists the data sources we use. Section 3 introduces our sector definitions and explains how and why they differ from those of the FFA. Section 4 discusses the classification of assets into nominal, real, investment intermediary shares, and equity. Section 5 explains how we construct payment streams for bonds and mortgages. Section 6 reviews the construction of household-level nominal positions. Finally, Section 7 discusses the reconciliation of aggregates derived from FFA and SCF data.

2 Data Sources

Our main data source for sectoral positions is the *Flow of Funds Accounts of the United States* (FFA). We use quarterly FFA data from 1952:1 to 2002:1. For household positions, we rely on the 1989 and 2001 editions of the *Survey of Consumer Finances* (SCF). Both data sets are available from the Board of Governors of the Federal Reserve System. As additional sources on positions, we use various issues of the *Life Insurers' Factbook*, published annually by the American Council of Life Insurers (ACLI), as well as the *International Investment Position*, published by the Bureau of Economic Analysis. For market interest rates, we rely on the monthly release *Selected Interest Rates* from the Federal Reserve Board. Our measure of inflation is the *Consumer Price Index for All Urban Consumers*, available from the Bureau of Labor Statistics. For the zero coupon yield curve, we use the McCulloch-Kwan data set described in McCulloch (1990), which is available for 1946-1991, and zero coupon yields provided by the Federal Reserve Board for the years 1992-2002. Data on the maturity distribution of Treasury securities comes from the *Economic Report of the President*.

Information on interest, maturity and contract form for mortgages is from the *Monthly Interest Survey* provided by the Federal Housing Finance Board.

3 Consolidation of Sectors

Table 3 is a list of sectors and classes of financial institutions for which the FFA supplies aggregate data. We calculate direct and indirect net nominal positions for four *end-user* sectors: households, the government, the rest of the world, and nonprofit organizations. The calculation uses direct nominal positions of all sectors and institutions. Among institutions, the key distinction is between those that have only one class of liabilities and those that have several classes. We call the former group *investment intermediaries*.

Investment Intermediaries

The most important investment intermediaries are mutual funds (MF), money market mutual funds (MMMF), bank investment trusts, and private defined contribution (DC) pension plans.[1] The single class of liabilities of these institutions is fund shares. We assign nominal positions of investment intermediaries directly to their shareholders. For MMMFs and MFs, these shareholders include other intermediaries, in particular DC plans and trusts. Cross-holdings between MMMFs and MFs, however, are negligible. We therefore proceed sequentially: we first reassign mutual fund nominal assets to other intermediaries as well as all end users, and then in a second step reassign pension and trust assets to households.

In recent years, life insurance companies have increasingly offered investment risk pass-through products such as variable annuities, in addition to their more traditional nominal liabilities. Life insurers are required by law to keep a *separate account* for assets that back pass-through claims. We treat this separate account as an investment intermediary—gains and losses accrue to pension reserve holders at life insurance companies, rather than to the owners of these companies. Since the FFA does not distinguish between life insurers' separate and general accounts, we use data on the account composition from the Life Insurers Fact Book for the 1990s.

[1] A breakdown of private pension assets into DC and defined benefit (DB) pension plans is available only since 1984. Before that time, we postulate that a constant share equal to the 1984 number was DC.

Sector	Table	Number
Households	Households and nonprofit organizations	B.100
Government	Consolidated federal, state, and local	L.106c
	Government employee retirement funds	L.120
	Monetary authority	L.108
Rest of the World	Rest of the world	L.107
	Foreign banking offices in U.S.	L.111
	Foreign funding corporations	L131
Investment Intermediaries	Money market mutual funds	L.121
	Mutual funds	L.122
	Bank personal trusts and estates	L.116
	Private pension funds	L.119
	Life insurance companies (separate account)	L.117
Nonfinancial Business	Nonfarm nonfinancial corporate business	B.102
	Nonfarm noncorporate business	B.103
	Farm business	L.104
Financial business	US-chartered commercial banks	L.109
	Saving institutions	L.114
	Credit unions	L.115
	Life insurance companies (general account)	L.117
	Other insurance companies	L.118
	Closed-end and exchange traded funds	L.123
	Government-sponsored enterprises	L.124
	Federally related mortgage pools	L.125
	Issuers of asset-backed securities	L.126
	Finance companies	L.127
	Mortgage companies	L.128
	Real estate investment trusts	L.129
	Security brokers and dealers	L.130
	Funding corporations (except foreign)	L.131

