Essays in Property Taxation and Multinational Tax Avoidance

by

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à mes parents, pour avoir toujours encouragé leur “savant”

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CHAPTER I

Introduction

Variation in tax policy features and implementation provides a unique opportunity to study the incentive effects of taxation on individual and firm behavior. Each of the three chapters of this dissertation seeks to exploit such variation in order to better understand the potential efficiency and distributional consequences of particular forms of property taxation and taxation of multinational corporations. Ideally, the results presented herein should help to inform policy debates not only in these two areas but also in the formulation of tax policy more generally.

Chapter II assesses the degree of capitalization of temporary idiosyncratic differences in property tax obligations which arise from a unique set of features of the Michigan property tax system. Methodologically, the analysis builds upon an extensive literature on property tax capitalization in an environment free of certain serious econometric concerns. Beyond this methodological contribution, however, the research ultimately addresses a more fundamental question: namely, do households understand the tax implications of their home purchases? The answer to this question on the basis of an empirical analysis of roughly 5,000 residential home sales in Ann Arbor, Michigan over the period 1997-2007 appears to be "No" for the average home purchase. In particular, sellers of homes with temporarily low tax obligations are dramatically overcompensated, as if such reduced obligations were believed—incorrectly—to be permanent. Homebuyers on average thus appear to behave in a cognitively-biased

manner and exhibit limited attention to the tax system, consistent with a wide range of anecdotal evidence and a growing literature on consumer irrationality.

Despite these seemingly-dire consequences for homebuyers, confusion of this nature may nevertheless mitigate the efficiency losses due to reduced homeowner mobility that are typically associated with the acquisition-value based assessments which characterize the Michigan property tax system and those of nearly half of all other states in the U.S. Michigan's implementation of these acquisition-value based assessment limits may therefore constitute a step in the direction of optimal tax salience. Weighing against these possible efficiency gains, naturally, are losses due to housing overconsumption resulting from homebuyers' underestimation of future tax obligations. Even without taking a stand on the relative magnitudes of these offsetting welfare effects, the results of Chapter II lend broad support to the view that tax salience considerations ought to play an important role in the design of tax policy.

Chapters III and IV turn to the tax avoidance behavior of U.S. multinational corporations—tax-paying entities whose sophistication with respect to the tax system almost surely lies at the opposite extreme end of the spectrum from homebuyers—and present alternative approaches to quantifying the extent of domestic profit reallocation that might be expected to result from a transition to a territorial tax system wherein foreign source earnings are exempt from domestic taxation. In Chapter III, the case considered is that of the dividends received deduction (DRD) enacted under the American Jobs Creation Act of 2004, which provided temporary incentives for multinationals to report domestic income as being earned in low-tax foreign jurisdictions in order to repatriate these immediately under preferential terms. Concretely, the repatriation tax owed to the U.S. tax authority upon remittance of foreign-source earnings under the DRD was reduced from a maximum residual rate of 35 percent to 5.25 percent, with corresponding tax savings ranging as a function of foreign tax rates from 0 to 0.2975 dollars per dollar of income round-tripped in the postulated

manner.

Using uniquely-suited firm-level data compiled by the Bureau of Economic Analysis on the operations of U.S. multinational parents and their foreign affiliates to estimate a panel difference-in-difference model of multinational income shifting, the analysis of Chapter III yields an aggregate increase in foreign pre-tax earnings of $32 billion as a direct response to the DRD. Underlying this increase—equal to approximately one-sixth of total qualifying dividend repatriations identified in the data, or 2.5 percent of taxable U.S. corporate profits reported in 2005—is a semi-elasticity of affiliate pre-tax non-equity returns of -0.5 with respect to effective foreign tax rates. This represents a modest short-run response by comparison to the latest comparable (long-run) estimates in the literature, and moreover likely constitutes an upper bound on the true round-tripping effect attributable to the DRD given the indirect nature of the proxy measure of income reallocation used. Estimates involving more direct proxies for transfer pricing or earnings stripping are inconclusive, as are the results associated with the interaction of research and development expenditures—elsewhere shown to be correlated with tax avoidance capabilities—and reductions in repatriation taxes. Evidence of heterogeneity in income reallocation responses across industrial sectors is with very few exceptions likewise weak. The overall results hence suggest modest effects of a large temporary reduction in the repatriation tax on short-run income shifting activity and may alleviate concerns with respect to the income reallocation consequences of moving to a territorial tax system in the U.S., as is often proposed.

Chapter IV adopts an event study methodology to quantifying the same tax avoidance response on the basis of changes in firms' stock market capitalization over the period January 28-February 3, 2009, dates on which a proposal to renew the DRD was announced and then rejected by the U.S. Senate for inclusion in what became the American Recovery and Reinvestment Act of 2009. This approach holds the

promise of being able to separately identify investors' valuations of tax savings accruing to repatriation of previously-designated permanently reinvested earnings from tax savings associated with round-tripping of domestic earnings over the short- and longer-term. In practice, however, the estimated relationships between multinational abnormal returns over different dates in the event window and firm characteristics related to presumptive income shifting costs interacted with round-tripping tax savings rates fail to inform the expected value of the tax avoidance opportunities afforded by the proposed DRD in an entirely conclusive manner.

Individually, results from separate specifications imply a positive effect on stock market returns from the interaction of round-tripping tax savings rates and either intangible assets or research and development expenses immediately prior to the rejection of the DRD proposal, consistent with investors valuing the tax avoidance opportunities available to multinational corporations. Taken at face value, a one standard deviation increase in research and development expenditures is thus associated with a $64 million increase in stock market capitalization for the average multinational (0.53 percent) on February 3, the last trading day before the Senate voted down the DRD proposal, with most of this effect coming through anticipated tax savings on shifted earnings. In addition, multinationals with larger predicted savings from remittances out of permanently reinvested earnings are disproportionately punished by investors in the period leading up to the eventual Senate debate and rejection of the DRD amendment, perhaps reflecting concerns over the book tax consequences of repatriating earnings on which no U.S. tax expenses were previously recognized. The absence of a clear reversal in investor valuations on subsequent trading days with respect to either savings on permanently reinvested earnings or research and development expenses (among other firm characteristics), however, calls into question the reliability of these estimated effects as measures of perceived tax and tax avoidance benefits from a renewed DRD. Examination of stock market returns over a longer

horizon spanning the event window suggests that information leakage and gradual capitalization of such information into share prices may have been widespread and provides a partial explanation for the general lack of statistical precision throughout the analysis. For this and other reasons, little can be said with certainty regarding the perceived reward for multinational tax avoidance that would be provided under a DRD, and currently-unfolding events surrounding the possibility of another repatriation tax holiday may eventually yield preferable event dates.

Despite this ambiguity, the results of Chapter IV—like those in Chapters II and III—are intended to advance the level at which tax policy is currently debated while providing a platform for conducting further analysis of pivotal issues. Several ideas for future work are described in each of the chapters that follow.

CHAPTER II

Capitalizing on Capped Taxable Values: How Michigan Homebuyers are Paying for Assessment Limits

2.1 Introduction

Faced with rapidly rising home prices and property tax obligations, California in 1978 became the first U.S. state to curb property tax growth through the imposition of assessment limits under Proposition 13. Nineteen additional states plus the District of Columbia subsequently followed suit in adopting similar legislation, including Michigan—the focus of the analysis in this paper—in 1994.[1] An important motivation for implementing assessment limits of this type has been the desire to reduce uncertainty over the trajectory of future property tax obligations and thereby impart a greater degree of predictability to one of the most consequential financial decisions taken by households: the purchase of a home.[2] Contrary to this intent, however, I find that common misperceptions about the implementation and property tax implications of assessment limits appear to sharply penalize the average Michigan homebuyer in an unanticipated manner while conferring upon sellers the full stream

[1]The remaining states with some form of statewide assessment limits are Arizona, Arkansas, Colorado, Florida, Iowa, Maryland, Minnesota, Montana, New Mexico, Oklahoma, Oregon, South Carolina, and Texas. Connecticut, Georgia, Illinois, and New York allow limits to be set at the local level (Haveman and Sexton, 2008).

[2]This is by no means the only motive for assessment limits. For a good discussion of other motives behind California's adoption of Proposition 13, see O'Sullivan, Sexton and Sheffrin (1995a).

of benefits associated with maintaining such limits indefinitely.

Under the form of assessment limits pioneered by California, acquisition-value property assessments can give rise to taxable values (TV) against which property taxes are levied that are far smaller than the local authority's assessment of real market values as a result of capping the rate of annual TV growth in years where no change of ownership has occurred. Consequently, during periods of rising real estate prices, properties of equal assessed value may face substantially different tax obligations, with lower obligations applying to homes that were acquired less recently. Under Michigan's Proposal A, these differences in tax liability persist until January 1 of the year following sale, at which point the TV is uncapped and reset to equal the assessed value, thereby conferring upon most new homebuyers a temporary tax benefit in the year of purchase followed by a permanent tax increase in all subsequent years (popularly referred to as the "pop-up" tax).

The objective of this paper is to exploit the features of the Michigan property tax system to estimate the extent to which temporary tax savings are capitalized into the prices of residential homes within a single jurisdiction and thereby evaluate homebuyers' comprehension of the system. This empirical strategy has the virtue of avoiding two of the main econometric problems that have plagued estimation of property tax capitalization elsewhere in the literature: namely, that (1) the degree of capitalization of entire streams of future tax obligations cannot be separately identified from the discount rate, and (2) cross-jurisdictional variation in tax liabilities is correlated with variation in public service provision that is likely to be unobservable, at least in part. Furthermore, remaining endogeneity concerns can be addressed through the use of instrumental variables methods by taking advantage of the mechanical relationship between the number of years elapsed since a property was last acquired and the size of the temporarily-inherited tax savings (henceforth referred to as the capped TV benefit).

Controlling for a wide range of property characteristics among homes sold in Ann Arbor, Michigan over the period 1997-2007, I find that homebuyers dramatically overcompensate sellers of homes with temporarily low tax obligations as if such obligations would persist indefinitely beyond the first period without TV uncapping. In particular, under the preferred specification, a $1 increase in the capped TV benefit (i.e. reduction in first-period tax obligations) for the average property implies a roughly $30 increase in sale price. Under full capitalization, this is equivalent to the present discounted value of an infinite stream of $1 in annual tax savings at a real interest rate of approximately 3 percent.

Though striking, this finding is consistent with several pieces of anecdotal evidence in a setting characterized by ample scope for confusion or outright ignorance of the implications of Michigan's property tax and assessment system. Firstly, if taxes are capitalized into home values to any degree, neither sellers nor real estate agents have any financial incentive to draw potential buyers' attention to future tax increases since this would only serve to depress sale prices. Mortgage lenders' stake in the matter is ambiguous, but as a result of federal regulations, Michigan lenders are bound by the Real Estate Settlement Procedures Act of 1974 (RESPA) to base their estimates of future tax obligations directly on the sellers' last twelve months of tax payments for the purposes of determining the maximum amount that borrowers may be expected to pay into mortgage escrow accounts (C.F.R. §3500.17(c)(7)).[3] Moreover, current tax liabilities figure prominently on MLS listings of properties for sale.[4] As such, the tax-relevant information available to homebuyers prior to purchase is predominantly backward-looking.

[3]The sole source of discretion available to Michigan lenders in terms of calculating prospective buyers' maximum affordable monthly mortgage payments is in determining the appropriate local tax rate as a function of expected residency status (personal communication from Bill Holmes, President and Co-founder, Ann Arbor Mortgage Company).

[4]MLS listings also provide information on sellers' assessed values, the closest proxy for post-sale taxable value and hence tax liability, but interpreting this information requires further understanding of the tax system.

According to the City of Ann Arbor Assessor's Office, the result of this misguided focus on seller tax liabilities is reflected in the large volume of complaints received by their office involving new homeowners who have experienced significant jumps in tax liability due to TV uncapping. Such complaints were especially common at the peak of the housing market when the average increase in annual tax liability for new homebuyers in Ann Arbor was roughly 40 percent.[5] At around the same time, apparent cognizance of widespread confusion regarding the tax implications of acquisition-value assessments among real estate professionals (and of the associated potential for conflicts of interest) prompted the largest real estate agency in Ann Arbor, Reinhart Realtors, to provide written notices to all prospective homebuyers describing the features of the Michigan property tax system with special emphasis given to the likelihood of a jump up in tax liability following purchase.[6]

Despite informational efforts of this nature, the results in this paper suggest a profound failure in the communication of the details and property tax implications of home purchases in the aftermath of Proposal A. Why state and local authorities and real estate professionals have not been more successful in dispelling the most common misconceptions about Michigan property taxes by making the "pop-up" tax more salient is an interesting question. In California, for example, TV uncapping is effective immediately upon change of ownership through a supplemental assessment retroactive to the date of sale, thereby drastically reducing the scope for homebuyers to mistake sellers' current tax liability for their own future obligations. This policy has the added benefit from the state's perspective of leaving no property tax revenues on the table. A common criticism of assessment limits, however, is that they may inefficiently induce homeowners to remain "locked-in" to their homes and move less frequently than they otherwise optimally would. Michigan's implementation of assessment limits may

[5]Personal communication from Mike Courtney, Chief Appraiser, City of Ann Arbor Assessor's Office.

[6]Reinhart's practice continues to this day despite the diminished relevance of this cautionary statement following multiple years of housing market declines.

obfuscate the property tax consequences of real estate transactions in an arguably-desirable manner by reducing this lock-in effect.[7,8]

Efficiency considerations aside, the evidence presented in this paper also builds on the expanding understanding of the many ways in which market participants do not behave as purely rational and self-interested actors. In this context, as in other documented examples of households making apparent investment mistakes when purchasing a home,[9] the scale of homebuyer error is very large—in proportion to the magnitude of the investment involved. A question that inevitably emerges from this is that if market participants are incapable of making rational decisions consistent with economic theory when many thousands of dollars are at stake, why believe rationality to hold for decisions of less consequence? Part of the answer surely lies with the unique nature of housing as a good with which buyers have very limited experience and where information costs are consequently high, but this question deserves continued attention.[10]

The remainder of the paper is organized as follows. Section 2.2 positions this paper within the context of the relevant literature. Section 2.3 discusses the details of acquisition-value based property tax systems and the Michigan system in particular, while Section 2.4 derives theoretical and empirical models of property tax capitaliza-

[7]In related work in progress, I find evidence of market participants willingly delaying late December sales into early January where the tax benefits associated with delaying TV uncapping are largest. Thus, it may be that while homebuyers tend, on average, to ignore impending property tax increases beginning in the year following purchase, the marginal buyer confronted with nearly-immediate uncapping is more likely to be well-informed of the tax consequences of their purchase and the timing thereof (Bradley, 2010).

[8]For recent arguments as to why the government should optimally exploit cognitive biases by minimizing the salience of certain features of tax instruments, see Schenk (2010) and Congdon, Kling and Mullainathan (2009).

[9]Campbell (2006) characterizes one common such mistake involving homeowners who fail to refinance their fixed-rate mortgages when it would be beneficial to do so (even accounting for the option value of delaying refinancing). However, if information costs are sufficiently high, such consumer behavior may nevertheless be "rationally inattentive." This is the conclusion of Bucks and Pence (2008) with respect to the prevalence of borrowers who misunderstand the terms of their mortgage contracts, especially among holders of adjustable-rate mortgages.

[10]DellaVigna (2009) points precisely to housing as an example for why market forces may not eradicate non-standard behaviors through experience.

tion suited to this setting. Section 2.5 identifies the data used. Section 2.6 presents the results along with a discussion of possible alternative interpretations, and Section 2.7 concludes.

2.2 Literature Review

The understanding that property values should reflect the stream of benefits accruing to landowners net of any costs incurred dates at least as far back as Adam Smith. Correspondingly, there exists a very long and broad literature examining the degree to which property taxes and public services are capitalized into the prices of land (improved and otherwise). The primary challenges in this literature have been of an empirical nature and manifest themselves in several ways. Foremost among these is the simultaneous determination of local tax and expenditure policies alongside property values whereby the aggregate level of housing values in a jurisdiction dictates the level of the tax rate required to finance the desired level of public expenditures, both of which in turn affect housing prices. Ordinary least squares (OLS) estimates of the relationship between housing values and property taxes will consequently be biased due to this simultaneity. By extension, failure to adequately control for all dimensions of public service provision or other types of housing amenities is liable to introduce omitted variable bias in estimates of tax capitalization. These endogeneity problems are especially vexing with cross-jurisdictional data, which is precisely where most tax rate and public service variation arise. In addition, all studies must confront the inability to separately identify tax capitalization estimates from the discount rate given the durable nature of housing and the necessity to make recurring tax payments.

From a methodological standpoint, this paper builds on the extensive literature on property tax capitalization that has sought to take seriously these many econometric challenges. Oates (1969) is widely credited as the first attempt to rigorously account for the endogeneity of property taxes in the capitalization literature but nevertheless

suffers from weak instruments and a failure to directly address unobserved variation in public service provision across municipalities. The wide variety of methods employed in the many ensuing papers reflects the difficulty of adequately addressing the multiple econometric challenges posed, with the most successful strategies either exploiting unusual natural settings, as in the case of Richardson and Thalheimer (1981) and Palmon and Smith (1998), or the occurrence of property tax reforms, as in Rosen (1982); Yinger et al. (1988); Bradbury, Mayer and Case (2001); and Feldman (2010).[11]

Even these more successful strategies, however, remain subject to certain concerns. None, for example, can avoid the necessity of making assumptions about the appropriate discount rate in the settings considered. Among cross-jurisdictional studies—including Oates (1969), Richardson and Thalheimer (1981), and Rosen (1982)—Palmon and Smith (1998) offers the most compelling case for being able to ignore variation in public services as a source of bias while also providing justification for variation in tax rates. Yinger et al. (1988) and Feldman (2010) abstract from this issue by considering evidence on homes sold before and after changes in tax regimes within individual jurisdictions (in Massachusetts and Michigan, respectively), but even here, the source of the changes in effective tax rates must be carefully explained. For instance, there may exist reasons in Feldman (2010) to question the exogeneity of changes in assessment ratios around Proposal A that produce differential tax benefits of the reform, especially if prices or assessments exhibit mean-reverting tendencies, and thus instrumental variables methods should likely be employed.

Perhaps on account of some of these remaining issues and perhaps on account of the different settings considered, the range of capitalization estimates obtained in these papers spans 15 to 65 percent, even after all are translated using the consensus 3 percent real interest rate established by Yinger et al. (1988) to discount streams

[11] Yinger et al. (1988) present an excellent comparison and review of the numerous variants of Oates (1969), with special attention paid to their approaches to endogeneity and identification issues. Ross and Yinger (1999) provide a modestly-updated review.

of future tax obligations.[12] More generally, the broader literature (in which more significant econometric concerns may exist) spans the full range of possible degrees of capitalization from 0 to 100 percent.[13]

Rather than offering an additional point along this spectrum of estimates of property tax capitalization, the findings presented in this paper fall into a growing literature on cognitive biases and tax salience while carrying implications for the efficiency consequences of acquisition-value assessment limits. A relatively narrow literature considers the latter, of which Ferreira (2010) represents one of the latest examples. Looking at whether California's Proposition 13 may have induced homeowners to remain in their homes longer than otherwise due to the tax savings associated with avoiding or deferring TV uncapping, Ferreira (2010) finds a fairly sizeable lock-in effect. In particular, as a consequence of an amendment to Proposition 13 allowing "seniors" to retain the benefits of their limited assessments following a new home purchase, homeowners just over the age of 55 are 25 percent more likely to move than those just younger.[14,15,16]

[12]Do and Sirmans (1994) estimate the real interest rate to be 4 percent by reversing the usual procedure in the tax capitalization literature in a context where they claim 100 percent property tax capitalization to be ensured. The validity of this assumption is questionable, however, as discussed in Ross and Yinger (1999).

