

Government Policy and Ownership of Equity Securities

Supplement

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1 Stock Ownership Data

Annual ownership statistics exist for the United States since 1945, Japan 1949, Germany 1950, Canada 1961, and France 1977. Time-series of ownership data for Sweden begin 1950, United Kingdom 1957, and Finland 1958, but data are incomplete and only available for some years. The data sources are: Flow of Funds (United States); Statistics Canada; Revell and Moyle (1966), Moyle (1971), and Statistics United Kingdom; Spånt (1975), Boman (1982), Statistics Sweden, the Shareholder Survey and the Fact Book of the Tokyo Stock Exchange (Japan); Deutsches Aktieninstitut (Germany); Bank of France; Grandell (1959), Laakso (1979), Airaksinen and Kallinen (1987), Karhunen and Keloharju (2001) (Finland).

The U.S. ownership data are constructed by the Federal Reserve.¹ The direct household ownership is estimated as a residual in a calculation which starts with the market value of listed stocks, adds an estimate of the book value of non-listed stocks, eliminates inter-corporate ownership, and subtracts the ownership of domestic financial institutions and foreigners. Even though this residual is labeled by the Federal reserve as the “household sector,” it contains non-listed stocks as well as ownership of non-profit organizations and thus is likely upward biased relative to the fraction of direct household ownership reported in the data for other sample countries.² The bias arising from non-listed stocks can be estimated from the difference between the Flow of Funds total and stock market capitalizations, and the ownership of non-profit organizations is available from 1987–2000 (Table L.100a). To make the U.S. data comparable to that of other sample countries, we use the adjusted household sector ownership by subtracting the value of non-listed stocks and our estimate of the ownership of non-profit organizations. Non-listed stocks and non-profit organizations account for approximately four percentage points each of the household sector. Correcting for these biases, the fraction of household ownership in the United States is 30% as of 2006.³ It is important to note that in our regression analysis, the dependent variable is the change in household ownership,

¹Reported in the Flow of Funds. One additional issue we have encountered in using the U.S. ownership data is that the Federal Reserve tends to revise its estimates, at times to a non-trivial extent. The data we use are based on the June 2011 version of the data.

²The Federal Reserve estimate is also in principle biased downwards because it eliminates inter-corporate ownership. However, it is likely this bias is very small.

³Poterba and Samwick (1995) and French (2008) make further attempts to adjust the household sector.

and thus all these adjustments have no influence on the results.

The Canadian ownership shares are constructed as in the United States except that the total is defined as the book value of listed and non-listed stocks. The household sector is derived as the residual and consists of actual households and non-profit organizations. Therefore, the Canadian household sector is also upward biased. The book value of listed and non-listed stocks exceeds the market value of listed stocks by 26% over the 1980–2005 period. Therefore, we adjust the fractions from Statistics Canada by the overshooting 26%. Specifically, for households, we subtract 0.26 from the observed fraction of household ownership and divide by 0.74. For all others sectors, we divide the observed fraction of ownership by 0.74. The adjusted fraction of household ownership in 2006 is 28.3%. Inter-corporate ownership is explicit, but quite small. We add Social Security funds to institutional ownership.

The Japanese ownership shares are reported as fractions of the number of shares outstanding before 1970 and as fractions of market values from 1970 onwards. Given that households tend to hold a larger share of small cap stocks, the aggregate household ownership share in 1949–1970 is likely to be overestimated.⁴ For the United Kingdom, Germany, France, and Sweden, the ownership shares are fractions of market values. The UK ownership statistics are based on company surveys with the most recent ownership statistics from the share registry. The official share registry is also the basis for the ownership statistics from recent years in Sweden (since 1975) and Finland (since 1994). The older data from Sweden and Finland are compiled using a variety of methods.⁵

An important caveat is that in all countries direct household ownership includes insider/managerial ownership, which ideally for our purposes we would have liked to exclude, because such ownership is likely motivated by non-tax reasons. Some estimates for the United States between 1993 and 2004 suggest that insider ownership is around 7%.⁶ The problem is that the extent of insider ownership as well as the forms it takes are likely to be different across our sample, which our data do not

⁴In Japan, financial institutions include trust banks, investment trusts, annuity trusts, and insurance companies.

⁵Sweden: the 1950 data are based on a survey of household finances by Statistics Sweden. The 1961 and 1970 data are computed as the residual from point estimates of the portfolios of financial institutions and business corporations. The ownership fractions are based on market values. Institutional ownership combines investment and holding companies. Finland: the 1958 data are based on tax-assessed values, the 1972 data on market values, and the 1980–1986 data on nominal share values.

⁶Authors own estimates based on manually collected proxy data for S&P1500 firms using the EDGAR data service.

allow us to adjust for.

