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Institutions and Saving for Retirement
Comparing the United States, Italy, and the Netherlands

Arie Kapteyn and Constantijn Panis

9.1 Introduction

This paper analyzes retirement saving and portfolio choice in the United States, Italy, and the Netherlands. In addition to relying on public retirement provisions, households prepare for retirement through tax-sheltered and after-tax savings. They may invest these funds in a wide variety of assets, including housing, stocks, bonds, savings accounts, and so on. These asset types differ in their risk, return, and liquidity characteristics as well as in their fiscal treatment. Economic theory postulates that households allocate their portfolios according to their risk aversion, time horizon, uncertain out-of-pocket medical expenditures, income risk, informal (family) risk-sharing arrangements, and more. While the literature has tested various parts of the theory, both testing and quantification of the theory are hampered by the fact that some of the major variables do not exhibit sufficient variation within a country to establish their relative importance for portfolio choice, or, more generally, for retirement saving and investment. This paper partially fills that gap by exploring three countries with widely varying institutional arrangements for retirement income.

Portfolio allocation behavior is important for a number of reasons (e.g.,

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Bertaut and Starr-McCluer 2000). Returns vary across asset types, so portfolio composition has important implications for the pace of wealth accumulation and the degree of retirement preparedness; risks vary across asset types, so portfolio composition has important implications for the distribution of retirement income; portfolio decisions illuminate how tax policy affects household spending and saving; portfolio decisions illuminate how macro variables (interest rates, stock prices, inflation, unemployment) affect household spending and saving; also, understanding households' portfolio decisions may provide deeper insight into theories of consumption and saving behavior.

This paper is organized as follows. Section 9.2 poses a brief theoretical framework. Section 9.3 highlights relevant aspects of the legal and institutional environments of the three countries under study. Section 9.4 describes the three countries' microdata that we use. Section 9.5 draws together the theoretical framework and the institutional differences to formulate four hypotheses about expected patterns in the microdata from the different countries. Section 9.6 presents the empirical analysis with particular emphasis on section 9.5's hypotheses. Section 9.7 concludes.

9.2 Theoretical Framework

Our point of departure to study retirement savings is the life-cycle hypothesis (LCH) formulated by Modigliani and Brumberg (1954). The basic tenet of the LCH is that rational consumers will try to smooth consumption over the life cycle in such a way that the marginal utility of consumption is equalized across periods. Since individuals usually have a life-cycle income pattern that is inversely U-shaped (at young ages, earnings are modest but grow until roughly retirement, after which income declines), the life-cycle pattern of wealth is also inversely U-shaped. In its simplest form, sometimes referred to as a "stripped-down" version (Browning and Lusardi 1996), the LCH fails to explain several well-known facts. Several extensions have therefore been introduced. These include the incorporation of uncertainty, bequest motives, borrowing constraints, precautionary motives, transaction costs associated with the reshuffling of portfolios, taxes, and lack of financial sophistication. We draw on several of these extensions below, insofar as they shed light on the portfolios of the (near-)retired. Our interest is primarily in the implications of institutional arrangements for individuals' wealth accumulation and profile.

9.3 Legal and Institutional Environments

Kapteyn and Panis (2002) provide a detailed discussion of legal issues and institutional features that affect retirement income in the United States, Italy, and the Netherlands. This section highlights the features that

are relevant for our purposes. In separate subsections, we highlight the three legs of the proverbial retirement income stool: social security, occupational pensions, and private savings.[1] We then discuss capital market imperfections (transaction costs and liquidity constraints) and exposure to financial risks in retirement.

9.3.1 Social Security

In the United States, social security is mainly provided as Old-Age and Survivors Insurance (OASI).[2] It makes cash payments to retired workers, spouses of retired workers, and widows and children of deceased workers. A separate program, Supplemental Security Income (SSI), makes cash payments to, among others, needy elderly. The Italian social security program, Programma Nazionale di Sicurezza Sociale, makes cash payments to retired workers and widow(er)s of deceased workers; it also guarantees a minimum benefit for the poor. The Italian program does not have a spousal benefit. In the Netherlands, cash payments are made to elderly individuals—regardless of their work history—on the basis of the General Old-Age Act (Algemene Ouderdoms Wet [AOW]). We use the term "social security" to refer to all programs that pay cash benefits to the elderly, regardless of whether the entitlement originates from contributive insurance or social assistance.

All three social security programs are predominantly funded on a pay-as-you-go basis. The United States maintains a buffer in the form of an OASI trust fund. There is no trust fund in Italy. Italian social security outlays currently exceed contributions by about 8–17 percent of payroll (Brugiavini 1999); the difference is funded from general tax revenues. The Netherlands instituted a trust fund in 1996.

In all three countries, participation in social security is mandatory, and coverage is nearly universal. Almost all elderly are eligible to receive some benefits.

Table 9.1 gives an indication of the generosity of social security in the three countries. The first column shows social security expenditures as a percentage of gross domestic product (GDP). Italy spent approximately 15.7 percent of GDP on social security in 1999, far higher than the United

1. Laws and institutions are changing continuously. As a general rule, we describe the status around the time of our household surveys, that is, from roughly 1995 to 1999, and note major changes over time only where relevant. All amounts are in 1998 currencies, unless stated otherwise. We converted all amounts in Dutch guilders (NLG) or Italian liras (ITL) into euros (€) at the exchange rates that were irrevocably fixed at the euro's conceptual introduction in the beginning of 1999: €1 = NLG 2.20371 = ITL 1936.27. On 1 January 1999 the exchange rate of the euro and the U.S. dollar was $1 = €0.857. The dollar exceeded parity with the euro for several years but had returned to its initial level of $1 = €0.857 by June of 2003. For purposes of comparing purchasing power, an exchange rate of one to one is probably a reasonable approximation.

2. Unless noted otherwise, our discussion does not extend to public support for the disabled and their dependents.

Table 9.1 **Social security outlays and dependency ratios**

	(1) Social security outlays as percentage of GDP (1999)	(2) Population age 65+ as percentage of population age 25–64 (1994)	Ratio of (1) and (2)
United States	3.9	24.8	0.156
Italy	15.7	29.6	0.523
The Netherlands	5.0	24.4	0.208

Sources: Board of OASI Trustees (2001); Social Security Administration (2000); Franco (2000); Kapteyn and De Vos (1999); Bureau of the Census (2001).

States (3.9 percent in 2000) and the Netherlands (5.0 percent in 1999). This is in minor part explained by the age structure of its population. The second column shows the elderly dependency ratio, that is, the size of the population that is at least sixty-five years old as a fraction of the working-age population. Italy again tops the list, but the differences are not large.[3] The third column shows the ratio of social security outlays as a fraction of GDP and the dependency ratio. It may be interpreted as a measure of the generosity of each country's social security program. Italy remains far above the other two countries. This is largely because occupational pensions, which play a significant role in the United States and the Netherlands, are negligible in Italy—see below. In addition, until recently, early retirement was very widespread in Italy, especially in the public sector. Several categories of public employees could retire after fifteen to twenty years of contributions. Early retirement essentially increases the dependency ratio.

Social security benefits are paid in the form of a lifelong annuity in all three countries.

In the United States, OASI benefits are a function of historical earnings, retirement age, and marital status. They may be claimed at age sixty-two; delayed claiming results in higher benefits according to a schedule that is roughly actuarially fair. In 2001, average retired worker benefits were $845 per month. Aged couples received an average of $1,410 per month, and single elderly widow(er)s $811. Benefits are adjusted annually for inflation. The replacement rate for unmarried individuals with average wages was approximately 44 percent. The nationwide average replacement rate, including spousal and other derived benefits, was approximately 56 percent in 1995 (Blöndal and Scarpetta 1998). There is no minimum OASI benefit. However, regardless of their earnings history, elderly individuals (and couples) are eligible for a monthly SSI benefit of $530 ($796 for couples).

3. Italy's fertility rate was very low during the 1990s, well below the replacement level. While the dependence ratio is only somewhat larger in Italy than in the United States and the Netherlands, the difference is expected to increase markedly in the future.

In Italy, private-sector workers may retire with full benefits at age sixty (men) or fifty-five (women) or after thirty-five years of social security tax payments, whichever is earlier.[4] For public-sector employees, only twenty (men) or fifteen (women) years of tax payments are required. Benefits are a function of number of years worked and so-called pensionable earnings. For private-sector employees, pensionable earnings are equal to the average earnings of the last five years prior to retirement. (For public-sector employees, pensionable earnings are based on the last paycheck only.) Pensionable earnings are converted into social security benefits by applying a 2 percent factor (referred to as the rate of return) for each year of social security tax payment up to a maximum of forty years (Brugiavini 1999). A worker can thus get at most 80 percent of his pensionable earnings. Earnings that enter the calculation of pensionable earnings are capped. Benefits are therefore also capped, at approximately €6,000 per month in 2000. Contributions are not subject to any maximum. There is no actuarial adjustment for retirement age.[5] There are no spousal benefits in Italy. However, the entire benefit becomes payable to a surviving spouse upon death of the retiree. In 2000, the benefit was never lower than a means-tested minimum benefit of approximately €370 per month. A substantial fraction of retirees receive this minimum benefit. Benefits are adjusted regularly for nominal wages.