[13]A further challenge for obtaining definitive estimates of property tax capitalization in the U.S. is the deductibility of state and local taxes since the value of the deduction depends first on whether a taxpayer itemizes, and if so, on the homeowners' tax bracket. de Bartolomé and Rosenthal (1999) account for this using a unique dataset from the American Housing Survey consisting of both housing and household income information. They conclude on the basis of their findings that much of the variation in capitalization estimates found in the literature likely results from variation in the proportion of itemizing homeowners across study settings.

[14]Other studies to examine the California experience with respect to homeowner mobility include Quigley (1987); O'Sullivan, Sexton and Sheffrin (1995b); Nagy (1997); and Wasi and White (2005). This last paper finds very large lock-in effects in jurisdictions that experienced very high rates of housing price growth, but the appropriateness of their chosen control groups (Texas and Florida—both states with later imposition of assessment limits) for their difference-in-difference methodology is a source of concern since there may exist other state-specific channels determining homeowner mobility.

[15]Skidmore and Tosun (2010) contemplate the related issue of in-migration in the context of Michigan's Proposal A and find as much as a 32 percent reduction in in-migration due to a one standard deviation increase in the ratio of county-average assessed-to-taxable value ratios, which they attribute to Proposal A's erosion of the tax base and required offsetting tax rate increases (effective and nominal) for new homeowners.

[16]In 2008, Florida became the first state with assessment limits to allow residents to preserve the

Underlying the abovementioned studies of property tax capitalization and mobility effects of assessment limits is an implicit assumption (as in most of economics) that homebuyers and sellers behave in a rational and self-interested manner and therefore grasp the tax consequences of their decisions in the real estate market. This view is challenged in other settings by emerging experimental and non-experimental evidence.[17] Chetty, Looney and Kroft (2009) and Chetty and Saez (2009), for instance, present evidence of households significantly altering their behavior in response to exogenous changes in the prominence or salience of sales and excise taxes and EITC benefits, respectively, despite the relatively low cost to consumers and taxpayers of otherwise availing themselves of the details of these taxes and credits.[18] Finkelstein (2009) documents a lesser degree of responsiveness among drivers subject to automatic toll collections following changes in toll rates and likewise interprets this difference in behavior as reflecting the salience of the toll.

In the property tax environment, Cabral and Hoxby (2010) find that homeowners whose tax payments are made through escrow accounts managed by their mortgage lenders are more likely to misgauge the magnitude of their annual tax obligations. Interpreting this evidence as an indication of reduced salience of the property tax among homeowners subject to escrow, they then apply variation in the prevalence of tax escrow accounts to try and explain collective attitudes toward the property tax and the occurrence of tax reforms. An explicit presumption in Cabral and Hoxby (2010) is that the use of tax escrow accounts does not affect the underlying nature of demand in the real estate market due to the timing of the start of payments into

tax benefits of their capped taxable values when moving within state by transferring up to $500000 of currently-exempt property value to a newly-purchased primary residence. This will surely provide fertile ground for future studies.

[17]Evidence of cognitive biases in the real estate market in general is documented, for example, in Genesove and Mayer (2001), whereby nominal loss aversion among sellers can help explain the puzzle of the positive price-volume correlation.

[18]DellaVigna (2009) provides a comprehensive review of the evidence drawn from the intersection of the psychology and economics literatures and refers to this type of irrationality as non-standard decision-making due to limited attention.

escrow. This runs counter to the finding in this paper if those homebuyers who are required to make escrow payments are more likely to trust mortgage lenders in their (deficient) calculation of estimated property tax obligations at the time of purchase.

2.3 Property Taxation

Property assessment practices in the U.S. fall under either of two general methods—market-value and acquisition-value based assessments—with the latter method having supplanted the former in nearly half of all states since 1978. Under both methods, local governments perform periodic property reassessments in order to ascertain current market values (MV) (i.e. the prices that properties would be expected to fetch in the market if they were to sell) using a combination of rigorous statistical techniques and discretionary assessor analysis.[19] Property tax liabilities are then calculated as the product of the local millage or property tax rate, τ, and taxable value (TV), which is equal to MV or some fraction thereof in a household's first year of ownership (i.e. $TV_0 = \lambda MV_0$, $\lambda \in [0, 1]$).

Under market-value assessments, $TV_t = \lambda MV_t$ also holds in every period beyond the first, such that TV and MV move in tandem,[20] whereas under acquisition-value assessments, the TV against which property taxes are levied is constrained to grow at an annual rate no faster than some pre-specified level. Hence, under this latter system, assessments remain tied to the TV that prevailed at the time of acquisition, and this TV is considered to be capped so long as no further change of ownership occurs. Upon sale, TV is once again uncapped and reset to equal the contemporaneous measure of

[19]Contrary to what many homebuyers expect, the result of employing statistical methods in property assessments is that even where sale prices are directly observed, MVs and sale prices are only equal *on average*. This is intended as a means of smoothing out any idiosyncratic components of buyer and seller matches, such as where a seller is willing to accept a below-market price in order to vacate their home rapidly.

[20]If reassessments are infrequently performed, as occurs in some states, taxable values may in practice lag behind assessed values for brief periods before adjusting upwards.

λMV.[21]

In Michigan, λMV is referred to as the state equalized value (SEV), with $\lambda = 0.5$.[22] Under Proposal A, capped TVs are limited to grow at or below the rate of annual statewide CPI inflation or 5 percent, whichever is less, and may never exceed SEV.[23] In practice, annual statewide inflation has not exceeded 3.7 percent since 1995, such that Michigan's 5 percent cap has never been the binding limit.[24] One consequence of this system is that so long as housing appreciation outstrips the rate of ordinary inflation—as was the case for most of the period following implementation of Proposal A—property owners may benefit from lower property tax obligations than they would otherwise face in the absence of assessment limits. Figure 2.1 presents three hypothetical scenarios for the tax liabilities incurred by a median-valued property purchased in 1996 that either (1) never benefitted from assessment limits (e.g. by selling in each year or in the counterfactual absence of Proposal A; dotted blue upper line), (2) resold once in 2002 (dashed red line), or (3) never resold (solid lower black line). With assessed values growing at the average Ann Arbor rate in each period, a large gap in tax obligations rapidly emerges between homes owned for differing lengths of time, as shown in the figure.

Correspondingly, TV uncapping following a change of ownership could trigger a large increase in tax liability. In the hypothetical example of the median home that first sold in 1996 and resold in 2002, this jump in property taxes in 2003 would have been approximately $\$6000 - \$3500 = \$2500$. Figure 2.2 shows the median percent

[21] Certain types of transactions are exempt from uncapping. This typically includes most related-party transactions such as transfers between spouses or from parents to children, as well as sales of agricultural property.

[22] Strictly speaking, λMV is provisionally referred to as the assessed value (AV) pending approval of local assessments by county and state equalization offices. The purpose of λ is not clear since a lower λ could be merely offset by a higher τ, but a wide range of values nevertheless appear across states.

[23] A recent source of confusion and complaints among Michigan homeowners has been the continued increase in capped TVs—and therefore tax liability—even as property values and SEV were falling.

[24] California's 2 percent cap remains the lowest among all states with assessment limits, whereas Minnesota's 15 percent cap (with no provision for inflation) is the highest (Haveman and Sexton (2008).

changes in tax liability actually experienced by homes sold in Ann Arbor over the period 1997-2007 as a result of TV uncapping. At their peak in 2003, the median homebuyer would have been hit by a 40 percent increase in tax obligations over those of the sellers. Measured in nominal dollars, the median pop-up tax peaked instead in 2005 at just under $1500. The precise magnitude of this jump in tax liability varies across properties depending on the value of the property when it sold previously (thereby establishing the base-period TV), the number of years elapsed since the last change of ownership, and the difference between annual CPI and housing price inflation over these intervening years. Observationally-equivalent properties may hence face different tax liabilities (and the potential for different increases in tax liability following sale) as a function of when each property last changed hands, with longer-held homes paying lower taxes on average than homes with more recent turnover.

As a result of Michigan's practice of only implementing property reassessments on January 1 of each year, including property subject to TV uncapping following sale, new homebuyers may temporarily avert the pop-up tax to varying degrees according to the timing of their purchase. Thus, homebuyers effectively inherit the sellers' capped TV and associated tax liability in the year of purchase, thereby conferring upon homebuyers a temporary tax reduction in the first year of purchase relative to a system in which uncapping were immediately or even retroactively applied to the date of sale, as in California. Figure 2.3 depicts the amount of taxes averted in this manner as a fraction of the sale price among homes sold in Ann Arbor. The pro-rata capped TV benefit in the year of sale in this context is measured as $d\tau_0(SEV_0 - TV_0)$, where d denotes the fraction of the year remaining at the time of sale. As shown, the median benefit peaked over the 2004-2006 period at approximately 0.2 percent of the sale price, or $450. The dispersion of pro-rata capped TV benefits accruing to new homebuyers over this period was relatively wide, however, such that 10 percent

of sales captured virtually no benefit while another 10 percent captured benefits in excess of 0.5 percent of the sale price. Tax savings near or above 1 percent of the sale price were available to 1 percent of homebuyers. As the next section describes, it is upon this variation in capped TV benefits across comparable sales that the analysis in this paper relies.

2.4 Capitalization Theory and Estimation

The standard model of property tax capitalization requires relatively little modification to accommodate consideration of the effects of the Michigan property tax system and, in particular, the discontinuous tax treatment around January 1 of properties sold in the previous calendar year. I therefore begin with a description of the basic model—which takes as its point of departure the notion that property values should be equal to the present value stream of rental services rendered net of property tax obligations—and later introduce the necessary features to account for Michigan's acquisition-value assessment limits with January 1 reassessments.[25] Supposing per-period rental services, R, are constant over the lifetime of the house and capture all housing amenities and associated public services, and T denotes the tax payment, then the price of the house, P, should be:

$$P = \sum_{n=0}^{N} \frac{R - T}{(1+r)^n} \tag{2.1}$$

where $N+1$ is the expected lifetime of the house, and r is the interest rate.[26] Under a general property tax system with market value assessments, $T = \tau TV$, while evidence with respect to housing depreciation suggests that $N \approx \infty$ represents a decent

[25]For a more complete presentation of the basic model, see Ross and Yinger (1999) or Yinger et al. (1988).

[26]Under the assumption that R and T are constant over time, in a world with inflation, this is equivalent to specifying R and T in real terms. Therefore r should likewise be taken to be the real interest rate.

approximation (Yinger et al., 1988).

Presented in this simple manner, it is not immediately clear why property tax capitalization should ever differ from 100 percent. Several practical explanations are plausible, however. First, mobility of capital implies that the supply of housing need not be fixed, unlike land, thereby giving rise to a distribution of the property tax burden across current and future property owners. Second, current tax obligations may not be expected to persist indefinitely. Anticipated increases (decreases) in tax liability would therefore tend to amplify (dampen) the estimated degree of capitalization. Third, the deductibility of state and local taxes among itemizing taxpayers at the federal level reduces the out-of-pocket cost of property tax payments below the measured level. Fourth, without controlling for public service provision explicitly, intrajurisdictional studies may estimate the degree of property tax capitalization net of services received. The first and last of these explanations have generally served as the primary motivation for studies of property tax capitalization, but for the present paper, the most relevant explanation may be that homebuyers have imperfect information about the property tax system and thereby form incorrect expectations about their future tax obligations.

Allowing thus for under- or overcapitalization, regardless of its origin, (2.1) may be rewritten as

$$P = \frac{1+r}{r}R - \beta\frac{1+r}{r}\tau TV \tag{2.2}$$

where β represents the degree of capitalization and is the coefficient of interest in the standard empirical analysis.

Unfortunately, estimation of β must confront numerous econometric difficulties, hence the wide variety of empirical approaches pursued in the literature. A first concern has to do with the choice of the appropriate discount rate because property tax capitalization and the discount rate cannot be separately identified. Assumptions about the value of r may significantly influence results. For a given reduction in sale

prices attributed to property taxation, assuming a higher interest rate (e.g., nominal instead of real) will reduce the present value of future tax obligations and thereby increase the degree of estimated property tax capitalization. Endogeneity issues also abound. If tax payments, T, appear in the estimating equation, a simultaneity problem may arise in that a random shock to P (e.g. through an increase in the cost of new building materials) will likewise affect TV (and therefore T) if observed by the assessor. If instead the effective tax rate, $t = \frac{\tau TV}{P}$, is used in the estimating equation, this induces a mechanical simultaneity problem given that t is defined in terms of P. Statutory property tax rates might instead be used in the context of a cross-jurisdictional analysis, but in that case, the statutory rates themselves are endogenous to local government choices over public expenditures and the aggregate level of housing prices. Within jurisdiction, statutory tax rates are invariant by definition (within similar property classes), making them useless in most cross-sectional empirical applications. In addition to simultaneity bias, omitted variable bias may also arise, either through the existence of unobserved public services which influence property values directly and are correlated with tax rates, or through the existence of housing characteristics that are used by local assessors in determining assessed values (appropriately) but are unobserved by researchers.

As previously discussed, the Michigan property tax system can give rise to differing tax obligations in the year that a property is sold for owners of similar homes purely as a result of one home having previously changed hands more recently than the other. Thereafter, two such homes face identical streams of tax payments upon uncapping. Consequently, it is possible to examine the extent to which the tax savings associated with inheriting temporarily low tax obligations in the first partial year of ownership are reflected in sale prices without resting property tax capitalization estimates on entire streams of subsequent years' tax liabilities or rates of time discounting. Moreover, the simultaneity of tax obligations and sale prices is not a

concern in the year of purchase as a result of the exogenous determination of TV_0 under acquisition-value assessments.

A few relatively straightforward modifications to the standard model of property tax capitalization in (2.1) make the virtues of the Michigan property tax system for estimation purposes more clear. From the perspective of a well-informed buyer, the inherited capped TV and lower associated tax liability only apply to the fraction of the calendar year remaining beyond the date of sale, $d \in [0, 1]$. After the fraction of year d has elapsed, TV uncapping implies that all subsequent tax obligations are based on assessed values (i.e. SEV) for the first full calendar year following sale and may jump discontinuously on January 1. In addition, capping of TVs is of no relevance unless the rate of appreciation of rental services differs from the rate of CPI inflation that is used to augment capped TVs each year. This difference in growth rates is denoted by h, while the rate of CPI inflation is π.[27] Hence, the nominal present value of rental services grows by $(1 + h)(1 + \pi)$ each year (deflated by the nominal interest rate), while tax liability is restricted to grow by only $(1 + \pi)$ per year beginning the year after TV uncapping. In the simple case where $N = 2$ years, the market price of a property sold in period 0 should therefore be

$$\begin{aligned} P_0 = {} & d(R_0 - \tau TV_0) + (1 - d)(R_0 - \tau SEV_1) \\ & + d\frac{R_0(1 + h)(1 + \pi) - \tau SEV_1}{(1 + \pi)(1 + r)} + (1 - d)\frac{R_0(1 + h)(1 + \pi) - \tau(1 + \pi)SEV_1}{(1 + \pi)(1 + r)} \end{aligned}$$

For more general N,

$$P_0 = d\tau(SEV_1 - TV_0) + \sum_{n=0}^{N-1} \frac{R_0(1 + h)^n}{(1 + r)^n} - \left[\sum_{n=1}^{N-1} \frac{1}{(1 + r)^n}\right](\tau SEV_1)\left[1 - d + d(1 + \pi)^{-1}\right]$$

[27] This is referred to as the inflation rate multiplier (IRM) in the Michigan property tax jargon.

and as N goes toward infinity,

$$P_0 = d\tau(SEV_1 - TV_0) + R_0\frac{1+r}{r-h} - \frac{\tau SEV_1}{r}\left[1 - d + d(1+\pi)^{-1}\right] \tag{2.3}$$

When CPI inflation is low, the last term in (2.3) in brackets is approximately 1, leaving a clean expression consisting of the inherited capped TV tax savings, $d\tau(SEV_1 - TV_0)$, whose effect on sale prices is the object of interest, as well as the flow of housing amenities, the real interest rate, the rate of housing appreciation net of ordinary inflation, and the present value of future tax obligations.[28]

Allowing for less-than-full property tax capitalization,

$$P_0 = \alpha d\tau(SEV_1 - TV_0) + R_0\frac{1+r}{r-h} - \gamma\frac{\tau SEV_1}{r} \tag{2.4}$$

where α and γ capture the degree of capitalization of current and future tax obligations, respectively. By measuring the impact of an increase in temporary tax savings (i.e. reduction in seller tax obligations) in the present period only, α may be estimated without making any assumptions regarding the appropriate discount rate, unlike γ (or β in the standard model). Buyers who are poorly-informed with respect to the details and implications of Proposal A and behave as though they will permanently inherit seller tax obligations without triggering TV uncapping, in contrast, are more accurately characterized as acting according to

$$P_0 = R_0\frac{1+r}{r-h} - \beta\frac{1+r}{r}\tau TV_0 \tag{2.5}$$

This represents a modest re-specification of (2.2) wherein the real value of rental

[28]Note that $d\tau(SEV_1 - TV_0)$ differs slightly from the previous definition of the capped TV benefit, $d\tau(SEV_0 - TV_0)$. From a theoretical perspective, SEV_0 is counterfactually irrelevant since it never appears in the calculation of tax liability. In the empirical analysis that follows, the capped TV benefit $d\tau(SEV_0 - TV_0)$ is used as a proxy for the theoretical measure of tax savings on the grounds that it suffers less from the potential endogeneity of SEV_1 to observed sale prices as well as for its intuitive appeal.

services is allowed to grow at rate h, and the level of recurring annual tax obligations is taken to be equal to those of the seller in the year of sale.

Both models (2.4) and (2.5) can be readily estimated in a straightforward manner. In practice, (2.4) forms the basis of the empirical analysis under the presumption that homebuyers behave in a rational and well-informed manner while allowing for detection of deviations from such behavior—especially ignorance of TV uncapping—through measurement of the independent effect of SEV on sale prices.[29] Assuming R_0 to be a linear function of time-invariant housing characteristics, denoted by the vector $\mathbf{X_i}$, the estimating equation for measuring capitalization of the inherited tax savings for house i in year n in this setting is

$$P_{in} = \kappa + \alpha d_i \tau_n (SEV_{i,n+1} - TV_{in}) + \theta \tau_n SEV_{i,n+1} + \delta \mathbf{X_i} + \nu \mathbf{x_n} + \epsilon_{in} \tag{2.6}$$

where $\mathbf{x_n}$ represents a vector of year and seasonal effects. Capitalization of future tax obligations is captured by $\theta = \frac{\gamma}{r}$, which depends on the assumed real interest rate.