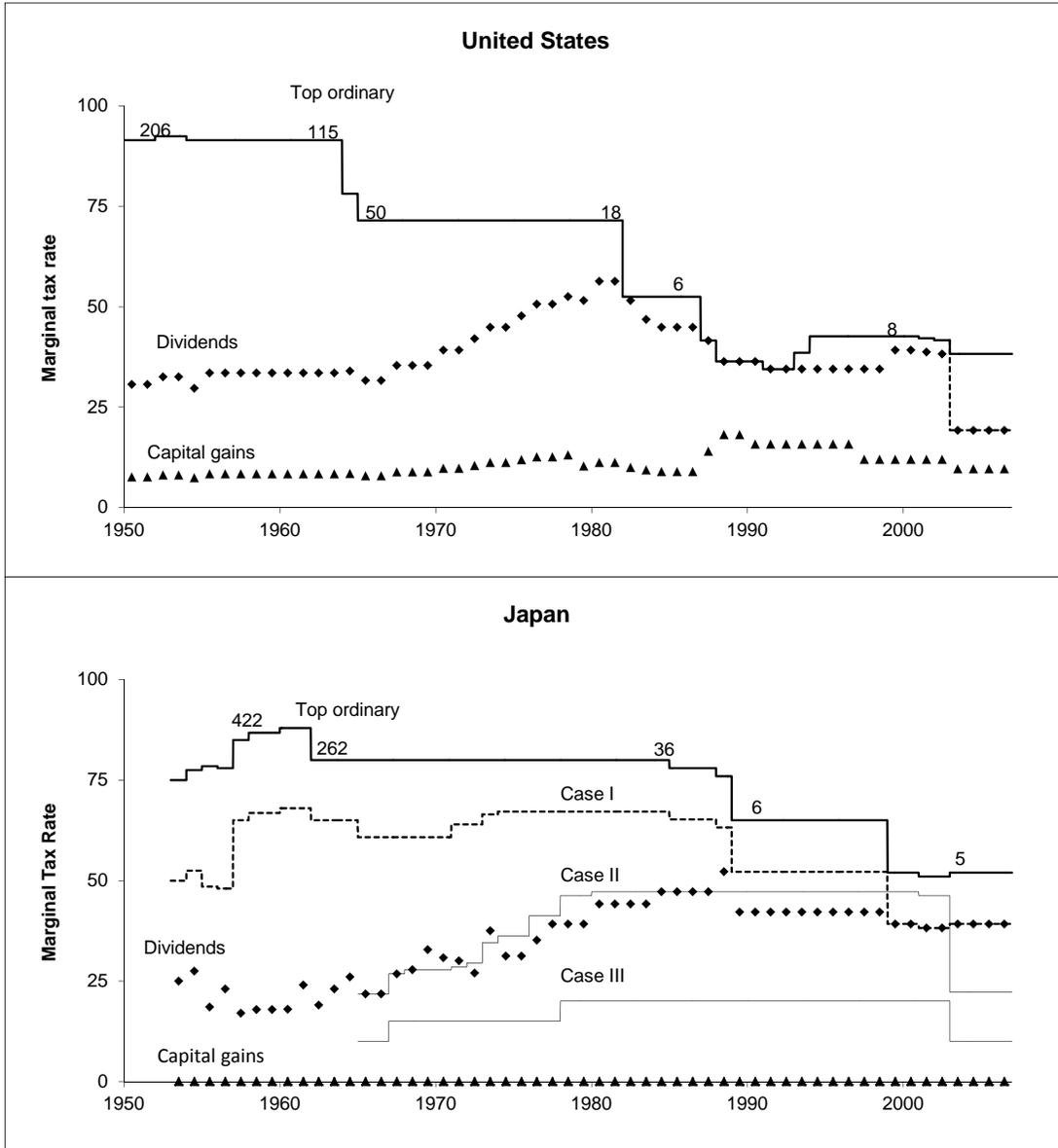
2 Evolution on Personal Income Tax on Stocks

In this section, we present and discuss the evolution of personal income tax. The sequence of plots contained in Figures 1a–1b shows the evolution of marginal tax rates. In all plots, the solid line above is the top statutory rate on ordinary income, and the dashed line below is the top statutory rate on dividends. The numbers adjacent to the top statutory tax rate (solid line) are the top income tax brackets expressed as multiples of GDP per capita. Below the top statutory rates, we plot our proxies for the marginal tax rate on dividends (diamonds) and capital gains (triangles) of the GDP5 household.

The top left panel of Figure 1a shows the evolution of marginal tax rates in the United States. We assume that state tax is a constant 5%.⁷ The top statutory rate on ordinary income equals the top statutory rate on dividends between 1950 and 2002. Since 2003, dividends are taxed at a lower rate. (This change in the tax code is represented by the dashed line.) Even though the top statutory income tax rate is exceedingly high at the beginning of the sample (91.45–92.4% between 1950 and 1964), it is relevant to a few households. Over the same period, the top statutory income tax rate is activated only for households with a multiple 115–206 (for married couples filed jointly). The marginal tax rates on dividends and capital gains for the GDP5 household are, in fact, substantially lower, at 30–33%. Over the long term, two opposite forces affect the marginal tax rates. First, the top statutory income tax rate gradually and substantially declines to the level below 40% after TRA 1986. This tends to reduce marginal tax rates. Second, the multiple at which the top statutory rate is activated declines precipitously from 222 in 1950 to just 6–8 over the past 20 years. The second effect, bracket creep, which increases marginal tax rates, dominates between 1965 and 1980. Thus, over that period the GDP5 household experienced substantial increase in its tax burden despite reduction in top tax rates. The Reagan reforms of 1982 and 1986 reverse the bracket creep which leads to the prevalence of the first effect. In addition, TRA 1986 introduces

⁷In addition, we assume that the household takes the standard deduction (except in 1977–1986 when the standard deduction is built into the tax table as a tax-exempt income bracket) and two exemptions.

Figure 1a: Marginal Tax Rates



The figure shows the top statutory tax rate (solid line), the top statutory rate on dividends (dashed line), the marginal tax rate on dividends (diamonds) and long-term capital gains (triangles) of the GDP5 household. The numbers adjacent to the top statutory rate are top income brackets of representative years expressed in multiples of GDP per capita. In Japan, the marginal tax rate depends on the size of the dividend from each company. Cases I, II, and III refer to a large, an intermediate, and a small dividend, respectively.

automatic inflation indexation which virtually removes the second effect. The capital gains tax rate (triangles) is approximately constant around 10%.