In the Netherlands, social security benefit rules are very simple. Earnings history does not play a role: the benefits are almost exclusively a function of marital status and residency history. In 2001, unmarried individuals age sixty-five or older received €883 per month; married couples with both spouses at least age sixty-five received €1,206 per month. Married couples with one spouse below age sixty-five received between €603 and €1,206, depending on the younger spouse's income (Social Insurance Bank 2000). The eligibility age is sixty-five, and there is no provision for early retirement.[6] There is no link between labor force participation and entitlement to social security. The full benefits apply to residents who have lived their entire working life (age fifteen to sixty-four) in the Netherlands; benefits are reduced by 2 percent for every year spent abroad (Kapteyn and de Vos 1999). Benefits are adjusted annually for nominal wage growth.

4. Italian social security benefit calculations changed materially in 1992 and, to a lesser extent, in 1995. The changes will be phased in over a long period. Workers with at least eighteen years of contributions in 1995 will receive benefits computed on the basis of the rules applying before the 1992 reform (Franco 2000). For purposes of our analysis, which focuses on individuals aged fifty and older, the pre-1992 regime therefore applies.

5. The 1992 and 1995 reforms made fundamental changes to benefit calculations. Benefits are now uncapped but progressive, and there is an actuarial adjustment for retirement age. On average, the new rules will reduce benefits by 27–29 percent (Beltrametti 1996; Rostagno 1996).

6. Occupational pensions often offer bridge benefits between the (early) retirement age and age sixty-five.

Table 9.2 **Contribution and replacement rates**

	Contribution rate (% of taxable income)			
	Employer	Employee	Total	Average replacement rate
United States	5.26	5.26	10.52	56.0
Italy	18.93	8.34	27.27	80.0
The Netherlands	0.00	17.90	17.90	45.8

Source: Blöndal and Scarpetta (1998).

Table 9.3 **Importance of occupational pensions (late 1990s)**

	Funds (% of GDP)	Percent of retirees receiving pension	Percent of working population covered
Italy	Negligible	Negligible	0.02
The Netherlands	118	76 (men) 23 (women)	90
United States	66	48 (men) 26 (women)	44

Source: Johnson (1999).

Table 9.2 summarizes social security contribution rates and average replacement rates for the three countries. The replacement rates are the average over four scenarios and may therefore differ from the average nationwide replacement rates.[7]

9.3.2 Occupational Pensions

Occupational pensions are retirement income schemes that are sponsored by employers. The United States, Italy, and the Netherlands vary widely in the role of occupational pensions. They are widespread, well funded, and generous in the Netherlands; largely immaterial for most Italians (except for so-called severance pay arrangements; see below); and on roughly equal footing with social security in the United States. Table 9.3 shows pension assets as a percentage of GDP, the percentage of retirees with any pension benefits, and the percentage of the working population that is covered by a pension plan.

Traditionally, employer-sponsored pensions in the United States have been of the defined benefit (DB) type. The plans are specific to individual employers, not to industry groups—such as is mostly the case in the

7. The replacement rates are computed as averages of four scenarios: two earnings levels (average and two-thirds of average), and two household compositions (single worker and worker with a dependent spouse). The earnings profile is assumed to be flat, and earnings are revalued according to changes in average earnings. The rates refer to basic pensions, means-tested supplements, and mandatory occupational pensions only. See Blöndal and Scarpetta (1998).

Netherlands.[8] Given that there are tens of thousands of different plans, their features vary widely. Portability is very limited. The benefit is typically fixed in nominal terms upon job separation. An increasing fraction of DB plans—64 percent in 1993—offers the option of a lump-sum distribution upon job separation (Scott and Shoven 1996). Workers who take that option may leave the distribution tax-sheltered by investing it in an individual retirement account (IRA) or they may cash it out (Hurd, Lillard, and Panis 1998).

In 1978, 38 percent of American workers were covered by a DB pension, compared to only 21 percent in 1997 (Department of Labor 2001). Instead, defined contribution (DC) plans are becoming more widespread (up from 7 percent in 1978 to 25 percent in 1997). Under DC plans, retirement income depends on the level of contributions and the rate of return earned on those contributions. Workers typically decide on the allocation on their plan balance and bear the investment risk.

In Italy, the social security program was traditionally intended to provide comprehensive retirement income. In light of its social security program's dire financial outlook, Italy established DC pension plans in 1992. These plans are still in their infancy. As of March 1999, only approximately 400,000 workers were enrolled in a DC plan, and total assets represented only 0.015 percent of GDP (Banca d'Italia 1999). With few exceptions, there are no DB plans.

While not strictly a pension plan, so-called severance pay arrangements have long played an important role in Italian retirement income security. They are somewhat similar to DC plans but are paid out upon job separation, regardless of age. Employers contribute 6.9 percent of workers' wages into a self-administered fund (Franco 2000). Workers earn a legally determined return on those funds of 1.5 percent plus three-fourths of the inflation rate. While this severance entitlement is accruing, the worker has a secure but uncollectable credit with his employer, who retains full discretionary powers over the funds (Franco 2000). Upon job separation, there is a lump-sum severance payment. Severance pay credits comprised 5.2 percent of household financial wealth in 1997 (authors' calculations, based on the 1998 Survey of Household Income and Wealth [SHIW]).

In the Netherlands, occupational pensions are widespread and large. Plans are organized by industry sectors and administered by industrial organizations. Virtually all pensions are DB pensions. They are easily ported across employers. If a worker's previous and new employers belong to the same industrial organization, portability is merely an administrative issue. If the employers belong to different industrial organizations, the plan administrators settle internally such that the previous administrator dis-

8. The Pension Benefit Guaranty Corporation, a federal agency, guarantees pension payments to retirees whose pension plan ended.

Table 9.4 **After-tax median replacement rates**

	Replacement rate
Italy	75
The Netherlands	91
United States	41

Source: Gruber and Wise (1999).

burses a lump sum to the new administrator. The employee receives credit for accumulated pension rights as part of the new pension.[9] All benefits are paid in the form of a lifelong annuity; lump-sum distributions upon job termination are not allowed.

Of course, what matters for individual households is the combined replacement rate resulting from the combination of social security and occupational pensions. Table 9.4 provides an estimate of the after-tax replacement rates in the three countries for a typical (median) household. Clearly, the replacement rate is highest in the Netherlands and lowest by far in the United States.[10] Based on microdata from the three countries, we calculate and report below an alternative measure of replacement rate.

9.3.3 Private Savings

In addition to claims on social security and occupational pensions, individuals build up private savings to support them during retirement. Private savings may take many forms. They may be held in financial instruments, in real estate, or other. They are not restricted to after-tax funds. Specifically, we include IRAs, universal life insurance, and similar tax-sheltered accounts among private savings. The largest differences in private saving across the United States, Italy, and the Netherlands lie in opportunities to save in tax-sheltered instruments.

Americans may accumulate retirement savings in IRAs. Individuals may contribute up to $2,000 annually to IRAs.[11] In traditional IRAs, contributions are tax deductible; distributions (including interest) are taxed at the time of the distribution. Contributions are fully tax deductible only for per-

9. For example, suppose someone worked for twelve years under a plan that promises a benefit equal to 1.5 percent of last earned salary for every year worked. His new plan promises 2.0 percent of last earned salary per year worked. The worker receives credit in his new plan for $(12 \cdot 1.5)\ 2.0 = 9$ years of work, as if those years were worked at the new employer under the new pension plan.

10. There are many ways to calculate replacement rates. Table 9.4 is therefore not directly comparable to table 9.2. However, within each table, the rates are computed in the same manner.

11. Individuals who separate from a job with a pension plan may often take a lump-sum distribution of their pension rights. Such distributions may be rolled over into an IRA and remain tax sheltered. There is no limit on the amount that may be contributed to IRAs in this manner.

sons whose income falls below certain phaseout levels, which depend on whether the person is covered by an occupational pension. Since 1997, so-called Roth IRAs allow for after-tax contributions; distributions (including interest) are tax-free. By the end of 1999, the assets in IRAs amounted to $2.47 trillion (Copeland 2001). By comparison, assets of private DB and DC pension plans amounted to $2.14 trillion and $2.53 trillion, respectively (Federal Reserve 2001).

There is no Italian equivalent of IRAs. However, all Italians are eligible for universal life insurance contracts that are hybrids of term life insurance and savings plans: they pay out a benefit upon death or reaching a specific age, whichever comes first. The general principle of taxation on these contracts is very favorable: both contributions and benefits are partially tax exempt. The value of such life insurance contracts comprised 5.5 percent of household financial wealth in 1997 (authors' calculations, based on the 1998 SHIW).

The situation is similar in the Netherlands. Dutch law does not recognize IRAs but offers tax advantages for universal life insurance policies. The limit up to which contributions are tax deferred has fluctuated widely. Prior to 1992 the limit was €7,300, fixed in nominal terms. In 1992 the limit was lowered. For the year 2000 it was €5,600 for a married couple. (Starting in 2001 the limit is lower yet, at only €1,000; it is higher for individuals with income over which no pension rights are accumulated, such as the use of a company car.) Dutch universal life insurance payments must take the form of a lifelong or fixed-term annuity. The annuity benefits are subject to income tax.