Table 1: Tables in the Flow of Funds Accounts

Rest of the World

Our rest of the world (ROW) sector combines the FFA's ROW sector as well as two classes of foreign financial institutions. First, for foreign banking offices in the US, the FFA provides a detailed table of positions. Second, funding corporations set up by foreign institutions to issue commercial paper in the US are part of the FFA's funding corporations sector, where they are lumped together with nonbank financial holding companies and custodial accounts for reinvested collateral associated with securities-lending operations. The commercial paper issued by foreign-controlled funding corporations is either used to finance foreign banking offices, or is to raise funds that are then transferred to the foreign parent. We thus construct a *foreign funding corporations* sector. Its assets are equal to miscellaneous claims on foreign banking offices minus foreign direct investment in funding corporations and its liabilities are equal to sufficient commercial paper to balance the books.

Business

Our business sector comprises all FFA sectors and groups of institutions not already mentioned. From the point of view of the end-user and, in particular, household positions, it is not important whether an institution is a corporation or not. The nonfinancial business sector thus contains the FFA nonfarm, noncorporate business, farm business, as well as nonfinancial corporate sectors. The distinction between nonfinancial and financial sectors is also immaterial for the end-user calculations, because we cannot distinguish between holdings of financial and nonfinancial equity. However, it is useful for interpreting aggregate redistribution effects caused by indirect nominal positions. The financial business sector contains US commercial banks, other (that is, non-life) insurance companies, closed-end and exchange-traded funds, brokers and dealers, savings institutions, credit unions, the government-sponsored enterprises, finance companies, mortgage companies and REITs. In addition, it contains the general account business of life insurers, and funding corporations that are not foreign-controlled.

We also assign assets and liabilities of federally related mortgage pools to the financial sector. We assume that mortgage pools are financed entirely by pass-through mortgage-backed securities. The assumption of full pass-through implies that shareholders of the financial sector take neither gains or losses on pool mortgages from inflation—any changes

in the value of pool mortgages is born by holders of the mortgage-backed securities. The point of our convention—counting mortgage-backed securities as bonds issued by the financial sector and treating already securitized mortgages akin to non-securitized mortgages held by the financial sector—is to highlight the role of securitization and facilitate our discussion of the distribution of losses.

4 Classification of Assets

We classify balance sheet items into "nominal," "real," "investment intermediary shares," and "equity." We assume that loans and fixed income securities are nominal, unless the Flow of Funds Guide provides information to the contrary. Securities denominated in foreign currency are classified as real. Domestic corporate equity, and ownership of non-corporate business is classified as equity. In what follows, we comment briefly on five sets of claims where classification is not obvious: defined benefit pension assets, asset backed securities, foreign equity positions, foreign deposits, and the FFA's "miscellaneous financial assets and liabilities."

Pensions

We deviate from the FFA in our treatment of defined benefit (DB) pension assets. In the FFA, pension plan holdings are included on the asset side of household balance sheets. With this convention, nominal assets in DB pension plans would contribute to households' nominal position. This would imply that households themselves bear all losses that the pension fund incurs from inflation. In contrast, we view defined-benefit plans as a real tax-transfer system, together with an endowment, the returns on which can be spent on transfers. The plan sponsor (i.e., a firm or a part of the government) is responsible for delivering a real flow of transfer payments. This view seems reasonable given that most plans specify benefits in terms of a replacement rate for wages at retirement. Since wages increase with inflation, future benefits are effectively indexed, at least over the medium run that is of interest to us. In many cases, this is reinforced by explicit inflation protection of payments after retirement.

With this assumption, gains and losses from inflation incurred by the pension funds accrue to the plan sponsor. For a private plan, a shortfall in the endowment due to infla-

tion thus directly hurts the shareholders of sponsoring firm. Similarly, for a government-sponsored plan, the shortfall resembles an increase in net government debt. To capture these redistributions, we make three adjustments to the positions derived from FFA balance sheets. First, we add nominal assets in private DB pension funds to the net nominal position of businesses. Second, we reduce net government debt by nominal assets in DB funds for government employees. Finally, we subtract all pension claims from the asset side of the households' balance sheet.

