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Liquidity in Retirement Savings Systems
An International Comparison

John Beshears, James J. Choi, Joshua Hurwitz, David Laibson, and Brigitte C. Madrian

What is the socially optimal level of liquidity in a retirement savings system? Liquid retirement savings are desirable because liquidity enables agents to flexibly respond to preretirement events that raise the marginal utility of consumption, like income shocks.[1] On the other hand, preretirement liquidity is undesirable when it leads to undersaving arising from, for example, planning mistakes or self-control problems.[2]

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1. For example, see Carroll (1992, 1997).
2. See Laibson (1997), Gul and Pesendorfer (2001), and Fudenberg and Levine (2006).

This chapter compares the liquidity that six developed economies have built into their employer-based defined-contribution (DC) retirement savings systems.[3] We find that all of them, with the sole exception of the United States, have made their DC systems largely *illiquid* before age fifty-five.

In the United States, employer-sponsored DC account balances can be moved to an individual retirement account (i.e., a "rollover" IRA) once the individual no longer works for the employer, which provides considerable scope for liquidation before the withdrawal-eligibility age of 59.5. Pre-eligibility IRA withdrawals may be made for any reason by paying a 10 percent tax penalty, and certain classes of pre-eligibility IRA withdrawals are exempt from this penalty.[4]

Liquidity generates significant preretirement "leakage" in the United States: for every $1 contributed to the DC accounts of savers under age fifty-five (not counting rollovers), $0.40 simultaneously flows out of the DC system (not counting loans or rollovers).[5] This amount of leakage may or may not be socially optimal, an issue that is beyond the scope of the current chapter.[6]

2.1 Analytic Framework

We focus on the five highest-GDP-developed countries that have English as an official language: the United States, the United Kingdom, Canada, Australia, and Singapore.[7] We also analyze Germany, the largest developed economy with a substantial pool of DC savings that does not have English as an official language.[8]

We analyze employer-based DC plans instead of defined-benefit (DB) plans for three reasons. First, DC plans are gaining assets relative to DB plans in almost all countries around the world, including the six that we study. Second, DC plans already have more than half of retirement wealth

3. For an extensive set of international pension comparisons, see Garcia-Huitron and Ponds (2015).

4. For example, no penalty is charged on withdrawals made for (a) permanent and total disability; (b) unreimbursed medical expenses exceeding 10 percent of adjusted gross income; (c) buying, building, or rebuilding a home if the withdrawal does not exceed $10,000 and the account holder has not owned a home in the past two years; (d) higher education costs; (e) tax payments resulting from an IRS levy; (f) health insurance premiums if unemployed for more than twelve weeks; (g) a series of substantially equal periodic payments made over one's life expectancy; (h) distributions to an alternate payee under a qualified domestic relation order; or (i) recovery from designated natural disasters.

5. See Argento, Bryant, and Sabelhaus (2015).

6. However, see Laibson, Repetto, and Tobacman (1998), Amador, Werning, and Angeletos (2006), Beshears, Choi, Harris, et al. (2015), and Beshears, Choi, Clayton, et al. (2015).

7. South Africa is coded as economically developing and is omitted.

8. Since 2002, DC arrangements have been permitted in three of the five types of occupational schemes in Germany. German savers had also set up over 14 million Riester plans as of 2011 (Börsch-Supan, Coppola, and Reil-Held 2012). The DC saving in Japan is still in its infancy.

in three of the countries that we study: Australia, Singapore, and the United States.[9] Third, in most circumstances, DC assets are at least as liquid as DB assets, so DC assets are the relevant margin for a household considering liquidating retirement wealth to augment preretirement consumption.

There are many ways to measure liquidity, including the actual quantity of liquidations or the marginal price of liquidations. We use the marginal price because statistics on actual liquidations are difficult to obtain. Even if such statistics were readily available, it is unclear how they should be compared across countries. For example, should liquidations be normalized by DC balances, retirement assets, total assets, or gross domestic product (GDP)? Also, from an economic perspective, the most natural object to study is the marginal price because it summarizes the incentives that consumers face.

Accordingly, we compute the marginal rate of transformation (MRT) between withdrawal-funded consumption at ages when the household is "*pre*eligible" for withdrawals and withdrawal-funded consumption at ages when the household is "eligible" to make withdrawals (in all countries that we study, eligibility age begins no earlier than fifty-five and no later than sixty-three):[10]

$$\text{MRT} = \frac{1 - \tau(pre, y)}{\left[1 - \tau(\text{eligible}, Y)\right] \times R^n}. \tag{1}$$

We apply this definition to "general" consumption, which means consumption for any purpose (as opposed to targeted consumption—such as paying a medical bill or buying a home). In this equation, $\tau(pre,y)$ is the marginal tax rate (accounting for penalties and phase-outs of means-tested benefits) on a \$1 withdrawal from the DC plan when (a) the household is young enough to be at a preeligible withdrawal age *and* (b) the household's

9. In 2013, the Social Security trust fund contained \$2.8 trillion, and other retirement plan assets totaled \$23.0 trillion, summing to \$25.8 trillion. The DC plans (including the federal government's Thrift Savings Plan and state and local DC plans) had assets of approximately \$13.2 trillion, more than half of the \$25.8 trillion total. (Sources: Social Security Trust Fund, Investment Company Institute, Thrift Savings Plan, and authors' calculations.)

10. Singaporeans turning fifty-five after 2012 may only withdraw S\$5,000 of their Central Provident Fund (CPF) balances plus amounts exceeding the Minimum Sum and Medisave Minimum Sum between age fifty-five and the drawdown age (currently sixty-four). The remainder is paid out as an annuity beginning at the drawdown age.

In Germany, access to vested occupational pension benefits is typically linked to eligibility for state-provided pension benefits. Benefits can only commence when the member provides a pension approval certificate (i.e., proof that she receives state-provided pension benefits). The early state retirement age for the long-term insured is currently sixty-three.

We do not model provisions allowing for early access to small balances upon job separation. For example, employers in Canada (Ontario) may allow (or require) separated employees to withdraw balances of less than 20 percent of the Year's Maximum Pensionable Earnings (YMPE) (as defined under the Canada Pension Plan) applicable to their termination year. Employers in Germany may enforce the liquidation of balances below a restrictive minimum threshold if the separating employee does not transfer her pension rights to a new employer. Superannuation fund members in Australia may access balances of less than AU\$200 from previous employers.

employment income, y, in the withdrawal year is less than or equal to the household's permanent income, Y. Likewise, τ(eligible, Y) is the marginal tax rate on a \$1 withdrawal from the DC plan when (a) the household is old enough to be eligible to make withdrawals *and* (b) household earnings in the withdrawal year equal permanent income, Y. Because we are studying a situation in which the household may have a liquidity need at a preeligible age, we calculate how the MRT varies as we change y. We assume permanent income is Y = US\$60,000, which is approximately the median household income in each of the six countries. For simplicity, we set the gross real interest rate, R, to 1 (i.e., we set the net real interest rate to zero). Cross-country comparisons are not affected by this interest rate assumption.

We need to make additional demographic assumptions to pin down the household's marginal tax rate. We assume the household is a one-earner married couple with no dependents that rents housing, takes the standard income tax deduction, and is not disabled. In the preeligible withdrawal state, the earner is any age strictly under fifty-five; in the eligible withdrawal state, the earner is at least sixty-five years old.

In some situations, withdrawals are completely prohibited in the preeligible state. We treat such a ban as a 100 percent marginal tax rate—that is, $\tau(pre, y) = 1$. High values of the MRT are associated with high levels of liquidity (early withdrawals are potentially encouraged), and low values of the MRT are associated with low levels of liquidity (early withdrawals are discouraged or completely banned).

2.2 DC Liquidity across Six Countries

We are now ready to describe the MRT as a function of labor income during the preeligible withdrawal year, y, country by country. More detailed analysis and a description of our methodology are provided in the appendix.

2.2.1 Germany, Singapore, and the United Kingdom

In Germany, Singapore, and the United Kingdom, early withdrawals from retirement accounts are banned for general consumption: MRT = 0 for all y.[11] Only disabled[12] or terminally ill individuals may receive payments (an allowance that exists in all six countries). Although Singapore's DC assets are completely illiquid with respect to general (untargeted) consumption, Singapore has targeted DC accounts for medical expenses, a home purchase

11. We do not consider the Supplementary Retirement Scheme in Singapore, a voluntary DC plan designed to complement the CPF. More details can be found in the appendix.

12. In Germany, *if* the occupational pension plan covers disability, any payments during disability will be contingent on providing an official pension approval certificate from the social insurance system. If the employee is temporarily disabled, the payment of state-provided pension benefits will be discontinued and the employee will lose the pension approval certificate once s/he returns to work.

(which must be repaid with interest if the home is sold), and education (which must be repaid with interest in twelve years).[13]

2.2.2 Canada and Australia

In Canada[14] and Australia, the MRT = 0 under normal circumstances,[15] but DC balances become liquid in the event of adverse transitory labor income shocks.