In addition to the primary virtues of the Michigan property tax system for obtaining unbiased estimates of capitalization—namely, the predeterminedness of TV_{in} and separate identifiability of the capitalization parameter α—the use of sale observations from a single jurisdiction implies that local public goods can be assumed to be uniformly provided across all homes such that public expenditures or services need not be taken into account (and risk omission of potentially-unobserved variables).[30] Moreover, where observations are at the level of home sales, there is little reason to believe in a pattern of reverse causality from individual home prices to the locally-chosen level of the statutory property tax rate.

[29] The tax effect attributed to SEV, and therefore actual future tax obligations, should be negligible if homebuyers are ignorant of the Michigan property tax system but exert a strong negative effect on sale prices otherwise.

[30] The one area in which this assumption may be violated is in terms of public schooling. As reflected in real estate marketing practices, homebuyers appear to care a great deal about differential quality among public schools, even within districts.

Despite these many reasons for viewing Michigan as an ideal natural setting for studying within-jurisdiction property tax capitalization, several important econometric concerns associated with the specification in (2.6) nonetheless remain. First, there may exist a mechanical relationship between sale prices and capped TV benefits whereby larger, more valuable homes experience larger tax savings (measured in dollars) with each passing year of capped TV growth. This is addressed by taking an approximate log transformation and re-specifying all implicated terms in logs.[31] Second, post-sale assessed values (SEV_{n+1}) are likely to incorporate information about observed sale prices despite the application of statistically-based replacement-cost assessment techniques by the local assessors. This is especially true given that new property owners have the option to appeal their assessments. On the one hand, the mere threat of costly appeals may deter assessors from attracting too much scrutiny from new property owners. On the other hand, actual appeals likely consist of bargaining over the difference between initial assessed values and property owners' prior valuations, thereby introducing price information in this manner. Pre-sale SEV (SEV_n) represents an assessment of true market value stripped of any such information and therefore provides a close proxy deprived of simultaneity concerns. More vexing, however, is that even pre-sale SEV may be correlated with omitted housing or market characteristics such that omitted variable bias remains a possibility. This problem is mitigated by the inclusion of a broad array of housing controls along with neighborhood, school, and year fixed effects. Nevertheless, the application of comparable sales analyses in arriving at SEV, for example, may still present an omitted variables concern.

An additional issue is that the statutory property tax rate τ depends on whether a home has been granted a primary residence (homestead) exemption.[32] Without

[31] Just under 20 percent of all observations in the data have zero capped TV benefits and are consequently excluded. Estimation of the exact log-transformed model requires the use of non-linear estimation techniques which consistently fail to converge.

[32] Homestead status is granted to qualifying primary residences. By Michigan law, local property

complete information on residency status of sellers and buyers, the approximately 25 percent lower homestead rate is assumed to apply to all properties. Consequently, the capped TV benefit term will be systematically too small for all secondary residences, thereby leading to possible overstatement of the degree of capitalization. Finally, the fraction of the year, d, over which any capped TV benefit is inherited may be endogenously determined. This is especially troublesome if market participants recognize that larger capped TV benefits may be captured by delaying sale from one year into the next (i.e. by delaying TV uncapping by up to one year), thereby leading to a possible spurious positive correlation between the pro-rated inherited tax savings and sale price. Working in the opposite direction is the fact that in an era of rising house prices, nominal sale prices will generally be lower at the beginning of a calendar year than at the end, all else equal. This is only partially accounted for through the use of controls for month of sale due to the non-linearity of seasonal demand, and the endogeneity of d consequently remains an important problem.

The remedy for these many endogeneity issues lies in the use of appropriate instrumental variables methods. Accordingly, provided that valid instruments exist, the basic regression model can be re-specified as

$$\log P_{in} = \kappa + \alpha E[\log d_i \tau_n (SEV_{in} - TV_{in}) | \mathbf{Z_{in}}] + \theta E[\log \tau_n SEV_{in} | \mathbf{Z_{in}}] + \delta \mathbf{X_i} + \nu \mathbf{x_n} + \epsilon_{in} \tag{2.7}$$

where the $E[\cdot|\mathbf{Z_{in}}]$ terms denote predicted values from first stage regressions of the endogenous regressors on the vector of instruments, $\mathbf{Z_{in}}$. The implementation of acquisition-value assessment limits offers a natural exclusion restriction for the capped TV benefit in the form of the number of years that the cap has been in place (i.e. the number of years that a property has been owned without change of hands since enactment of Proposal A). A plausible instrument for future tax liability, meanwhile,

tax rates may be up to 1.8 percentage points (18 mills) higher for non-homestead properties.

is the level of SEV that prevailed in the year that a property previously sold re-scaled by intervening growth in citywide assessed values. This measure of "predicted" SEV is intended to be stripped of the influence of sale price realizations, assessment shocks, or comparable sales analyses that are otherwise correlated with sale price.

The validity of the first exclusion restriction rests on years of ownership having no direct effect on sale price independent of its influence on the magnitude of the capped TV benefit and is slightly more fragile than the second restriction. A possible concern in this context is that years of ownership may also reflect the extent to which a home is out-of-date if homeowners are more likely to update or renovate their homes closer to their time of purchase, in which case capitalization of the capped TV benefit will tend to be understated. If tenure of ownership instead serves as a signal of homes with highly desirable or unique features (e.g. architectural details, floorplan, quality of materials, etc.) or if long-term property owners are more likely to care about general maintenance than owners who never had intentions of remaining in their homes for an extended period, then the associated effect on sale price may be confounded with that of the tax effect and lead to overstatement of the tax effect. In addition, length of ownership may itself respond to the existence of limitations on TV growth due to the lock-in effect.

These concerns are addressed to the extent possible through the inclusion of appropriate controls, including the number of years elapsed since additions or other major renovations were last performed (and reported to the assessor). Results with an alternative instrument for the capped TV benefit—the differential between average assessed value growth and nominal price growth over the inter-sale period interacted with the measure of pre-sale SEV that prevailed at the time of the sellers' purchase—are also considered and compared.

It is worth noting that by construction of these instruments, none of the proposed IV strategies account for differences in pro-rata capped TV benefits arising

through within-year timing of sales, and thus variation in d is discarded as a source of identification. This is desirable to the extent that variation in d is endogenous and may lead to biased capitalization estimates, but it comes at the expense of not being able to utilize valuable exogenous variation in d. A better approach would consist of decomposing the regressor of interest in (2.7) into separate terms for $\log d$ and the log of the full-year capped TV benefit and employing instruments for both. Ideally, information with respect to the identity of homebuyers such as whether they had school-aged children could be used for such a purpose by providing a valid instrument for d whereby the timing of closing within year is affected in a manner unrelated to any tax incentives. Unfortunately, as is made clear in the next section, no such information is available, and consequently d is preserved in the preferred empirical specification (IV) strictly for consistency of exposition.[33]

2.5 Data

The primary source of data used in this analysis consists of a panel of assessed and taxable values for Ann Arbor, Michigan for the period 1997-2007 along with complete property sales data back to 1984. These files cover all properties in Ann Arbor, a city of approximately 115000 residents in the southeast portion of the state and home to the University of Michigan. Over 85 percent of the roughly 30000 parcels into which the city is divided are residential property. The data include all of the

[33]As a technical matter, all variation in d is ascribed to the residuals in the first-stage IV regressions, as is confirmed by the invariance of the second-stage results to the inclusion of d in the calculation of the regressor of interest. Any remaining concerns with respect to the implications of ignoring the timing of sales as a source of variation in the theoretically-relevant measure of the capped TV benefit should be alleviated by the observation that there exists no systematic statistical relationship between d and $\tau(SEV - TV)$. One might otherwise worry that the results that follow are an artifact of failing to account for particular sorts of relationships, such as if both terms were negatively correlated (contrary to the tax incentives perceived by a rational homebuyer), in which case capitalization estimates of the full-year capped TV benefit might be biased upwards through the negative effect of d on sale prices in periods of rising home prices.

necessary information for calculating tax liabilities (assuming all properties to be primary residences) as well as information on date of last sale, last sale price, and a rich array of parcel and house characteristics, including square footage, number of bedrooms, full and half bathrooms, year built, etc. Excluded from the analysis are tax-exempt, commercial, industrial, and unimproved residential property;[34] transactions between related parties;[35] and high-frequency sales indicative of foreclosures or employer-subsidized relocations. The remaining sample consists of just over 19000 residential sale observations. Of these, approximately 5500 observations represent repeat sales for which complete prior-sale assessment information is available (i.e. where the previous sale occurred in 1997 or later) as required for the IV estimation, with more such observations naturally appearing in the later portion of the 1998-2007 sample period. This selection process will tend to exclude properties associated with either very small capped TV benefits (i.e. those sold shortly after Proposal A was implemented) or very large capped TV benefits (e.g. those sold only once near the end of the sample period).

Crucially, the data are identified by street address such that over 90 percent of all addresses can be mapped to one of fifty different neighborhoods (as defined by the City of Ann Arbor Assessor's office), eighteen elementary schools, five middle schools, and three high schools.[36]

[34]In principle, commercial and industrial property transactions are subject to the same tax implications and incentives as residential property. However, commercial property in Ann Arbor includes several co-operative housing developments that experience fractional uncapping every year in proportion to the number of units (shares) which changed hands over the course of the year. Complications such as these make it unappealing to include non-residential property in the analysis. Assessments of vacant or unimproved land values are relatively unreliable due to the infrequency of such transactions and are therefore likewise excluded.

[35]These include transactions involving artificially low or high sale prices relative to SEV (e.g. sale prices in excess of four times SEV, less than $100, and/or less than 50 percent of SEV with no TV uncapping following sale). Inspection of these omitted transactions confirms that these involve transactions between related parties of different sorts: family members, trusts, business partnerships, etc., as well as parcel splits. Such transactions do not provide an accurate picture of market valuation, nor do they carry the same tax implications as arm's-length sales.

[36]Ann Arbor's third mainstream high school opened its doors in 2008. Unfortunately, the Ann Arbor Public Schools system has not preserved high school attendance boundary coordinate maps that pre-date its opening. To the extent that this was an anticipated event, it may be reasonable to

Figure 2.4 depicts monthly sale volumes and median sale prices over the sample period for all Ann Arbor homes. As the figure makes clear, sales volume follows a strong seasonal pattern, with two to three times more sales occurring in the summer months than in the winter. Median sale prices are somewhat more volatile over the course of the year but generally trend with sales volume, albeit with a slight lag. For applications where this degree of price volatility is undesirable, data on regional trends in median housing prices for the East North Central Census Division (encompassing the states of Illinois, Indiana, Michigan, Ohio, and Wisconsin) are drawn from the Federal Housing Finance Agency's (FHFA) housing price index (HPI). This latter series—normalized to equal the average level of median monthly home prices in Ann Arbor in 2000—is also shown in Figure 2.4 and reveals the Ann Arbor real estate market to generally move in parallel with the broader regional market.

Summary statistics for the complete sample of mapped property sales are presented in Table 2.1 and provide a comparison of the average property characteristics of homes with relatively high and relatively low full-year capped TV benefits as a proportion of pre-sale assessed value (i.e. low versus high TV to SEV ratios). As shown, homes with a high ratio of full-year capped TV benefits to SEV relative to the median among all homes sold in the same year reap predictably larger pro-rata tax savings, on average, than those with a low ratio of full-year capped TV benefits to SEV. This is due entirely to lower TVs relative to SEV among the former group. More generally, according to t tests of equal means, the two groups of homes differ in a statistically-significant manner along every dimension except in the average timing of sales reflected by d. Homes with relatively low TVs (high capped TV benefits) are on average almost 15 years older, smaller, and less recently renovated than those homes with relatively high TVs, and not surprisingly, tend to sell for less. These

assume that home prices in the relevant area adjusted to reflect the amenity value of the new high school several years prior to 2008 (albeit surely not as early as 1997). In practice, the small number of high schools suggests that they are unlikely to drive variation in sale prices beyond that which is already picked up by the other spatial fixed effects.

systematic differences highlight the importance of controlling for all of these property characteristics in the empirical analysis that follows.

2.6 Results

Informal evidence of the relationship between inherited capped TV tax savings and Ann Arbor home sale prices can be seen in Figure 2.5. Conditional on sale year (2006) and residential square footage quintile, homes with larger full-year capped TV benefits scaled by pre-sale SEV (likewise categorized into quintiles), $\frac{\tau(SEV-TV)}{SEV}$, are generally associated with higher median sale prices, often in amounts far exceeding the value of the mean or median capped TV benefit.[37] Among the smallest 20 percent of homes (with residential floor space of less than 1008 ft^2), for example, median sale prices rise from \$160000 for homes in the bottom quintile of the $\frac{\tau(SEV-TV)}{SEV}$ distribution to \$195000 in the top quintile, as indicated by looking across the left-most five bars in Figure 2.5. Given median full-year capped TV benefits of \$0 in the former group and \$1534 in the latter, and assuming that all systematic variation in sale prices within square footage quintile were directly attributable to such tax savings, this would represent approximately (\$195000-\$160000)/\$1534 $\approx$ 23-fold capitalization of full-year capped TV benefits. As depicted in Figure 2.6, similar informal capitalization estimates predominate across all benefit and square footage quintiles, suggesting that substantial overcapitalization is a fairly general result.

Additional graphical evidence of first-period property tax capitalization involving the entire data sample is presented in Figure 2.7 and further supports the basic

[37] Although not the only meaningful determinant of the value of housing amenities, square footage nevertheless likely represents one of the most broadly-encompassing measures of house value, such that variation in sale prices due to housing amenities across the distribution of capped TV benefits should be limited. Scaling benefits by SEV is intended to further control for additional non-tax determinants of market value. Similar results obtain by conditioning on the number of bedrooms rather than square footage. Full-year rather than pro-rata capped TV benefits are used to avoid confounding the effects of inherited tax savings with within-year trends in housing prices in an era of persistent market appreciation.

prediction that larger capped TV benefits should yield higher sale prices, all else equal. Predicted house prices are obtained from a regression of observed sale prices on the full set of housing and market covariates described in the previous section, including home and garage square footage; number of bedrooms, full, and half bathrooms; age and age squared of the physical structure; age of renovations (i.e. the number of years elapsed since a property experienced fractional uncapping, or, in the absence of such evidence, the number of years since the last sale), and a measure of the lagged sale price rescaled by regional HPI appreciation over the intervening period. In addition, macroeconomic trends affecting the evolution of the Ann Arbor housing market are also controlled for using sale year dummies, while sale month indicators account for seasonal effects. Neighborhood and school fixed effects round out the set of regressors. This hedonic regression thus amounts to estimating the empirical capitalization model excluding all tax effects,

$$P_{in} = \kappa + \delta \mathbf{X_i} + \nu \mathbf{x_n} + \epsilon_{in}^{HED} \tag{2.8}$$

and accounts for 80 percent of the variation in observed sale prices as measured by the regression R^2. As shown in Figure 2.7, capped TV benefits represent an important determinant of the otherwise unexplained variation in housing prices (i.e. the residuals from the hedonic regression, $P_{in} - (\hat{\kappa} + \hat{\delta}\mathbf{X_i} + \hat{\nu}\mathbf{x_n})$, expressed as a fraction of predicted sale prices). This is indicative of larger first-period tax savings yielding larger-than-predicted sale prices.

Of course, the exact degree of importance of this relationship and direction of causality cannot be determined without estimating the full regression model specified in (2.7). Table 2.2 presents the ordinary least squares (OLS) results from estimating a somewhat simpler specification (denoted as specification 1) that omits the regressor associated with future tax liability alongside the full preferred specification (denoted

as specification 2). Standard errors are clustered at the neighborhood level, here and throughout the remaining analysis. Using the same set of housing and market covariates as in the hedonic regression, the two models yield very different tax effects that highlight the extent of endogeneity bias associated with the introduction of the second tax term, τSEV. In particular, future tax liability is associated with a significant *positive* effect on sale prices, such that SEV appears to convey additional price-relevant information beyond that which the rich array of controls is able to explain, and the effect of this information dominates any negative tax effects. Moreover, the separate inclusion of future tax liability appears to rob the capped TV benefit of its expected positive effect on sale prices. Taken seriously, these OLS results suggest capitalization estimates of the first-period capped TV benefit ranging from around 500 percent to -300 percent for the average Ann Arbor home; however, the variation in these estimates and the positive effect of future tax liability on sale prices speaks fairly clearly to the existence of previously-discussed endogeneity issues. These must be addressed through the application of instrumental variables (IV) methods.

Second-stage results from two-stage least squares (2SLS) estimation of the same two specifications as considered under OLS are presented in Table 2.3, with the corresponding first-stage estimates provided in Table 2.4. The primary instrument for both specifications consists of years of ownership, while lagged pre-sale SEV rescaled by intervening average assessed value growth is used as an additional instrument to further account for the endogeneity of the future tax liability term in the full capitalization model. Both instruments perform well in the first stage as illustrated by the sign, magnitude, and precision of their estimated effects, especially in their ability to explain variation in the endogenous capped TV benefit, and instrument weakness does not appear to be a concern. In the base specification with only the single endogenous regressor the weak instrument hurdle is easily cleared as measured against Staiger and Stock (1997) rule-of-thumb threshold value ($F > 10$) or the more formal set of

critical values established by Stock and Yogo (2002). In the full specification with two endogenous regressors and clustered standard errors, the robust Kleibergen-Paap Wald rk F statistic of 4.26 falls between the Stock and Yogo (2002) critical values for tests of size 15 and 20 percent at a significance level of 5 percent (Baum, Schaffer and Stillman, 2010). Rejecting instrument weakness on this basis is comparable in degree of conservativeness to rejecting with an F statistic of 10 in cases with a single endogenous regressor.[38]

As shown in Table 2.3, the impact of instrumenting in the second stage is quite stark. Under either specification, capitalization of the first-period inherited tax savings is considerably increased relative to the OLS estimates. The estimated coefficients imply that a 10 percent increase in the pro-rata capped TV benefit is associated with an increase in sale price of between 1.0 and 1.3 percent. For the average home over the sample period, this translates into capitalization of first-period tax savings on the order of 3100 to 3900 percent. Moreover, unlike under OLS, future tax liability no longer has a statistically significant positive effect on sale prices in the full model of capitalization. Hence it appears that homebuyers' only tax-related concern—mistakenly—is with respect to the level of the capped TV and sellers' current tax liability.