Asset-Backed Securities

As mentioned in the above discussion of the business sector, we assume that all claims on federally related mortgage pools recorded by the FFA are pass-through mortgage-backed securities. Unfortunately, the FFA do not publish aggregate holdings for securities backed by mortgages in federally related pools. Instead, these securities are subsumed under what the FFA call "government agency bonds." The latter category also contains bonds issued by the government-sponsored enterprises as well as a small amount of bonds issued by various budget agencies. To allocate federally related pool securities to their holders, we assume that a dollar held in the FFA's agency bonds is split between pool securities and other agency bonds proportionately to outstanding quantities.

For the government-sponsored enterprises (GSE), the FFA provide a balance sheet, where the major class of liabilities is agency bonds. Since the GSEs also issue equity, we do not treat their liabilities as pass-through, but instead as corporate bonds. We proceed similarly for other (that is, not federally related) issuers of asset-backed securities. For this sector, the FFA lists assets and liabilities, where the latter consists of both commercial paper and corporate bonds. Since there is no information on what type of loans backs which liability, we simply follow the classification of the FFA. To the extent that asset-backed commercial paper is backed by short term loans such as credit card or trade receivables, this approach effectively treats asset-backed paper as a pass-through security: all short term securities are priced the same way in our setup.

Foreign Equity Positions

The FFA ROW table lists foreigners' portfolio equity positions in the US. We add to this foreign direct investment not in foreign banking offices or funding corporations to define

the ROW's equity holdings. To be consistent with our treatment of equity at market value, we use data on the market value of foreign direct investment from the BEA's International Investment Position, available since 1982. We do not have comprehensive data on dollar denominated claims of foreign corporations. For simplicity, we thus treat foreign equity and foreign direct investment by US investors abroad as entirely real, hence ignoring indirect net nominal positions of US investors through dollar-denominated claims issued by foreign corporations. For our benchmark year 1989 (and more generally all years except the late 1990s), foreign equity holdings are in any case relatively small.

Foreign Deposits

The magnitude of US private deposits abroad has been increasing in the late 1990s, reaching 6% of GDP in 2001. According to BEA data, Eurodollar deposits are a significant share of this total, which suggests that they should be partly counted towards US nominal assets. Unfortunately, the FFA has only scant information on US private deposits abroad. In particular, while these deposits are recorded as a liability of the rest of the world, the FFA does not identify most of the depositors. In 2001, about 90% of all deposits abroad were booked as a 'discrepancy' item, that is, the counterparty to the rest of the world could not be provided. We only know that about 10% are held by money market mutual funds, and that households directly hold a negligible share. The FFA also does not identify the share of US deposits abroad that is denominated in dollars. Given these data problems, our baseline scenario proceeds under the assumption that all unidentified private deposits abroad are real, or denominated in foreign currency.

As a sensitivity check, we have also recomputed positions under the assumption that all foreign deposits are dollar-denominated and held by commercial banks. In the late 1990s, this convention reduces the short-term nominal position of the rest of the world, while increasing that of the domestic financial system. For example, the 2001 net nominal position of the foreign sector falls from 31% to 25% of GDP. In terms of redistribution, the new convention reduces the loss of the foreign sector in the *Full Surprise* case from 14% to 11% of GDP. In the *Indexing ASAP* case, short term deposits are barely affected and the loss remains essentially unchanged at 7% of GDP.

The qualitative facts about positions and redistribution in the 1990s are therefore not altered by the alternative convention. Interestingly, two of our stylized facts become more pronounced. On the one hand, higher short-term borrowing of the foreign sector increases

the maturity mismatch in that sector, thus increasing its vulnerability to gradual inflation episodes. On the other hand, more short-term lending by banks further reduces the maturity mismatch of the domestic financial system. In the text, this trend of the 1990s was already apparent and was mostly due to securitization. In any case, its main effect is to reduce the vulnerability of equityholders to gradual inflation.