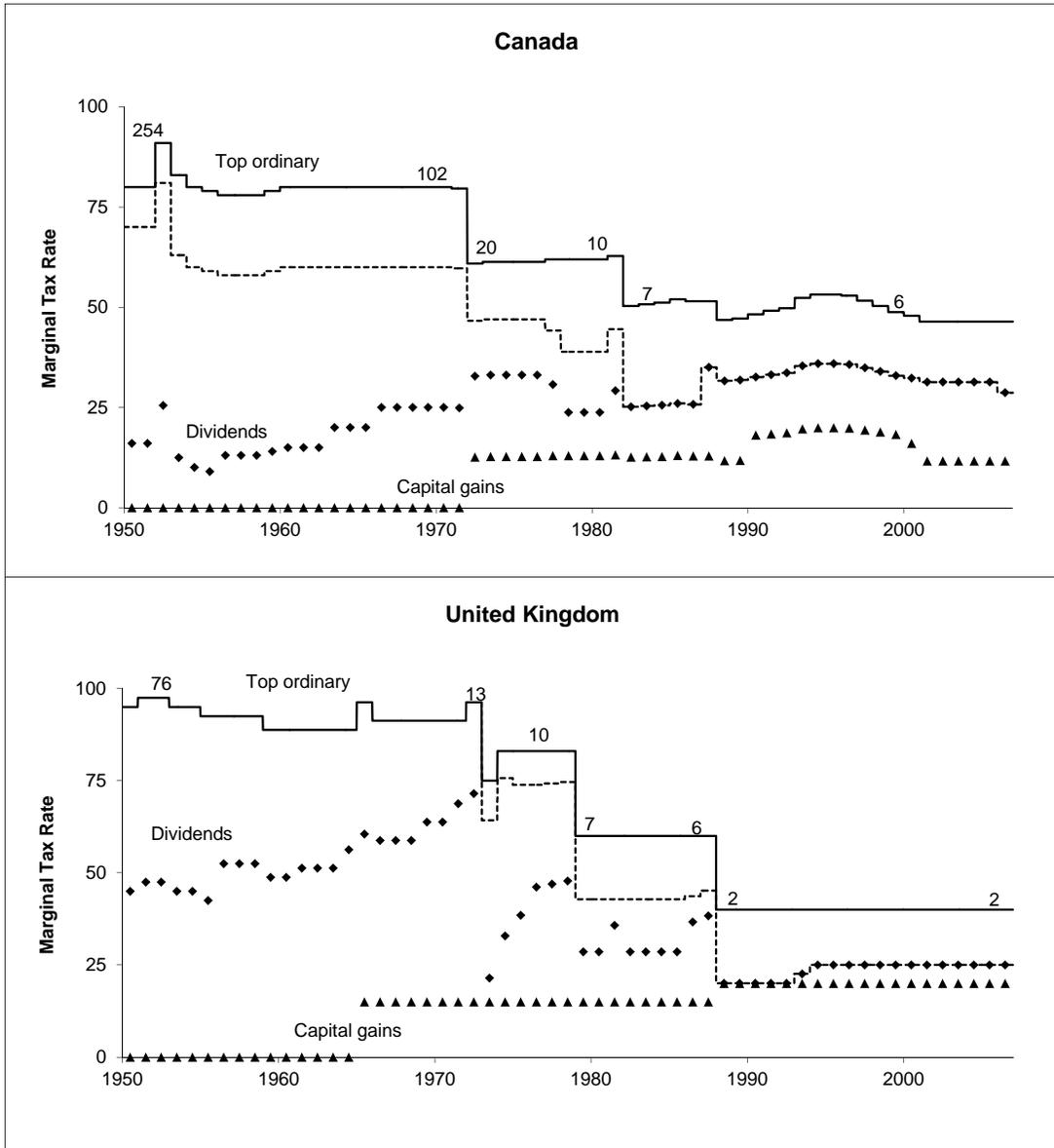
The comparison of the evolution of tax rates between various countries in our sample provides the most direct justification for using a cross-country panel to address our research questions. The plots clearly demonstrate that there are substantial time-series and cross-sectional differences in tax rates that will allow us to use within-panel variation. For example, the treatment of dividend tax reliefs is very different across the countries. As another striking example, capital gains tax is absent in France, Germany, and Japan for the whole period and in other countries for extensive periods, with the United States being the only country that imposes capital gains tax throughout the entire time period.

At the same time, the evolution of tax systems share a number of common features. In the first decade after World War II, high top statutory rates on personal income are coupled with low marginal tax rates for the GDP5 household. In the subsequent decades, marginal tax rates drift upwards (bracket creep), and the GDP-per-capita multiple at the top statutory rate decreases from an average well above 100 in 1950 to around 10 in 1980. In the extreme cases of Sweden and Finland (Figure 1b), the marginal tax rates of the GDP5 household are equal to the top statutory rates in the 1970s and 1980s, and the top statutory rate applies to an income multiple of only two. The bracket creep, that ended with TRA 1986 in the United States, faced similar tax reforms in other countries: the United Kingdom 1988, Japan 1989, Sweden 1991, and Finland 1993. In all the countries, the marginal tax rates of the GDP5 household become similar to top statutory rates over the past 20 years but top statutory rates are much lower than in the past.

3 Personal Taxation of Stocks

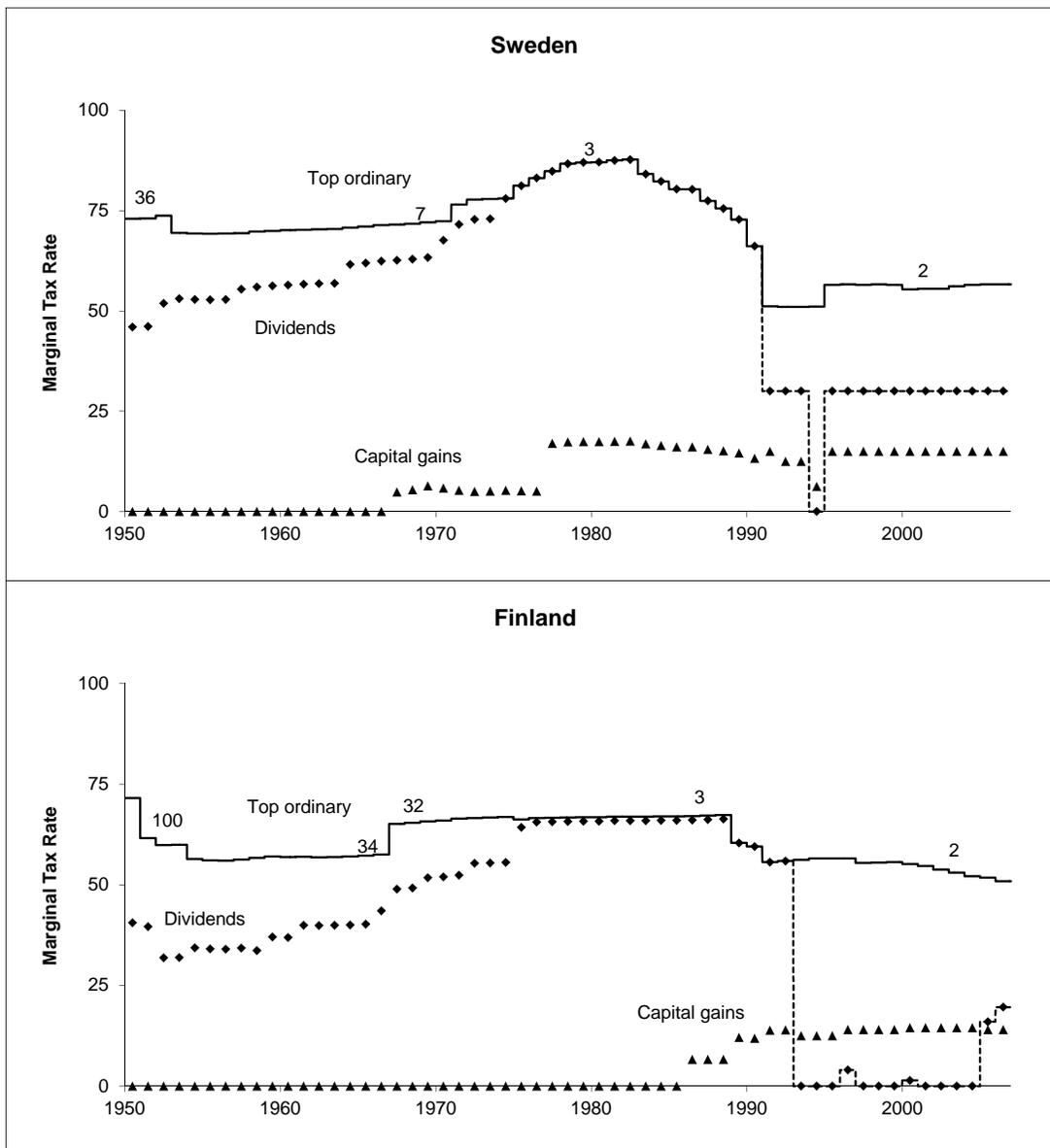
This appendix explains the principles of personal taxation of income from stocks in the United States, Canada, United Kingdom, Japan, Germany, France, Sweden, and Finland. We do not cover the taxation of corporate income except where it is needed to understand personal taxation of