As a theoretical matter, the sign of the bias associated with OLS estimates of capitalization of the capped TV benefit is ambiguous. The observed negative bias implied by the difference in empirical results across the OLS and IV specifications therefore carries implications with respect to which of the postulated endogeneity concerns are ultimately most relevant. Since most of the concerns discussed in Section 2.4 would rather suggest finding upwardly-biased OLS estimates of the effect of capped TV benefits on sale prices, the reverse finding is intriguing. The most direct

[38]IV point estimates are virtually identical when estimated by limited information maximum likelihood (LIML) instead of 2SLS. Following from the fact that LIML produces unbiased coefficient estimates even when weak instruments are present, this suggests the absence of weak IV bias in the more familiar 2SLS results.

explanation for the implied negative bias is through the endogeneity of d. Given that the sample period under consideration was characterized by steadily-rising housing prices, smaller values of d should consistently imply higher prices. Indeed, in models estimated in levels with a separate control for d (disregarding possible simultaneity), shifting a sale from the beginning of the year ($d = 1$) to the end of the same calendar year ($d = 0$) is associated with a greater than \$10000 increase in the average sale price across all model specifications and all instrument(s) used. However, this explanation is not particularly compelling given the high degree of similarity in capitalization estimates obtained under log-linear models where d is omitted from the OLS regressions altogether or included as a separate control (results not shown).

For a further possible explanation of the difference in magnitude of OLS and IV capitalization estimates, it is worth examining the broader set of coefficient estimates obtained under the different estimation techniques. Beyond property tax capitalization, the estimated price effects of the many housing and market covariates described in Tables 2.2 and 2.3 are all of a reasonable sign and magnitude and generally show little difference between the two estimation methods. Not surprisingly, one of the strongest predictors of sale price is the lagged sale price rescaled by inter-sale HPI growth, $P_{Hist} \cdot \Delta HPI$, but it is also worth noting the relatively important negative impact of renovation age on sale price, especially under the IV specification. This follows in part from the fact that identification arises precisely from the approximate 10 percent subsample of homes for which renovation age and years owned differ and may help explain the implicit negative bias in the OLS capitalization estimates for which IV provides a correction. The use of years owned as an instrument helps to distinguish two sources of variation in capped TV benefits: namely, (1) the mechanical accumulation of lower relative tax obligations due to assessment limits, and (2) the depreciation of intangible housing amenities over time that may go unnoticed by the

assessor.[39] Without instrumenting, the strong positive correlation between the size of the capped TV benefit and the number of years elapsed since renovations were last performed (by the assumption that renovations were last performed in the year of last sale without evidence to the contrary, plus assessor ignorance of certain dimensions of housing depreciation) works against finding a large positive effect of the capped TV benefit or large negative effect of renovation age on sale price. Furthermore, the two effects may be further confounded by the fact that properties with similar renovation ages may in fact have very different ownership histories and therefore carry very different first-period tax obligations.[40] Once years owned is separately accounted for, however, renovation age is allowed to play its intended role by signalling the degree to which a home is up-to-date.

Yet another explanation for the larger IV estimates of capitalization of first-period tax savings could be that instrument exogeneity is in fact violated and that years of ownership exert a positive influence on sale prices independent of their effect on the size of capped TV benefits, also as discussed in Section 2.4. An alternative instrument more closely related to the mechanical calculation of capped TV benefits is therefore considered. Tables 2.5 and 2.6 present additional 2SLS results involving the use of lagged pre-sale SEV rescaled by the difference between assessment growth and CPI inflation (i.e. the Michigan Tax Commission's inflation rate multiplier) over the inter-sale period as an instrument in place of years owned.[41] While years of ownership are still implicitly reflected in this "predicted" capped TV benefit instrument, additional

[39]By this I refer to amenities whose value fluctuates according to tastes and fashions in a manner unrelated to physical depreciation of the asset. Thus, for instance, a home with oak flooring might have been perceived as less valuable during the later part of the last decade than one with pine flooring due to a shift in preferences towards lighter-colored woods, despite the greater durability of oak. Certain types of physical depreciation may also fail to be reflected in property assessments, of course, and can also contribute to negative bias in the OLS estimate of first-period capitalization.

[40]The direction of bias in this context is ambiguous. In instances where longer-held homes are more recently-renovated than homes held for an intermediate period of time, failure to account for length of ownership could erroneously attribute the tax benefits of assessment limits to the occurrence of renovations and thereby dampen estimates of first-period capitalization.

[41]Virtually identical results emerge where the measure of assessed value growth is at the neighborhood rather than city level.

sources of variation are introduced that ought to mitigate concerns about the direct effect of homeowner tenure on sale prices, assuming these have any merit. The overall results are qualitatively little changed with this alternative instrument, though the degree of overcapitalization of the capped TV benefit is halved in the full specification with pro-rata first-period tax savings and future tax liability entering as separate terms and modestly reduced otherwise. Even halved, this estimate of first-period capped TV benefit capitalization remains above 1500 percent for the average home, far above the OLS estimate.

These results can be read in either of two ways: (1) there may exist some basis for questioning the validity of the years owned instrument, hence the reduction in magnitude of the capped TV benefit effect under the alternative IV approach, or (2), the alternative instrument suffers from instrument weakness, especially in its ability to account for variation in future tax obligations, and merely represents an intermediate strategy between OLS and IV with the more appealing years owned instrument. Indeed, support for this latter view can be seen in the significant positive effect of future tax liability on sale prices (albeit at only the 10 percent level)—previously interpreted as evidence of omitted variable bias showing through—and of the low joint significance of the instruments in the first stage regression involving future tax liability as the dependent variable. Regardless of which view is correct, however, the ultimate message remains the same: first-period tax savings are significantly overvalued in a manner which cannot be reconciled with rational or well-informed behavior on the part of Ann Arbor homebuyers. Whether full-year capped TV benefits are capitalized 1500 percent or 3100 percent (i.e. 50 percent or 100 percent capitalization of an infinite stream of annually-recurring first-period benefits at an approximate 3 percent real interest rate), this can only represent a costly error from the perspective of new homebuyers (and a valuable payoff for sellers).[42] In particular, the form that this

[42]Equivalently, these different measures of overcapitalization are also consistent with 100 percent capitalization under real interest rates of 6 percent versus 3 percent, respectively. In fact, without a

mistake takes is for homebuyers to believe that *holding* τSEV *constant*, an increase in the capped TV benefit (i.e. decrease in τTV) will persist for the lifetime of the home. Hence, this is equivalent to homebuyers believing that seller tax obligations, τTV, will carry over to themselves and remain unchanged indefinitely. Since the tax implications of seller SEV are ignored in this context, SEV can only be relevant insofar as there exist omitted variables in the regression model (and that these are not adequately accounted for by IV).

This proposed form of buyer irrationality can be "tested" by estimating a reduced-form version of (2.5) wherein the only determinant of tax liability is perceived to be the sellers' capped TV and sellers' SEV is omitted altogether. An important caveat, however, is that TV and SEV are so highly correlated for the average home in the sample ($\rho = 0.95$) that evidence of a large price response to seller tax obligations cannot be distinguished from an indirect response to future tax obligations without accounting separately for both. Thus, the fact that 2SLS results from this rudimentary "test" (not shown) reveal a large negative impact of seller tax obligations on sale prices cannot be attributed too much significance.

One plausible alternative interpretation for the overcapitalization result is that properties are systematically under-assessed in years where no change of ownership has occurred due to a lack of incentives to the contrary, *and* assessors are more reluctant to fully offset these under-assessments when establishing post-sale SEV for fear of triggering costly appeals—particularly in an environment where homebuyers ignore the existence of the pop-up tax. In such a case, a larger capped TV benefit may also serve as a signal of lower future tax obligations than would otherwise be incurred. Superficially, there exists some evidence to suggest that both of these conditions may be true. In the full panel of assessed values, year-on-year changes in

strong consensus in the literature as to either the "correct" degree of capitalization of recurring tax obligations nor even the appropriate discount rate, many plausible combinations of interest rates and capitalization percentages exist that nevertheless lead to the same conclusion about homebuyers' misunderstanding of the Michigan property tax system.

SEV are 1.1 percent higher, on average, among properties that changed hands in the previous period than among those that did not, and the magnitude of this correction is reduced by 0.24 percent for each additional year that a property was held.[43] However, the latter finding is also consistent with the earlier conjecture that assessors might tend to *overassess* (underassess less) homes that have seen less recent changes of ownership due to their inability to observe depreciation of certain intangible housing amenities, thereby requiring smaller upward revisions to assessed values following sales. Meanwhile, the former finding may reflect homebuyers' tendency to make home improvements immediately following purchase as assumed elsewhere in this analysis. Indeed, the 1.1 percent increase in SEV following sale is small in comparison to the estimated 8.7 percent increase in SEV following the occurrence of observed renovations in non-sale years (results not shown). If either of these are correct explanations for the patterns in the data, then the mechanism for this alternative interpretation of the overcapitalization result is invalid. Moreover, the importance of this postulated effect appears to be very small (at best) given the even larger estimates of first-period tax capitalization that emerge from estimation of the basic model using post-sale SEV to calculate capped TV benefits wherein the signalling channel is eliminated (results not shown).[44]

Another possibility is that deeply cash-constrained homebuyers may have been prepared to pay a hefty premium for homes with temporarily low property tax obligations so as to incur reduced closing costs and cash outlays in the first months of

[43]New construction is excluded from this analysis (i.e. structures less than two years of age; approximately 1 percent of the sample of parcel-year observations for the 1998-2007 period) to avoid situations in which, for instance, vacant land was transformed into a new $500000 home over the course of one or two years of construction, thereby exerting undue influence on the estimated effects. When such properties are included, the effects are dramatically amplified in magnitude, though the implications are unchanged.

[44]Capitalization of the capped TV benefit is modestly reduced in the full specification involving future tax liability where both tax terms are computed using post-sale SEV, while future tax liability is itself associated with a larger positive effect on sale prices. As previously discussed, there are several reasons for expecting this type of result and worrying about the inclusion of post-sale SEV as an independent variable, even under instrumental variables since the existence of a valid instrument is highly dubious.

ownership. While this cannot be ruled out as a contributing factor, the magnitude of the observed overcapitalization is substantially greater than the premium observed in the market for reducing mortgage down payments by a comparable dollar amount within the realm of 30 year fixed rate mortgages, and this thus seems unlikely to play a major role. As an example, increasing the down payment on a $250000 home with a 30-year 6.5 percent fixed rate mortgage by $1500 above the 20 percent threshold is associated with a current value savings of $1900 over the life of the loan. Conversely, reducing the down payment by $1500 below the 20 percent threshold under comparable terms is associated with a $2900 lifetime penalty assuming that lenders require the purchase of private mortgage insurance (PMI) at a cost of 0.66 percent of loan value so long as homeowner equity is below 20 percent. These figures suggest a willingness to pay of less than $2 per $1 reduction in cash outlays at the time of purchase. Discontinuities may nevertheless arise at other thresholds, such as in the extreme case where 0 percent down represents a binding constraint, or at the 5 percent down threshold below which additional interest rate premia may apply, but the mass of buyers residing precisely at these discontinuities is presumably small.[45] Moreover, liquidity constraints cannot explain the statistical irrelevance of future tax obligations in the analysis. It follows that the interpretation of the overcapitalization result that is consistent with the full range of evidence—statistical and anecdotal—is that of uninformed homebuyers valuing homes on the basis of seller tax obligations rather than on the basis of expected uncapped taxable values (i.e. seller assessed values).

[45] Adams, Einav and Levin (2009) present evidence from the used auto market indicating that consumer demand among subprime borrowers is equally responsive to a $100 increase in the required down payment as to a $3000 increase in sale price, suggesting that liquidity constraints can indeed be very severe among this subgroup of the population. Such severe constraints would seem unlikely in the housing market for two reasons. First, autos are necessary in ways that homes are not (i.e. there exists no reasonable long-term rental market for cars), perhaps especially for this subgroup of the population. Second, over half of all loans examined by Adams, Einav and Levin (2009) terminate in default and face an average interest rate of 25-30 percent, thereby implying a degree of adverse selection and moral hazard unfathomable in the housing market.

2.7 Conclusion

The evidence presented in this paper suggests that homebuyers are, on average, grossly mistaken about the implications of the Michigan property tax system and fail to obtain sufficient information to make financially-sound decisions with regards to the tax consequences of homeownership, even with many thousands of dollars potentially at stake. Having recently witnessed the large numbers of homeowners foreclosed out of homes whose mortgages they could not afford, it likely comes as little surprise that homebuyers commonly make ill-informed decisions. In this context, it is perhaps even less surprising given that there are many good reasons for thinking that prospective homebuyers might easily be deceived into focusing solely on seller tax liabilities without recognizing the effects of TV uncapping. Simply put, sellers and real estate professionals lack the financial incentives to draw attention to any such misunderstandings, while mortgage lending practices and sale listings explicitly highlight current tax obligations and capped TVs at the expense of the more relevant measures of SEV. Nevertheless, although perhaps not an incredible surprise, the significant overcapitalization of temporary tax savings represents an especially striking example of irrational or cognitively-biased behavior given the vast sums of money involved. A back-of-the-envelope calculation suggests that in 2005 alone, homebuyers in Ann Arbor would have collectively overpaid $64 million (30 times the average first-period capped TV benefit across all purchases). In a less highly-educated Michigan town, the frequency and magnitude of homebuyer error could well be even larger, although this may be tempered by the fact that Ann Arbor's relatively highly-educated residents are also likely to be more transient and therefore perhaps less innately familiar with the state's tax system. Regardless, competitive bidding for homes implies that only some ill-informed bidders are necessary to drive the overcapitalization result, such that the Ann Arbor experience is unlikely to differ from that in other Michigan jurisdictions.

An interesting question to ask is why policymakers, state and local authorities, and real estate professionals have not been able to put an end to such confusion in the many years since Proposal A was enacted, especially since one of the primary intentions of the policy was to protect homeowners from property tax uncertainty. For those in the real estate business, misalignment of incentives is surely a factor, but to understand the lack of success of those involved in policymaking and implementation, it is worth considering the source of buyer misunderstandings. Ultimately, the aspect of Proposal A that seems most responsible for obscuring the tax implications of acquisition-value assessment limits is the delay in TV uncapping until January 1 following all sales. With immediate uncapping, it stands to reason that seller tax obligations would not figure prominently in any of the information considered by prospective homebuyers. Despite the precedent established by California in its use of supplemental assessments to achieve immediate uncapping under Proposition 13, Michigan rejected this policy feature, thereby foregoing tax revenue from a source that would require no new information reporting. A possible explanation for this decision is that policymakers did not want to discourage homeownership by immediately hitting homebuyers with large tax increases (relative to the previous owners' tax liability) in a salient manner.[46]

Since long before Proposal A, considerable attention has been devoted to the lock-in effect that emerges under property tax systems which cap TV growth between sales, whereby owners of homes who face disproportionately low TVs relative to their assessed values will be reluctant to lose their associated tax benefits by moving and purchasing a new home with an uncapped TV. An important implication of homebuyers compensating sellers as if temporary capped TV benefits were permanent is that concerns over reduced turnover and homeowner mobility due to acquisition value

[46]Continued concern for this issue among state policymakers led to an attempt in March 2007 to provide a boost to the Michigan housing market by enacting an 18-month moratorium on the pop-up tax. Ultimately, the bill failed to pass the Michigan Senate, and the concern largely evaporated with the collapse of the housing market (and therefore the importance of the pop-up tax) soon thereafter.

assessment limits are substantially mitigated or even eliminated. Although it is hard to conceive of Michigan policymakers intentionally choosing to conceal the full tax implications of property transactions under Proposal A so as to mitigate efficiency losses due to reduced homeowner mobility—the likely intention being to merely offer a one-period tax benefit so as to avoid a chilling effect on the real estate market—it certainly appears in hindsight that deviation from the policy framework of Proposition 13 may have been desirable just for that purpose. This evidence thus lends further support for the emerging view that governments may do well to manipulate the salience of various features of the tax system so as to minimize undesirable distortions, a view advocated on the basis of precisely this type of evidence of cognitively-biased behavior by Schenk (2010) and Congdon, Kling and Mullainathan (2009).[47]

Two words of caution are in order about trying to extend the results presented in this paper to the more general issues of the capitalization effects of Proposal A and the lock-in effect. First, it is tempting to conclude that if sale prices in the post-Proposal A era reflect 100 percent capitalization of seller tax obligations, then all of the tax benefits associated with the implementation of assessment limits were captured by the homeowners of record in 1994. Such a claim would run counter to much of the existing literature and does not in fact follow from the evidence presented here, the reason being that the estimation strategy only utilizes data on the second (or later) sales to occur after 1994. Thus, one cannot draw conclusions regarding the behavior of homebuyers who were the first to trigger TV uncapping when information about the implications of Proposal A was presumably more widespread in the news and elsewhere, and the possibility that 1994 homeowners received no capitalized tax benefits whatsoever cannot be rejected. Second, it is also tempting to infer from the

[47]Weighing against the welfare improvements due to mitigation of the lock-in effect under the Michigan property tax system, of course, are the welfare losses associated with homebuyers' choices over sub-optimally high housing consumption levels. Starting from a second-best situation, the net welfare consequences of the differences between Michigan's Proposal A and California's Proposition 13 are thus strictly-speaking ambiguous, such that a definitive determination of the efficiency consequences of Proposal A would ultimately require precise measures of both welfare effects.

results presented here that the Michigan property tax system is devoid of any lock-in effect. For the average sale, sellers are compensated in a manner that effectively precludes having to forego the full stream of capped TV tax savings such that the lock-in effect is indeed non-existent. However, the unobserved counterfactual may involve prospective sellers who have been unsuccessful in securing uninformed-buyer matches and remain inefficiently wedded to their capped TVs. Consequently, it is more reasonable to infer that the lock-in effect in the aggregate is merely significantly reduced.

Several interesting avenues for further research are suggested by the results in this paper, each of which I intend to address in the future using additional data from various complementary sources. First, it would be very useful to confirm the postulated nature of the policy feature that gives rise to widespread homebuyer confusion by performing a rigorous comparison of capitalization of capped TV benefits and the associated lock-in effect in Michigan versus California, where Californian capped TV benefits would be artificially-constructed assuming counterfactual January 1 TV uncapping. Second, homebuyers' ignorance of the pop-up tax ought to be reflected in mortgage and property tax default and delinquency rates in proportion to the magnitude of the discontinuity between seller and buyer tax obligations. This is an eminently testable prediction and clear manifestation of homebuyers' sub-optimal housing consumption decisions whose importance should be weighed against possible efficiency gains from reduced homeowner lock-in under Proposal A. Furthermore, the Michigan property tax system also carries strong implications for the timing of sales that may shed light on possible heterogeneity in the degree to which market participants are well-informed with regards to the tax system. These timing issues are considered in a companion paper whose results remain very preliminary. Finally, property tax salience and cognitive biases of the nature presented here could also be studied to positive effect in an experimental setting.