Unidentified Miscellaneous Items

In the FFA, unidentified miscellaneous assets and liabilities are residuals that result from subtracting all identifiable categories from total assets and liabilities reported for a given sector. The only sector where unidentified miscellaneous items are substantial is nonfinancial corporate business: in the late 1990s, they account for up to 20% of total assets and liabilities. To get an idea of what is going on, we have examined balance sheets in Compustat, which are available in more disaggregated form than those in the FFA. The Compustat numbers suggest that a large share of unidentified items are accounting items that do not represent claims on another party. For example, goodwill acquired through takeovers or mergers made up 9% of total assets of Compustat Industrial firms in 2000. The revaluation of pure accounting items like goodwill does not lead to redistribution from one party to another, even if the item is nominal.[2] We therefore omit all unidentified miscellaneous assets and liabilities from our calculations.

5 Valuation

We now describe how we estimate the streams of payments for various types of bonds and loans.

5.1 Market Value of Bonds

To construct payment streams for coupon bonds, we need reasonable approximations of the maturity and coupon rate distributions of outstanding bonds at a point in time, in particular for our benchmark years 1989 and 2001. For Treasury securities, the FFA do

[2]Redistribution through the revaluation of goodwill is an issue only if there are nominal rigidities in the tax system, which we are leaving out of this step in our analysis.

not distinguish bills (with maturity of one year or less) and bonds. Since bills make up a large—and changing—fraction of the total, we use data on the maturity distribution of outstanding bonds held by the private sector, available from the US Treasury. For corporate bonds, the situation is different since the FFA do identify short term commercial paper separately. We assume that all new issues have a maturity of 10 years. This number is chosen to be somewhat smaller than the maturity of a typical corporate bond (15 years for privately placed bonds and 18 years for publicly traded bonds, according to Barclay and Smith (1999), in order to accommodate the fact that many corporate bonds are callable. While a more careful modeling of callability may be desirable for other applications, we have found that changing these numbers within a reasonable range do not much affect our redistribution results. Finally, for municipal bonds, which are traditionally long term, we assume that every new issue has a maturity of 20 years.

We use our assumptions about maturity and the series of outstanding face values from the FFA to construct time series for new issues of bonds. To do so, we need to impose initial conditions. We have maturity data for Treasuries since 1967, and we assume that the 1967 maturity structure was being replicated in all earlier years. We also assume that before 1952, where our FFA numbers start, the total outstanding quantity was being replicated for each class of bonds. Starting from the initial distributions of bond vintages, it is then straightforward to recursively calculate series of new issues, every year retiring old bonds and inferring new issues from the change in outstanding face values. With this procedure, initial conditions strongly affect the results in the early years of the sample, and hence may induce some error there. However, their effect diminishes over time. As we move towards 1989, the benchmark year for our calibration, the results are mostly driven by observables.

The next step is to determine the series of future coupon payments for every vintage of bonds. We assume that bonds with maturity longer than one year are issued at par. For Treasuries, where we consider issues of different maturities, we take the coupon rates to be the appropriate Treasury constant maturity yields prevailing in the issue year. For corporate and muni bonds, we set coupon rates equal to the Moody's Aaa rate and the yield on the Fed's index of state and local bonds, respectively. For Treasury securities with maturity equal to one year or less, we assume that they are issued at a discount, and we use the prevailing six month zero coupon yield to discount them. In addition to the above coupon bonds, there is a set of short term liquid assets. The FFA distinguish checkable deposits, time and savings deposits, open market paper, various types of payables

(trade payables, taxes payable etc.), various types of receivables (trade receivables, pension contribution receivables, insurance receivables etc.), as well as security repurchase agreements. We value all of these assets at par.

5.2 Market Value of Mortgages

To estimate payments on mortgages, we use data on mortgage rates, average maturity, the share of adjustable rate loans in new contracts (from the Federal Housing Finance Board, FHFB), as well as the series of outstanding face value for all mortgages (from the FFA). Unfortunately, data on the adjustable rate share in new mortgages are available only starting in 1982. As shown in Figure 1 these data show a high share of adjustable rate immediately after the high inflation experience of the late 1970s and early 1980s, and a steadily decreasing share thereafter. We thus conjecture that the share of adjustable rate mortgages was highly correlated with inflation even before 1982. We postulate the shape indicated in Figure 1: we set the share to its historical low of 12% up to the mid 1970s and let it increase in small steps so that it joins the actual series in 1982. We check this assumption using SCF data on mortgages in our benchmark 1989: we verify that the 1989 share of the face value of ARM mortgages in total face values from our FFA calculation matches the corresponding number calculated from the SCF.