Rates of return in the stock market have varied substantially across the three countries. Consider the Morgan Stanley Capital International (MSCI) index, representative of large companies and computed consistently over time and across countries. Between 1970 and mid-2001, the overall annual rate of return, including reinvested dividends, was highest in the Netherlands (13.8 percent nominal, 10.9 percent real), followed by the United States (11.9 percent nominal, 8.3 percent real), and Italy (11.2 percent nominal, 2.3 percent real). The Italian market exhibited markedly more volatility. For example, the standard deviation of annual nominal returns in Italy was 34.4 percent, compared to 16.6 percent in the United States and 21.7 percent in the Netherlands.

9.3.4 Capital Market Imperfections

Access to capital markets for households varies across the three countries. We discuss housing transactions, mortgages, and transaction costs of stock purchases.

Transaction costs of housing in the United States consist largely of real estate agent fees (approximately 6 percent of the house price) and legal fees (roughly 2 percent). Transfer taxes are negligible in most areas. In the

Netherlands, transaction costs are largely real estate agent fees (typically 1.5 percent of the house price) and a transfer tax of 6 percent. Legal fees are minimal by comparison. House transaction costs are higher in Italy than in the United States and the Netherlands. Real estate agent fees are 8–10 percent, and a transfer tax of 6–7 percent applies.

There is a well-developed mortgage market in the United States, including a standardized secondary market. Buyers may choose variable or fixed interest rate loans of up to thirty years' maturity. The typical down payment is 10 or 20 percent of the value of the house, but full financing is available. Interest payments are generally fully deductible for income tax purposes. The mortgage market is much less developed in Italy, perhaps due to banks' limited ability to sell the house in case of default on mortgage payments. Anecdotal evidence suggests that the associated legal proceedings may take as long as ten years. Banks therefore typically require a down payment of 40 to 50 percent of the price of the house. In the Netherlands the mortgage market is well developed, with a wide variety of loan options available. Many mortgage products are tied to universal life insurances, largely to take maximal advantage of the tax deductibility of mortgage interest. In principle, there are no down payment requirements. To cover the transaction costs of buying a house, mortgages of up to 110 percent of the transaction price are available and common. In 1998, per capita mortgage debt in the United States ($15,421) and the Netherlands (€14,167) was almost identical, and about ten times as large as in Italy (€1,415) (De Nederlandsche Bank 2000; Federal Reserve 2001).

The three countries may also face different transactions costs for the purchase and sale of stocks. An informal Internet search in March 2002 revealed roughly comparable fees for unassisted stock transactions via online brokers. In the United States, E-Trade (us.etrade.com) charges $14.95–19.95 per transaction, and Charles Schwab (www.schwab.com) charges $29.95 for up to 1,000 shares. In the Netherlands, Robeco (www.robecodirect.nl) charges 0.3–0.4 percent of the total transaction, often with a €15 minimum. In Italy, Twicetrade (www.twicetrade.it) charges €12 plus the lower of €0.019 per share and €19. The differences are not large. However, they reflect current online trades only. Actual average commissions during our analysis period (mid- to late 1990s), when online banking was far less developed, are likely much higher. We do not have comparable information on trends in transactions costs.

9.3.5 Exposure to Financial Risks Before and After Retirement

We now turn to financial risks before and after retirement. Before retirement, the main source of financial risk is earnings uncertainty. Casual observation would suggest that in the United States, earnings uncertainty is considerably larger than in Italy or the Netherlands. Social insurance programs (unemployment, sickness, disability) in the two European coun-

tries are generally more generous than in the United States, and employment protection laws make it relatively hard to fire employees in Italy and the Netherlands. An interesting piece of direct evidence on earnings uncertainty comes from a common question asked in household surveys in the three countries. The question asks respondents directly for the amount of income uncertainty they face. Guiso, Jappelli, and Pistaferri (1999) analyzed the coefficient of variation of income uncertainty for the United States, the Netherlands, and Italy. They found that income uncertainty across respondents had about the same distribution in Italy and the Netherlands. By contrast, U.S. respondents reported much more income uncertainty than the respondents in the two European countries.

Loss of earnings due to disability is another important financial risk before retirement. In all three countries, workers may count on long-term disability insurance in case of disability. Generally, public disability insurance schemes are more generous in Italy and the Netherlands than in the United States. In many cases, workers are covered by private disability insurance in all three countries.

After retirement, the main source of financial risk is health related. Americans face greater risks of large out-of-pocket medical expenses than their Dutch or Italian counterparts. In the Netherlands, virtually all elderly are covered by comprehensive health insurance with negligible out-of-pocket expenses. In Italy, the public health system grants essentially free assistance to the entire population in case of illness. However, only inpatient assistance is provided, implying substantial out-of-pocket expenses for the elderly in case of a serious illness that requires little hospital care. In the United States, the elderly may face serious out-of-pocket medical expenses, depending on their insurance coverage. Elderly with low income and financial assets are typically eligible for Medicaid, which offers fairly comprehensive insurance, including for deductibles. The risks are also limited for elderly that are covered by both private health insurance and Medicare, a public health insurance program for the elderly and disabled. However, American elderly who rely only on Medicare face substantial risks of large out-of-pocket expenses. Medicare consists of two components. Coverage for part A is almost universal; it covers inpatient expenses in hospitals and skilled nursing facilities. Most elderly also have supplemental (part B) coverage, purchased at subsidized rates. Medicare requires copayments that can be substantial, especially in the case of long hospital stays.

9.4 Data

Our analysis is based on microdata on individuals aged fifty and older from each country. For the United States, we use the Health and Retirement Study (HRS); for Italy, the SHIW; and for the Netherlands, the SocioEconomic Panel (SEP). We briefly describe each survey.

For the United States, we use the HRS, including all its cohorts. The HRS is a national longitudinal sample of households with at least one person born in 1931–41 (fifty-one to sixty-one years old at the 1992 baseline) or 1923 or before, that is, with at least one person aged seventy or over in 1993. The 1998 interview added the 1924–30 and 1942–47 birth cohorts, so that the most recent data cover all individuals over age fifty. We use the 1998 data and rely on other waves (1992–2000) where longitudinal information is needed. The principal objective of the HRS is to monitor economic transitions in work, income, wealth, and changes in health status. The first wave of data was collected in 1992 (1993 for the pre-1923 birth cohort), with follow-ups fielded at approximately two-year intervals. Blacks, Hispanics, and Florida residents were oversampled at a rate of two to one. The 1998 HRS contained 21,351 respondents: 8,949 men and 12,402 women.

The main wealth data for Italy is the SHIW, collected by the Banca d'Italia, Italy's central bank. Its main purpose is to collect detailed data on demographics, household consumption, income, and balance sheets. This survey is representative of the Italian population and has been fielded biannually since 1984. Financial wealth data have only been publicly available since 1989. Beginning in 1989, some but not all of the households were re-interviewed in subsequent panels. The panel component has increased over time—in 1989, 29 percent of the households were re-interviewed and by 1995, 45 percent were re-interviewed. The sample size is about 8,500 households. The SHIW contains questions on detailed asset and debt categories.

For the Netherlands, we rely on the SEP, a representative panel survey conducted by Statistics Netherlands. The SEP covers about 5,000 households and is representative of the noninstitutionalized Dutch population. It contains detailed information about a number of household demographic characteristics and collects data on household income and wealth. The SEP has been collected annually since 1984. It is a panel data set. Since 1987, the SEP contains a wealth module with fairly detailed questions on asset and debt categories. These categories have varied somewhat during the course of the panel. Because of problems collecting the data, no asset and debt information has been collected on the self-employed since 1990. In 1997, the SEP contained 8,904 respondents: 4,385 men and 4,519 women.

9.5 Method and Hypotheses

The aim of this paper is to exploit institutional variation across countries to shed light on the effect of different policies on the wealth accumulation and portfolio choices of households near or in retirement. Since, at this stage, we are only considering three countries, we have in a sense only three

data points to generalize from. Thus, if we were to take a completely atheoretical approach we would have very few degrees of freedom to establish any empirical regularity with reasonable confidence. We therefore take a different approach. Drawing on the theoretical framework of the life-cycle hypothesis and the description of institutional differences across countries we formulate a number of stylized predictions, which are next confronted with the data at hand. The more these predictions are corroborated by the microdata, the more confident we can be that the policies in the different countries help explain the differences in wealth accumulation and portfolio composition that we observe.

An important caveat in our analysis will be that we generally assume that policies are exogenous. Thus, for example, we exclude the possibility that social security benefits are generous because citizens of a country have an innate tendency to save too little for retirement.

We briefly characterize a number of stylized facts that we expect to hold in the microdata across the three countries as a result of their institutional differences and the theoretical framework. We formulate our "predictions" as rather informal hypotheses, with generally a ceteris paribus clause to account for other counteracting institutional effects.