Figure 2.1: Effect of Proposal A Assessment Limits:
Annual Tax Liabilities for Different Sale Histories, Ann Arbor

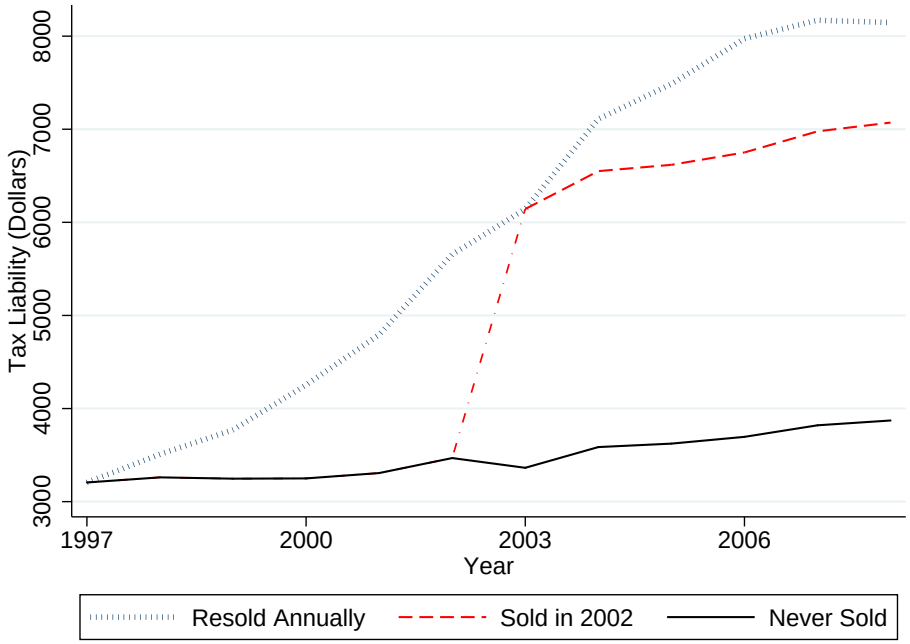


Figure 2.2: Median Changes in Annual Tax Liability Following Sale,
Ann Arbor Sales of Existing Homes

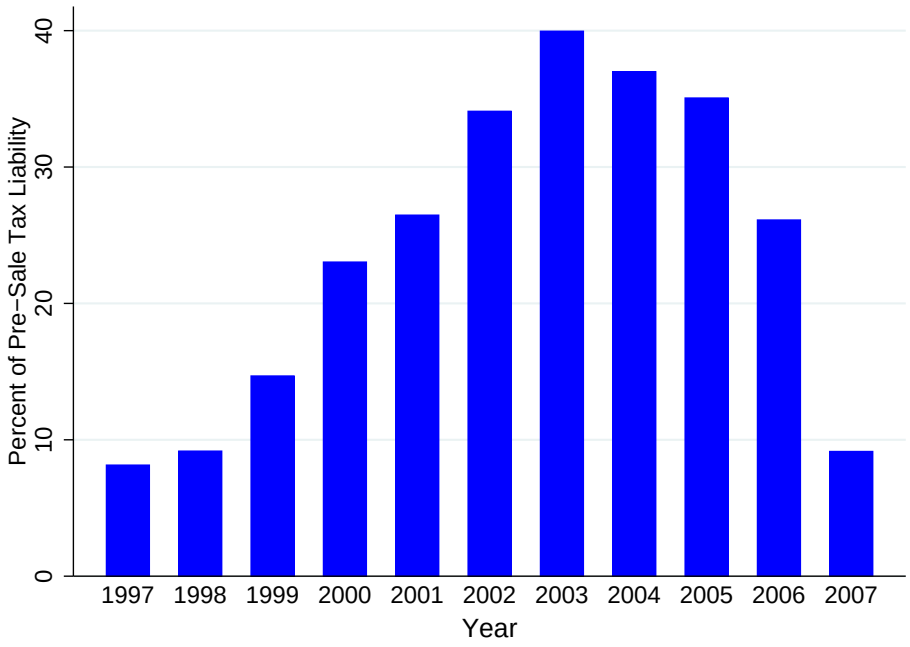


Figure 2.3: Pro-rata Capped TV Benefits in Year of Sale, Ann Arbor Sales of Existing Homes

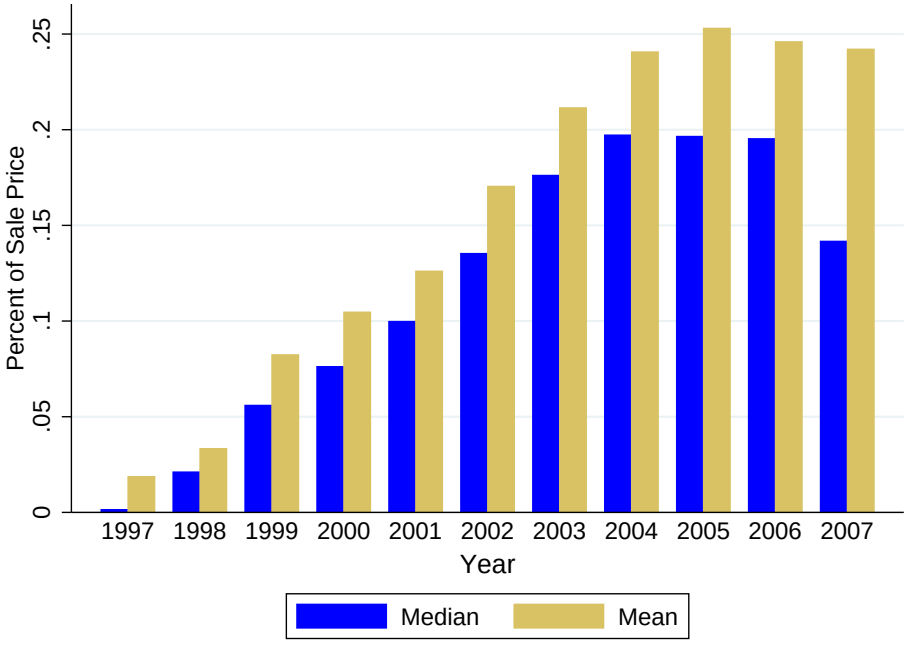


Figure 2.4: Monthly Sales Volumes and Prices, Ann Arbor

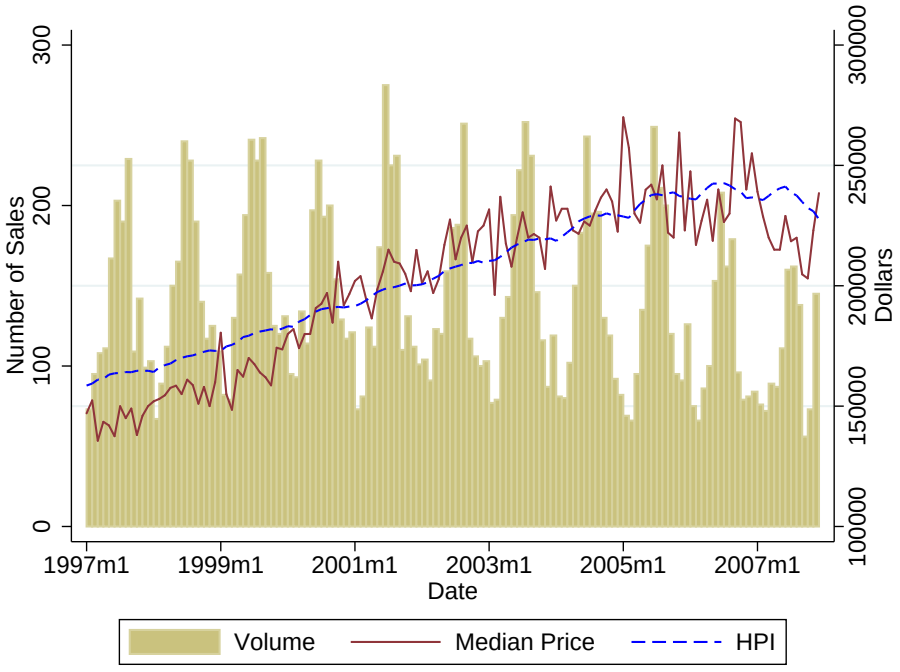
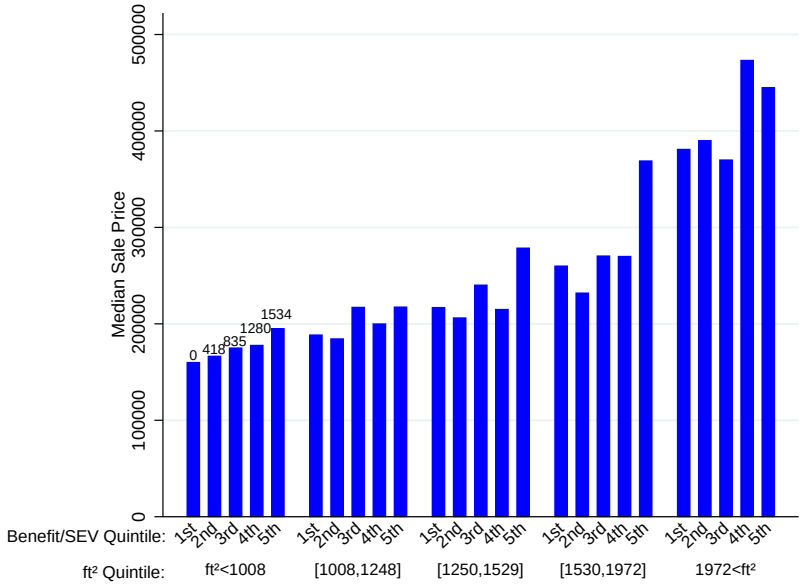
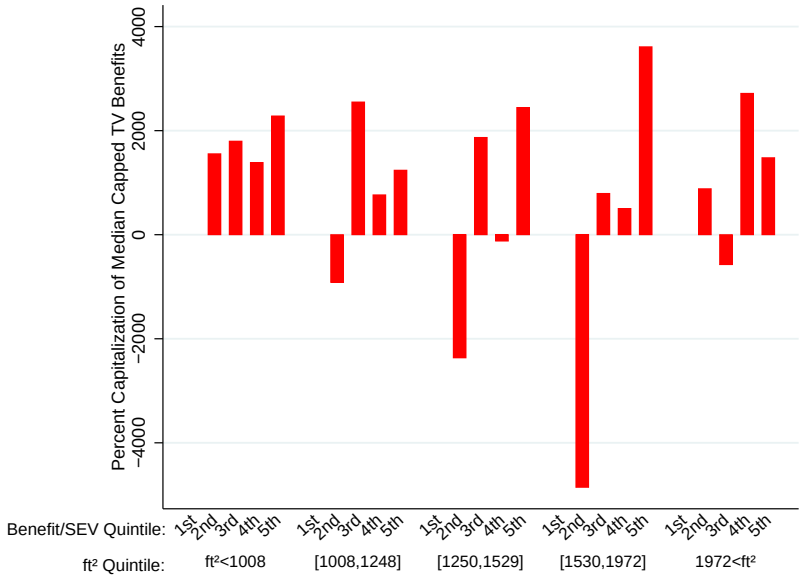


Figure 2.5: Median Sale Prices by Home Square Footage and Full-Year Capped TV Benefit/SEV Quintiles, Ann Arbor (2006)



Median full-year capped TV benefits, $\tau(SEV - TV)$, within benefit/SEV and square footage quintile are indicated atop the corresponding bars for the first square footage quintile only.

Figure 2.6: Capped TV Benefit Capitalization by Home Square Footage and Full-Year Capped TV Benefit/SEV Quintiles, Ann Arbor (2006)



Capitalization estimates are measured within square footage quintile as the difference in median sale prices between the 1^{st} and n^{th} benefit/SEV quintile divided by the corresponding difference in median full-year capped TV benefits, $\tau(SEV - TV)$.

Figure 2.7: Pro-Rata Capped TV Benefits and Predicted Sale Prices

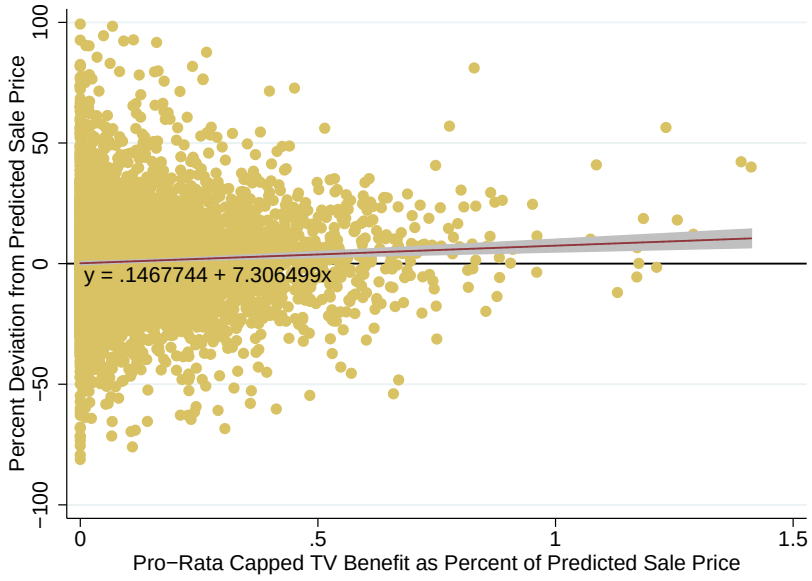


Table 2.1: Mean Property Characteristics
by Ratio of Full-year Capped TV Benefits to SEV, Ann Arbor

	Low $\frac{\tau(SEV_n - TV_n)}{SEV_n}$	High $\frac{\tau(SEV_n - TV_n)}{SEV_n}$	Difference (High-Low)[a]	N
$d\tau(SEV - TV)$	\$163	\$527	\$364***	18033
SEV	\$95782	\$92035	-\$3747***	18041
TV	\$88818	\$68726	-\$20092***	18041
d	0.48	0.48	-0.00	18040
Years owned	4.3	8.1	3.8***	11915
Residence sq. ft.	1602	1480	-122***	18033
Garage sq. ft.	321	286	-35***	18041
# Bedrooms	2.95	3.03	0.08***	15713
# Baths (Full)	1.51	1.42	-0.08***	18041
# Baths (Half)	0.78	0.59	-0.19***	18041
Age	30.7	45.2	14.5***	17878
Renovation age	3.7	6.7	3.1***	13825
Sale Price	\$234989	\$223386	-\$11603***	18041

[a] Significance levels corresponding to t tests of equal means between high and low capped TV benefit groups (allowing for unequal variances) are designated according to *** p<0.01 and * p<0.10.

Table 2.2: Property Tax Capitalization - OLS

	(1)		(2)	
$Y = \log P$	Coeff.	(s.e.)	Coeff.	(s.e.)
$\log d\tau(SEV - TV)$	0.016***	(0.005)	-0.010**	(0.005)
$\log \tau SEV$	-	-	0.481***	(0.079)
$\log P_{Hist} \cdot \Delta HPI$	0.278***	(0.032)	0.132***	(0.020)
Residence sq. ft. (x 10^3)	0.246***	(0.017)	0.152***	(0.034)
Garage sq. ft. (x 10^3)	0.257***	(0.038)	0.138**	(0.056)
# Bedrooms	0.019**	(0.008)	0.012*	(0.006)
# Baths (Full)	0.035***	(0.008)	0.018*	(0.009)
# Baths (Half)	0.029***	(0.009)	0.007	(0.006)
Age	-0.002**	(0.001)	-0.001	(0.001)
Age^2	0.000***	(0.000)	0.000*	(0.000)
Renovation age	-0.004**	(0.002)	-0.002	(0.002)
N	5406		5406	
R-squared	0.837		0.867	

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors are clustered at the neighborhood level. Month, year, neighborhood, and school fixed effects are included in all specifications.

Table 2.3: Property Tax Capitalization - IV Second Stage

	(1)		(2)	
$Y = \log P$	Coeff.	(s.e.)	Coeff.	(s.e.)
$E[\log d\tau(SEV - TV)\|\mathbf{Z}]$	0.126***	(0.017)	0.101***	(0.023)
$E[\log \tau SEV\|\mathbf{Z}]$	-	-	0.196	(0.218)
$\log P_{Hist} \cdot \Delta HPI$	0.293***	(0.036)	0.368***	(0.085)
Residence sq. ft. (x 10^3)	0.221***	(0.021)	0.115***	(0.038)
Garage sq. ft. (x 10^3)	0.226***	(0.042)	0.093**	(0.044)
# Bedrooms	0.015*	(0.008)	0.011*	(0.007)
# Baths (Full)	0.025***	(0.009)	0.016	(0.011)
# Baths (Half)	0.017*	(0.010)	0.002	(0.011)
Age	-0.003***	(0.001)	-0.001	(0.001)
Age^2	0.000***	(0.000)	0.000*	(0.000)
Renovation age	-0.026***	(0.004)	-0.022***	(0.005)
N	5406		3833	
R-squared	0.796		0.842	

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors are clustered at the neighborhood level. Month, year, neighborhood, and school fixed effects are included in all specifications.

Table 2.4: Property Tax Capitalization - IV First Stages

Endogenous Regressor:	(1)		(2)			
	$\log d\tau(SEV - TV)$		$\log d\tau(SEV - TV)$		$\log \tau SEV$	
	Coeff.	(s.e.)	Coeff.	(s.e.)	Coeff.	(s.e.)
Instrument:						
Years owned	0.176***	(0.011)	0.235***	(0.015)	0.013***	(0.004)
$\log SEV_{Hist} \cdot \Delta SEV$	-	-	0.100**	(0.046)	0.063***	(0.022)
$\log P_{Hist} \cdot \Delta HPI$	-0.082	(0.079)	-0.227***	(0.077)	0.286***	(0.040)
Residence sq. ft. (x 10^3)	0.205***	(0.066)	0.282***	(0.061)	0.218***	(0.018)
Garage sq. ft. (x 10^3)	0.251**	(0.107)	0.289**	(0.110)	0.244***	(0.022)
# Bedrooms	0.035*	(0.021)	0.023	(0.024)	0.012**	(0.005)
# Baths (Full)	0.064*	(0.032)	0.063	(0.041)	0.040***	(0.008)
# Baths (Half)	0.091***	(0.033)	0.079	(0.050)	0.035***	(0.007)
Age	0.006	(0.004)	0.004	(0.004)	-0.005***	(0.001)
Age^2	-0.000	(0.000)	0.000	(0.000)	0.000***	(0.000)
Renovation age	0.052***	(0.010)	0.044***	(0.013)	-0.010***	(0.003)
N	5406		3833		3833	
R-squared	0.709		0.681		0.923	
F-stat	265		164		17.0	
Kleibergen-Paap rk Wald F-stat	265		4.26		4.26	

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors are clustered at the neighborhood level. Month, year, neighborhood, and school fixed effects are included in all specifications.