Canada (Ontario). Employer-based DC plan balances cannot be accessed before the eligibility age unless a household's expected income in the twelve-month period following the application for withdrawal falls below US$32,428.[16] Therefore, MRT = 0 at our hypothetical household's normal level of income: US$60,000. Once income in the preeligible withdrawal year falls below US$32,428, the MRT jumps from 0 to 1.11. The MRT increases with further declines in income, y, because the marginal tax rate in the preeligible year falls while the marginal tax rate in the eligible year is held fixed. Means-tested benefit programs generate (local) non-monotonicities in the marginal tax rate that feed through to the MRT. As income approaches zero, the MRT plateaus at a peak value of 1.50 (see figure 2.1). Hence, the Canadian DC system has the intuitively appealing property that, for a typical household, DC withdrawals are barred when income is near its normal level but are encouraged (MRT > 1) when income declines substantially.

Australia. In Australia, the MRT = 0 as long as the household remains employed, no matter how low income falls. However, if the household receives income support from the government for at least twenty-six weeks (e.g., unemployment benefits), the household becomes eligible for DC with-

13. See Agarwal, Pan, and Qian (2014) for a discussion of spending that occurs in Singapore once participants can access part of their balance at age fifty-five.

14. Our analysis for Canada considers Registered Pension Plans, which require employer contributions and are subject to both federal tax jurisdiction and federal or provincial pension legislation. Group Registered Retirement Savings Plans, on the other hand, do not require employer contributions and are not subject to pension legislation. Legally, these plans may allow for withdrawals at any age, but sponsoring employers can and typically do place restrictions on early access, at least until separation from employment. A more detailed analysis of these plans can be found in the appendix.

15. There are some additional withdrawal provisions in these two countries, which are limited to a specific need (such as outstanding medical expenses, mortgage payments, etc.) or group (such as temporary residents permanently leaving Australia) and are explained in the appendix.

16. We assume that the preeligible household accesses DC funds transferred to a "locked-in retirement account." Withdrawals may be made from a locked-in account under the "low expected income" financial hardship provision if total expected income in the twelve-month period following the application for withdrawal falls far enough below two-thirds of the YMPE to permit a withdrawal of at least C$500. The maximum eligible withdrawal amount is (50 percent × YMPE)—(75 percent × Expected Income During the Next 12 Months). Therefore, withdrawals of at least C$500 may be made when expected income falls to C$33,400, or about US$32,427 using the 2013 annual exchange rate: (50 percent × C$51,100)—(75 percent × C$33,400) = C$500. Due to the C$500 minimum withdrawal requirement, we calculate the MRT in this case based on the effective marginal tax rate on the last dollar of a C$501 pension withdrawal.

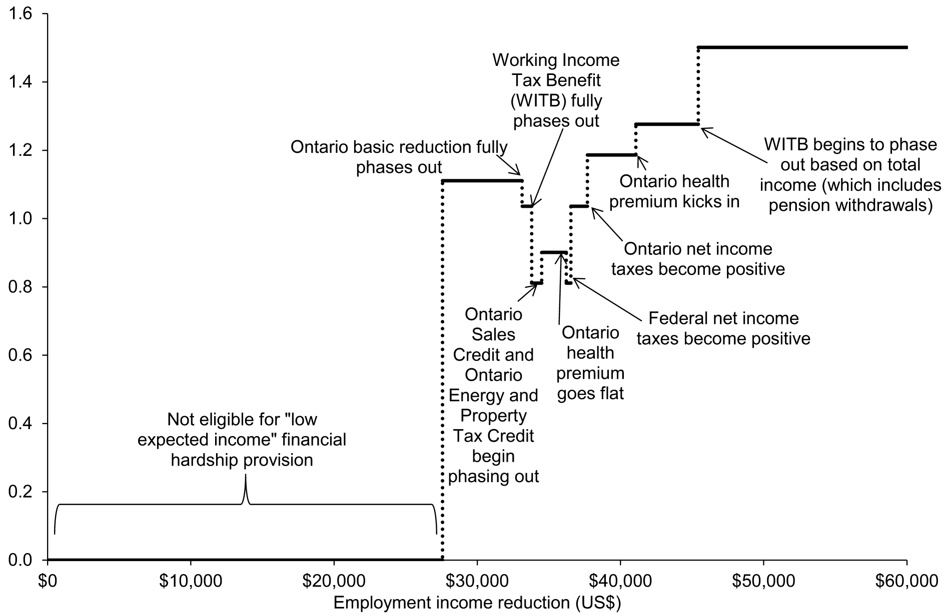

Fig. 2.1 Marginal rate of transformation (MRT) for Canada

Note: This figure reports the MRT for a household in Ontario, Canada, with assets from a DC registered pension plan that has been rolled over to a locked-in retirement account. For more details see the appendix.

drawals.[17] Hence, Australia also has a rising MRT as income in the preeligible year declines if low income in the preeligible year is due to a long unemployment or underemployment spell and the household receives government benefits as a result (see figure 2.2).

2.2.3 United States

In contrast, even at a normal level of income, the US DC system is liquid. Workers can roll over balances from a previous employer's DC plan into an IRA and then liquidate those balances under any circumstances with a maximum tax penalty of 10 percent. For instance, if our hypothetical household

17. The severe financial hardship provision that allows early access in this case restricts the withdrawals to AU$10,000 (with a minimum of AU$1,000) to cover reasonable and immediate family living expenses, such as general outstanding bills, insurance premiums, or mortgage payments. These withdrawals must be approved by the plan trustee. Given the AU$1,000 minimum withdrawal requirement in this case, we calculate the MRT based on the effective marginal tax rate on the last dollar of a AU$1,001 pension withdrawal. In Australia, withdrawals are also possible during temporary disability. In this case, withdrawals must typically be taken as an income stream throughout the period of disability (whereas a single lump sum may be taken for permanent disability).

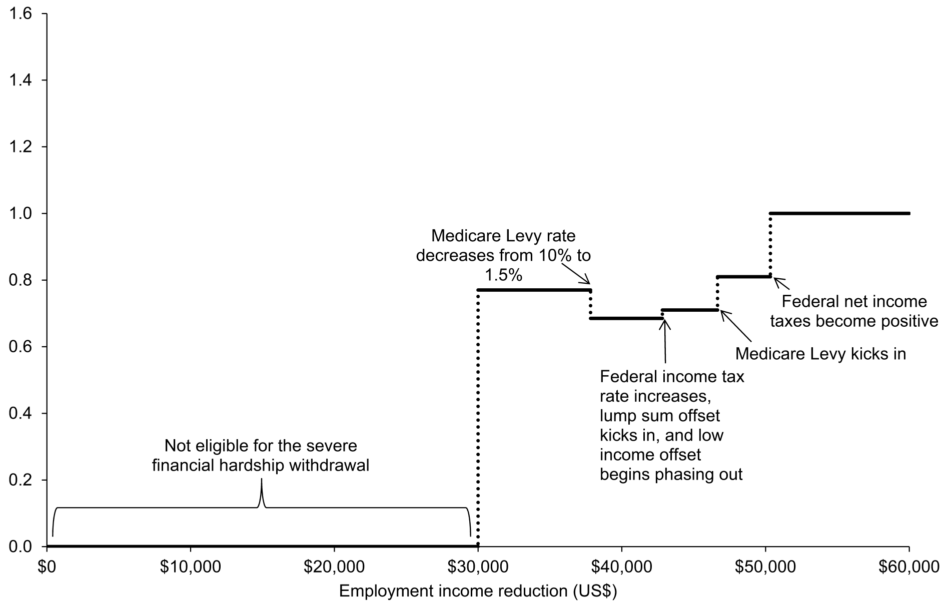

Fig. 2.2 Marginal rate of transformation (MRT) for Australia

Notes: This figure reports the MRT for a household in New South Wales, Australia, with DC assets in a superannuation fund. We assume that the reduction in employment income is due entirely to an unemployment spell. Hence, an x percent reduction in income is engendered by x percent of fifty-two weeks of unemployment. We also assume that the household receives unemployment benefits throughout the unemployment spell. For more details see the appendix.

lived in Texas, its MRT with preeligible income equal to permanent income would be

$$\text{(2)} \qquad \text{MRT} = \frac{1-\tau(pre, y)}{1-\tau(\text{eligible}, Y)}$$

$$= \frac{1-0.1-0.15}{1-0.15} = 0.88.$$

As preeligible income falls below its normal level, the MRT tends to rise (as in Canada and Australia) due to falling marginal tax rates in the preeligible withdrawal year. As preeligible income approaches zero, the MRT eventually exceeds one (see figure 2.3). Hence, like the Canadian and Australian systems, the US MRT increases as income falls transitorily, but the rise is much more muted in the United States: the MRT increases from 0 to 1.50 in Canada, from 0 to 1 in Australia, and from 0.88 to 1.06 in the United States.