Hypothesis 1: The Displacement Effects of Retirement Benefits

A straightforward implication of the LCH is that more generous retirement benefits will induce less saving for retirement. We will therefore consider replacement rates at retirement in the three countries and predict that the country with the lowest replacement rate will be the country with the highest saving rate, ceteris paribus. Based on the discussion above we expect retirement savings to be most prominent in the United States and least prominent in the Netherlands, at least at the median.

Hypothesis 2: The Role of Earnings and Consumption Uncertainty

The LCH, extended to incorporate uncertainty, predicts that the introduction of additional uncertainty increases an agent's saving if and only if the agent is "prudent" (Kimball 1990; Gollier 2001).[12] Empirical work suggests that generally an increase in risk leads to more saving, but the estimated magnitude varies considerably across studies (e.g., Dynan 1993; Guiso, Jappelli, and Terlizzese 1992; Lusardi 1997; Hubbard, Skinner, and Zeldes 1994a,b, 1995; Banks, Blundell, and Brugiavini 2001).

Saving for precautionary reasons should be most prominent in a country with the highest earnings uncertainty. We will invoke subjective infor-

12. A necessary and sufficient condition for prudence is that an agent's marginal utility of future consumption is convex (Gollier 2001, Proposition 60). Prudence is related to, but is not the same as, risk aversion. A consumer is prudent if absolute risk aversion is decreasing in wealth; in the special case of constant relative risk aversion, (relative) prudence is equal to (relative) risk aversion + 1.

mation on earnings uncertainty to support the assumption that earnings uncertainty is highest in the United States and hence that we would expect to have the highest level of precautionary saving in the United States, again under ceteris paribus conditions. In addition to earnings uncertainty, consumption uncertainty may be important as well. A prime example of consumption uncertainty would be the possibility of unforeseen large out-of-pocket medical expenses. It appears that this kind of consumption risk is considerably larger in the United States than in Europe. Hence, even after retirement, when earnings uncertainty presumably does not play a role anymore, we would still expect precautionary motives to lead to a stronger desire to hold bequeathable wealth in the United States than in Italy or the Netherlands.

Hypothesis 3: The Role of Capital Market Imperfections

In the basic, stripped-down version of the LCH, consumers may be borrowing to finance consumption at a young age and enter middle age with negative wealth. Only after earnings exceed optimal lifetime consumption will saving become positive. Clearly such a pattern will not be observed if capital market imperfections prevent substantial borrowing at young ages. A point in case is the possibility to obtain home mortgages. As observed above, the typical minimum down payment requirement in the United States is 10–20 percent. In Italy the minimum down payment is on the order of 40–50 percent. In the Netherlands one can buy a house with a negative down payment up to 10 percent (i.e., one can borrow 110 percent of the market value of the house). Aspiring homeowners will thus need to save the most in Italy and the least in the Netherlands. From a liquidity constraints perspective, the risk of an adverse income shock yields the same result. Without liquidity constraints, the consumption effects of an adverse income shock may be spread out over many periods by borrowing to pay for current consumption and reducing consumption in all future periods by a little bit, rather than immediately cutting consumption by the total shortfall in income. Liquidity constraints limit the possibility to spread out the consumption shortfall over many periods. The only way to reduce the risk of such a forced reduction in consumption is to save more. Savings then act as a "buffer stock" (Deaton 1991; Carroll 1992, 1997). Liquidity constraints thus increase saving, even if they are not binding in the current period.

Differences in capital market structure in the three countries thus predict that Italy should have the highest saving rate and the Netherlands the lowest. In addition, when considering net household wealth, Italy should be the country where net wealth, as a percentage of gross wealth, is highest.

Hypothesis 4: Portfolio Composition

The preceding hypotheses imply higher levels of private wealth in Italy and the United States upon retirement than in the Netherlands. The implications for stock ownership and the share of wealth that is held in stocks

are not clear-cut. Standard theory predicts that all agents should invest at least some fraction in stocks. The data clearly do not support this prediction, possibly because of the cost of acquiring information about stocks, transaction costs, and minimum investment requirements (Haliassos and Bertaut 1995; Vissing Jørgensen 2000). Standard theory further predicts that, under the usual assumption of constant relative risk aversion, the share of risky assets does not vary with wealth. However, economies of scale in portfolio management costs would induce a positive correlation between the share of risky assets and wealth. Empirically, people with more wealth own more risky assets, such as stocks (e.g., Hochgürtel 1998; Barsky et al., 1997; Carroll 2001; Hurd 2001).

The above suggests that stock ownership in Italy and the United States should be higher than in the Netherlands. On the other hand, the less well-developed capital market in Italy may reduce stock ownership in Italy. Similarly, the existence of more earnings and consumption uncertainty (e.g., medical expenses) in the United States may depress stock ownership in favor of more secure assets. We hypothesize that stock ownership in the Netherlands will be the lowest among the three countries, because of the lowest level of private wealth. In the United States, the combination of a well-developed capital market and a high level of private wealth for retirement and precautionary purposes should induce a relatively high level of stock ownership.

9.6 Empirical Analysis

We begin by presenting a number of relevant descriptive statistics for the three countries. We then discuss the evidence in favor of (or against) the hypotheses we have formulated above. Most of the analyses are in simple tabular form, with sometimes an excursion to multivariate analyses.

9.6.1 Descriptive Statistics

For Italy and the Netherlands, we restrict our analysis to households with a head over age fifty. For the United States, we consider the entire 1998 HRS, representative of the population age fifty-one and older. Table 9.5 presents data for 1998 for the United States and Italy and 1997 for the Netherlands. The table indicates that the age distributions in the three countries are very similar, with samples roughly equally split between heads of household under and over age sixty-five. Italian and Dutch respondents are somewhat more likely to be married than American respondents. Based on the educational distributions reported in table 9.5, U.S. respondents appear to be somewhat better educated than their Italian and Dutch counterparts. The comparison should be interpreted with caution, though, because the schooling systems differ greatly across the three countries.

The mean noncapital after-tax household income in the United States was higher than in Italy and the Netherlands, whereas median income was

Table 9.5 Demographics and income (unit of observation: household)

	United States	Italy	The Netherlands
Number of households	14,147	4,200	1,487
Age household head			
50–59	35.1	38.0	33.0
60–64	13.7	16.8	15.4
65+	51.2	45.2	51.6
Household structure			
Couple	53.4	67.4	60.8
Single male	11.1	8.8	10.6
Single female	35.5	23.8	28.7
Education household head			
Elementary	33.0[a]	51.8	30.6
Some high school		24.8	18.4[b]
High school	29.2	16.5	32.2[c]
Some college	37.8	7.0	18.8[d]
Household noncapital income			
Mean	$26,500	€24,000	€24,600
Median	$18,800	€20,400	€21,300

[a]less than high school
[b]lower vocational/junior high school
[c]middle vocational
[d]at least high school

lower.[13] The pattern reversal reflects a more equal income distribution in Italy and the Netherlands compared to the United States.

Our hypotheses are couched in terms of accumulated savings and allocation into risky assets. Given the information in the microdata, we define risky assets as stock and bond holdings. An intuitive measure of risky asset allocation is the ratio of risky assets to net worth. Unfortunately, nonnegligible subsamples report zero or negative net worth, so that the ratio of risky assets to net worth cannot be determined or is very difficult to interpret. Instead, we define two related measures. Consider households' balance sheets in table 9.6.

We decompose the ratio of risky assets to net worth as follows:

$$\frac{R}{\mathrm{NW}} = \frac{R}{\mathrm{GW}}\frac{\mathrm{GW}}{\mathrm{NW}} = \frac{\frac{R}{\mathrm{GW}}}{\frac{\mathrm{NW}}{\mathrm{GW}}} = \frac{\text{Exposure}}{\text{Solvency}}.$$

13. The American HRS collects gross income data, whereas the Italian SHIW and Dutch SEP ask for after-tax income. We estimated tax liabilities to convert the American income data to be net of taxes. Since the state of residence and many financial details are unknown, we assume standard deductions and account for federal taxation only. This includes federal income tax and Federal Insurance Contributions Act (FICA) liabilities. Incomes after state income tax, where applicable, are therefore slightly lower than reported in table 9.5.

Table 9.6 Stylized household balance sheet

Assets		Liabilities	
Safe (cash, savings accounts)	S	Net worth	NW
Risky (stocks, bonds)	R	Debts (mortgage and other)	D
Gross housing (housing equity + mortgage debt)	H		
Other	O		
Gross wealth	GW	Gross wealth	GW

Very few respondents report having no gross wealth at all. Both *exposure,* defined as the ratio of risky assets to gross wealth, and *solvency,* defined as the ratio of net worth to gross wealth, are therefore straightforward to construct.