Figure 1b: Marginal Tax Rates



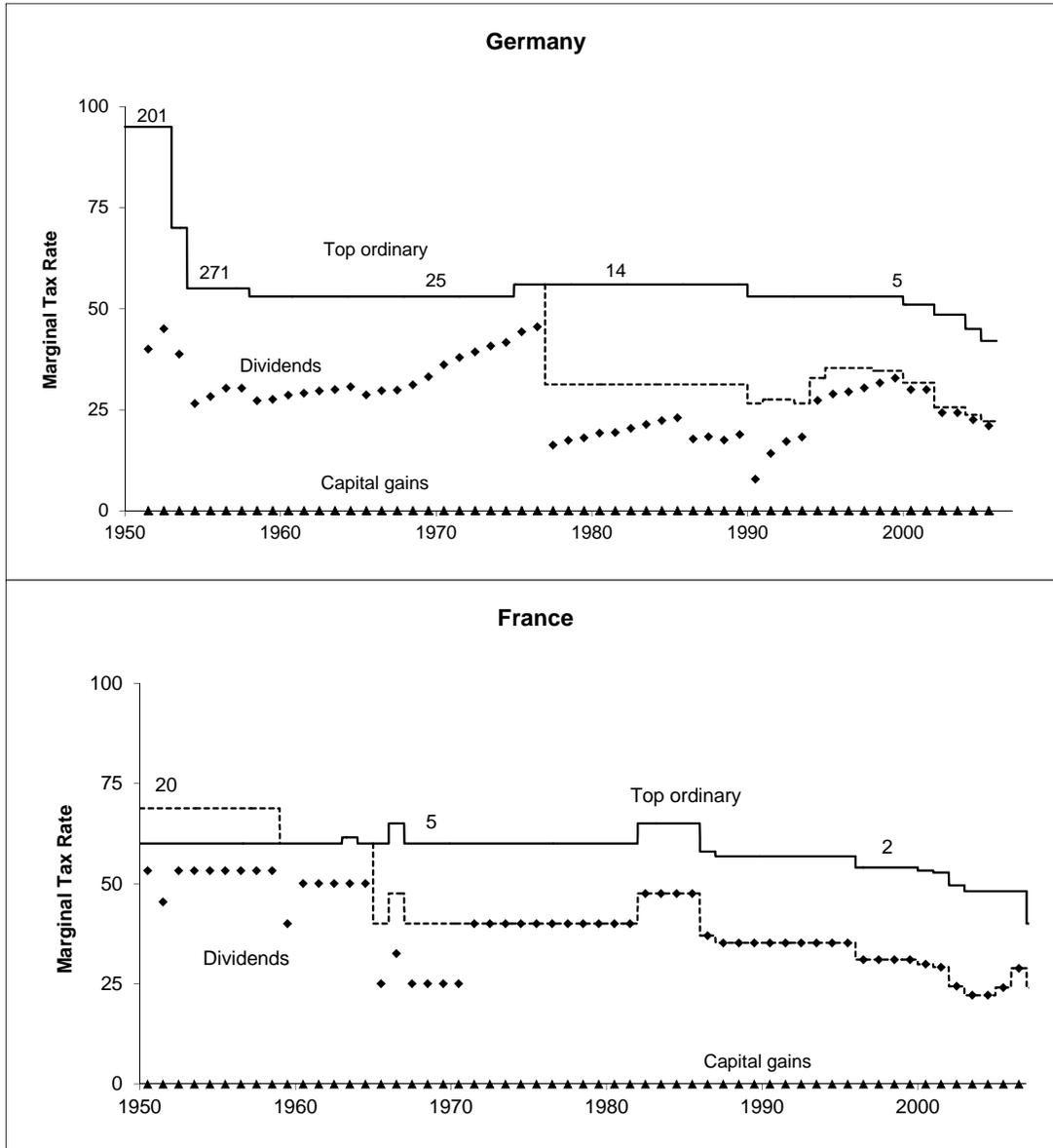
The figure shows the top statutory tax rate (solid line), the top statutory rate on dividends (dashed line), the marginal tax rate on dividends (diamonds) and long-term capital gains (triangles) of the representative GDP5 household. The numbers adjacent to the top statutory rate are top income brackets of representative years expressed in multiples of GDP per capita.

Figure 1c: Marginal Tax Rates



The figure shows the top statutory tax rate (solid line), the top statutory rate on dividends (dashed line), the marginal tax rate on dividends (diamonds) and long-term capital gains (triangles) of the representative GDP5 household. The numbers adjacent to the top statutory rate are top income brackets of representative years expressed in multiples of GDP per capita.