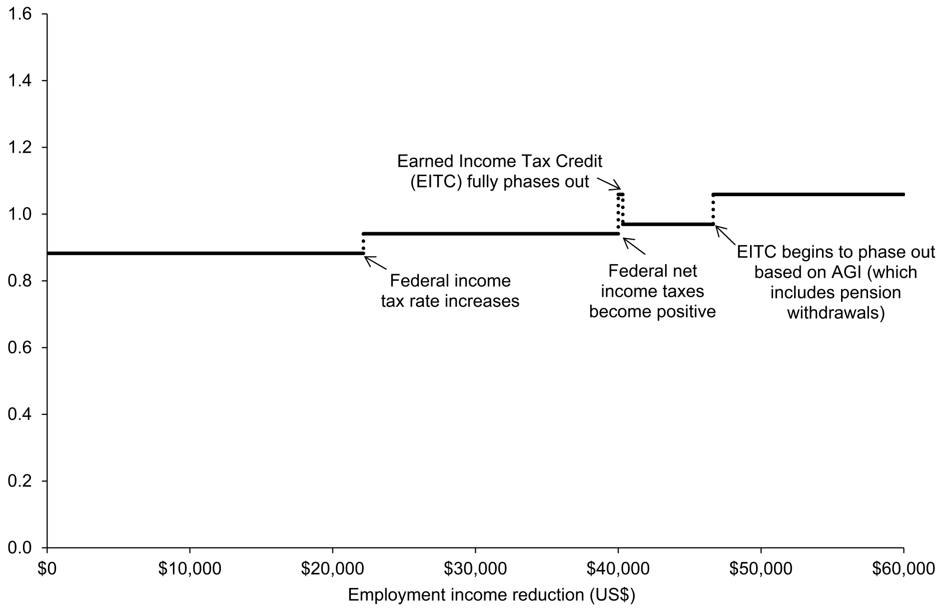

Fig. 2.3 Marginal rate of transformation (MRT) for the United States
Note: This figure reports the MRT for a household in Texas with some DC assets that have been or can be rolled over to an IRA. For more details see the appendix.

2.3 Conclusions

The six countries that we study fall into three groups. In Germany, Singapore, and the United Kingdom, withdrawals for general consumption in employer-based DC plans are banned, no matter the level of transitory income.

By contrast, in Canada and Australia, liquidity in employer-based DC plans is sharply state-contingent. For a household that normally earns US$60,000, DC accounts are completely illiquid unless annual income falls substantially, at which point the DC assets may be accessed. For example, Canadian workers who temporarily have very low income face strong incentives to *withdraw* their DC balances (MRT = 1.50).

The United States stands alone with respect to the high degree of liquidity in its DC system. Penalties for early withdrawals are relatively low, even at normal levels of income, and early withdrawals are slightly subsidized as income falls transitorily.

Explaining these cross-country differences in employer-based DC plans is beyond the scope of the current chapter. Nevertheless, we list four (mutually compatible) hypotheses for future research.

First, the differences in liquidity across DC regimes might matter little for welfare because the benefits of illiquidity (e.g., addressing a self-control problem) and the benefits of flexibility (e.g., liquidity during financial emergencies) are approximately equal in magnitude. Under this first hypothesis, differences across countries are welfare-neutral, so it is not surprising to see wide variation. See Beshears, Choi, Clayton, et al. (2015) for analysis that points in this direction.

The second hypothesis is akin to the first. If a country's DC system was designed to only be a minor supplement to a larger retirement income system, then its liquidity properties would have little welfare consequence. Thus, wide variation in these properties could ensue. The US DC system was first conceived as a top-up for DB pension plans. Only by historical "accident" did it instead become a substitute for DB plans over time, as DB plans lost appeal because of their nonportability and (employer) balance sheet risk. The United States was not intended to have a highly liquid workplace pension system, but this is what resulted from the unforeseen atrophy of the DB leg of the retirement savings system. The German DC system was also designed as a top-up to a DB system, but unlike in the United States, it is essentially illiquid before retirement.

Third, cross-country differences might reflect different ideological preferences. If a country's citizens have a relatively strong preference for economic freedom (potentially as an end in itself), this would tilt the retirement savings system toward more flexible institutions.

Finally, variation in the employer-based DC plans might result from other cross-country differences, like the strength of the social safety net. Liquid DC accounts are particularly useful if other sources of income support (e.g., unemployment benefits) are not sufficient during periods of financial duress. However, if this were the explanatory mechanism for the US DC system's liquidity, we would expect to see US liquidity being made contingent on the presence of an income/expenditure shock (e.g., withdrawals that are only liquid during an unemployment spell or coincident with a large health shock). Instead, US households are able to access their balances under any circumstances by paying no more than a 10 percent penalty.

Appendix

Methodology

In our analysis we consider households in the most populated regions of the six countries that we study: the United States (California and Texas), Canada (Ontario), Australia (New South Wales), the United Kingdom (London), Singapore (Singapore), and Germany (Berlin). We focus on the early withdrawal rules of the primary employer-based defined-contribution

(DC) schemes in these countries, as well as personal DC schemes that are largely funded by rollovers from employer-based plans (such as individual retirement accounts in the United States). Within this set of DC schemes, we consider all tax-advantaged DC retirement plans except those that accept only after-tax contributions (such as Roth 401[k] plans in the United States). Whereas all six countries permit early benefit access for disability or terminal illness, we focus on the degree of early access to retirement savings permitted in response to a general liquidity need at various levels of household income.

We calculate the marginal rate of transformation (MRT) between consumption of \$1 (for general spending) funded by a withdrawal from the DC account prior to the retirement-eligibility age and consumption of \$1 funded by a withdrawal from the account after the retirement-eligibility age. This calculation requires knowledge of the rules regarding pension eligibility and tax treatment of pension withdrawals and income in each country. To understand each country's pension rules, we analyzed governmental sources, including pension legislation and agency websites, as well as industry reports and academic literature. To verify our tax calculations, we used professional software for the United States and Canada (TurboTax) and free software provided by the government for Australia (E-tax). Since early access to DC retirement savings is fully restricted for our purposes in the United Kingdom, Singapore, and Germany, we did not need to conduct a tax analysis for these countries.

To standardize our tax calculations across countries, we assume the household is a one-earner married couple that files jointly, takes the standard income tax deduction, has no dependents, rents its housing, and is not disabled. These assumptions minimize differences in marginal tax rates across age and income states driven purely by state-dependent tax credits and deductions. We also assume that both partners are less than age fifty-five in the preeligible state and at least age sixty-five in the eligible state. These age restrictions ensure a change in eligibility status across the two states in all six countries, although the age threshold for the latter state could be set as low as age fifty-five (depending on the country) with no change in results.

Finally, we assume in our baseline scenario that the household has an annual gross income equivalent of US\$60,000 for all countries. By comparison, median household income was US\$60,190 in California and US\$51,704 in Texas in 2013 (United States Census Bureau 2013). In Singapore, the average annualized 2012–2013 income for households residing in four-room flats (32.6 percent of resident households) was US\$71,002 for the third income quintile, while the average for those residing in five-room and executive flats (25.5 percent of resident households) was US\$82,166 for the third income quintile (Department of Statistics Singapore 2014a, 2014b).[18]

18. The income data reported in this section are converted to 2013 US\$ using historical exchange rates from the Federal Reserve Bank of St. Louis FRED Economic Data and CPI data from the Bureau of Labor Statistics.

In London, 2009 median household income was £33,430, or roughly US$57,209 in 2013 dollars (Greater London Authority 2010). In Ontario, 2012 median income for "all census families" was US$74,890, or roughly US$75,600 in 2013 dollars (Statistics Canada 2014a). This estimate excludes about 16 percent of the population classified as "persons not in census families," who had 2012 median income of about US$24,000 (in 2013 dollars). In 2012, *median net* household income in Berlin was about US$25,800 in 2013 dollars (Office for Statistics Berlin-Brandenburg 2013), whereas *average gross* household income in Berlin and New Länder was about US$49,265 (German Federal Statistical Office [Destatis] 2013). Finally, annualized 2011–2012 median income in New South Wales was US$77,769, or about US$79,700 in 2013 dollars (Australian Bureau of Statistics 2013). The deviation between the median household income in each country and our assumption of US$60,000 does not affect any of the MRT calculations.

The remainder of this appendix presents profiles of each country that we study, including general information on each country's DC retirement schemes, a summary of the eligibility rules that apply to our analysis, and a detailed presentation of our MRT calculations.