Table 9.7 characterizes the size and composition of bequeathable household wealth in the three samples. The American and Italian figures are based on 1998 HRS and SHIW, the Dutch on the 1997 SEP. As predicted, the Netherlands has by far the lowest level of private household wealth, both in the mean and in the median. Partly this reflects the lower home ownership rate in the Netherlands for these older cohorts. Stock or bond ownership is highest in the United States (33 percent) and lowest in the Netherlands (19 percent). Following table 9.6, we aggregated assets in four broad categories: (a) safe assets (saving and checking accounts, cash); (b) risky assets (stocks and bonds); (c) housing and other real estate; and (d) other. Since the Dutch sample excludes the self-employed, we have excluded business equity in all countries. U.S. households clearly hold the most risky assets, both in absolute value and as a fraction of gross wealth. Dutch households hold more of their gross wealth in safe assets than the Americans and Italians. Again, this partly reflects the lower home ownership rate in the Netherlands for this age group. In both the United States and the Netherlands, the share of risky assets increased between 1992 and 1997–98 (not shown). The average solvency ratios are large and negative in the United States and Italy, because the ratios are dominated by households with negative net worth that is large relative to their reported gross wealth.

9.6.2 Empirical Evidence for the Hypotheses

Hypothesis 1: The Displacement Effects of Retirement Benefits

Although we have provided some evidence that replacement rates at retirement are lowest in the United States and highest in the Netherlands, it is useful to exploit our microdata to shed further light on this. The replacement rates given in section 9.3.2 were based on hypothetical (median) individuals in the three different countries and on plausible institutional

Table 9.7 Assets and asset allocation (unit of observation: household)

	United States	Italy	The Netherlands
Gross wealth			
Mean	276,200	168,100	95,300
Median	130,000	96,500	45,200
Net worth			
Mean	253,400	166,200	79,300
Median	105,000	95,000	33,500
Owns house (%)			
Mean	76.8	71.8	46.5
Median	100	100	0
Owns stocks/bonds (%)			
Mean	33.0	26.8	18.7
Median	0	0	0
Exposure (R/GW)			
Mean	0.079	0.051	0.039
Median	0	0	0
Solvency (NW/GW)			
Mean	–51.8	–18.3	0.62
Median	1	1	1
Housing equity (if owner)			
Mean	128,200	121,800	111,600
Median	95,000	100,000	95,800
Stocks/bonds (if owner)			
Mean	169,500	54,483	45,700
Median	45,000	20,000	16,900
Portfolio shares (%)			
Safe (S/GW)			
Mean	20.4	29.4	43.4
Risky (R/GW)			
Mean	7.9	5.1	3.9
House (H/GW)			
Mean	45.6	53.2	38.6
Other (O/GW)			
Mean	26.0	12.3	14.0

Note: Monetary values in $ for the United States and in € for Italy and the Netherlands.

parameters. Here we take a different approach. We exploit the longitudinal nature of the data to consider incomes in the waves before and after a respondent first reports being retired to gauge the actual change in income experienced by those who retire. For example, if someone first reports being retired in 1994, we consider incomes as reported in 1993 and 1995. (In the American HRS and Italian SHIW data, the waves are two years apart, except three years for the 1995–98 SHIW.) This approach avoids contamination from part-year employment. We consider *household* noncapital income before and after *individual* retirement. This assumes resource sharing within a household, so that, for instance, a transfer of resources by other household members compensates for a drop in the new retiree's income.

Table 9.8 **Empirical replacement rates, wealth accumulation, and income growth in the United States**

	N	Mean	10th percentile	Median	90th percentile
Newly retired					
Preretirement household noncapital income	1,953	36,600	6,900	30,600	69,500
Postretirement income	1,797	26,100	6,500	21,200	47,300
Postretirement income + annuity value of wealth	1,797	44,100	9,000	34,100	83,100
Replacement rate (%)	1,749	147.1	28.7	75.7	175.2
Generalized replacement rate[a]	1,749	261.0	47.6	111.4	271.6
Not newly retired					
Noncapital household income $t-2$	29,442	36,800	7,000	30,000	69,200
Noncapital household income $t+2$	28,894	35,900	6,300	29,500	68,700
Income ratio $(t+2)/(t-2)$ (%)	19,463	213.1	33.5	97.8	179.6
Newly retired					
Preretirement household net worth	1,982	215,200	1,100	115,600	491,600
Postretirement household net worth	1,815	254,900	1,000	124,700	594,500
Wealth growth (%)	1,746	41.9	–85.1	2.2	169.0
Not newly retired					
Net worth $t-2$	29,735	246,400	2,500	113,200	552,200
Net worth $t+2$	29,204	267,700	3,200	119,900	588,000
Wealth growth (%)	19,936	114.3	–83.2	6.6	192.8

Note: N = number of observations.

[a]Postretirement noncapital household income + annuity value of wealth divided by preretirement noncapital household income. The annuity value assumes a 3 percent interest rate.

This assumption acknowledges the joint nature of retirement decisions (e.g., Zweimüller and Winter-Ebmer 1996; Gustman and Steinmeier 1994; Maestas 2001). Finally, we consider after-tax income,[14] expressed in constant 1998 dollars.

The top panel of table 9.8 presents empirical after-tax replacement rates for the United States based on the 1992–2000 HRS. The table compares incomes in the wave before retirement and the wave after retirement,[15] that is, at $t-2$ and $t+2$. Postretirement income is substantially lower than preretirement income, both in the mean and the median.[16] The average re-

14. See note 13.

15. For the United States and Italy, retirement is defined based on respondent's own report of (complete) retirement status. For the Netherlands, retirement is defined as receiving some form of income transfer (pension, disability, or unemployment benefits), being over fifty years old, and not doing any work for pay.

16. In order to exploit the longitudinal feature of the HRS, the sample consists of original HRS respondents, that is, those born in 1931–41 and their spouses. The sample is thus younger than the sample used in table 9.5, which included all HRS cohorts. This explains why mean and median income levels in table 9.8 exceed those in table 9.5.

placement rate is well above unity, but this is driven by a small number of respondents with particularly low preretirement income. The median replacement rate is 75.7 percent. There is large variation: at the 10th percentile, income dropped by three-quarters after retirement, whereas it increased by three-quarters in real terms at the 90th percentile.

To put these findings in perspective, compare the income changes between the year before retirement and the year after retirement with income changes of individuals who did not retire (i.e., who worked in years $t-2$, t, $t+2$, or who were retired in all three waves). We observe that the latter individuals also experienced a decline in real income, at least at the median. The decline in income is far smaller at the median (2.2 percent) than the median decline among newly retired individuals (24.3 percent).

The replacement rate improves if we assume that individuals who retire can annuitize their wealth and consume the annuity. Adding the annuity value of bequeathable wealth to postretirement income, possible consumption levels exceed preretirement income for most households. We define the generalized replacement rate as the sum of postretirement income and annuity value of private wealth divided by preretirement income. At the median, the generalized replacement rate is above one (111.4 percent). Even at the 10th percentile, postretirement consumption may be sustained at almost half the level of preretirement income.

The bottom part of table 9.8 presents a similar analysis for household net worth around retirement and compares changes to wealth changes of households in which no retirement takes place. Most households experience wealth growth, but wealth grows somewhat faster for households who do not have a recently retired member. At the median, the increase is 2.2 percent among households that transitioned through retirement and 6.6 percent among those who did not.

Similar to table 9.8, table 9.9 documents income replacement rates, wealth accumulation, and income growth in Italy, based on 1987–98 data. Table 9.8 was in 1998 dollars; table 9.9 in 1998 euros. As in the United States, real household noncapital income tends to drop after retirement. However, the declines are milder. At the median, postretirement Italian household incomes replace 85.9 percent of preretirement income, about 10 percentage points above the median U.S. replacement rate. While there is substantial variation, the differences are smaller than in the United States. For example, at the 10th and 90th percentile, postretirement incomes are about 50 percent below and above their preretirement levels, compared to three-quarter differences in the United States. At the median, real incomes among households that did not transition through a retirement remained almost exactly constant. Naturally, the replacement rates increase when including the annuity value of net worth. The median generalized replacement rate for new retirees in Italy is 124.5 percent, again greater than in the United States (111.4 percent).

Table 9.9 Empirical replacement rates, wealth accumulation, and income growth in Italy

	N	Mean	10th percentile	Median	90th percentile
Newly retired					
Preretirement household noncapital income	402	33,800	15,300	30,150	55,300
Postretirement income	402	30,300	11,600	26,150	51,800
Postretirement income + annuity value of wealth	402	46,100	14,000	39,100	79,500
Replacement rate (%)	402	97.3	49.1	85.9	147.5
Generalized replacement rate[a]	402	143.7	65.5	124.5	231.9
Not newly retired					
Noncapital household income $t-2$	5,682	25,300	9,800	21,500	45,100
Noncapital household income $t+2$	5,682	26,000	9,600	21,400	46,300
Income ratio $(t+2)/(t-2)$ (%)	5,673	112.0	57.9	100.8	170.0
Newly retired					
Preretirement household net worth	402	187,200	7,700	122,650	435,200
Postretirement household net worth	402	225,000	11,100	153,650	515,400
Wealth growth (%)	398	320.8	–68.4	24.0	350.6
Not newly retired					
Net worth $t-2$	5,682	154,600	3,800	87,900	350,600
Net worth $t+2$	5,682	189,900	4,400	110,000	431,500
Wealth growth (%)	5,595	305.2	–73.3	14.5	373.2

Note: N = number of observations.