Table 2.5: Property Tax Capitalization - Alternate IV Second Stage

	(1)		(2)	
$Y = \log P$	Coeff.	(s.e.)	Coeff.	(s.e.)
$E[\log d\tau(SEV - TV)\|\mathbf{Z}]$	0.091***	(0.023)	0.049***	(0.017)
$E[\log \tau SEV\|\mathbf{Z}]$	-	-	0.333*	(0.177)
$\log P_{Hist} \cdot \Delta HPI$	0.418***	(0.048)	0.305***	(0.069)
Residence sq. ft. (x 10^3)	0.179***	(0.020)	0.115***	(0.038)
Garage sq. ft. (x 10^3)	0.161***	(0.025)	0.093**	(0.044)
# Bedrooms	0.014**	(0.006)	0.010*	(0.006)
# Baths (Full)	0.024**	(0.010)	0.013	(0.010)
# Baths (Half)	0.013	(0.010)	0.003	(0.009)
Age	-0.002*	(0.001)	-0.000	(0.001)
Age^2	0.000***	(0.000)	0.000	(0.000)
Renovation age	-0.023***	(0.007)	-0.013***	(0.005)
N	3801		3801	
R-squared	0.842		0.879	

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors are clustered at the neighborhood level. Month, year, neighborhood, and school fixed effects are included in all specifications.

Table 2.6: Property Tax Capitalization - Alternate IV First Stages

Endogenous Regressor:	(1)		(2)			
	$\log d\tau(SEV - TV)$		$\log d\tau(SEV - TV)$		$\log \tau SEV$	
	Coeff.	(s.e.)	Coeff.	(s.e.)	Coeff.	(s.e.)
Instrument:						
$\log SEV_{Hist} \cdot (\Delta SEV - \Delta CPI)$	0.332***	(0.065)	0.686***	(0.075)	0.007	(0.010)
$\log SEV_{Hist} \cdot \Delta SEV$	-	-	-0.570***	(0.096)	0.056**	(0.027)
$\log P_{Hist} \cdot \Delta HPI$	-0.343***	(0.071)	-0.237***	(0.080)	0.286***	(0.041)
Residence sq. ft. (x 10^3)	0.251***	(0.057)	0.280***	(0.060)	0.219***	(0.019)
Garage sq. ft. (x 10^3)	0.351***	(0.103)	0.363***	(0.113)	0.247***	(0.022)
# Bedrooms	0.025	(0.023)	0.027	(0.024)	0.012**	(0.005)
# Baths (Full)	0.069	(0.042)	0.071	(0.043)	0.041***	(0.008)
# Baths (Half)	0.070	(0.051)	0.090*	(0.048)	0.037***	(0.007)
Age	-0.000	(0.004)	0.003	(0.005)	-0.005***	(0.001)
Age^2	0.000	(0.000)	0.000	(0.000)	0.000***	(0.000)
Renovation age	0.185***	(0.020)	0.118***	(0.013)	-0.000	(0.003)
N	3801		3801		3801	
R-squared	0.682		0.690		0.922	
F-stat	26.3		46.7		4.59	
Kleibergen-Paap rk Wald F-stat	26.3		3.74		3.74	

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors are clustered at the neighborhood level. Month, year, neighborhood, and school fixed effects are included in all specifications.

CHAPTER III

Round-tripping of Domestic Profits under the American Jobs Creation Act of 2004

3.1 Introduction

Tax-motivated patterns of international investment and income reallocation by multinational corporations are of special interest to policymakers confronted with the tradeoff between raising sufficient revenue and encouraging domestic investment. In an attempt to promote the latter, the American Jobs Creation Act of 2004 (AJCA) allowed U.S. multinational corporations to deduct 85 percent of the extraordinary dividends remitted by their controlled foreign corporations from their foreign-source income tax liability over a one year period. While the actual effect of this dividends received deduction (DRD) on U.S. investment and growth remains somewhat of an open question, tax return data reveal that the provision was widely exploited, with U.S. multinationals repatriating $312 billion in qualifying dividends between 2004 and 2006 in order to receive preferential tax treatment.

Foremost among the corporations to benefit from the temporary tax holiday were pharmaceutical and medical manufacturing firms as well as manufacturers of elec-

The statistical analysis of firm-level data on U.S. multinational companies was conducted at the Bureau of Economic Analysis, U.S. Department of Commerce under arrangements that maintain legal confidentiality. The views expressed are those of the author and do not reflect official positions of the U.S. Department of Commerce.

tronics and other high-technology equipment (Redmiles, 2008). Ordinarily, firms in these industries are thought to have a greater degree of flexibility in allocating capital across borders while minimizing tax liabilities on account of their reliance on transactions involving intangible assets and other sophisticated arrangements. The surge in dividend remittances among high-technology firms in response to the AJCA is thus surprising; if such firms are especially capable at avoiding the burden of corporate income taxes, why was the DRD so attractive?

The explanation considered here—widely-ignored up to this point—is that the AJCA created a strong incentive for multinationals to shift domestic earnings to subsidiaries in low-tax countries in order to immediately repatriate these under the terms of the temporary tax holiday (and thereby escape the U.S. corporate tax base) and that those firms most capable of engaging in this unconventional form of round-tripping of domestic earnings were precisely those with the greatest ease of reallocating income on a short-term basis.[1] The purpose of this paper is therefore to consider the empirical evidence for the simultaneous expatriation of domestic earnings and repatriation of foreign income by U.S. multinationals and measure the elasticity of income shifting with respect to the associated tax savings, using the repatriation response to the DRD for cleaner identification than has previously been applied in the literature. Understanding the responsiveness of profit shifting activity to changes in country-specific tax prices of repatriating foreign-source income is critical to predicting the patterns of income reallocation that would result from moving towards a territorial tax system in the U.S. in which foreign earnings are exempt from domestic taxation. This is especially relevant as fewer and fewer industrial countries continue to tax the worldwide income of their resident corporations, thereby increasing pressure on the

[1] A multinational facing the top statutory corporate income tax rate in the U.S. of 35 percent ($\tau_m^c = 0.35$) could save up to \$0.2975 in taxes per dollar of income shifted abroad and repatriated by avoiding the U.S. corporate income tax on 85 percent of the earnings involved less any applicable foreign income taxes (τ_i^c) and withholding taxes (τ_i^w), with an offset for U.S. foreign tax credits attributable to the non-deductible portion of dividends remitted:

Tax Savings $= (0.85)(\tau_m^c - \tau_i^c - \tau_i^w(1-\tau_i^c))$. If $\tau_m^c = 0.35$ and $\tau_i^c = \tau_i^w = 0, (0.85)(0.35) = 0.2975$.

U.S. to follow suit. Moreover, the magnitude of the aggregate round-tripping effect has important implications for whether the DRD successfully promoted new domestic investment or simply provided a large tax benefit to U.S. multinational corporations at a high cost to government revenue by encouraging firms to merely report domestic income as foreign-earned.[2]

In order to evaluate whether dividend repatriation and income shifting were in fact chosen as complementary mechanisms for exploiting the tax-minimizing opportunities provided under the AJCA, I first construct a simple two-period model of foreign investment which yields the central theoretical result that the optimal level of income reallocation is independent of the level of dividend remittances, conditional on these being non-zero. Qualifying dividend repatriations in this context effectively serve as a switch, endogenously turning on and off the reduction in the repatriation tax available under the DRD and therefore the incentives for round-tripping. I proceed to estimate several variants of an approximate panel difference-in-difference model derived from this theoretical result using confidential data collected by the Bureau of Economic Analysis (BEA) on the operations of non-bank U.S. multinationals and their majority-owned foreign affiliates. This approach has the virtue of combining the best data available with an empirical strategy that avoids the confounding effects of time-invariant country-specific determinants of real economic activity that may be correlated with foreign tax rates. I am thereby able to surmount two of the primary obstacles to accurately quantifying the extent of income reallocation by U.S. multinationals, obstacles that previous studies have confronted with mixed success.

Taking care to account for the simultaneity of the dividend repatriation and income reallocation decisions, instrumental variables results indicate that the short-run

[2]Identical profit reallocation incentives would also apply to foreign earnings subject to the same high rate of corporate taxation abroad as in the U.S. if the domestic reinvestment requirements of the DRD were non-binding. Several papers on the topic provide evidence demonstrating that this did not appear to generally be the case (see e.g. Blouin and Krull (2009); Clemons and Kinney (2008); Dharmapala, Foley and Forbes (2010); or Graham, Hanlon and Shevlin (2010)).

semi-elasticity of foreign non-equity pre-tax returns on assets with respect to effective foreign tax rates is -0.5, well below the long-run semi-elasticity of -3.6 found in Clausing (2009) and the average long-run semi-elasticity of reported earnings of -2 found in the literature more broadly. A 1 percentage point reduction in the repatriation tax thus leads to a 0.6 percent increase in reported earnings per dollar of assets. On the basis of the characteristics of the median dividend-paying affiliate, this translates to an aggregate increase in foreign earnings of $32 billion as a direct consequence of the tax holiday, or roughly one sixth of total qualifying AJCA remittances identified in the data and 2.5 percent of taxable U.S. corporate profits reported in 2005. Research and development expenditures—elsewhere shown to be associated with income shifting activity—have an indeterminate effect on affiliate earnings through their interaction with the AJCA tax savings. Using several more direct proxy measures of income shifting, I find no statistically-significant evidence of a round-tripping effect, and point estimates are occasionally of a perverse sign. Even the estimated elasticity of -0.5 for the benchmark proxy of income shifting reflects earnings reallocated from all sources, including other foreign jurisdictions, such that the $32 billion may best be viewed as an upper bound on the round-tripping of domestic earnings effect. As such, it appears that the AJCA elicited at most a moderate incremental tax avoidance response despite the exceptional incentives, at least for the average firm. Evidence from affiliates categorized by industrial sector is mildly suggestive of some heterogeneity of response—consistent with differences in scope for engaging in tax avoidance—but by no means can explain the prevalence of remittances from the pharmaceutical and high-technology sectors.

Possible explanations for the apparent absence of any stronger round-tripping effect are that U.S. tax enforcement effectively constrains multinational tax avoidance or that firms were wary of booking any tax expenses—however modest—on earnings designated as indefinitely-reinvested abroad for which no tax obligations were previ-

ously recognized, [3] while an opposing view is that complicated triangulation arrangements between multiple foreign affiliates and their parents thwart the data's ability to properly identify income shifting activity. An intermediate explanation is that the temporary nature of the tax holiday restricted firms in their range of responses. The truth likely lies somewhere in between all of these explanations, but it is nevertheless noteworthy that the main thrust of the effect of the DRD was not to reward short-run income reallocation in a striking manner. While it is undoubtedly true that certain tax avoidance arrangements may require many years to establish (e.g., through the creation of multi-tiered ownership structures with tax haven holding companies) and consequently inhibit a short-run round-tripping response, if multinational tax avoidance mechanisms were already as widespread as often alleged, many firms ought to have acted upon the very powerful income shifting incentives provided by the DRD. Viewed as an experiment with 85 percent territoriality, the weakness of the observed round-tripping effect should assuage concerns related to the domestic profit reallocation consequences of adopting a territorial tax regime, at least over the short term.

The remainder of the paper is organized as follows: Section 3.2 identifies those features of the U.S. tax system and of the American Jobs Creation Act of 2004 which are most important for the purposes of my analysis, Section 3.3 examines the relevant literature on multinational tax avoidance, Section 3.4 presents a theoretical model of dividend repatriation and income shifting, Section 3.5 discusses the data used, Section 3.6 characterizes the empirical analyses and their results, and Section 3.7 concludes.

[3]This latter explanation is at least partially contradicted by the work of Collins, Hand and Shackelford (2001) and Oler, Shevlin and Wilson (2007), which suggest that shareholders challenge the credibility of permanently-reinvested designations by capitalizing unrecognized U.S. tax liabilities (at ordinary repatriation tax rates) into share prices. Nevertheless, the possibility of this type of accounting effect on round-tripping behavior remains so long as firm managers are wary of overtly belying the permanently-reinvested designation and attracting potential investor lawsuits. Graham, Hanlon and Shevlin (2011) make this point more generally as justification for their finding that U.S. corporations' investment location and repatriation behavior appears equally sensitive to accounting effects of booking tax expenses as to cash tax effects.

3.2 U.S. Multinational Taxation

The U.S. tax system operates on a residence, or worldwide, basis, meaning that all income earned by U.S. residents and resident corporations is taxed by the government regardless of origin.[4] Most types of income, however, are only taxed upon repatriation, and U.S. tax liability on foreign-source income may therefore be deferred. In order to avoid double taxation of profits earned abroad—once by the relevant foreign government and again by the U.S. tax authority once repatriated—the U.S. tax system offers foreign tax credits for corporate income and withholding taxes paid to foreign governments. These credits are not to exceed domestic tax liability on foreign-source income. In addition, the U.S. has ratified many double-tax treaties with foreign countries whereby both parties agree to minimize withholding taxes on dividend, royalty, or interest payments made by affiliates of each others' multinational corporations.

The first column of Table 3.1 provides a simple numerical application of U.S. taxation of foreign-source income. Under current tax rates, the subsidiary of a U.S. multinational with profits of $100 in Ireland would owe $12.50 in corporate income taxes to the Irish government in the year earned. Assuming for convenience no additional dividend withholding tax,[5] the U.S. parent could then claim a $12.50 foreign tax credit upon repatriation of the remaining $87.50 and apply the credit against its U.S. tax liability of $35 (35 percent of pre-foreign-tax income). The $100 of foreign earnings would thereby trigger a residual tax payment of $22.50 to the U.S. government at the time of repatriation for a total tax burden of $35. As such, the U.S.

[4]See Desai, Foley and Hines (2001) for a thorough description of the U.S. tax system as it applies to foreign-source income.

[5]Technically, the statutory Irish withholding tax rate applied to dividend payments made to foreign shareholders is 20 percent. This rate is reduced or eliminated for payments made to shareholders in countries with which Ireland has a double-tax treaty (PricewaterhouseCoopers, 2007). Under the U.S.-Irish treaty, both countries agree—barring a handful of special cases—to impose withholding taxes of no more than 5 percent on gross dividends paid to entities with greater than 10 percent ownership stakes and no more than 15 percent otherwise (U.S. Department of the Treasury, 1997).

tax treatment of foreign-source income is intended to promote capital export neutrality by avoiding interfering with decisions regarding the location of international capital by domestic multinationals. The U.S. tax system is in this sense allocationally-efficient; however, deferral tends to distort the timing of investment decisions and is consequently intertemporally inefficient.

Additional complications in the tax treatment of foreign-source income arise from efforts by the U.S. government to minimize tax sheltering activity and avoid promoting inefficient capital flow patterns. In practice, excess foreign tax credits may be earned in countries with tax rates exceeding the U.S. tax rate on foreign-source income—ordinarily, the same as the domestic corporate tax rate—and these may be used to offset residual tax liability on earnings received from foreign subsidiaries located in relatively low-tax regimes. This amounts to allowing worldwide averaging of foreign tax rates, although again, there are exceptions to this, and worldwide averaging may only be applied to earnings from sources which fall into the same "basket." While the number of baskets into which income may be categorized has varied over time,[6] the distinction between active- and passive-source income (i.e. income associated with real economic activity, such as manufacturing, versus income earned through financial investments) persists. The larger the number of baskets, the more difficult it is for firms to exploit differential tax rates across countries and the less useful is worldwide averaging.[7] Foreign tax credits may also be allocated across time, with carryforwards of up to ten years and carrybacks of one year permitted.[8]

As alluded to above, not all types of foreign income are immune to U.S. taxation

[6]Among its many provisions, the AJCA also reduced the number of baskets, thereby facilitating worldwide averaging.

[7]Desai and Hines (1999), for example, offer evidence indicating that the introduction under the Tax Reform Act of 1986 of separate baskets for the purposes of computing foreign tax credits associated with dividend repatriations by individual minority-owned affiliates (i.e. joint ventures) had the effect of significantly reducing joint venture participation by U.S. firms, especially in low-tax jurisdictions. Partly in response to the magnitude of this unintended effect, this tax provision was phased out under the 1997 tax reform.

[8]Prior to the AJCA, foreign tax credits could be carried forward five years or back two.

until remitted. In particular, unincorporated foreign affiliates (branches) are required to pay taxes to the U.S. government immediately, regardless of whether repatriation has occurred. Income subject to Subpart F of the U.S. tax code is "deemed repatriated" and is likewise taxed upon accrual in order to prevent firms from locating all of their passive investments in low-tax jurisdictions.[9] Also, although foreign withholding taxes on payments made by affiliates to their U.S. parents are commonly driven towards zero through double-tax treaties, non-zero rates introduce an additional layer of taxation which is applied by foreign governments to the after-corporate-income-tax amount remitted and is payable by the recipient firm. This produces immediate foreign tax credits for U.S. parents and increases the probability of being in an excess credit position while providing a further possible disincentive for repatriating earnings.

As designed, the U.S. tax system leaves few opportunities for firms to minimize their tax liabilities via strategic reallocation of taxable income, but nonetheless, two primary exceptions exist. The first involves the use of excess foreign tax credits. If a U.S. multinational earns excess foreign tax credits from its operations in high-tax countries, then these credits may be applied against income earned in low-tax countries so as to reduce or eliminate any resulting residual U.S. tax liability, thereby creating an incentive to report income in low-tax locations. The second motive for allocating earnings to relatively low-tax countries depends on a firm's ability to exploit deferral by earning a sufficiently high rate of return abroad on the untaxed portion of the foreign income such that the U.S. tax due upon repatriation allows for a higher after-tax return than would have been possible by repatriating the foreign earnings immediately and reinvesting in the U.S. parent.

[9] "Subpart F income consists of income from passive investments (such as interest and dividends received from investments in securities), foreign base company income (that arises from using a foreign affiliate as a conduit for certain types of international transactions), income that is invested in United States property, money used offshore to insure risks in the United States, and money used to pay bribes to foreign government officials." (Desai, Foley and Hines, 2003)

While both of these tax-minimizing mechanisms surely provide incentives for locating real investment in low-tax regions, the incentives also extend to the attribution of U.S.-earned income to low-tax countries through various channels. Transfer pricing represents one of the primary such channels, whereby income reallocation is achieved by artificially understating prices imposed on sales from a U.S. parent to a foreign subsidiary in a low-tax jurisdiction and overstating prices paid for sales in the other direction. In order to reduce the scope for this type of activity, the IRS and other tax authorities require that transactions between related parties occur at "arm's-length" prices (i.e. at those prices which would prevail between unrelated firms), but this represents a difficult requirement to enforce in the case of transactions involving "goods" which are not commonly sold in the marketplace, such as copyrights, patents, technological know-how, brand recognition, etc. In conjunction with other tax authorities, the IRS has consequently moved toward promoting the use of voluntary advance pricing agreements whereby U.S. and foreign multinationals may submit proposed transaction prices for several years at a time so as to reach multi-party agreements between the relevant tax authorities and the firm in question, thereby avoiding costly audits and litigation. Between its initial implementation in the early 1990s and the end of 2005, 610 such agreements had been executed, of which approximately 350 were likely to still be in effect at the time of the AJCA. If the latest years are an accurate guide, nearly two-thirds of these agreements involve U.S. subsidiaries of foreign multinationals, thereby suggesting that the number of U.S. firms bound by advance pricing agreements remains relatively small (U.S. Department of the Treasury, Internal Revenue Service (2006); U.S. Department of the Treasury, Internal Revenue Service (2008)).