United States

In the United States, about half of private-sector workers participate in an employer-sponsored retirement plan, of whom more than two-thirds are covered by a DC plan, primarily a traditional 401(k) plan (Munnell 2014). In 2013, private-employer-sponsored DC plans held $4.9 trillion in assets (34 percent of total private retirement assets) and individual retirement accounts (IRAs) held $6.5 trillion in assets (45 percent of total private retirement assets). The IRAs are personal DC accounts that are not linked to an employer; however, incoming flows to IRAs are dominated by rollovers from employer-sponsored plans (Copeland 2014). There has been a significant increase in DC plan participation in the public sector over the last decade, although the vast majority of public pension assets still reside in defined-benefit (DB) plans (Beshears et al. 2011).

Contributions to traditional 401(k) plans and IRAs are tax deductible, and investments grow tax deferred until withdrawal. Distributions are taxed as ordinary income, and withdrawals before age 59.5 incur an additional 10 percent federal tax penalty.[19] There are, however, many circumstances under which the tax penalty for early withdrawals from 401(k) plans is waived, including (a) the account holder has a job separation at or after age fifty-five; (b) the account holder suffers permanent and total disability; (c) the account holder has unreimbursed medical expenses exceeding 10 percent of adjusted gross income (AGI); (d) the withdrawal is used to make back tax payments resulting from an IRS levy; (e) the withdrawals

19. Throughout this appendix, we refer to the effective income tax rates applicable to pension withdrawals rather than the withholding tax rates.

take the form of a series of substantially equal periodic payments made over one's life expectancy; (f) the withdrawal is a refund of excess contributions; (g) the withdrawals are distributions to an alternate payee under a Qualified Domestic Relations Order; (h) temporary relief granted to victims of designated natural disasters; (i) the withdrawals are used to pay inheritances to beneficiaries after the death of the account holder; and (j) the withdrawals are used to make certain distributions to qualifying military reservists (Internal Revenue Service 2014).

Traditional IRAs carry the same early withdrawal rules except they do not allow penalty-free withdrawals upon job separation at or after age fifty-five. They do, however, permit penalty-free withdrawals of up to $10,000 at any age to buy, build, or rebuild a home if the account owner has not owned a home in the previous two years. They also allow for penalty-free withdrawals to pay for higher education costs and health insurance premiums (conditional on receiving unemployment benefits for at least twelve consecutive weeks). All other IRA withdrawals before age 59.5, which may be made at any time and for any reason, are subject to the 10 percent tax penalty.

Employers sponsoring 401(k) plans may permit loans or distributions (hardship or nonhardship related) while the account holder is still working for the employer, although they are not legally required to do so. In-service distributions made before age 59.5 are subject to the 10 percent tax penalty; loans are not subject to the tax penalty unless the recipient defaults on repayment. Loans are restricted to the lesser of 50 percent of the vested account balance or $50,000, and are generally repayable over five years at an interest rate determined by the employer.

For our analysis of the United States, we assume that both the preeligible household and the eligible household take distributions from an IRA containing funds rolled over from a 401(k) plan linked to a previous employer. The results would be the same if we assumed that the household was permitted to take an in-service distribution from its current 401(k) plan. In practice, some employers do not allow in-service withdrawals, and of those that do, many place restrictions on their use. As noted earlier, the total amount of assets held in IRAs in the United States exceeds that in employer-sponsored plans by over 30 percent; it is a relevant withdrawal margin for most households with retirement assets because all 401(k) accounts at previous employers can be rolled over into an IRA.

In calculating the effective marginal tax rate on pension withdrawals, we use the *tax rate schedules* published in the IRS Tax Guide for Individuals to determine the federal income tax liability (Internal Revenue Service 2013b).[20] In practice, the IRS *tax tables* provided in the same document determine the actual income tax paid on a given level of taxable income.

20. Our tax calculations for the United States apply for the 2013 tax year, which coincides with the 2013 calendar year.

These tables provide discrete tax amounts that apply to taxable incomes within a certain range, as opposed to a rate that is assessed on each dollar of taxable income. For instance, according to the tax tables, taxable income between $10,000 and $10,049 is subject to a tax of $1,003. For our calculations, we apply the underlying marginal tax rate (10 percent in this example) from the tax schedule to each dollar of taxable income within this range, so that the tax on $10,000 of taxable income is $1,000.00 and the tax on $10,049 of taxable income is $1,004.90. Similarly, we phase out the Earned Income Tax Credit (EITC) linearly, as opposed to adhering to the discrete amounts provided in the EITC table (Internal Revenue Service 2013a). This ensures that there are no large jumps in the figures we plot below.

We perform separate calculations for the two most populated states: California and Texas. Both of these states are unique in that California is one of only two states to our knowledge that levies its own tax penalty on early distributions (2.5 percent) in addition to the 10 percent federal penalty,[21] while Texas is one of seven states with no state income tax (two additional states do not tax *wage* income) (Intuit TurboTax 2014). Texas (figure 2.3) is illustrative in that it allows us to focus solely on the incentives built into the federal tax system. California (figure 2A.1), on the other hand, illustrates the combined effect of both federal and state income taxes, along with both federal and state penalties for preeligible pension withdrawals.

The figures we show plot the MRT between the withdrawal-funded consumption of preeligible and eligible households for different levels of preeligible household income. Our baseline scenario is when both the preeligible and the eligible household have incomes of US$60,000. This corresponds to the left-most point on the x-axis in all of the figures that follow. We place the figure for Texas in the body of the chapter—figure 2.3—and we place the figure for California in this appendix: figure 2A.1. The MRT is 0.88 in Texas and 0.85 in California. That is, the preeligible household in these states can consume 88 percent (Texas) and 85 percent (California) of what the eligible household can consume out of a marginal $1 withdrawal from its retirement account. In no other country that we study does the MRT of the primary employer-based DC scheme exceed zero (with a zero income shock).[22]

The x-axis in the figures measures the magnitude of the negative transitory labor income shock experienced by the preeligible household. As we move to the right, this negative income shock increases from US$0 (the far left) to US$60,000 (the far right), at which point the preeligible household has no income. In both Texas and California, the MRT is either flat or increasing with the size of the income shock with one exception: the region where AGI is between US$13,350 and US$19,680, which is where the EITC (a refund-

21. Nebraska imposes a tax penalty on early withdrawals equal to a specified percentage (29.6 percent in 2014) of the federal tax penalty (Nebraska Department of Revenue 2014).

22. As discussed in the next section, the only potential exception to this finding is group RRSPs in Canada, which are not subject to pension legislation.

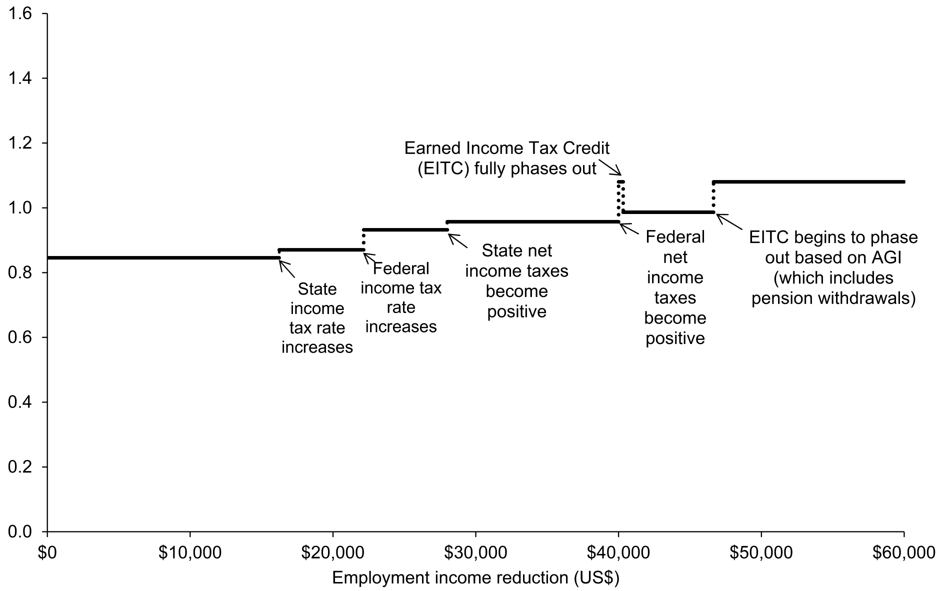

Fig. 2A.1 Marginal rate of transformation (MRT) for California

Note: This figure reports the MRT for a household in California with some DC assets that have been or can be rolled over to an IRA.

able tax credit for lower-income workers) phases out. When AGI, which includes pension withdrawals, is less than US$13,350, the EITC is determined solely based on employment income, which excludes pension withdrawals. Once AGI exceeds this threshold, it becomes the income measure used to determine the EITC, and pension withdrawals reduce the amount of the credit. In general the MRTs are similar across the two states, although a progressive state income tax in California and the lack of a state income tax in Texas makes the MRT greater at lower levels of income in California, despite the 2.5 percent tax penalty on early withdrawals. The MRT in both states hovers close to or above 1.0 once income falls below US$19,680 (corresponding to an income reduction of US$40,320) and increases to 1.06 in Texas and 1.08 in California when income falls to $0 (corresponding to an income reduction of US$60,000).