[a]Postretirement noncapital household income + annuity value of wealth divided by preretirement noncapital household income. The annuity value assumes a 3 percent interest rate.

Italian households enjoyed greater wealth gains than American households during the mid- and late 1990s. At the median, net worth among households with a new retiree increased by 24 percent. This gain exceeds the gain among households that did not experience a retirement (14.5 percent), probably because of severance payments (see above).

Table 9.10 shows the same set of statistics for the Netherlands, based on 1984–97 income reports and 1987–97 wealth data. Income and wealth values are in 1998 euros. Dutch replacement rates generally exceed those of both the United States and Italy. At the median, fully 102.3 percent of real preretirement income is replaced. The spread is narrower than in the other two countries. At the 10th and 90th percentile, only about one-third of preretirement income is lost or gained, compared to one-half in Italy and three-quarters in the United States. Dutch households without a new retiree also fared well—at the median, their real household noncapital income rose by 8.1 percent. The spread is again small, much smaller than in the United States and Italy. (This is in part explained by the fact that the Dutch income and wealth figures refer to survey waves that are only two years apart; the Dutch SEP survey is conducted annually, whereas Ameri-

Table 9.10 **Empirical replacement rates, wealth accumulation, and income growth in the Netherlands**

	N	Mean	10th percentile	Median	90th percentile
Newly retired					
Preretirement household noncapital income	772	22,200	10,500	18,800	38,600
Postretirement income	772	21,900	10,900	18,600	37,400
Postretirement income + annuity value of wealth	772	26,900	12,100	22,900	49,700
Replacement rate (%)	772	113.9	68.0	102.3	138.3
Generalized replacement rate[a]	772	137.1	80.8	114.5	187.2
Not newly retired					
Noncapital household income $t - 1$	52,333	27,300	12,600	25,900	43,200
Noncapital household income $t + 1$	52,333	29,600	13,000	28,100	47,000
Income ratio $(t + 1)/(t - 1)$ (%)	52,333	124.3	81.8	108.1	138.9
Newly retired					
Preretirement household net worth	802	63,400	600	23,400	172,600
Postretirement household net worth	802	67,000	800	23,000	175,400
Wealth growth (%)	800	–82.0	–61.2	4.5	128.3
Not newly retired					
Net worth $t - 1$	55,995	47,900	100	23,300	121,500
Net worth $t + 1$	55,995	57,100	400	31,100	141,100
Wealth growth (%)	55,995	118.2	–79.7	12.5	164.2

Note: N = number of observations.

[a]Postretirement noncapital household income + annuity value of wealth divided by preretirement noncapital household income. The annuity value assumes a 3 percent interest rate.

can HRS and Italian SHIW waves are generally two years apart.) Adding in the annuity value of net worth increases the replacement rates, though not by very much. This reflects the small average wealth holdings among Dutch households.

In the Netherlands, households with a newly retired member enjoyed an increase of 4.5 percent in net worth, far lower than in Italy but somewhat higher than in the United States. The increase among households without a retiring member was one-eighth in two years time, more than the comparable American and Italian figures.

In summary, replacement rates are lowest in the United States and highest in the Netherlands, with a gap at the median of 26.6 percentage points. However, American households accumulate far more private savings than their Dutch counterparts. The replacement rate gap narrows to just 3.1 percentage points when we include the annuity value of net worth in the calculations. This is fully consistent with a life-cycle model in which retirement saving is crowded out by institutional old age pension provisions in the Netherlands, but much less so in the United States.

Clearly, we do not control for the endogeneity of the retirement decision

in the empirical analysis. One would expect that, other things being equal, an individual facing a low replacement rate and with little bequeathable wealth to be less likely to retire than an individual with a high replacement rate and substantial bequeathable wealth. By working longer one may be able to increase one's wealth. This will tend to improve the generalized replacement rate. Hence, the relatively small observed differences in generalized replacement rates between the United States and the Netherlands may partly be due to the fact that Americans have a stronger incentive to work longer. Thus, the relatively modest differences in generalized replacement rates across the United States and the Netherlands may be the result of at least two behavioral reactions to differences in replacement rates: these affect both saving decisions and retirement decisions.

Hypothesis 2: The Effect of Earnings and Consumption Uncertainty

Above we argued that Americans face greater financial risks, both before and after retirement. A problem in a cross-country context with the data at hand is that we do not have individual information on the amount of uncertainty faced by the individuals in our sample. Since there are at least two different strong incentives for households in the United States to accumulate more private wealth than in Italy or the Netherlands (precaution and to provide for retirement), it is probably impossible to disentangle the relative influence of the two different incentives. We have argued above that in any case retirement provisions provide a powerful explanation for the difference in wealth accumulation between the United States and the Netherlands. Providing further insight into the patterns of wealth accumulation in Italy, the Netherlands, and the United States, table 9.11 presents results of a regression of household net worth on a number of household characteristics.

Since both household income and net worth have a skewed distribution, we have applied a loglike transformation to these variables. A direct logarithmic transformation is not possible, since both variables can take on negative values. Hence we adopted the inverse hyperbolic sine: $h(x) = \log(\sqrt{x^2 + 1} + x)$. For values of x not too close to zero, $h(x)$ is approximately equal to $\log(2x)$ for positive x and $-\log(2x)$ for negative x. The function $h(x)$ is antisymmetric: $h(x) = -h(-x)$. The drawback of the inverse hyperbolic sine in comparison to the logarithm is that it is not invariant to a change of units. The regressions reported involve both quantities measured in U.S. dollars and quantities measured in euros. If we were to use logs of the monetary variables, the currency differences would simply be absorbed in the country-specific intercepts. For the inverse hyperbolic sine, that is only approximately true.[17]

Table 9.11 presents two regressions. The first regression involves full in-

17. We measure net worth in dollars and euros, so that the outcome is far from zero for most respondents with nonzero net worth. At zero, there is no scale issue.

Table 9.11 Cross country regressions for net worth

	Separate age functions	IT/NL same age function
Dummy SEP1992	541.482	4.479***
	(0.74)	(6.26)
Dummy SEP1997	541.655	4.673***
	(0.74)	(6.49)
Dummy HRS1992	622.872	–41.788
	(0.86)	(0.56)
Dummy HRS1998	622.080	–42.579
	(0.85)	(0.57)
h(noncapital household income)		
US	0.308***	0.308***
	(17.61)	(17.61)
IT	0.668***	0.668***
	(11.80)	(11.81)
NL	0.031	0.024
	(0.72)	(0.56)
Dummy retired		
US	–0.697***	–0.697***
	(11.52)	(11.52)
IT	0.907***	0.933***
	(5.21)	(5.57)
NL	0.530**	0.648***
	(2.05)	(3.15)
High school, US	1.073***	1.073***
	(8.68)	(8.68)
More than high school, US	1.682***	1.682***
	(18.07)	(18.06)
Some high school, IT	0.900***	0.916***
	(4.73)	(4.86)
High school, IT	1.529***	1.550***
	(6.89)	(7.03)
Some college, IT	2.016***	2.017***
	(6.47)	(6.48)
Lower vocational/junior high, NL	1.034***	1.009***
	(4.02)	(3.94)
Middle vocational, NL	2.044***	1.989***
	(8.92)	(8.82)
Some college, NL	2.829***	2.788***
	(10.42)	(10.41)
No. of observations	21,517	21,517
R^2	0.08	0.08

Notes: Dependent variables: Inverse hyperbolic sine h(·) of household net worth. Absolute value of *t*-statistics in parentheses. US = United States; IT = Italy; NL = the Netherlands.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

teractions of all variables with country dummies, which is equivalent to having separate equations for each country. It turned out that the age functions of Italy and the Netherlands are quite similar, an impression that was confirmed by a statistical test. Hence, the regression was repeated with identical age functions for the Netherlands and Italy. We specified the effect of age on wealth accumulation as a fifth-degree polynomial. Rather than presenting the estimated coefficients of the polynomials, we sketch the estimated age functions in figure 9.1.

Figure 9.1 shows that after age fifty, American households keep accumulating wealth at a brisk pace, whereas the age profile in the Netherlands and Italy is approximately flat or slightly downward sloping. This would be consistent with the prevalence of a precautionary motive to guard against high out-of-pocket medical costs in the United States as compared to Italy and the Netherlands. Here, and repeatedly in subsequent analyses, we have to offer the caveat that we are not controlling for cohort effects, so that the age effects we observe may be (and probably are) contaminated by cohort effects. Disentangling age and cohort effects is beyond the scope of the current study.

Since the definitions of education levels differ substantially across the three countries, all education dummies are country specific. The lowest education category is always the reference category. Net worth increases monotonically with education in all three countries.