In our calculations, we take the maturity of all new contracts in a given year to be equal to the average maturity reported by the FHFB. We assume that fixed and adjustable rate mortgages are amortized according to the same scheme. At any point in time, every vintage of mortgages is associated with its own current interest rate. When a vintage is created, its current rate is the mortgage rate on new issues from the FHFB. We assume that a vintage is refinanced whenever the market rate on new mortgages drops below the current rate of the vintage, and that refinancing does not change the maturity of the vintage. To determine amortization on outstanding vintages in a given year, we calculate annual mortgage payments for every outstanding vintage using its current rate and remaining maturity. For the given year, amortization is determined as if the current interest rate were in place until maturity. The amortization scheme thus changes with every refinancing.

We check whether our assumptions on refinancing produce sensible results by comparing the distributions of interest rates across vintages with the interest rates reported by the SCF for 1989. Table 5.2 lists mean interest rates and years since the last refinancing for

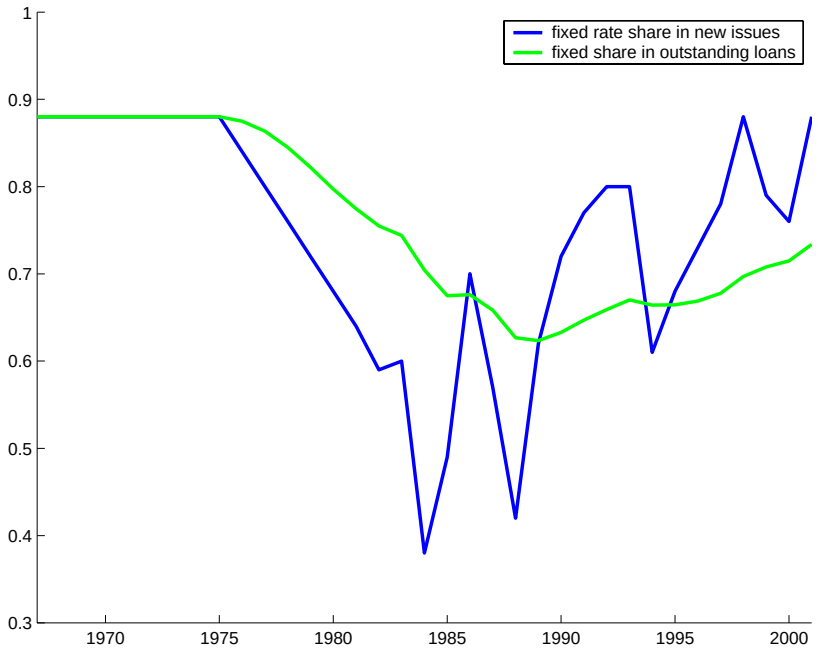

Figure 1: Share of Fixed Rate Mortgages

our middle class cohorts, who are the most important mortgage borrowers. There is some evidence of lower rates on old fixed rate mortgages that were locked in before the high interest period in the early 1980s, as well as on very young mortgages. Nevertheless, all rates are within two percentage points of each other. Our FFA calculation imply a current rate of 9.8% for the 1989 vintage, 9.0% for the 1978-1988 vintages (this the 1987 rate, obtained by refinancing), and slightly lower rates for vintages 1977 and older. While this might understate the rates paid by younger cohorts, probably because we do not take refinancing costs into account, we conclude that our rule does not induce significant bias in valuation.

To construct series of outstanding face values and new issues for both types of mortgages, we again need to impose initial conditions. As for bonds, we assume that 1952 was a 'steady state,' where the outstanding mortgage debt was being replicated, with the same maturity for all new issues, the same mortgage rate, and the same share of adjustable rate contracts. Starting from this initial distribution, we recursively calculate time series for outstanding fixed and floating rate mortgage debt, for each year amortizing all old vintages of mortgages and inferring the quantity of new contracts from the change in total face value. Given series of new fixed rate contracts and mortgage rates, we then calculate, for every year *and every vintage,* the stream of payments yet to be made on the