Canada

About one-third of the Canadian labor force, or 40 percent of employed workers, are covered by workplace pensions, or Registered Pension Plans (RPPs) (Ambachtsheer 2009; Government of Canada Office of the Chief Actuary 2014). Among these covered private (public)-sector workers, about 48 percent (94 percent) are covered by DB plans, and about 52 percent (6 percent) are covered by DC or other plans. Participation in these plans is often mandatory, and employer contributions are required. Similar to traditional 401(k) plans in the United States, employee and employer contributions to DC RPPs are tax deductible, investment earnings grow tax deferred, and distributions are taxed as ordinary income. The RPPs must comply with the provisions of the federal Income Tax Act to receive tax benefits, but the minimum standards for design, funding, communications, and administration for most plans are established by provincial legislation (Van Riesen 2009).[23] For this analysis, we have focused on the provincial legislation of Ontario, established under the Pension Benefits Act.[24] Ontario's RPP membership accounts for more than 35 percent of total RPP membership in Canada (Statistics Canada 2014b).

In Ontario, vested funds in DC RPPs may in general not be accessed until age fifty-five, ten years before the normal retirement age. Vested RPP participants who separate from employment may generally (a) leave their balances in the plan until becoming eligible or deciding to receive a benefit;[25] (b) transfer their balances to a new employer's plan; (c) purchase a life annuity that commences no earlier than the plan's eligible retirement age; or (d) transfer their balances to a locked-in retirement account (LIRA) or a life income fund (LIF). The LIRAs are accounts that allow for continued tax-deferred growth but do not accept contributions or permit withdrawals (except under the conditions described below). By age seventy-one, funds in a LIRA must be transferred to a LIF or used to purchase an annuity. The LIFs are income funds that provide a regular stream of retirement income once the original pension plan eligibility age has been reached. They have both a minimum withdrawal percentage and a maximum withdrawal percentage that increase with age.

Since December 21, 2010, Ontario has permitted LIRA holders to withdraw up to 50 percent of their LIRA balances upon transfer to a LIF, as long as the holder is at least fifty-five years old and the distribution is made within sixty days of the transfer. Those with less than C$21,000 (in 2014) across all of their locked-in accounts may also withdraw all of these balances if at least age fifty-five.

There are several financial and nonfinancial hardship provisions that allow early distributions from LIRAs before age fifty-five (Financial Services Commission of Ontario 2014). These distributions are also taxed as ordinary income. The financial hardship provisions allow for early distributions if (a) the account owner has low expected income; (b) the distributions

23. A minority of RPPs are regulated under federal pension legislation.

24. The Pension Benefits Act is available at: http://www.e-laws.gov.on.ca/html/statutes/english/elaws_statutes_90p08_e.htm.

25. Currently, DC RPP members cannot receive retirement income directly from the plan. However, Bill 120 (legislated in 2010) amends the Pension Benefits Act to allow members to establish a variable account within the DC RPP to receive income directly from the plan. This amendment has not yet been proclaimed.

are used to pay for outstanding medical expenses, including renovations to a principal residence for medical reasons; (c) the distributions are used to pay for first and last month's rent payments for the account owner's principal residence; or (d) the account owner is in arrears of rent or in default on a mortgage. These withdrawals may be made from an account only once a year (unless for outstanding medical expenses) as a lump sum that is limited to a minimum amount of C$500 and a maximum amount that is set as a percentage of the Year's Maximum Pensionable Earnings (YMPE).[26] The nonfinancial hardship provisions allow early distributions in cases of (a) terminal illness that reduces life expectancy to two years or less; (b) emigration from Canada as a nonresident for at least twenty-four months; or (c) excess transfers to LIRAs exceeding federal Income Tax Act limits. Under the first two conditions, the entire balance may be accessed; under the third condition, only the amount of the excess transfer may be accessed.

Finally, effective July 1, 2012, a new provision was added to the Pension Benefits Act allowing separated vested DC RPP members with account balances that are less than 20 percent of the YMPE in the year they separated from employment to withdraw all of these funds at any age. The funds may be accessed as a lump sum at any time or transferred to a RRSP (described below) within the first ninety days of receiving the option. Employers are not required to offer this withdrawal option; they are also allowed to make these withdrawals mandatory (Financial Services Commission of Ontario 2013).

Another DC savings option in Canada is the Registered Retirement Savings Plan (RRSP), an individual retirement account that may be opened privately through a financial institution ("individual RRSP") or offered through an employer ("group RRSP"). The RRSPs must be registered with the Canada Revenue Agency (and thus are subject to the federal Income Tax Act[27]) but are *not* subject to pension legislation (Van Riesen 2009). As such, these plans are less regulated than RPPs. Unlike RPPs, group RRSPs are typically voluntary, do not require employer contributions, allow for distributions at any age, and do not require any benefits to be taken as an income stream. However, employers can and typically do place restrictions on early access to these funds, at least until separation from employment. Under the Income Tax Act, employers may not make direct contributions to group RRSPs; instead, they must increase an employee's gross salary by a set amount and then transfer this amount into the employee's RRSP account (Frenken 1995). These contributions are included in the employee's taxable income and are subject to payroll taxes, unlike contributions to RPPs. The employee may later deduct these contributions up to the RRSP deduction limit (18 percent of the previous year's earnings up to C$23,820 in 2013).

26. The YMPE is defined under the Canada Pension Plan, a contributory public pension plan covering workers in all Canadian provinces except Quebec. The YMPE was C$51,100 in 2013.

27. For provisions in the Income Tax Act pertaining to RRSPs, see Canada Revenue Agency, "IC 72–22R9," available at http://www.cra-arc.gc.ca/E/pub/tp/ic72–22r9/ic72–22r9-e.html.

This limit is reduced by employer and employee contributions to RPPs; however, the difference between the maximum limit and actual contributions in any year can be carried forward to increase the contribution limit in future years. Withdrawals from RRSPs are subject to ordinary income taxes. Tax- and interest-free loans may be taken from RRSPs for first-time home purchases under the Home Buyer's Plan (repayable over fifteen years beginning two years after the withdrawal) or to finance education or training under the Lifelong Learning Plan (repayable over ten years beginning five years after the withdrawal).

For this analysis, we focus on DC RPPs, since they are subject to Ontario's pension legislation, are typically mandatory, and require employer contributions. Unfortunately, Statistics Canada's Pension Plans in Canada database, the best-known source of pension data in the country, provides plan and membership data on RPPs but not on group RRSPs (Baldwin 2015). This makes it difficult to quantify the relative importance of the two systems. In 2012, there were about 1.63 million members in RPPs with DC components (Statistics Canada 2014c). A recent government estimate suggests that in the same year there were about 1.50 million separate participants (those who do not participate in a RPP) in group RRSPs and/or Deferred Profit Sharing Plans (DPSPs) (Government of Canada Office of the Chief Actuary 2014).[28] Data comparing assets are even harder to come by. One source is Canadian Institutional Investment Network (2013), which summarizes survey data from nearly 400 firms with employer-sponsored DC plans. Among the surveyed organizations, 27 percent offer only a DC RPP, 15 percent offer only a group RRSP, and 59 percent offer both.[29] Assets under management in the average surveyed DC RPP were over five times the amount of assets in the average group RRSP. If group RRSPs were considered to be part of the primary employer-based DC scheme in Canada, these plans would be the only caveat to our finding that the United States is the sole country where the MRT does not equal zero at higher levels of income.

One feature relevant to our analysis of RPPs in Ontario is the "low expected income" financial hardship withdrawal provision that allows individuals of any age to make a withdrawal from a LIRA, which typically contains funds rolled over from RPPs. Under this provision, individuals can access their LIRA for any purpose if their total expected (self-reported) income in the next twelve months is less than two-thirds of the YMPE (C$51,100 × 2/3 = C$34,067 in 2013) (Financial Services Commission of Ontario 2014). Withdrawals are limited to the difference between 50 percent of the YMPE and 75 percent of total expected income in the next twelve months (with a

28. The DPSPs, in which an employer allocates a share of firm profits to employees in a trust account, are also not subject to pension legislation and may allow an employee to withdraw all or part of her account while still in active employment (Service Canada 2014).

29. Of the employers sponsoring a group RRSP, 58 percent made a contribution to the plan (whereas employer contributions are mandatory for RPPs).

minimum withdrawal amount of C$500).[30] We assume that the preeligible household accesses funds previously rolled over from a DC RPP to a LIRA using this financial hardship withdrawal provision. For the eligible household, we assume that the household transfers rolled over DC RPP funds within a LIRA to a LIF and then exercises the option to access part of this transfer as an immediate lump sum. Figure 2.1 presents our calculations under these assumptions.