The AJCA made several changes to the U.S. tax system and its treatment of U.S. corporations. For the purposes of this paper, the most important provision of the Act was the special one-time 85 percent DRD for the repatriation of unremitted foreign

earnings from U.S. controlled foreign corporations, subject to certain requirements.[10] The effective implication of the 85 percent deduction was to reduce the U.S. tax rate on qualifying dividends received from abroad from 35 percent (equal to the top statutory corporate income tax rate) to as low as 5.25 percent (i.e. $(0.35)(1 - 0.85) = 0.0525$) with foreign tax credits granted only for foreign taxes paid on the non-deductible portion of remitted earnings. U.S. multinationals were allowed to elect to apply the provision as early as the last fiscal year beginning before October 22, 2004—the date on which the AJCA was signed—or as late as the last fiscal year beginning during the one-year period through October 22, 2005.

In order for dividends to qualify for the DRD, the amount repatriated had to be considered "extraordinary," and firms had to submit Domestic Reinvestment Plans outlining the U.S. investment projects to which the remitted funds would be allocated to their Boards for approval.[11] Extraordinary dividends were defined as any amount exceeding average repatriations over the five-year period ending before July 1, 2003, with the largest and smallest observations excluded from the average. Dividends distributed out of previously-taxed Subpart F income had to be automatically included, but firms could otherwise elect which dividends to apply to the base requirement (i.e. the "ordinary" portion of repatriated earnings which would face the usual repatriation tax rate). In order to prevent firms from avoiding foreign-source income tax liability on future profits, qualifying dividend repatriations could not exceed the amount of foreign earnings declared to be permanently reinvested on the last annual financial statement dated and audited prior to June 30, 2003 or $500 million,

[10] The AJCA also legislated the phasing out of the extraterritorial income credit for U.S. exporters and provided a new deduction for domestic manufacturing. I assume that these additional provisions had no material impact on the repatriation and income reallocation decisions of U.S. firms.

[11] Allowable reinvestment expenses included hiring or training of U.S. staff and increased employee wages and benefits (excluding executive compensation), U.S. research and development, infrastructure or other capital investments, certain types of debt repayment, advertising or marketing, and acquisitions (including of foreign entities). Unauthorized uses of repatriated earnings included share repurchases, shareholder distributions, portfolio and other types of passive investments, and tax payments, among others (Redmiles, 2008).

whichever was greater, and new related-party debt-financing by foreign subsidiaries would offset qualifying dividends dollar-for-dollar (Redmiles, 2008).[12]

The potential tax benefit associated with the dividends received deduction can best be understood through a modified numerical example presented in the second column of Table 3.1. Under the same assumptions as before, $100 of earnings in Ireland would once again be taxed as corporate income by the Irish government at the 12.5 percent rate upon accrual, leaving $87.50 (after-tax) to repatriate. Assuming the entire after-tax amount was deemed to qualify for exceptional treatment under the AJCA, 85 percent of pre-tax foreign earnings could be deducted from the U.S. tax base, leaving only $15 of pre-tax earnings on which to pay the 35 percent dividend tax rate. Allowing for foreign tax credits on the non-deductible portion of pre-tax dividends, residual U.S. tax liability would be $(0.35 - 0.125)(0.15)(\$100) = \$3.37$, for a total tax burden of only $15.87. Relative to the usual treatment of corporate income, the DRD clearly presented highly favorable treatment for foreign income, whether physically earned abroad or earned domestically and shifted overseas prior to repatriation.

3.3 Literature Review

The rapid emergence of foreign direct investment launched a broad literature beginning in the 1980s that has sought to identify the determinants of multinational capital flows and the location of reported earnings, with a special emphasis placed on the prominent role played by domestic and foreign taxation of corporate income.[13] A fundamental challenge in identifying the extent of tax-motivated income reallocation among multinational corporations has been distinguishing between legitimate sources

[12]In situations where firms indicated the amount of taxes averted by declaring earnings to be indefinitely reinvested rather than the amount of earnings themselves, the limit on qualifying dividends was determined as the grossed up tax liability (i.e. tax liability/0.35).

[13]For more comprehensive reviews, see Gresik (2001), Gordon and Hines (2002), or Devereux (2006).

of variation in reported income across jurisdictions (i.e. income attributable to real activities) and those which serve purely tax-sheltering purposes. This has been complicated by the necessity of focusing primarily on cross-jurisdiction variation in tax rates due to the limited variation in rates over time. As a consequence, the source of variation in tax rates may be endogenously-correlated with other jurisdiction-specific effects, such as quality of legal protections, governance, etc. Furthermore, due to inherent limitations associated with trying to establish the existence of tax avoidance behavior from publicly-available data, most studies have sought to indirectly infer income reallocation from unusual patterns in reported earnings or tax obligations in relation to foreign tax rates.

In this vein, Grubert and Mutti (1991) use aggregate country-level data on U.S. multinational affiliates' reported income from the Bureau of Economic Analysis' 1982 Benchmark Survey to compare after-tax rates of return. Under perfect capital mobility, after-tax risk-adjusted returns should theoretically equalize across countries (absent any income reallocation) such that affiliates in relatively high-tax jurisdictions should earn higher pre-tax rates of return by way of compensation. The authors instead find a significant negative relationship between statutory corporate income tax rates and reported profitability among affiliates, as would be consistent with income shifting.[14] Hines and Rice (1994) apply an instrumental variables approach to the same data to account for the possible endogeneity of tax rates and likewise report a significant negative effect of average tax rates on affiliate profitability. Klassen and Shackelford (1998), Bartelsman and Beetsma (2003), and Mintz and Smart (2004) provide yet further similar evidence for firms in Canada, the U.S., and the OECD using panel data. In an excellent review, de Mooij (2005) calculates corporate tax semi-elasticities of reported pre-tax income ranging from -0.1 to -3.5 across these five studies, with a mean of -2. Thus, a 1 percentage point reduction in the corporate

[14]Strictly speaking, the theory makes predictions about marginal rather than average rates of return. By necessity, this distinction is largely ignored in empirical work.

income tax rate is associated with a 2 percent increase in aggregate reported taxable income.

Using a panel of country-level data similar to that used by Grubert and Mutti (1991) and Hines and Rice (1994) for the period 1982-2004, Clausing (2009) finds an even larger effect on reported profit *rates*, whereby a 1 percentage point reduction in the effective foreign tax rate yields a 3.6 percent increase in reported pre-tax earnings per dollar of sales. Translated into an aggregate dollar effect, Clausing (2009) calculates that the responsiveness of reported earnings to cross-country differences in corporate tax rates resulted in a leakage of $180 billion in U.S. profits in 2004 (including over $45 billion from U.S.-based affiliates of foreign multinationals), more than twice the leakage she attributes to tax-motivated patterns of real activity. This large effect is premised on unexplained differences in relative tax rates, however, and makes little attempt to account for potentially-correlated country-specific non-tax sources of variation in average firm profitability over time (like most of the studies before it).

Notable exceptions to the practice of inferring tax avoidance activity from indirect evidence on reported profitability are Clausing (2001); Clausing (2003); and Bernard, Jensen and Schott (2006). Each of these studies focus on the transfer pricing channel whereby multinational corporations may shift earnings by manipulating transaction prices between parents and affiliates (referred to as intrafirm or related-party trade) and thereby avoid some of the criticisms associated with the difficulty of accounting for different determinants of foreign earnings. Clausing (2001) finds that aggregate bilateral trade patterns between U.S. multinational parents and their foreign affiliates are consistent with tax-motivated underpricing of exports and overpricing of imports to and from relatively low-tax countries, respectively, and conversely with respect to high-tax countries. Thus, a 10 percentage point increase in an affiliate's host country effective tax rate is associated with a 4.4 percentage point improvement

in the U.S. trade balance vis-à-vis the host country.[15] Clausing (2003) extends this analysis by examining a unique dataset of intrafirm and arm's-length trade prices compiled by the U.S. Bureau of Labor Statistics for nearly 22000 goods. Relative to non-intrafirm prices, she finds that intrafirm prices for U.S. exports are 0.94 percent lower, on average, for trading partners with 1 percent lower effective tax rates, and import prices are 0.64 percent higher—precisely the pattern of transaction price manipulations that would be expected to follow from tax-sheltering motives. Using a separate set of highly-disaggregated prices for U.S. multinational exports drawn from customs declaration forms, Bernard, Jensen and Schott (2006) similarly find that a 1 percentage point decrease in the foreign tax rate leads to a reduction in related-party export prices of 0.56 to 0.6 percent relative to arm's-length prices.

The present paper builds on these many techniques for estimating the extent of multinational tax avoidance by considering the effects of foreign tax rates on a range of proxy measures of income shifting, where the source of tax rate variation is plausibly exogenous to other country-specific determinants of firm activity. This strategy thereby avoids the principal caveats from the existing literature.

3.4 Multinational Investment Theory

Unlike any of the above-mentioned studies, the variation in tax rates that this paper exploits is driven by the occurrence of a tax reform: a major, albeit temporary, change in the treatment of foreign-source income for U.S. multinational corporations. As such, the question of interest is to what extent did firms respond to country-specific reductions in the repatriation tax (i.e. the tax owed to the U.S. tax authority upon remittance of foreign earnings to the U.S. parent, net of foreign tax credits) by adjusting the location of their reported earnings, where the availability of the

[15] Omitted from the panel estimation strategy employed in Clausing (2001), however, are country fixed effects. These results should hence be interpreted with caution if tax rates are correlated with other country characteristics that might similarly influence trade patterns.

tax reduction is conditional upon election by the firm to remit earnings under the terms of the DRD. Consideration of this question therefore requires a model of foreign investment that allows firms to simultaneously choose the optimal level of dividend remittances and income shifting as a function of time-varying domestic and foreign corporate income tax rates.[16]

Intuitively, the *level* of dividend repatriations under the AJCA ought to be irrelevant to the income reallocation decision (unless the maximum permissible amount of dividend repatriations presents a binding constraint). Instead, knowledge of the repatriation decision at the extensive margin should be all that matters, the reason being that the marginal benefit from reporting domestic profits as foreign-earned under the tax holiday is constant conditional on remittances being positive and zero otherwise, while the marginal cost of income reallocation is unaffected by the tax reform. Consequently, the only reason for allocating *additional* income abroad in response to the reduction in the repatriation tax is for engaging in round-tripping.[17] This intuition is confirmed in the theory that follows.

Consider a two-period model of foreign investment involving a single U.S. multinational parent m with a mature foreign subsidiary i[18] operating in a relatively low-tax country where the multinational's objective consists of maximizing the present value of after-tax cash flow accruing to the parent over both periods. In the interest of simplicity, this model abstracts from the issue of worldwide averaging of foreign tax

[16]The only other example in the literature of a theoretical model of joint repatriation and income shifting decisions is presented in Weichenrieder (1996) for the purposes of evaluating the investment implications of incomplete double-tax relief on foreign earnings. This framework is inappropriate for considering residence-based taxation as practiced in the U.S., however, even under the near-exemption of foreign-source income offered by the DRD. Grubert (1998) discusses the implications of income shifting within the context of a model that examines the substitutability of dividends, royalty payments, interest payments, and retained earnings for the purposes of redirecting subsidiary cash flow, but he does not model tax avoidance expressly.

[17]This claim breaks down if enactment of the DRD is taken by firms as a signal of future changes in the tax system or if it creates expectations for future similar tax holidays, as discussed in Clausing (2005).

[18]Hartman (1985) established this distinction to designate a foreign subsidiary which is no longer in need of parent equity injections and is capable of financing itself out of retained earnings.

credits across multiple subsidiaries while keeping the number of channels for financial flows to a minimum (e.g., by ruling out parent equity injections) and preserving the incentives for deferral that are inherent to the U.S. tax system.

In the first period ($t = 1$), parent and subsidiary each earn pre-tax income of $F(k_{m1})$ and $f(k_{i1}) + \rho c_{i1}$ on their respective domestic and foreign capital stocks k_{m1} and k_{i1} and foreign cash holdings c_{i1}. The world rate of return on passive assets, ρ, is assumed to be equal to $f'(k_{i1})$ such that the foreign subsidiary has exhausted all profitable active investment opportunities, whereas $F'(k_{m1}) \geq \rho$, thereby allowing for the possibility of more profitable redeployment of capital by the parent.[19] Both profit functions are subject to diminishing returns, $F''(\cdot) < 0$ and $f''(\cdot) < 0$, and subsume all production costs.

Prior to reporting period $t = 1$ income to the tax authority, the multinational chooses the optimal level of domestic income to report as earned by the subsidiary, s_{i1}, along with the level of dividend remittances, d_{i1}. The cost of income shifting, $c(s_{it})$, is assumed to be a convex function of the form $c(s_{it}) = \kappa_i s_{it}^2$, where κ_i represents a firm-specific cost shifter that is intended to account for heterogeneity in the ease of engaging in tax avoidance.[20] Without loss of generality, income shifting costs are furthermore assumed to be borne by the parent in a tax deductible manner.

All reported foreign earnings not remitted to the U.S. parent at the end of the first period are retained by the subsidiary and invested in the passive asset, c_{i2}, until the end of the second period, at which point all foreign operations must be liquidated. Hence, dividend remittances at the end of period $t = 2$ are known in advance and are not a choice variable, while due to the non-zero cost of income shifting coupled with worldwide taxation, $s_{i2} = 0$ must necessarily hold. Mathematically, the firm's

[19] One possible motive for holding cash abroad in this context is provided in Foley et al. (2007) wherein the repatriation tax deters domestic reinvestment of trapped foreign equity.

[20] Gordon and Hines (2002) specify κ_i, for example, as being inversely proportional to the level of real subsidiary income. This is also where firms' reliance on intangible assets and intellectual property would play a role if these reduce the probability of detection of income manipulation.

maximization problem can be expressed as

$$\max_{\{s_{i1},d_{i1}\}} \sum_{t=1}^{2} \beta^{t-1} \Big\{ (1-\tau_m^c)\left[F(k_{mt}) - s_{it} - c(s_{it})\right] + (1-\tau_t^d) d_{it} \Big\} \tag{3.1}$$

subject to

$$d_{i1} \in \left[0, (1-\tau_i^c)\big(\rho c_{i1} + f(k_{i1}) + s_{i1}\big) + c_{i1}\right] \tag{3.2}$$

$$s_{i1} \in \left[0, F(k_{m1}) - c(s_{i1})\right] \tag{3.3}$$

In order to characterize the AJCA and its incentives for round-tripping of U.S. earnings, the repatriation tax, τ_t^d is allowed to vary between the two periods, whereas the domestic and foreign corporate income tax rates τ_m^c and τ_i^c are taken to be time invariant.[21] In particular,

$$\tau_1^d = (1 - 0.85 I[d_{i1} > 0]) \frac{\tau_m^c - \tau_i^c}{1 - \tau_i^c}$$
$$\tau_2^d = \frac{\tau_m^c - \tau_i^c}{1 - \tau_i^c}$$

such that $\tau_1^d < \tau_2^d$ is the relevant repatriation tax conditional on the firm's election to exploit the tax holiday, and $\tau_1^d = \tau_2^d$ otherwise.

Working backwards, liquidation of foreign operations at the end of period $t = 2$ implies that

$$d_{i2} = (1-\tau_i^c)\big[f(k_{i2}) + \rho c_{i2}\big] + c_{i2}$$

[21] Foreign withholding taxes introduce an additional layer of taxation, thereby further complicating the income reallocation and repatriation decision. This extra complication does not however yield any strong new insights with regards to round-tripping of domestic earnings, and withholding taxes are excluded from the model on this basis. In practice, withholding taxes in this context can be thought of as raising the effective foreign tax rate above the statutory corporate rate.

where

$$k_{i2} = k_{i1} \text{ (by assumption of } f'(k_{i1}) = \rho \text{ and } f''(\cdot) < 0), \text{ and}$$
$$c_{i2} = (1 - \tau_i^c)\left[\rho c_{i1} + f(k_{i1}) + s_{i1}^*\right] - d_{i1}^* + c_{i1}$$

Substituting these into the firm's maximization problem and solving for the first order conditions yields

$$\frac{\partial \mathcal{L}}{\partial d_{i1}} : \ \lambda - \lambda^0 \equiv (1-\tau_1^d) + \beta\left\{(1-\tau_m^c)F'(k_{m2})(1-\tau_1^d) - (1-\tau_2^d)\left[1+\rho(1-\tau_i^c)\right]\right\} \quad (3.4)$$

and

$$\frac{\partial \mathcal{L}}{\partial s_{i1}} : \ \alpha\big(1 + c'(s_{i1}^*)\big) - \alpha^0 - \lambda(1-\tau_i^c) \equiv -(1-\tau_m^c)\big(1 + c'(s_{i1}^*)\big) \quad (3.5)$$
$$+ \beta\left\{(1-\tau_2^d)\left[1+\rho(1-\tau_i^c)\right](1-\tau_i^c) - (1-\tau_m^c)^2 F'(k_{m2})\big(1 + c'(s_{i1}^*)\big)\right\}$$

where λ^0 and α^0 are the Lagrange multipliers corresponding to the non-negativity constraints on d_{i1} and s_{i1}, respectively, while λ and α refer to the corresponding upper bounds.

Working through the full set of Kuhn-Tucker conditions, it can be shown that whenever $d_{i1}^* > 0$, the optimal choice of s_{i1}^* must satisfy

$$(1-\tau_m^c)c'(s_{i1}^*) \equiv 0.85(\tau_m^c - \tau_i^c) \quad (3.6)$$

provided that the upper bound constraint on the level of desired income shifting is non-binding. Otherwise, $s_{i1}^* = \bar{s_{i1}} \equiv F(k_{m1}) - c(s_{i1})$ whenever $(1-\tau_m^c)c'(\bar{s_{i1}}) < 0.85(\tau_m^c - \tau_i^c)$. This implies—as one might expect—that domestic profits should be shifted to the foreign subsidiary up to the point where its tax deductible marginal cost is precisely equal to the marginal benefit of round-tripping, regardless of the level

of earnings remitted under the temporarily-reduced repatriation tax (so long as it is non-zero).