The effect of being retired differs substantially across the three countries, with a negative effect in the United States and positive effects in the Netherlands and Italy. We should be somewhat careful in interpreting these results, as retirement status is correlated with age. In particular, the negative effect of being retired on net worth in the United States should be considered jointly with the strong positive age effect on net worth, shown in fig-

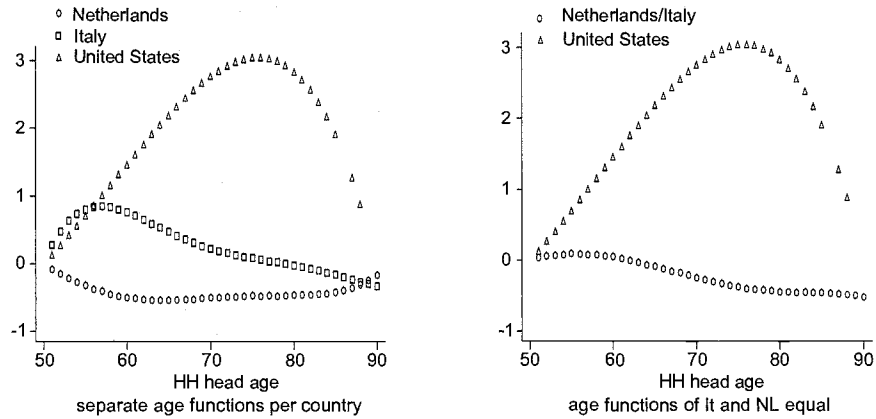

Fig. 9.1 Estimated age functions in the net worth regressions

ure 9.1. More important, retirement may be partly endogenous in the sense that retirement is more likely for individuals with more wealth. Thus, the positive sign of the retirement dummy in Italy and the Netherlands may simply reflect that people with more wealth are more likely to retire. With this interpretation, the sign of the retirement dummy in the United States is harder to understand.

Household income has a positive influence on capital accumulation. However, the strength of the effect varies substantially across the three countries. In the Netherlands the effect of income is very small and not statistically significant. In Italy and the United States it is much bigger and very significant. The discussion of the next hypothesis interprets this pattern.

Hypothesis 3: The Role of Capital Market Imperfections

The implications of the differences in capital markets in the United States, the Netherlands, and Italy are that, ceteris paribus, Italy should have the highest saving rate and the Netherlands the lowest. In addition, when considering net household wealth Italy should be the country where net wealth, as a percentage of gross wealth, should be highest. The former implication is hard to test directly, because of other factors influencing saving rates, but the latter implication is easy to verify.

Table 9.7 shows that median solvency (net worth divided by gross wealth) is equal to one in all three countries. The ratios of median net worth and median gross wealth in table 9.7 are 0.81 in the United States, 0.98 in Italy, and 0.74 in the Netherlands. Thus, for a given level of net worth Italian households borrow considerably less money than households in the United States and the Netherlands. The weaker borrowing constraints in the latter countries induce lower private capital accumulation.

Somewhat tentatively, we interpret the high coefficient of noncapital income in the wealth regressions in table 9.11 for Italy as another indication of the relevance of borrowing constraints. Conceivably, the harder it is to borrow money to invest in profitable undertakings (e.g., real estate or stocks), the more important income becomes as a source of capital for investment. Thus, ceteris paribus, the connection between income and wealth accumulation would be stronger in Italy than in the United States or the Netherlands.

Hypothesis 4: Portfolio Composition

We hypothesized that stock ownership in the Netherlands will be the lowest among the three countries, because it has the lowest level of private wealth. In the United States, the combination of a well-developed capital market and a high level of private wealth for retirement purposes should induce a relatively high level of stock ownership. Italy should be in between, because it has a relatively high level of private wealth but a less-developed capital market. To shed light on the plausibility of these hypotheses, table 9.12 presents results from cross-country regressions of the

Table 9.12 The share of risky assets across countries

	(1)	(2)	(3)
Dummy HRS1992	–43.591	0.205**	0.062***
	(0.63)	(2.45)	(4.19)
Dummy HRS1998	–43.554	0.244***	0.101***
	(0.63)	(2.92)	(6.47)
Dummy SEP1992	–29.098	–0.437***	–0.643***
	(0.42)	(3.60)	(7.54)
Dummy SEP1997	–29.077	–0.415***	–0.631***
	(0.42)	(3.39)	(7.28)
h(noncapital income)			
US	0.015***	0.015***	
	(9.17)	(9.24)	
IT	0.018***	0.019***	
	(2.83)	(2.91)	
NL	0.004	0.004	
	(1.00)	(0.96)	
h(net worth)			
US	0.052***	0.052***	
	(32.30)	(32.36)	
IT	0.060***	0.061***	
	(12.01)	(12.14)	
NL	0.109***	0.109***	0.105***
	(15.32)	(15.30)	(14.67)
Dummy retired			
US	–0.000	0.001	0.001
	t(0.00)	(0.17)	(0.17)
IT	0.075***	0.067***	0.068***
	(4.89)	(4.87)	(4.95)
NL	0.031	0.047**	0.050**
	(1.10)	(2.39)	(2.50)
High school, US	–0.005	–0.006	–0.006
	(0.43)	(0.52)	(0.54)
More than high school, US	0.075***	0.074***	0.074***
	(9.45)	(9.34)	(9.29)
Some high school, IT	0.085***	0.089***	0.093***
	(5.14)	(5.49)	(5.80)
High school, IT	0.143***	0.146***	0.155***
	(7.83)	(8.09)	(8.91)
Some college, IT	0.154***	0.156***	0.169***
	(6.31)	(6.38)	(7.35)
Lower vocational/junior high, NL	–0.011	–0.015	0.003
	(0.33)	(0.46)	(0.10)
Middle vocational, NL	0.088***	0.084***	0.094***
	(3.38)	(3.22)	(3.55)
Some college, NL	0.170***	0.169***	0.182***
	(6.09)	(6.10)	(6.49)
h(noncapital income)			0.015***
			(9.67)
h(net worth)			0.053***
			(34.39)
No. of observations	21,447	21,445	21,344
Pseudo R^2	.21	.21	.21

Notes: Dependent variables: share of risky assets in gross wealth. Absolute value of *t*-statistics in parentheses. US = United States; IT = Italy; NL = the Netherlands.

***Significant at the 1 percent level.

**Significant at the 5 percent level.

share of risky assets (stocks and bonds) in gross wealth. The approach is similar to the approach in table 9.11. We start with separate analyses by country and then simplify the model by imposing equality of parameters allowed by the data. Since shares are between zero and one by construction, we use a two-limit tobit model to estimate the equation, with a lower limit equal to zero and an upper limit equal to one.

The first column presents estimates of the unrestricted equations. A test for equality of the age functions across countries is far from rejection and hence the second column imposes equal age functions. A test of equality of the income coefficients across the three countries is almost rejected at the 5 percent level ($F[2,21419] = 2.83, p = .0590$). Similarly, we cannot reject the hypothesis that the net worth coefficients of the United States and Italy are equal ($F[1,21419] = 2.73, p = .0984$) at the 5 percent level. The last column presents estimation results with these equalities imposed. Figure 9.2 sketches the estimated age function, which turns out to be fairly flat in the age range where most of the data points are.

For convenience, we restrict a discussion of table 9.12 to the last column. Household income has a relatively small but significant direct influence on the share of risky assets held. Its influence is positive, which would be consistent with a model where income can be used to buffer risks incurred by investing in the risky assets (i.e., having a higher noncapital income reduces background risk in some informal sense). Of course, there is also an indirect effect of income via its effect on total net worth, as discussed with re-

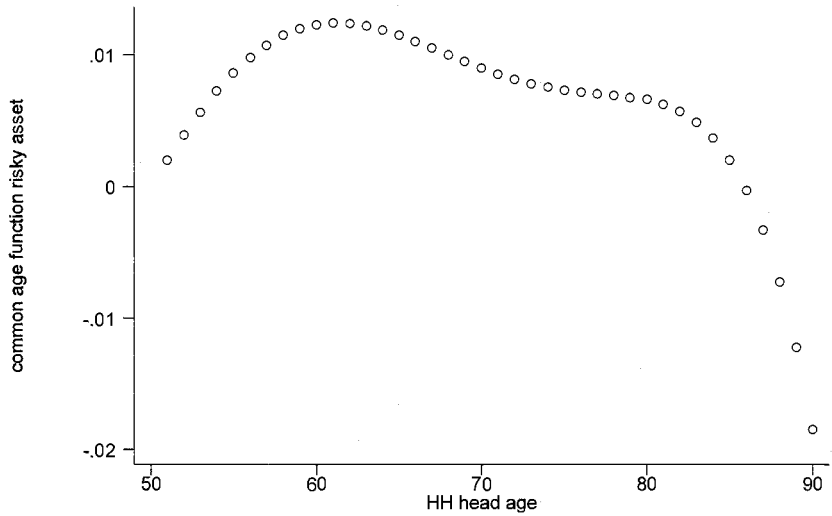

Fig. 9.2 A common age function to explain risky asset share across the three countries

spect to table 9.11. Net worth has a positive effect on the share of risky assets in all three countries, as expected.

The share of risky assets in gross wealth increases with education in all countries (except the difference between high school and less than high school in the United States; the difference between these two education levels is not statistically significant). This can be interpreted in at least two different ways: (a) owning stocks or bonds requires a certain level of knowledge which is more likely to be present among the higher-educated; (b) a higher education level reduces risks in the labor market and this reduction in background risk makes an individual less risk-averse.