Figure 2.1 shows the MRT between the withdrawal-funded consumption of preeligible and eligible households in Canada for different assumptions about preeligible household income relative to our prespecified benchmark.[31] In contrast to the United States, the MRT in our baseline scenario (income of US$60,000) is zero: preeligible households cannot access their balances at all outside of the limited exceptions noted above. Given the relatively stringent eligibility requirements for the low expected income withdrawal provision, the MRT remains zero as the size of the negative income shock increases until household income in the preeligible state falls below US$32,428. At this point, the MRT jumps to 1.11 and remains above 1.0 at most lower levels of income as well. Reductions in income generally result in a higher MRT, although this pattern is not monotonic for several reasons. Similar to the EITC in the United States, the Working Income Tax Benefit (WITB) for lower-income workers phases out based on total income (which includes pension withdrawals) between the range of US$14,572 and US$26,203, creating an implicit tax on pension withdrawals. Similarly, the phasing out of the Ontario basic income tax reduction, the Ontario Sales Credit, and the Ontario Energy and Property Tax Credit at lower levels of income create additional taxes on withdrawals. Finally, the Ontario health premium is levied at a 6 percent rate on income between US$18,932 and US$23,785, but then changes to a flat amount (C$300) for income between US$23,786 and US$32,247 (at which point the household is no longer eligible for a withdrawal). This shift removes the health premium's impact on the effective marginal tax rate on pension withdrawals within the higher income range. The Canadian MRT reaches its peak of 1.50 when income falls below US$14,572. Note that this MRT is substantially higher than the maximum US MRT.

30. Given these restrictions, withdrawals can only be made when expected income in the twelve months following application falls to C$33,400: (50% × C$51,100) – (75% × C$33,400) = C$500.

31. Our tax calculations for Ontario apply for the 2013 tax year, which coincides with the 2013 calendar year. We convert from C$ to US$ using the average daily exchange rate over this period (1.03 C$ to 1 US$). Since the "low expected income" withdrawal provision requires minimum withdrawals of at least C$500, we calculate the MRT based on the effective marginal tax rate on the last dollar of a C$501 pension withdrawal.

Australia

Over 90 percent of employed Australians save for retirement in a superannuation fund ("super"), which is a tax-advantaged private retirement plan with mandatory employer contributions (Agnew 2013).[32] Employees may also make voluntary income tax-deductible or after-tax contributions to their super. The vast majority of active employees participating in employer-sponsored retirement plans are members of DC or hybrid plans.

For this analysis, we assume that the household has a super funded solely from income tax-deductible contributions (which include employer contributions).[33] These contributions are not taxed as ordinary income. Instead, the contributions are taxed (when contributed) at a rate of 15 percent (30 percent if income exceeds AU$300,000)(Australian Taxation Office 2014).[34] Eligible distributions from supers are tax free after age sixty and predominantly taken as lump sums or account-based pensions (Chomik and Piggott 2012). Super members may access their balances when they reach the preservation age (currently fifty-five, increasing to sixty for those born after June 30, 1964) if retired from the labor force, or when they reach age sixty-five, regardless of work status.[35] There are also several exceptions allowing earlier access (detailed in the next paragraph). Lump-sum withdrawals made before the preservation age are taxed at the lower of the individual's marginal tax rate and 20 percent (plus the Medicare levy). Lump-sum withdrawals made between the preservation age and age sixty are tax free up to an inflation-indexed lifetime cap (AU$180,000 in 2013), and excess lump sums

32. The Superannuation Guarantee program that mandates private retirement provision commenced in 1992 (Bateman and Piggott 1999). It complements the first pillar of retirement savings, which unlike the public earnings-based schemes in many countries, is a means-tested "age pension" that phases out at higher levels of assets and retirement income. Generally, an employer must make mandatory super contributions for all employees age eighteen and over earning AU$450 or more per month (regardless of whether the employee is a full-time, part-time, or casual worker). An employer must also make contributions for employees under age eighteen who earn AU$450 or more per month and work at least thirty hours per week. The current employer contribution rate is 9.5 percent, increasing to 12 percent by 2025.

33. We do not consider after-tax contributions, which are made by less than 20 percent of employees (Australian Bureau of Statistics 2009). Unlike withdrawals of tax-deductible contributions, withdrawals of after-tax contributions are never taxable. Withdrawals from accounts containing both tax-deductible and after-tax contributions are taxed based on the proportion of each component in the account (i.e., withdrawals may not be taken solely from the after-tax component).

34. About 10 percent of super members, nearly all of which are public servants, participate in "untaxed" DB super schemes. Unlike in the funded DC arrangement that we consider, employer contributions in these schemes are not made until a benefit becomes payable and no contributions or earnings tax is paid. As a consequence, benefit payments are taxed at a higher rate. The majority of these plans are closed to new entrants.

35. Individuals who have reached the preservation age can access their super without retiring if using a "transition to retirement income" drawdown stream. Those who switch jobs after age sixty may also access accounts from previous employers.

above this cap are taxed at the lower of the individual's marginal tax rate and 15 percent (plus the Medicare levy). Annuities received before age sixty are taxed at the individual's marginal rate (plus the Medicare levy), minus a 15 percent tax offset if the individual has reached the preservation age.

Exceptions that permit access to super before the preservation age include (a) becoming disabled or terminally ill (if temporarily disabled, an individual may usually only receive an annuity for as long as she is unable to work; if permanently disabled, an individual may take an annuity or lump sum[36]; and if terminally ill, an individual may take a *tax-free* lump sum), (b) qualifying under "compassionate grounds" as determined by the Department of Human Services, (c) qualifying under severe financial hardship as determined by the plan trustee, (d) payment to a beneficiary following the death of an account owner,[37] (e) temporary residents permanently leaving Australia,[38] or (f) cashing out a balance of less than AU$200 following a job change.

Qualifying early withdrawals under the "compassionate grounds" exception are generally restricted to medical treatment or transport, mortgage assistance, disability-related home or vehicle modifications, palliative care, and funeral expenses for a dependent (Australian Department of Human Services 2014a). The severe financial hardship early withdrawal provision is limited to individuals under age fifty-five and thirty-nine weeks who receive government income support payments for at least twenty-six consecutive weeks.[39] This provision allows withdrawals of between AU$1,000 and AU$10,000 to cover reasonable and immediate family living expenses. Eligible expenses include general outstanding bills, outstanding insurance premiums, necessary motor vehicle repairs, education expenses, outstanding medical bills, minimum outstanding mortgage payments, and essential household goods. These withdrawals must be approved by the plan trustee.

For this analysis, we assume that the preeligible household is able to exploit this financial hardship provision after becoming unemployed and receiving Newstart Allowance, Australia's version of unemployment benefits, for at least twenty-six weeks (when annual employment income has been halved). In 2014, the maximum Newstart Allowance benefit for a married couple is AU$931 per fortnight (or AU$465.50 per week) (Australian Department of Human Services 2014b). This amount is reduced in accor-

36. For withdrawals on account of permanent disability before age sixty, a 15 percent tax offset applies if the payment is received as an annuity.

37. If the beneficiary is a dependent of the deceased account owner, the inheritance is tax free if taken as a lump sum. If taken as an income stream, the payments are tax free if either the deceased account holder or the beneficiary is at least sixty years old; if both are under sixty years old, the payments are taxable as ordinary income minus a 15 percent tax offset. If the beneficiary is not a dependent, the inheritance may only be taken as a lump sum and is taxed at the lower of the individual's marginal tax rate and 15 percent (plus the Medicare levy).

38. These payments are receivable as lump sums and taxed at 38 percent, regardless of age.

39. A similar provision is also available to individuals who are at least age fifty-five and thirty-nine weeks if they are not gainfully employed and have received income support payments for at least thirty-nine cumulative weeks since turning fifty-five.

dance with an asset test and an income test that considers income earned during the benefit receipt period (there is no look-back period). We assume that each reduction in employment income displayed on the x-axis of figure 2.2 corresponds to a period of unemployment in which the preeligible household receives the maximum Newstart Allowance benefit in the background. For instance, when employment income falls to US$45,000, or three-fourths of the starting amount, we assume that the household accrues [(1 – ¾) × 52 weeks × (AU$465.50)] in Newstart Allowance benefits. The eligible household, being at least age sixty-five, is able to make tax-free withdrawals from the super for any reason.

Under these assumptions, the MRT in Australia starts at zero in the baseline scenario and remains so until employment income has been halved (US$30,000), at which point the MRT jumps to 0.77.[40] The MRT increases as employment income falls with the exception of a slight dip resulting from a change in the Medicare levy from a 1.5 percent rate on total income to a 10 percent rate on income within a lower threshold. The MRT increases to 1.0 once employment income reaches US$9,664 and the household's marginal tax rate falls to 0 percent. Had we barred this household from receiving income support payments, early super access at lower levels of income would be prohibited, and the MRT would remain zero across the income distribution.