Figure 1d: Marginal Tax Rates



The figure shows the top statutory tax rate (solid line), the top statutory rate on dividends (dashed line), the marginal tax rate on dividends (diamonds) and long-term capital gains (triangles) of the representative GDP5 household. The numbers adjacent to the top statutory rate are top income tax brackets of representative years expressed in multiples of GDP per capita.

dividends. The following general notation is used:

τ_d	=	personal tax rate on dividend income.
τ_r	=	reduction rate on dividend income.
τ_i	=	imputation rate on dividend income.
τ_g	=	personal tax rate on capital gains.
τ_p	=	personal tax rate on ordinary income.
τ_{pi}	=	personal tax rate on investment income.
τ_{pc}	=	central personal tax rate.
τ_{ps}	=	sub-central personal tax rate.
τ_{sc}	=	central surtax rate on personal tax.
τ_{ss}	=	sub-central surtax rate on personal tax.

The precise meaning of each tax rate is explained in its context below. Many tax systems are covered and additional notation is introduced as needed. The statutory tax rate data are not reported here, but can be requested from the authors.

3.1 United States

Personal income is subject to federal, state, and city taxes. When there is a choice (since 1949), we choose the federal tax tables for a married couple filing jointly. We adjust for state tax by assuming it is a time-series constant $\tau_{ps} = 5\%$, but we ignore city tax. The assumption for the state tax rate is based on the equally-weighted average top statutory state tax rates in 1950, 1987, and 2006. The information is taken from Sagoo (2005).

3.1.1 Dividends

From 1913–2002, dividends are taxed as ordinary income. State taxes are deductible at the federal level, so the marginal tax rate on dividend income equals:

$$\tau_d = \tau_{pc}(1 - \tau_{ps}) + \tau_{ps}, \tag{1}$$

where τ_{pc} is the federal tax rate and τ_{ps} the state tax rate. In 2003, the United States switches to a dual-income system, where ordinary income and investment income are taxed as separate income classes. The marginal tax rate on dividends is:

$$\tau_d = \tau_{pi}(1 - \tau_{ps}) + \tau_{ps}, \quad (2)$$

where τ_{pi} is the dividend tax rate.

3.1.2 Capital Gains

Capital gains taxation of stocks begins in 1916. From 1916–1933, realized capital gains on stocks are taxed as ordinary income. From 1922–1933, the capital gains tax rate is capped at 12.5%. From 1934–1986, a portion π of long-term capital gains is taxed:

$$\tau_g = \pi \times [\tau_{pc}(1 - \tau_{ps}) + \tau_{ps}]. \quad (3)$$

The inclusion portion π varies over time. The federal capital gains tax rate is capped at 30% (1938–1941) and 25% (1942–1969). The cap is removed in 1972–1986. There is a Vietnam war capital gains surtax τ_{sg} in 1968–1970:

$$\tau_g = \pi \times [\tau_{pc}(1 + \tau_{sg})(1 - \tau_{ps}) + \tau_{ps}]. \quad (4)$$

Since 1987, long-term capital gains are taxed as a separate income class:

$$\tau_g = \tau_{pi}(1 - \tau_{ps}) + \tau_{ps}, \quad (5)$$

where τ_{pi} is the long-term capital gains tax rate.

3.2 Canada

A distinguishing feature of the Canadian tax system is that provincial (sub-central) tax rates are defined as proportions of federal (central) taxes. Hence, central and sub-central tax rates are

multiplied with each other, which means that the provincial tax is a tax on the federal tax. We approximate the provincial tax with the rates from Ontario. Our main data sources are Revenue Canada (1950–2006), Perry (1989), and Perry (1990).⁸

3.2.1 Dividends

We begin with the Canadian tax system in 1949–1971. A tax credit is provided at the central level for sub-central taxes. Let τ_{rs} denote the sub-central reduction rate. The personal tax rate net of the sub-central tax credit equals:

$$\tau_p = \tau_{pc} + (\tau_{ps} - \tau_{rs})\tau_{pc}. \quad (6)$$

Dividends are taxed as personal income, but Canada offers a dividend-tax relief at rate τ_r . Dividend income is taxed at the rate:

$$\begin{aligned} \tau_d &= \tau_{pc} - \tau_r && \text{(central tax)} \\ &+ (\tau_{ps} - \tau_{rs}) \times (\tau_{pc} - \tau_r) && \text{(sub-central tax)} \end{aligned} \quad (7)$$

This expression corrects Lakonishok and Vermaelen (1983) and Booth and Johnston (1984), who include the sub-central tax credit, but fail to include the sub-central tax.

We proceed with the tax system in 1972–1999. There are two important changes. First, an imputation-tax credit at rate τ_i replaces the dividend-reduction rate τ_r . The dividend tax and the imputation-tax credit are levied on the grossed-up dividend $1 + g$. Second, the sub-central tax credit is abandoned and, later, surtaxes are added at both the central and the sub-central level.

⁸We would like to thank particularly Alan Macnaughton of the University of Waterloo for carefully checking the details of our analysis of the Canadian tax code.

The surtaxes are defined as proportions of other taxes. Dividend income is taxed at rate:

$$\begin{aligned}
\tau_d &= [(1+g)\tau_{pc} - (1+g)\tau_i] && \text{(central tax)} \\
&+ [(1+g)\tau_{pc} - (1+g)\tau_i] \times \tau_{sc} && \text{(central surtax)} \\
&+ [(1+g)\tau_{pc} - (1+g)\tau_i] \times \tau_{ps} && \text{(sub-central tax)} \\
&+ [(1+g)\tau_{pc} - (1+g)\tau_i] \times \tau_{ps} \times \tau_{ss} && \text{(sub-central surtax)}
\end{aligned} \tag{8}$$

This expression can be simplified to:

$$\tau_d = (1+g)(\tau_{pc} - \tau_i) [1 + \tau_{ps}(1 + \tau_{ss}) + \tau_{sc}]. \tag{9}$$

The personal tax rate is simpler as there is no imputation-tax credit:

$$\tau_p = \tau_{pc} [1 + \tau_{ps}(1 + \tau_{ss}) + \tau_{sc}]. \tag{10}$$

Next, we explain the Canadian tax system as of 2000–2005. This tax reform changes the sub-central tax. Instead of a tax on tax, the sub-central tax becomes a tax on income. Surtaxes remain to be tax on tax. A new sub-central dividend credit at rate τ_{rs} is also introduced:

$$\begin{aligned}
\tau_d &= [(1+g)\tau_{pc} - (1+g)\tau_i] && \text{(central tax)} \\
&+ [(1+g)\tau_{pc} - (1+g)\tau_i] \times \tau_{sc} && \text{(central surtax)} \\
&+ [(1+g)\tau_{ps} - (1+g)\tau_{rs}] && \text{(sub-central tax)} \\
&+ [(1+g)\tau_{ps} - (1+g)\tau_{rs}] \times \tau_{ss} && \text{(sub-central surtax)}
\end{aligned} \tag{11}$$

Essentially, the federal and provincial taxes are calculated separately and then summed together.