Age	<35	35-45	45-55	55-65	65-75
Fixed rate mortgage holders					
Year last refinanced	1985	1982	1979	1977	1975
Interest rate	10.3	9.9	9.0	9.0	8.7
AR mortgage holders					
% all par values	32	31	25	20	10
% with 1 yr adj. interval	76	71	60	62	54
Year last refinanced	1986	1985	1984	1985	1978
Original interest rate	9.9	10.6	9.9	10.9	10.4
Current interest rate	8.8	9.3	8.6	10.7	8.7

Table 2: Cohort means of interest rates and year of last refinancing as well as within-cohort share of adjustable rate mortgages in total outstanding par values and within-cohort share of adjustable rate mortgages with a one-year adjustment interval, middle class cohorts, 1989 SCF.

mortgage. The nominal yield curve can again be used to compute the market value of these payments. Since we are assuming that rates are set to keep the market value of adjustable rate mortgages always at par value, the adjustment factor per dollar of face value is simply the sum of the market value of fixed rate loans and the face value of adjustable rate loans, divided by the face value of all mortgages.

6 Nominal Positions by Household Group

We obtain data on the cross section of portfolio holdings from the 1989 and 2001 editions of the Survey of Consumer Finances (SCF). The observation unit in the SCF is a household. In our benchmark year, 1989, the survey covers 3143 households, and weights are provided to produce U.S. aggregates. In all our calculations, we use the weights provided by the SCF to weight observations within an SCF implicate, and we average across the five implicates.

Age and Wealth Groups

We are interested in heterogeneity along three dimensions: age, wealth and use of credit markets. We first sort households into six age cohorts, by age of the household head: under 35, 35-45, 45-55, 55-65, 65-75, and over 75. For each cohort, we refer to the top 10 percent of households by net worth as 'rich' households. The non-rich households are

then sorted by the amount of debt they owe. We refer to those non-rich households whose market value of debt is above the median for non-rich households as the 'middle class,' and to the remainder as the 'poor.'

Table 3 presents summary statistics on the age and wealth groups. The middle class households are indeed richer than the poor in terms of net worth. This motivates the labels. Also, our overall rich group is the union, over cohorts, of the rich group from every cohort, and similarly for the middle and poor households. Since younger households are on average poorer, our rich group is somewhat poorer than the top 10% of the overall U.S. wealth distribution. Nevertheless, the statistics are quite similar.

Age	<35	35-45	45-55	55-65	65-75	>75
NW (mean)	49	162	278	308	291	242
NW (90%)	121	330	546	642	551	396
Size (%)	30	21	15	14	12	8
Rich						
NW (mean)	347	968	1,824	1,919	2,014	1,736
Middle						
NW (mean)	26	100	158	143	128	146
Poor						
NW (mean)	7	42	76	109	97	28

NOTE: Moments of net worth ($000s) and cohort sizes (percent of total population) by age, 1989 SCF.

Table 3: The Rich, the Poor, and the Middle Class

Positions

To aid the calibration of our model, we compute not only household nominal positions, but also equity and durables positions. Table 4 summarizes ownership of these broad asset classes by wealth group in a stylized balance sheet. All positions contain direct holdings as well as indirect holdings through investment intermediaries, and they are derived

from household holdings at market value. We now describe how these positions—as well as the net nominal positions reported in the main paper—are determined.

We group SCF financial asset holdings into seven categories: directly held bonds, directly held equity, money market mutual funds, mutual funds, pension assets, IRAs, life insurance, as well as "various short term assets." The latter category includes checking accounts, saving accounts, and certificates of deposits. We then assume that for every dollar of directly held bonds recorded in the SCF, a household holds the well-diversified portfolio of bonds directly held by the FFA household sector. We thus multiply the individual household's bond position with the appropriate market adjustment factor for bonds. Similarly, for every dollar of claims on a particular type of investment intermediary recorded in the SCF, we assume that the households owns a share in the portfolio held by all intermediaries of that type in the FFA.

We also break down holdings in IRAs using FFA data. The FFA does not provide exact holdings in IRAs, but records assets in these accounts as direct holdings. However, there is a supplemental table that indicates at which institutions the IRAs are held. We assume that accounts held at commercial banks, savings institutions and credit unions are in the form of savings deposits. The bulk of IRA assets are at mutual funds, life insurance companies, or in "other self-directed accounts." We assume that assets at life insurers are part of life insurers' separate accounts and that other self-directed accounts have the same composition as DC pension funds. Given these assumptions and the composition of investment intermediary portfolios, we construct a portfolio of assets corresponding to the average dollar held in an IRA.