United Kingdom

In 2012, about 47 percent of workers in the United Kingdom participated in an employer-sponsored retirement plan, split between DB occupational plans (28 percent), DC occupational plans (7.0 percent), group personal pension plans (6.7 percent), group stakeholder pension plans (3.5 percent), and unknown pension plans (1.3 percent) (United Kingdom Office for National Statistics 2013). Additionally, 7 percent of people age sixteen to sixty-four voluntarily contributed to an individual personal pension account.[41] Group personal pension plans are individual, tax-advantaged DC accounts

40. Our tax calculations for Australia apply for the 2014 tax year, which extends from July 2013 to June 2014. We convert from AU$ to US$ using the average daily exchange rate over this period (1.09 AU$ to 1 US$). Since the severe financial hardship withdrawal provision that we consider requires a minimum withdrawal of AU$1,000, we calculate the MRT based on the effective marginal tax rate on the last dollar of a AU$1,001 pension withdrawal.

41. There are two pillars of public retirement provision in the United Kingdom: the Basic State Pension, a flat benefit based on years of contributions, and the State Second Pension, an earnings-based scheme that replaced the State Earnings-Related Pension Scheme in 2002. The 1986 Social Security Act made it possible for employers offering occupational DC plans and employees opening individual personal pension accounts to "contract out" of the public earnings-based scheme beginning in 1988 (Liu 1999). By meeting minimum standards, these plans could substitute for the second layer of public provision. Since 2012, only DB plans have been eligible to contract out. For people reaching the state pension age after April 2016, the Basic State Pension and State Second Pension will be consolidated into a single-tier system and contracting out will no longer be an option (Towers Watson 2014).

that are linked to an employer. Group stakeholder pension plans are similar to group personal pension plans, but they have minimum standards set by the government, including limited management fees and the ability to switch providers at no charge. Contributions to all of these plans are tax relieved, investment earnings grow tax deferred, and distributions are taxed as ordinary income.[42]

Beginning in 2012 and following a phased-in schedule extending through 2017, employers will be required to automatically enroll most employees into a qualifying tax-registered occupational plan (DB or DC) or a DC employer-sponsored personal plan (The Pensions Regulator 2014). Employers may choose to enroll employees in the National Employment Savings Trust (NEST), a centralized DC plan established by the government that carries no initial charges or administrative fees for employers and a simple charging structure for employees.

Funds in occupational and personal pensions may not be legally accessed until age fifty-five at the earliest (rising to age fifty-seven by 2028), except under the circumstances described in the next paragraph. Beginning at age fifty-five, 25 percent of plan balances may be accessed as a tax-free lump sum; the remaining 75 percent may be received through (a) a life annuity, (b) a "capped drawdown" approach, (c) a "flexible drawdown" approach, or (d) a lump sum. The first three options are taxed as regular income; lump sums are taxed at a 55 percent rate. Exceptions to the 55 percent tax include lump sums from combined pension accounts holding £30,000 or less, lump sums from individual workplace pensions holding £10,000 or less, and lump sums from up to three personal pension plan accounts holding £10,000 or less, if the account holder is at least sixty years old. The capped drawdown approach sets a maximum annual withdrawal limit equal to 150 percent of an equivalent single life annuity. The flexible drawdown approach, which may only be utilized by individuals with at least £12,000 in guaranteed annual pension income, allows withdrawals with no maximum limit. Beginning in April 2015, individuals will be able to access the remaining 75 percent of their balances (after receiving the first 25 percent as a tax-free lump sum) as a lump sum subject to ordinary income tax rates.

The only exceptions to the age fifty-five eligibility requirement are for those who qualify under "ill health" or a "protected pension age." To qualify under the ill health exception, an individual must have a mental or physical illness that renders her incapable of carrying out her job until she reaches the eligible retirement age (as determined by a physician). The standard

42. There are two types of tax relief arrangements for pension contributions: net pay and relief at source. Under the net pay arrangement, employee contributions are fully tax deductible from income up to the contribution limit. Under the relief at source arrangement, contributions are taxed at the employee's marginal rate, but the provider adds tax relief directly to the employee's pension account at the "basic" marginal tax rate. The employee can later claim additional relief when filing income taxes if she is subject to a higher marginal tax rate than the basic rate.

tax rules apply to withdrawals under this condition unless life expectancy is reduced to less than one year, in which case all withdrawals are tax free. The protected pension age provision applies to certain individuals who were exempt from the normal minimum pension age increase (from fifty to fifty-five) in April 2010.

In contrast to the countries discussed so far, the MRT equals zero at all levels of income for our representative household in the United Kingdom: under no circumstances may DC retirement funds be accessed early to service a general liquidity need.

Singapore

In Singapore, the vast majority of retirement savings are made through the Central Provident Fund (CPF), a compulsory savings plan with three separate accounts: the Special Account (used for retirement savings and investment), the Ordinary Account (used to buy a home, finance education, pay for CPF insurance, invest, or transfer funds to the Special Account), and the Medisave Account (used for medical expenses and approved medical insurance). The Ordinary Account may be accessed throughout the working life to finance education at qualifying institutions (limited to 40 percent of the balance) or to buy a home and service its mortgage payments. Funds used for education must be repaid (with interest) within twelve years of completing or leaving a course of study; funds used for home purchases must only be repaid upon sale of the home.[43] The Medisave Account is also completely liquid throughout the working life for approved medical expenses or insurance and does not require repayment. Funds in the Special Account may not be accessed until age fifty-five, at the earliest. All contributions, investment earnings, and eligible withdrawals are tax free.

Required contributions to the CPF currently total 36 percent of covered wages (consisting of 20 percent employee contributions and 16 percent employer contributions) until the employee reaches age fifty, at which point both the employee and employer contribution rates begin to decline. The Ordinary Account receives a greater share of contributions than the Special Account and Medisave Account combined throughout most of the working career. Savings in the Ordinary Account earn a minimum credited return of 2.5 percent, and savings in the Special Account and Medisave Account earn a minimum credited return of 4 percent. The first S$60,000 of combined balances (with up to S$20,000 coming from the Ordinary Account) receive an additional 1 percent return. The CPF members may also choose to self-invest their Ordinary Account and/or Special Account savings in a range of investments, forgoing the guaranteed floor on returns.[44]

Upon reaching age fifty-five, the Ordinary and Special Accounts are con-

43. In reality, these housing loans typically span the life cycle since households can continue to draw CPF funds for subsequent home purchases.

44. Members must satisfy a minimum balance requirement of S$20,000 (S$40,000) in the Ordinary (Special) Account to be eligible to self-invest funds from this account.

solidated to form the Retirement Account, up to the legislated Minimum Sum (S$148,000 in 2013). Any excess balances in the Ordinary and Special Accounts above the Minimum Sum may then be withdrawn, conditional on also first securing the Medisave Minimum Sum (S$40,500 in 2013). Excess balances in the Medisave Account above the Medisave Minimum Sum may also be withdrawn if the regular Minimum Sum has been met. For those who are unable to meet the minimum sums, the maximum withdrawal permitted from the Retirement Account at age fifty-five is S$5,000.[45] These withdrawals may be made at any time between age fifty-five and the drawdown age (currently sixty-four, increasing to sixty-five in 2018). Savings in the Retirement Account are guaranteed an interest rate of at least 4 percent. Beginning at the drawdown age, funds from the Retirement Account are used to pay monthly income for life (i.e., an annuity).[46]

Other than for the purposes specified above, the only exceptions for accessing CPF funds before age fifty-five are for leaving Singapore residence permanently or suffering from a permanent disability or terminal illness. If terminally ill, an individual may take a full lump sum of the Ordinary and Special Accounts; if permanently disabled but not terminally ill, an individual may only withdraw balances exceeding a certain amount (known

45. These withdrawal provisions apply to CPF members turning fifty-five after 2012. Those who turned fifty-five between 1987 and 2009 were able to withdrawal 50 percent of their total account balances at age fifty-five regardless of whether they met the minimum sum requirements (Agarwal, Pan, and Qian 2014). This percentage declined by 10 percent each subsequent year (i.e., 40 percent for those turning fifty-five in 2009, 30 percent for those turning fifty-five in 2010, etc.) until January 1, 2013, when the current rules became active.