The expression simplifies to:

$$\tau_d = (1+g) [(\tau_{pc} - \tau_i)(1 + \tau_{sc}) + (\tau_{ps} - \tau_{rs})(1 + \tau_{ss})]. \tag{12}$$

Again, the personal tax rate is simpler:

$$\tau_p = \tau_{pc}(1 + \tau_{sc}) + \tau_{ps}(1 + \tau_{ss}). \quad (13)$$

3.2.2 Capital Gains

Capital gains taxation of stocks begins in 1972. The principles have not changed as of 2006. A proportion of long-term capital gains π is taxed as ordinary income:

$$\tau_g = \pi \times \tau_p. \quad (14)$$

From 1986–1989, households earn a lifetime capital gains exemption for the sale of all property including real estate. Although the exemption amount is quite large, we ignore this provision.

3.3 United Kingdom

Income taxes are collected at the central level only, so we do not need to worry about sub-central taxes. The main information and data sources are Orhial and Foldes (1975), King (1977), and the HM Revenue & Customs website (<http://www.hmrc.gov.uk/index.htm>).

3.3.1 Dividends

From 1947–1964, the United Kingdom has a tax system which can be characterized as a hybrid of two business taxation models. One component conforms to the classical model of corporate taxation with double taxation except that there are different tax rates for distributed and retained profits. Specifically, the corporation pays corporate tax at rate τ_{cd} on distributed profits and rate τ_{cr} on retained profits, where $\tau_{cd} \geq \tau_{cr}$. Shareholders in higher income brackets pay personal tax on dividends at rate $\tau_p - \tau_{pst}$, where τ_{pst} is the standard rate of income tax. The other component of the hybrid system conforms to the standard model of partnership taxation, where business income passes through and is taxed as personal income. Specifically, shareholders pay tax on corporate income at the standard rate of income tax τ_{pst} irrespective of whether corporate income is paid out or retained. This tax is paid in addition to personal tax on dividends.

In the hybrid system, the marginal tax rate on dividend income equals the personal rate. To see this, we decompose pre-tax corporate income Y into after-tax dividend D , after-tax retained earnings RET , paid corporate taxes on dividends, and paid corporate taxes on retained earnings:

$$Y = D + \tau_{cd}D + RET + \tau_{cr}RET. \quad (15)$$

From 1947–1951, an individual shareholder is liable for personal tax in the amount:

$$(\tau_p - \tau_{pst})D + \tau_{pst}D + \tau_{pst}RET. \quad (16)$$

The first term is personal income tax on dividends (first component of the hybrid system). The second and the third terms are personal tax on corporate income (second component). From this expression, we can see that the marginal tax rate on dividend income equals:

$$\tau_d = (\tau_p - \tau_{pst}) + \tau_{pst} = \tau_p. \quad (17)$$

From 1952–1964, the corporate tax deductability is removed and shareholders are also liable for personal tax on paid corporate taxes:

$$(\tau_p - \tau_{pst})D + \tau_{pst}D + \tau_{pst}RET + \tau_{pst}(\tau_{cd}D + \tau_{cr}RET). \quad (18)$$

We can see that the marginal tax rate on dividend income equals the marginal tax rate on personal income as in (17).

In 1965–1972, the United Kingdom switches to a classical tax system. Dividends are taxed as personal income at rate $\tau_d = \tau_p$. A few years later, in 1973–1998, the United Kingdom switches to an imputation-tax system with a significant dividend-tax relief. The tax and the imputation-tax credit is levied on the grossed-up dividend $1/(1 - \tau_i)$, so the marginal tax rate on dividend income equals:

$$\tau_d = \frac{\tau_p - \tau_i}{1 - \tau_i}. \quad (19)$$

The imputation rate is defined as the standard rate of income tax, which means that only households in higher income brackets pay tax on dividends. From 1973–1984, dividend income above an exclusion amount is subject to investment income surcharge at rate 15% on top of the ordinary income tax rate for high-income earners. We ignore the surcharge in our calculations because the exclusion amount is large.

Since 1999, the United Kingdom combines the imputation-tax system with a dual-income system where dividends are taxed as a separate income class at a proportional rate below ordinary income:

$$\tau_d = \frac{\tau_{pi} - \tau_i}{1 - \tau_i}. \quad (20)$$

3.3.2 Capital Gains

Capital gains taxation of stocks begins in 1965. From 1965–1987, the United Kingdom practices a dual-income system where realized capital gains are subject to a proportional rate after an initial exempt amount. From 1988–2006, realized capital gains are taxed as ordinary income except for an initial exempt amount. From 1982–1997, the cost basis is indexed for inflation with values provided in a table.