We note that the indicator for being retired is insignificant in the United States and significantly positive in both Italy and the Netherlands. A possible interpretation is that after retirement income and consumption risks have essentially disappeared in Italy and the Netherlands, whereas in the United States consumption risk associated with adverse health shocks becomes more important. This risk reduction after retirement in Italy and the Netherlands would allow households to take on more risk in the stock market.

It is tempting to interpret the country- and wave-specific dummies as propensities to hold risky assets, after controlling for the variables listed in table 9.12. One should note, however, that in general the values of the dummies are sensitive to the scaling of the monetary variables. If, for instance, we switch from dollars and euros to thousands of dollars and euros, then to a good approximation all monetary variables are reduced by $\ln(1{,}000) = 6.91$. Since the monetary variables have different coefficients for different countries, such changes in monetary units affect country- and wave-specific dummies differentially, without changing the underlying model. The only valid comparison in table 9.12 is between Italy and the United States in the last column, because we have restricted the coefficients of net worth and household income to be equal. We notice that the dummies for the United States are significantly positive, consistent with the notion that a more developed capital market in the United States facilitates stock and bond ownership, controlling for education, wealth, and demographics.

9.7 Conclusion

The analysis in this paper is a first attempt at consistently exploiting institutional variation across countries to improve our understanding of wealth accumulation and portfolio choice of households at or near retirement. The number of countries considered is limited, as is the amount of detail in the data that we have been able to use. The stylized facts that we are able to glean from the microdata are certainly consistent with the hypotheses that we formulated. In summary, their main implications are as follows:

- Americans should save more for retirement than the Dutch or the Italians.
- Americans should save more due to more exposure to uninsurable income and consumption risk.
- Italians should save more due to severe borrowing constraints in their country.
- The Dutch should have relatively low stockholdings due to the low level of private wealth.
- Stock ownership in the United States should be higher than in Italy because of more developed capital markets in the United States.

While each of these implications is borne out by the data, we cannot rule out alternatives to our stochastic life-cycle framework. Further, it is in general not possible to establish the relative magnitude of factors influencing wealth accumulation or portfolio choice. For instance, both low replacement rates at retirement and higher consumption and income risk in the United States imply that Americans should save more than Europeans. To further disentangle the relative effect of these factors one possibility would be to exploit variation in risk and replacement rates across individuals in the datasets, for example, along the lines of Carroll and Samwick (1998). However, such an approach is vulnerable to the criticism that individuals select into occupations that are more or less risky according to their risk preferences. Assuming that such self-selection is more difficult across countries, analyzing a substantial larger number of countries would appear to be preferable.

It is worthwhile to extend the analysis in two main directions. First, it is very desirable to add countries to have more institutional variation that can be exploited, as the problem of disentangling the roles of replacement rates and risk illustrates. Yet, second, the current data can be analyzed more extensively and more information can be brought to bear on the hypotheses formulated. In particular, one could exploit the longitudinal nature of the data more, for example, to disentangle age and cohort effects, but also to exploit time series variation in addition to cross-sectional and cross-country variation. This will also permit addressing such endogeneity issues as the timing of retirement.

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Comment Andrew A. Samwick

This chapter provides a systematic examination of the level and composition of wealth holdings across three developed countries. It is similar in spirit to cross-country comparisons in volumes by Poterba (1994) on saving and Gruber and Wise (1999) on retirement, in which micro-level data from several countries were harmonized to examine a specific issue. The analysis is organized around a set of motives for saving or stock ownership, with predictions made for the ranking of countries based on the institutions in each one. The goal of such an undertaking is to assess the validity of each motive as a separate component of a general life-cycle model.

This objective is for all practical purposes beyond the reach of a study that uses only macroeconomic data for each country, unless there were a long time series on aggregate saving with exogenous changes in the institutions of one country relative to the others. The use of microeconomic data is therefore a sensible area for current research. However, the same caveat regarding identification applies with microeconomic data as with macroeconomic data—to what extent are the differences across subgroups of the population due *only* to the institutions related to the specific motive in question? It is in this regard that more work needs to be done in this line of inquiry.

The authors' results are briefly summarized in table 9C.1.

The authors consider each of four savings and portfolio motives in turn: retirement saving, based on differences in replacement rates; precautionary saving, based on presumed differences in postretirement out-of-pocket health expenditures; liquidity constraints, particularly with respect to purchasing a home; and stock ownership, given the differences in wealth levels that decrease the household's aversion to holding risky assets. In general, the authors conjecture that households in the United States face lower replacement rates and higher postretirement uncertainty and should therefore hold more wealth. This, along with very well-developed equity markets, allows them to allocate more of their wealth to stock ownership. Italian households face more severe borrowing constraints in financial markets, particularly related to home ownership, and thus are conjectured to hold greater wealth to accumulate down payments or less debt relative to their assets.

The first hypothesis pertains to retirement saving. The authors set up a comparison between the raw replacement rates provided by social security and pensions and the generalized replacement rate, including the annuity

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Table 9C.1 **Relative strength of saving or portfolio motives, by country**

Motive	United States	Italy	The Netherlands
Retirement	High	Low	Low
Uncertainty	High	Low	Low
Liquidity constraints	Low	High	Low
Stock ownership	High	Low	Low

Note: Each cell reports the predicted relative amount of saving (or stock ownership) in each country due to the specified motive based on prevailing institutions.

Table 9C.2 **Raw and generalized replacement rates, by country**

Motive	United States	Italy	The Netherlands
Raw	75.7	85.9	102.3
Generalized	111.4	124.5	114.5

Notes: Each cell reports the ratio of postretirement noncapital income to preretirement income. The generalized replacement rates also include the annuity value of household wealth in the numerator.

value of wealth. Table 9C.2 shows the comparisons at the medians. The authors' argument receives some support—in the Netherlands, where raw replacement rates are highest, the annuity value of wealth accumulated privately is smaller than in the United States and Italy.

There are two important caveats to this conclusion. First, because the comparisons are done using actual retirements that are observed during the sample, there is a potential for sample selection to exaggerate the results. Households that have the highest replacement rates are more likely to retire. The bias may go in either direction—depending on whether it is the high raw replacement rate or the high annuity value of wealth that more strongly correlates with retirement behavior. This correlation must be estimated empirically for each country. Second, for Italy and the Netherlands, sample sizes are in the hundreds (largely because the surveys are for the whole population rather than just a cohort nearing retirement). Standard errors should be reported to determine whether the replacement rates are significantly different in each case.

The second hypothesis rests on the authors' assertion that households in the United States should save more to confront uncertainty in preretirement income and old-age health expenditures. The main finding is that Americans save more after age fifty. This could be evidence in favor of precautionary saving, but it could also be due to many other factors, including a stronger bequest motive. Much more could be done in this aspect of the paper. Other authors examining the relationship between income uncertainty and wealth (see, for example, Carroll and Samwick 1997) have tested whether households in higher-risk occupations, industries, or edu-

cation groups actually save more. The authors should include in their analysis proxies for the actual risks faced to determine if precautionary motives are in fact responsible for the disparities in saving.

The third hypothesis pertains to the effect of liquidity constraints on saving. In general, the possibility of being liquidity constrained in a future period generates higher saving in the current period. The authors approach this possibility by noting that Italy, where access to credit is more limited than in the other countries, has the highest ratio of net wealth to total wealth. This is also supportive of the hypothesis. One caveat to the comparison is that a sample of households near retirement age is not the most effective place to examine borrowing constraints, as a life-cycle model suggests very little borrowing at these ages in any country. Since most of the borrowing would occur earlier in life when the household first attempts to become a home owner, it would be better to make the comparison using a sample of younger households.

The last hypothesis considers portfolio choice, based on the results of the first three. Since risk aversion is thought to decrease as wealth increases, the higher wealth holdings in Italy and especially the United States should lead to higher stock ownership. This conjecture is empirically verified. However, there are several caveats to the interpretation. First, many other factors that differ at the country level may contribute to different degrees of stock ownership. For example, Poterba and Samwick (2003) show that marginal tax rates influence the ownership and allocation of financial assets in the United States. The finding that older households in the United States hold more stock in their portfolios could reflect a larger capital gains tax or estate tax preference for equities relative to the tax preferences in other countries. Second, I disagree with the underlying assumption that there is a single, global market for all securities—the supply of securities in each country will influence the portfolios of that country's households. There is no necessary reason why the aggregate debt-equity ratio in each country will be the same. High stock ownership in the United States may simply reflect a greater supply of corporate equity relative to the other countries. Third, in equilibrium, the holdings of a particular cohort (e.g., those nearing retirement) may be a passive response to the portfolio needs of another cohort. For example, younger households in the Netherlands may be more willing to hold stock than their contemporaries in other countries. The younger households would bid up the price of equities in the Netherlands, causing older households to hold less stock. The authors should take more care to control for these confounding possibilities in making their conclusions.

Overall, the authors achieve some degree of success in exploiting variation in institutions across countries to test hypotheses about saving. Certainly nothing in the chapter suggests a reason to doubt a straightforward stochastic life-cycle model. Future work needs to consider more carefully

the other factors that influence saving at the country level to ensure that the comparisons are truly identified.

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