46. The CPF members born after 1957 are automatically placed on "CPF LIFE," a mandatory annuity scheme, if they have at least S$40,000 in their Retirement Account at age fifty-five or at least S$60,000 in their Retirement Account at the drawdown age. Those who are not placed on CPF LIFE (and do not choose to opt in) receive phased withdrawal payments from the Retirement Account over about twenty years (or until the balance is exhausted) beginning at the drawdown age. Members in the CPF LIFE scheme may choose from one of two plans ("CPF LIFE Standard" or "CPF LIFE Basic"), which differ based on the size of the monthly payments (higher under the Standard plan) relative to the bequest (higher under the Basic plan). The Standard plan commits funds from the Retirement Account worth up to half the Minimum Sum to an annuity premium at age fifty-five; the remainder of the Retirement Account is committed to the annuity one to two months before the drawdown age. Beginning at the drawdown age, the annuity begins to pay a monthly income for life. Any unused annuity premiums are refunded to heirs as a bequest after the member's death. The Basic plan commits a small amount of funds (about 10 percent) from the Retirement Account to an annuity premium at age fifty-five; a second annuity premium worth a small portion of the money accrued in the Retirement Account after age fifty-five is paid one to two months before the drawdown age. Beginning at the drawdown age, remaining funds in the Retirement Account are used to pay a monthly income until the member turns ninety. At age ninety, the annuity contract begins to make monthly payments for life. The annuity payments are structured to preserve an equivalent benefit level to the Retirement Account payments. Any unused funds in the Retirement Account and unused annuity premiums are refunded to heirs as a bequest after the member's death. For details on the origin of the CPF LIFE scheme and pricing of the original annuity options, see Fong, Mitchell, and Koh (2011). For a description of the scheme in its current form, see the CPF LIFE member brochure available at http://mycpf.cpf.gov.sg/NR/rdonlyres/09EA0C05-C8E9–4705–9D91-E8BD1D12CF1E/0/LIFEBrochure.pdf.

as the Reduced Minimum Sum because it is below the regular Minimum Sum), which then immediately begins to provide monthly annuitized payouts. There is also a voluntary DC scheme in Singapore, the Supplementary Retirement Scheme (SRS), which is operated by three Singaporean banks. It was established in 2001 as a means for individuals to fund retirement savings in addition to their CPF savings and began allowing voluntary employer contributions in 2008 (Kok et al. 2013). However, few employers take advantage of the SRS as a supplementary retirement system for Singaporean citizens and permanent residents. It has received some limited use by employers to offer notional CPF contributions to foreign employees, who are not eligible to participate in the CPF, but the majority of employers who grant these contributions do so in cash payments (that are paid as salary and not as contributions to the SRS). Unlike the CPF, distributions from the SRS are taxable as income and can be made at any age. Only 50 percent of withdrawals made after the drawdown age are taxable, whereas 100 percent of withdrawals made before the drawdown age are taxable and are also subject to a 5 percent tax penalty (Island Revenue Authority of Singapore 2014).

For this analysis, we focus on the liquidity features of the CPF, since it is a mandatory plan and by far the dominant employer-based DC plan in Singapore. While the CPF is liquid throughout the working life to finance medical needs, education, and home purchases, there is no provision for early access for general liquidity needs (such as a decline in income). Thus, as in the United Kingdom, the MRT in Singapore equals zero across the income spectrum. (In addition, the special account is completely illiquid.)

Germany

Historically, Germany's statutory public pension insurance system guaranteed a generous net standard replacement rate of around 70 percent for a worker with average lifetime earnings and forty-five years of creditable service. Occupational and private pensions were largely supplemental and accounted for a small portion of retiree income (Berner 2006a; Börsch-Supan and Wilke 2004). However, in response to rising contribution rates required to fund the statutory system for a rapidly aging population, the Riester Reform of 2001 was legislated to stabilize the contribution rate and improve the balance of intergenerational risk sharing. To offset the reduction in future benefit levels prompted by these changes, the reform also introduced a series of new regulations, tax incentives, and subsidies aimed at increasing voluntary savings through occupational and personal plans.

Since 2002, German employees have had the legal right to request access to employer-based retirement benefits. These benefits can be funded internally through *Direktzusage* (a direct pension commitment through book reserves) or externally through one of four methods: *Unterstützungskasse* (support funds), *Direktversicherung* (direct insurance), *Pensionsfonds* (pension funds), and *Pensionskasse* (pension insurance funds). The current occupational pension landscape is made up predominantly of DB plans, but pension experts foresee a significant increase in DC activity in the future (Allianz Global Investors 2009). However, "pure DC" schemes do not exist under German law. Occupational DC schemes must provide a guarantee of minimum benefits, typically the sum of nominal paid-in contributions (Federal Financial Supervisory Authority of Germany 2014). They also involve no investment choice on the part of the employee. Since 2002, these DC schemes with minimum benefits have been permitted in the three fully funded vehicles: pension funds, pension insurance funds, and direct insurance. These plans allow tax-advantaged contributions and tax-deferred growth; benefits are taxed as income.

These plans are mostly illiquid during the accumulation phase, with access typically linked to eligibility for state-provided pension benefits.[47] The earliest retirement age for old-age pension benefits under the state system is sixty-three for the long-term insured (Börsch-Supan and Juerges 2011). In some cases, plans allow for disability benefits, which are also typically linked to state-provided benefits. Upon an employee's termination from employment, a sponsoring employer may also choose to cash out the employee's balances if they are below a restrictive minimum threshold and the employee does not transfer her pension rights to a new employer. Early distributions for other purposes, such as temporarily low income, are prohibited (Mackenzie 2010).

The most significant growth in DC coverage has been through private pensions known as Riester pensions, which were introduced with the 2001 reforms (Börsch-Supan, Coppola, and Reil-Held 2012).[48] Since 2006, these plans have outpaced occupational pensions as the main instrument for funded pension provision. Similar to occupational DC plans, they require a guarantee of nominal contributions. Government-matching subsidies are provided on contributions of up to 4 percent of gross earnings,[49] which are also tax deductible up to a limit. Additional subsidies are provided for each child. Like occupational DC schemes, Riester pensions are mostly illiquid, but unlike occupational DC schemes, Riester pensions do allow for early withdrawals of up to 100 percent of the accumulated balance for the pur-

47. German occupational pensions are regulated under the Betriebsrentengesetz (BetrAVG), available at http://www.gesetze-im-internet.de/bundesrecht/betravg/gesamt.pdf.

48. Here we refer to "Riester pensions" as personal investment accounts that are not linked to an employer and qualify for the Riester incentives (subsidy and tax relief). These plans must comply with the conditions set forth in the Certification of Retirement Pension Contracts Act ("AltZertG") in order to receive certification for the Riester incentives (United States General Accounting Office 2003). Certain employer-sponsored plans are also eligible to receive the Riester incentives but are not subject to the same certification requirements (Berner 2006b).

49. The full subsidy is receivable when total contributions, *including the subsidy*, equal 4 percent of gross earnings (Berner 2006b). Therefore, the required employee contribution to receive the full subsidy (a flat lump-sum benefit) scales down as a percentage of gross earnings at lower levels of income.

chase of owner-occupied housing. Otherwise, account holders are barred from making withdrawals before age sixty-two (age sixty for contracts concluded before 2012). They do retain the right to cancel a contract before the eligibility age, but then must repay all government subsidies and tax relief received to date (United States General Accounting Office 2003). Therefore, Riester pensions are usually not canceled before retirement (Kissling 2011). Benefits are taxable as income and typically received as an annuity, although a lump sum of up to 30 percent of account value is permitted (Hagen and Kleinlein 2012). Since occupational *and* private DC balances in Germany are inaccessible before the eligibility age for general liquidity needs, the MRT equals zero across all levels of household income, as in the United Kingdom and Singapore.

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Comment Daniel McFadden

Defined-contribution (DC) tax-qualified savings plans became broadly available in the United States after the Revenue Act of 1978, in which Section 401(K) estabished that firms offering these plans had to make them available equitably to all employees. Justifications for DC plans such as 401(k)s and for individual retirement accounts (IRAs) were that they would increase overall savings, and encourage retirement savings to supplement Social Security and keep middle-class retirees out of poverty. A question, then and now, is whether these plans do in fact increase total savings, or just divert savings into tax-qualified channels. The same question, writ smaller, can be asked about taxable early withdrawals from DC plans. First, does making DC plans more liquid induce higher withdrawals? If so, where do these withdrawals go? To a tax-qualified rollover individual retirement account (IRA)? To non-tax-qualified investments that achieve better or more diversified returns? To essential consumption in emergencies? To discretionary consumption such as vacations, cars, and boats? Second, does increased liquidity induce higher contribution rates, offsetting increased withdrawals, or does it instead reduce incentives for after-tax precautionary savings? Overall, does making tax-qualified plans more liquid increase consumers' lifetime welfare, or just pander to present bias that is in the end harmful?

Table 2C.1 shows that tax-qualified defined contribution (DC) and IRA savings plans are major components of retirement savings of individuals in the United States. Individuals age 59.5 and older are eligible to take taxable distributions from their tax-qualified assets without penalty, but below this age are *preeligible*, subject to a 10 percent early withdrawal penalty (paid to the IRS) unless the distribution qualifies as meeting IRS plus employer-specified hardship conditions. Argento, Bryant, and Sabelhaus (2013) use IRS data to estimate early withdrawals, penalized and not penalized, in 2010, with the results shown in table 2C.2. Collecting their results, gross contributions to tax-qualified savings plans by preeligible individuals were about 6.6 percent of their tax-qualified plan balances, but taxable distributions were 2.9 percent of these balances, leading to a net contribution rate

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