3.3.3 Pensions

From 1973–1997, untaxed investors also earn a tax refund on dividends (see Bell and Jenkinson (2002)). This means that the expected rate of return on a pension fund changes to:

$$r \approx \left(1 + \frac{\tau_i}{1 - \tau_i}\right) d + g, \quad (21)$$

and

$$\text{GAP} = \frac{\left(\frac{\tau_p}{1 - \tau_i}\right) d + \tau_g g}{1 + i}. \quad (22)$$

3.4 Japan

Taxes are collected at the central level, but the revenues from specific taxes are reserved for the sub-central administration. The central tax is referred to as national tax and the sub-central taxes

as prefectural tax and municipal tax, respectively. From 1953–1961, municipalities are offered the choice among three different tax schedules. We focus on option *b* which becomes the standard from 1962. The main data sources are Ishi (2001) and Tax Bureau of Finance (1953–2005). We are missing the tax tables from 1949–1952.⁹

3.4.1 Dividends

Dividend income is taxed as personal income subject to central tax rate τ_{pc} and sub-central tax rate τ_{ps} (prefectural and municipal tax). Both the central and the sub-central tax schedules are progressive. From 1950–2006, Japan offers a dividend-tax credit in the form of a rate reduction. The central reduction rate is τ_{rc} and the sub-central reduction rate τ_{rs} . The marginal tax rate on dividend income equals:

$$\tau_d = \tau_{pc} + \tau_{ps} - \tau_{rc} - \tau_{rs}. \quad (23)$$

The reduction rates are lower for higher dividend income (two income brackets). In our calculations, we choose the reduction rate for the lower income level because the higher income tax bracket is high (annual dividend income above JPY 10 million, approximately USD 100,000). The marginal tax rates on personal income $\tau_{pc} + \tau_{ps}$ is capped from 1961–1988:

$$\tau_d = \min[\tau_{pc} + \tau_{ps}, \tau_{cap}] - \tau_{rc} - \tau_{rs}, \quad (24)$$

i.e., the dividend-tax reduction is earned in full after the cap is imposed.

From 1965–2006, the marginal tax rate on dividends depends on the dividend amount earned from each stock in the portfolio. Therefore, the marginal tax rate does not only depend on household income but also on portfolio composition and dividend yield. The dividend is small, intermediate, or large depending on whether the dividend on the stock falls below, between, or exceeds JPY 50,000 and 250,000, respectively. In 1973, the cutoffs are doubled. From 1965–1988, large dividends are taxed according to (23). This tax treatment referred to as Case I in Figure 1a and the text above. For intermediate dividends, the shareholder can choose between personal taxation (23) and the

⁹We would like to thank particularly Chihiro Shima of the Development Bank of Japan for help with understanding the Japanese tax code.

following simplified procedure:

$$\tau_d = \tau_{pi} + \tau_{ps} - \tau_{rs}. \quad (25)$$

Under the option, a proportional investment tax τ_{pi} replaces the central tax schedule τ_{pc} and reduction τ_{rc} . The option is referred to as Case II above. Finally, for small dividends, the shareholder can choose between personal taxation (23) and not reporting the dividend income on the tax return. In the latter case, the shareholder ends up paying the proportional withholding tax collected at source. This is referred to as Case III above.

3.4.2 Capital Gains

Before 1953, capital gains on stocks are taxed as ordinary income. From 1953–1988, stocks are exempt from capital gains tax. Capital gains tax on stocks is reintroduced in 1989. For long-term capital gains defined by the minimum holding period of one year, shareholders are given a choice. First, the investor can choose to not report the capital gain. In this case, the capital gains tax equals the withholding tax of 1% of the sales price. Second, if the investor chooses to report the capital gain on the tax return, it is subject to a proportional investment income tax (national tax and local inhabitants tax). We ignore capital gains tax in our calculations.

3.5 Germany

Personal income is taxed at the central level only. We choose the tax schedule for a married couple filing jointly. From 1958–2006, there is only one tax schedule. Then, the tax for a married couple equals two times the tax on half the income, so the marginal tax rate for a married couple with income equal to GDP5 equals the marginal tax rate of a single filer with income equal to GDP2.5. The main data sources are Börsch-Supan (1994), Corneo (2005), and the German Tax Administration. We use the 1954 tax table for 1955 and 1956, which are missing.¹⁰

¹⁰We would like to thank particularly Sebastian Herzog of the University of Mannheim for help with understanding the German tax code.

3.5.1 Dividends

Dividends are taxed as personal income. A special feature of the German tax code since 1958 is that the marginal tax rate is determined by a combination of a step function and a continuous function. The marginal tax rate is a constant in the lowest and the highest income brackets, and it is determined by a polynomial function in the intermediate income brackets:

$$\tau_p = a + 2b_1 \left(\frac{Y - c}{d} \right)^1 - 3b_2 \left(\frac{Y - c}{d} \right)^2 + 4b_3 \left(\frac{Y - c}{d} \right)^3, \quad (26)$$

where Y denotes taxable income and $\{a, b_1, b_2, b_3, c, d\}$ are parameters which vary over time. The polynomial function has three terms in 1958–1974, four terms in 1975–1989 (as shown), and two terms in 1990–2006 (linear function).

From 1977–2001, Germany has an imputation-tax system that works as in the United Kingdom, Equation (19). From 2002–2006, Germany switches to a partial-inclusion system, where a proportion π of the dividend is taxable income:

$$\tau_d = \pi \times \tau_p. \quad (27)$$

Following the unification of West and East Germany, personal income is also subject to a multiplicative surtax:

$$\tau_d = \begin{cases} \left(\frac{\tau_p - \tau_i}{1 - \tau_i} \right) (1 + \tau_{sc}) & , \text{ in 1990–2001,} \\ \pi \tau_p (1 + \tau_{sc}) & , \text{ in 2002–2006.} \end{cases} \quad (28)$$

From 1950–2006, there is also a church tax which also enters like a multiplicative surtax. We ignore this tax. The church tax is optional (one can opt out of the church), the effective tax rate is relatively small in the order of 1–2%, and it varies geographically.

3.5.2 Capital Gains

Long-term capital gains defined by a minimum holding period of six months before 1998 and 12 months from 1998 are exempt from capital gains tax.

3.6 France

Taxes are collected at the central level only. We ignore surtaxes in our calculations. The main data sources are Fougère (1994) and Piketty (2001).

3.6.1 Dividends

From 1950-1959, dividends are taxed at source at rate τ_w . The net dividend is taxed as personal income:

$$\tau_d = 1 - (1 - \tau_p)(1 - \tau_w). \quad (29)$$

From 1960-1964, dividends are taxed as personal income. The withholding tax is fully deductible:

$$\tau_d = \tau_p. \quad (30)$$

From 1965-2004, France has a standard imputation-tax system that offers a partial credit for corporate taxes on distributed profits as in (19). In 2005-2006, France replaces the imputation-tax system with a partial-inclusion system where a proportion π of the dividend is taxed as personal income as in (27).

3.6.2 Capital Gains

Capital gains taxation of stocks begins in 1976. Capital gains are taxed as a separate income class subject to a low proportional rate. A relatively large amount is exempt, so we assume that the capital gains tax is effectively zero.