To construct equity and durables items, we first define *business wealth* as follows. For businesses in which the household has an active interest, it contains net equity as if the business were sold today, plus loans from the household to the business, minus loans from the business to the household. For businesses in which the household does not have an active interest, business wealth contains the market value of the interest. The fact that loans to and from the business are likely to be nominal could introduce a bias in our exercise, at least for the rich agents who hold most of the business wealth. However, loans to and from a business that is controlled by the household can be renegotiated at little cost. They are thus likely to be state-contingent and work more like equity.

We now define *equity* as the sum of business wealth and both direct and indirect holdings of public equity, while our *durables* item is the difference between all nonfinancial assets

	Assets				Liabilities			
	All	Rich	Middle	Poor	All	Rich	Middle	Poor
Durables	51	39	71	61				
Equity	27	40	10	12				
Nominal	20	21	19	27				
Debt					13	7	30	4
Net Worth					87	93	66	97

NOTE: Selected balance sheet items for whole population as well as Rich, Middle and Poor households, in percent of respective group assets, 1989 SCF.

Table 4: Balance Sheet

recorded by the SCF and business wealth. Combining public equity and business wealth into a single equity position avoids dealing with the different treatment of private equity in the SCF and FFA data. In the FFA, corporate equity contains closely held shares that are not publicly traded, and it is not possible to separate private and public equity. For the purposes of constructing indirect positions in the SCF, we thus use a single leverage ratio λ that is derived after consolidating corporate and noncorporate business. This leverage ratio is a weighted average of the separate ratios used for corporate and noncorporate business in the FFA data. It represents the net nominal leverage ratio of the entire business sector.

7 Reconciliation of FFA and SCF Positions

Our calculation of indirect holdings due to claims on investment intermediaries and equity makes sense only if the aggregate nominal positions in the SCF and FFA data are reasonably close. Antoniewicz (2000) provides a detailed analysis of discrepancies between the two data sets. She suggests a number of adjustments to the FFA numbers, after which the discrepancies for most nominal assets are relatively small. Exceptions are pension assets, time deposits and private equity. The SCF does not provide numbers on DB pension assets. This is natural, since survey respondents usually do not know what these

assets are: they only know contributions and expected benefits. This is in line with our view of DB pensions as a tax system. Our adjustment to the FFA-based calculations described in the previous subsection thus also brings our numbers in line with the SCF. Time and savings deposits recorded by the FFA are usually higher than in the SCF, while at the same time the value of closely held shares is larger in the SCF than in the FFA. This appears to be a general issue that has no obvious explanation, although differences in terms of how assets are attributed to private business versus the respective owners may play a role. In either case, since in our calculations the business sector is consolidated into the household sector, these differences do not change our aggregate numbers as long as both discrepancies are of comparable size. For our base year 1989, the discrepancies are both around $1trn. They thus cancel out and leave overall households assets roughly equal across the two datasets.

Discrepancies in aggregate positions, even if they leave total assets unchanged, will typically change nominal leverage. To obtain consistent results, we thus have two options: We can either adjust the FFA leverage ratio, or the SCF individual NNP (0) positions. Assuming that the FFA numbers are correct is essentially assuming that SCF survey respondents misstated their positions or that the weights designed to make the SCF representative are incorrect. In contrast, assuming that the SCF numbers are correct, is essentially assuming that FFA measurement of business financial assets has problems. Since household positions in the FFA are residuals, this indirectly leads to a mismeasurement of household positions. We adopt the second assumption here. We recalculate households' aggregate net nominal position based only on SCF assets and liabilities. We adjust the positions of other sectors to retain zero net supply of nominal claims. For most FFA instruments, it is straightforward to identify the broad sector that is the counterparty to a households' position. If the counterparty cannot be uniquely identified, we assume that lending and borrowing sectors are matched proportionately. The adjustment leads to changes in the leverage ratio and aggregate net nominal positions, on the order of a few percent of GDP. For this reason, the aggregate positions and redistribution numbers in the tables for 1989 and 2001 do not coincide exactly with their counterparts in the aggregate FFA-based figures.

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