3.7 Sweden

Personal income is subject to national tax (central), municipal tax, and church tax (sub-central). We use the average municipal tax rate, but we ignore the prefectural tax and the church tax, which are relatively small. We also ignore a social security tax (Folkpensionsavgift, 1936-1973), which is based on ordinary income including investment income. The social security tax is capped and rather small at higher income levels. When there is a choice (1953–1970), we use the national tax

rates for a married couple filing jointly. The main data sources are Söderberg (1996), Statistics Sweden, and the Swedish Tax Administration.

3.7.1 Dividends

Dividends are taxed as personal income. Sub-central taxes are deductible before 1971 and not deductible from 1971:

$$\tau_d = \begin{cases} \tau_{pc}(1 - \tau_{ps}) + \tau_{ps} & , \text{ in } 1948\text{--}1970, \\ \tau_{pc} + \tau_{ps} & , \text{ in } 1971\text{--}1990. \end{cases} \quad (31)$$

The combined marginal tax rate is capped in 1980–1985. In 1991, Sweden introduces a dual-income system, where ordinary income is subject to a progressive schedule and dividend income is taxed as investment income subject to a lower proportional rate:

$$\tau_d = \tau_{pi}. \quad (32)$$

3.7.2 Capital Gains

Capital gains taxation of stocks begins in 1910. From 1910–1951, short-term capital gains as defined by a holding period of less than five years are taxed as ordinary income, while long-term capital gains are exempt. From 1952–1976, a portion π of short-term capital gains is taxed as ordinary income as in (14). The portion depends on the holding period:

$$\pi = \begin{cases} 100\% & , \text{ if } 0\text{--}2 \text{ years,} \\ 75\% & , \text{ if } 2\text{--}3 \text{ years,} \\ 50\% & , \text{ if } 3\text{--}4 \text{ years,} \\ 25\% & , \text{ if } 4\text{--}5 \text{ years,} \\ 0\% & , \text{ if } >5 \text{ years.} \end{cases} \quad (33)$$

From 1967–1976, 10% of the sales price of a security held more than five years is taxed as ordinary income. From 1977–1989, the formula for the inclusion proportion changes to:

$$\pi = \begin{cases} 100\% & , \text{ if } 0\text{--}2 \text{ years,} \\ 40\% & , \text{ if } >2 \text{ years.} \end{cases} \quad (34)$$

In 1990, the proportion increases to $\pi = 50\%$. From 1991–2006, all capital gains are taxed as investment income:

$$\tau_g = \tau_{pi}. \quad (35)$$

The tax rule in effect 1967–1976 removes the basis from the calculation of the long-term capital gain. As above, let g denote nominal stock price growth rate. The statutory marginal tax rate on long-term capital gains equals:

$$\tau_g = 0.10\tau_p \left(\frac{(1+g)^N}{(1+g)^N - 1} \right). \quad (36)$$

This expression shows that the effect on the marginal tax rate from the loss of the basis is small over long investment horizons, especially when expected stock price growth is high. The value of the basis protection disappears in the limit as N goes to infinity. In the analysis above, we assume that $N = 15$, $g = 2\% + i$, where i equals three-year moving average inflation.

3.7.3 Pensions

From 1991–2006, imputed income from pension asset management defined as the average treasury rate during the previous year times the value of the pension assets in the beginning of the year is taxed at the proportional rate 15%. We denote r_f as the expected treasury rate with and measure it as 1% plus moving average inflation. The return advantage of saving inside a pension account becomes:

$$\text{GAP} = \frac{\tau_d d + \tau_g g - 0.15 r_f}{1 + i}. \quad (37)$$

3.8 Finland

Income taxation in Finland resembles Sweden in many ways. Personal income is subject to national tax (central), municipal tax, and church tax (sub-central). We approximate the sub-central tax rate with the average municipal tax rate, but we ignore the relatively small church tax. We use the national tax tables for a married couple filing jointly with no dependents (1950–1975). The main data sources are Kukkonen (2000) and the Finnish Tax Administration.

3.8.1 Dividends

From 1950–1992, dividends are taxed as ordinary income. The marginal tax rate on dividends equals the sum of central and sub-central tax rates:

$$\tau_d = \tau_{pc} + \tau_{ps}. \quad (38)$$

From 1993–2004, Finland uses a dual-income system with full imputation. Dividends are subject to investment income tax at rate τ_{pi} and corporate tax is credited back through imputation as in the United Kingdom, Equation (19). Most years, the investment income rate equals the imputation rate so that $\tau_d = 0$. Recently, in 2005–2006, Finland replaces the imputation system with a partial-inclusion system such that a proportion π of the dividend is taxed as investment income:

$$\tau_d = \pi \times \tau_{pi}. \quad (39)$$

3.8.2 Capital Gains

Capital gains taxation of stocks begins in 1920. From 1920–1985, short-term capital gains as defined by a holding period of less than five years are taxed as ordinary income, while long-term capital gains are exempt. From 1986–1992, the rules change gradually towards the new system in place since 1993. An initial (large) amount is tax exempt. A portion π of the capital gain above the tax-exempt amount is taxed as ordinary income as in (14). The portion depends on the holding

period. From 1986–1988 it is:

$$\pi = \begin{cases} 100\% & , \text{ if } 0\text{--}5 \text{ years,} \\ 20\% & , \text{ if } >5 \text{ years,} \end{cases} \quad (40)$$

from 1989–1990:

$$\pi = \begin{cases} 100\% & , \text{ if } 0\text{--}4 \text{ years,} \\ 80\% & , \text{ if } 4\text{--}5 \text{ years,} \\ 40\% & , \text{ if } >5 \text{ years,} \end{cases} \quad (41)$$

and from 1991–1992:

$$\pi = \begin{cases} 100\% & , \text{ if } 0\text{--}4 \text{ years,} \\ 80\% & , \text{ if } 4\text{--}5 \text{ years,} \\ 50\% & , \text{ if } >5 \text{ years.} \end{cases} \quad (42)$$

From 1993–2006, all capital gains on stocks are taxed as investment income as in (35). Since 1986, a long-term investor has the option to define the capital gain as 50% of the sales price from 1986–1992 and 30% from 1993–2006. In our calculations, we ignore this option and the initial tax-exempt amount because the difference is small.

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