In turn, following from the first order condition with respect to d_{i1}, the decision of whether to repatriate earnings in the first period under the tax holiday or exploit deferral and face the higher repatriation tax in the second period rests on the relation between the present after-tax value of \$1 of retained foreign earnings remitted at the end of period $t = 2$ and the same \$1 repatriated and subjected to the repatriation tax in period $t = 1$ and reinvested domestically:

$$\beta(1 - \tau_2^d)\left[1 + \rho(1 - \tau_i^c)\right] \gtreqless (1 - \tau_1^d)\left[1 + \beta(1 - \tau_m^c)F'(k_{m2})\right] \tag{3.7}$$

Whenever the benefits of deferral outweigh the benefits of the reduction in the repatriation tax in the first period (i.e. the term on the left hand side of the relation in (3.7) is larger than the term on the right), the firm will naturally choose $d_{i1}^* = 0$, and conversely, the firm will choose $d_{i1}^* > 0$ whenever this relation is reversed. Fundamentally, this decision thus rests on the relative magnitudes of the foreign and domestic tax rates τ_i^c and τ_m^c (and therefore the difference in the repatriation tax across periods, τ_1^d versus τ_2^d) as well as on the relative domestic and foreign rates of return in the second period, $F'(k_{m2})$ and ρ.[22] Since the domestic capital stock, k_{m2} is itself a function of d_{i1}^* and s_{i1}^* (and k_{m1}), closed form solutions for both decision variables cannot be obtained without making functional form assumptions with regards

[22]In the special case where $\beta \leq \frac{1}{1+\rho(1-\tau_i^c)}$ (i.e. the after-tax world rate of return exceeds $\rho(1-\tau_i^c)$), $d_{i1}^* = 0$ can never be optimal provided $F'(k_{m2}) \geq 0$ because the present value after-tax rate of return on foreign retained earnings is effectively negative, and it is therefore always preferable to exploit any available reduction in the repatriation tax in the first period. This differs from the proposition in Hines and Rice (1994) wherein permanent reinvestment of foreign earnings coupled with annual repatriation of passive income under Subpart F produces an equivalent outcome to immediate repatriation under a zero percent repatriation tax, assuming equivalent domestic and foreign pre-tax rates of return. More generally, deferral of this sort is preferred so long as $\frac{\rho}{F'(\cdot)} > \frac{1-\tau_m^c}{1-\tau_i^c}$. Here, taxation of first period (active) earnings may be delayed no more than a single period, and rates of return at home and abroad may in general differ and conceivably exceed the world rate of return.

to $F(\cdot)$. However, it should be clear that the lower the foreign tax rate and the lower the foreign rate of return on cash holdings, ρ, relative to the domestic rate of return in period $t = 1$, $F'(k_{m1})$, the greater the incentive for remittances to be positive.

If deferral turns out to be preferred to repatriation in the first period of the model, and $d_{i1}^* = 0$ under a given constellation of domestic and foreign tax rates and rates of return, the optimal extent of income reallocation may nevertheless be non-zero. Indeed, $s_{i1}^* = 0$ can *never* be optimal in this situation given that $\tau_i^c < \tau_m^c$, $c'(0) = 0$, and the shadow value associated with remitting negative earnings (i.e. paying dividends from the parent to the foreign subsidiary), λ^0, must be strictly positive whenever $d_{i1}^* = 0$. This follows from the fact that in addition to the preference for investing abroad and exploiting deferral implied by $d_{i1}^* = 0$, negative remittances—if feasible—would further yield a tax subsidy in the first period.[23] The resulting form of income shifting that is unmet by immediate remittances is precisely the type of tax avoidance that has implicitly been studied elsewhere in the literature and depends upon both relative tax rates and relative rates of return. In the model, this dependence manifests itself more generally through λ^0, such that an interior solution for s_{i1}^* exists that solves

$$\frac{\lambda^0}{1 - \tau_1^d} \equiv \beta \left[1 + \rho(1 - \tau_i^c)\right] \frac{c'(s_{i1})}{1 + c'(s_{i1})} > 0 \tag{3.8}$$

when $d_{i1}^* = 0$. This clearly differs from the previous characterization of the optimal extent of income shifting in (3.6) when the firm has opted to exploit the temporary reduction in the repatriation tax because this latter condition is not premised on round-tripping of domestic earnings. Income reallocation in the context of (3.8) is

[23]Under the ordinary treatment of foreign-source income, $s_{it} = 0$ may arise when $d_{it} > 0$ (as it does here in the second period) if the foreign rate of return is sufficiently low, and the firm wishes to redeploy foreign retained earnings, even at the expense of foregoing future deferral. This situation differs from the one considered in period $t = 1$ where income shifting does not affect the location of investments when $d_{i1} > 0$ and merely serves as a tool for avoiding the domestic corporate tax in favor of the repatriation tax.

associated with an additional cost beyond the direct cost of tax avoidance, $c(s_{i1})$: namely, the opportunity cost of reallocating domestic profits to the foreign subsidiary without immediate repatriation, which reflects the difference between the foregone rate of return on domestic reinvestment and the inferior rate of return earned abroad.

There are several key results to be drawn from this analysis. Under the ordinary treatment of foreign-source income, wherein the repatriation tax deters any round-tripping of domestic earnings, both dividend repatriation and income reallocation are simultaneously determined on the basis of the prevailing rates of return and tax rates at home and abroad. The attractiveness of tax avoidance is modified by a temporary reduction in the repatriation tax, however, by opening this channel for simultaneous income shifting and dividend repatriation, *conditional on qualifying remittances being chosen to be non-zero.* In the realm where repatriations are optimally-chosen to be non-zero, neither the level of dividend remittances nor the relative rates of return have any bearing on the desired extent of income shifting. Instead, following from the fact that the round-tripping of earnings does not affect the location of investment, the income reallocation decision is dictated only by the firm's tax deductible costs of tax avoidance and the difference between the domestic and foreign corporate income tax rates. Thus, the change in income shifting due to a temporary reduction in the repatriation tax as under the DRD results directly from the subsidiary's ability to immediately repatriate each dollar of shifted earnings for a constant savings of $0.85(\tau_m^c - \tau_i^c)$.

The firm's repatriation decision at the intensive margin in turn depends on the optimal s_{i1}^* that satisfies (3.6) as well as on the amount of foreign retained earnings and its after-tax rate of return relative to the domestic after-tax return on remitted earnings, taking into consideration changes in the repatriation tax over time. Among firms deciding to forego exploiting the tax holiday because the benefits of deferral outweigh the benefits of the reduction in the repatriation tax, the income reallocation

decision is subject to the same considerations as under the ordinary treatment of foreign-source income. These results with respect to the relationship between the desired level of income shifting, dividend remittances, tax rates, and rates of return determine the form of the empirical model introduced in Section 3.6.

3.5 Data

Data on the financial operations of U.S. multinational corporations are drawn from the Bureau of Economic Analysis' (BEA) annual surveys of U.S. Direct Investment Abroad for the period 1998-2006. Pursuant to the International Investment and Trade in Services Survey Act, all U.S. reporters (parent corporations) are required to report for themselves and for each of their non-bank majority-owned foreign affiliates (subsidiaries) a wide range of income statement, balance sheet, and other financial and operating information on a confidential basis (subject to certain firm size thresholds). On account of these confidentiality assurances and punishment for non-compliance, the accuracy of these data and breadth of coverage are believed to be excellent. Critical to the analysis of dividend repatriation and income shifting, these data represent a unique source of information on intrafirm financial flows and trade, including dividends paid by affiliates to their owners and bilateral related-party versus arm's-length goods imports and exports.

In addition, data on income taxes paid as a proportion of net pre-tax income (i.e. net income plus foreign income tax payments) can be used to calculate country-specific median effective foreign tax rates in every period. These measures of effective foreign income tax rates are preferable to the use of statutory corporate rates due to the prevalence of various tax holiday provisions granted by different countries to lure investment from abroad. The precise calculation of these country-specific effective tax rates follows the methodology described in Desai, Foley and Hines (2004) with the slight modification that in addition to excluding affiliates with negative net income

from the set of country-year observations from which the median effective tax rate is drawn, I also exclude affiliates for which reported tax payments were negative. This procedure explicitly censors all tax rates from below at 0 while implicitly restricting median effective tax rates to not exceed 100 percent.

Several adjustments to the measures of dividend remittances reported to the BEA are required to approximate the tax rule provisions of the AJCA with regards to the determination of which dividend payments qualified for the DRD. Fundamentally, the distinction between qualifying and non-qualifying repatriations revolves around: (1) the year in which a firm elected to exploit the DRD, (2) the extent to which total reported remittances exceeded the base-period (i.e. ordinary) repatriation amount, and (3) the allocation of qualifying and non-qualifying remittances among dividend-paying subsidiaries. The strategy employed for distinguishing qualifying from total (i.e. qualifying plus non-qualifying) repatriations thereby consists of calculating the base-period dividend amount in a first step using data from the period 1998-2002 as prescribed under the AJCA. Next, the fiscal year in which total repatriations exceeded the calculated base-period dividend requirement by the largest amount is identified as the AJCA year from among the pair of fiscal years that a firm could elect (i.e. either 2004/2005 or 2005/2006, depending on the end month of the firm's fiscal year). The resulting difference between total and base-period remittances in the AJCA year is defined to be the amount of qualifying dividends (i.e. "extraordinary dividends" in the terminology of the AJCA) accruing to the multinational, and these must then be allocated across dividend-paying foreign affiliates. A simple method for doing so consists of merely assigning each foreign affiliate to have the same proportion of qualifying-to-total remittances as for the entire multinational corporation. At the other extreme—and likely more consistent with firm choices—qualifying repatriations are instead assigned to foreign affiliates according to their effective foreign tax rates starting with the least-taxed of these and continuing until all qualifying remittances

are exhausted, such that non-qualifying repatriations are left to be paid by affiliates operating in more heavily-taxed countries where foreign tax credits are largest and the benefits of the DRD are smallest. To the extent that this latter allocation scheme may tend to overstate the responsiveness of qualifying remittances to the reduction in the repatriation tax, any resulting estimates should be interpreted accordingly and compared with those estimates obtained under the agnostic proportional allocation scheme. [24]

An additional complication inherent to the payment of dividends requires yet further special treatment. In particular, dividends may only be paid to those shareholders in a foreign affiliate with a direct ownership interest, and only in proportion to their equity stake. Consequently, if a foreign affiliate is only indirectly-held by the U.S. parent, such as if it is directly-held by a separate holding company subsidiary of the parent, dividend remittances from the downstream affiliate must be routed through the holding company. More generally, wherever multiple tiers of ownership exist, repatriated earnings must pass through all intermediate foreign affiliate parents before reaching the ultimate owner: the U.S. parent. As a result, provisions must be made to avoid double-counting of dividend payments where earnings remitted by a downstream foreign affiliate are erroneously re-attributed to each upstream affiliate along the ownership chain (assuming these are ultimately channeled all the way to the U.S. parent). Three approaches for dealing with this issue are considered.

[24]Dharmapala, Foley and Forbes (2010) are evidently skeptical of the ability to apply accounting rules to the BEA data and make the assumption that all dividend remittances in 2005 qualified for the DRD. Failure to account for the distinction between qualifying and non-qualifying dividends is problematic in two primary respects, however. First, a non-trivial proportion (14 percent) of those firms who took advantage of the DRD opted to do so in either 2004 or 2006 (Redmiles, 2008). Among such firms, 2005 remittances would have been ineligible for the preferential reduction in the repatriation tax. Second, other multinationals with non-zero repatriations in 2005 may nevertheless have failed to clear the base-period dividend amount (by choice or for lack of resources) or the domestic reinvestment requirement and likewise received no benefits from the DRD. Nevertheless, the view implicit in Dharmapala, Foley and Forbes (2010) is understandable given the assumptions required to approximate the rules stipulated by the AJCA, and an eventual robustness check consists of comparing results involving total remittances rather than the "qualifying" amounts calculated here.

Under the first "naive" approach, double-counting is simply ignored and remittances are recorded exactly as reported to the BEA. In the alternative, a relatively-direct approach to avoiding this double-counting consists of scaling dividend payments by the U.S. parents' direct equity interest in the foreign affiliates. Thus, remittances from indirectly-held foreign affiliates that pass through wholly-owned foreign affiliate parents (e.g. holding companies) will be attributed entirely to the latter directly-owned affiliates, and only to the extent that the dividends are indeed passed through. Unfortunately, this second method fails to allow for the possibility that dividend repatriation and income reallocation decisions may lie with indirectly-held foreign affiliates. While the effective tax rate of the final payor in the ownership chain may partially determine the tax benefit associated with DRD remittances for a particular multinational, the scope for transfer pricing, for example, may exist with the initial payor through their physical operations and active trade with the U.S. parent. Thankfully, ownership information for all majority-held foreign affiliates allows complete retracing of a firm's ownership structure in situations where affiliates are indirectly-held via one or more intermediate foreign affiliates of the same U.S. multinational reporter. The third method for calculating dividend repatriations thus measures the quantity of dividends that successfully pass through the ownership chain using information on the names and direct ownership shares of all foreign affiliate parents (who may themselves be indirectly-held by the U.S. parent), starting with the most distantly-held foreign affiliates first. Wherever remittances are channeled through multiple directly-held foreign affiliate parents located in different countries, the tax treatment assigned to the downstream payor is computed as the average tax rate of the directly-held intermediate affiliates weighted by the proportion of dividends ultimately passed through to the U.S. parent. Naturally, dividend payments by directly-held foreign affiliates (net of dividend receipts, if any) are treated exactly

as under the second method.[25]

Table 3.2 presents the aggregate annual quantities of total and qualifying remittances identified in the BEA data using the three methods for counting dividend repatriations described above.[26] These measures are referred to, respectively, as the naive, directly-held, and pass-through dividend amounts. By construction, both the directly-held and pass-through measures of dividend payments yield the same aggregate qualifying and total remittance amounts, the difference between these being only in the attribution of remittances across foreign affiliates of the same multinational corporation. The double-counting problem inherent to the naive approach is clearly illustrated by the considerably larger measures of remittances obtained under this method, thereby underscoring the importance of relying on either the directly-held or pass-through dividend measures in the following analysis. Indeed, the naive measure of remittances exceeds even the official remittance numbers based on tax return data by a wide margin, as indicated in the table.

Relative to this tax return benchmark, the BEA data account for approximately two thirds of all qualifying remittances when double-counting is properly avoided. This is very solid coverage considering that the BEA data omit all banks and relatively small affiliates.[27] Only multinationals with valid survey responses in multiple years at the level of both the non-bank U.S. reporter and the foreign affiliate are included in the analysis, where the existence of valid responses is contingent upon verification

[25]In a non-trivial number of cases, indirectly-held foreign affiliates report reciprocal ownership arrangements such that no foreign ultimate owner can be identified as the direct link to the U.S. parent through the recursive algorithm used to unwind these ownership chains. Dividend payments by foreign affiliates caught up in these circular arrangements are treated as under the second method.

[26]Total remittances are equal to the sum of the qualifying and non-qualifying amounts for all multinationals who had non-zero qualifying remittances in the year in question; e.g., dividend repatriations in 2006 by a firm who exploited the DRD in 2005 are not counted toward the 2006 total remittance amount.

[27]U.S. parents in the finance, insurance, real estate, and rental and leasing industry collectively accounted for $12 billion in qualifying remittances under the AJCA(Redmiles, 2008). Besides reasons owing to data availability, the exclusion of banks from the sample is warranted on the grounds that most foreign affiliates in the banking sector are organized as branches and therefore not subject to deferral—a central aspect of U.S. taxation of foreign-source income.

of reported information by the BEA for accuracy and consistency, conditional on meeting the reporting requirement size threshold. No imputed data are used. In non-benchmark years (i.e. all years except 1999 and 2004), the cutoff above which a long-form survey (which includes dividend remittance information) was required for majority-owned non-bank foreign affiliates was $150 million of total assets, sales or gross operating revenues, or net after-tax income (positive or negative). Hence, dividend remittances from small affiliates are not picked up, nor even for affiliates fluctuating around the size threshold.

Table 3.3 disaggregates 2005 qualifying pass-through dividends by country of origin for the top ten beneficiaries of the tax holiday. Select countries must be suppressed to avoid disclosure of firm-specific information on certain underlying data items. As shown, the largest tax savings from the DRD accrued primarily to countries categorized as tax havens, though the United Kingdom and Canada also notably appear, largely reflecting the significant number of U.S. foreign affiliates operating in both of these countries.

At the industry level, there exists an important distinction between the primary industry of the U.S. reporter and that of the foreign affiliates. Thus, the top ten NAICS 3-digit industrial sectors to benefit from the receipt of qualifying dividends under the DRD (shown in the top panel of Table 3.4) differ remarkably from the top ten industries of those dividend-paying affiliates conferring the largest savings upon their owners (bottom panel). In particular, while chemical manufacturing firms (primarily pharmaceuticals) reaped the largest tax savings from the tax holiday—consistent with Redmiles (2008) and news reports—holding companies were by far and away the predominant source of earnings remittances and associated savings, with affiliates in high-tech and chemical manufacturing placing a distant third and fourth.

Table 3.5 compares the mean and median characteristics of dividend repatriating and non-repatriating affiliates regardless of country of origin or industrial sector.

Here and hereinafter, "medians" are calculated as the average of five observations centered around the true median for confidentiality reasons. In order to match the subsequent analysis, all observations for which changes in affiliate non-equity pre-tax income per dollar of 2003 assets fell outside the 1^{st} through 99^{th} percentiles are excluded from this tabulation. Among dividend paying affiliates, average qualifying remittances were approximately $252 million in 2005, roughly two thirds of average retained earnings. Measured in levels, repatriating and non-repatriating affiliates do not appear vastly different in terms of basic characteristics such as assets, cash holdings, or R&D expenditures. However, average changes in reported pre-tax earnings (non-equity or otherwise) are significantly larger among dividend-paying affiliates as are the available tax savings per dollar remitted and sales. When affiliate size is taken into account by scaling all terms by the level of 2003 assets, the picture changes somewhat with repatriating affiliates also having significantly greater cash holdings and retained earnings, while the possibility that both groups of affiliates realized the same level of sales or R&D expenditures cannot be rejected under a t-test of equal means. Although not indicative of any causal relationship, the evidence on changes in reported affiliate earnings is certainly consistent with the round-tripping hypothesis.

3.6 Empirical Methods and Results

Following from the implications of the two-period model of foreign investment discussed in Section 3.4, the objective of the empirical analysis in this paper is to examine the short-run responsiveness of income shifting activity to changes in the treatment of domestic-versus-foreign income—modulated by the firm's decision about whether to repatriate foreign earnings under the DRD. As a first step, the theory predicts that the level of income shifted in any given period should depend on the difference between domestic and foreign corporate income tax rates and rates of return on assets, as well as on the additional cost of remitting foreign earnings back to the

parent. A reduced-form expression for the level of earnings shifted to affiliate i of multinational m in period t, S_{imt}, is thus:

$$S_{imt} = \alpha + \beta(\tau^c_{mt} - \tau^c_{it}) + \gamma(\tau^c_{mt} - \tau^*_t) + \phi g(\mathbf{X_{imt}}) + \eta_i + \nu_m + \mu_t + \varepsilon_{imt} \qquad (3.9)$$

where τ^c_{mt} and τ^c_{it} are the previously-defined domestic and foreign tax rates, respectively, while τ^*_t is the total tax rate applied to contemporaneously-earned and remitted foreign income after the provision of foreign tax credits. In other words, this is the effective tax on round-tripped domestic profits, which is simply the foreign income tax plus the domestically-imposed repatriation tax. In practice, τ^c_{it} is approximated by the median effective tax rate among all affiliates operating in the same country as i, as described in the previous section. Under the usual treatment of foreign-source income, the intended goal of capital export neutrality is achieved through $\tau^c_{mt} = \tau^*_t$, such that $\gamma(\tau^c_{mt} - \tau^*_t)$ would ordinarily drop out of the the expression for S_{imt}. To allow for the deductibility of foreign-source earnings, however, τ^*_t may be generically expressed as

$$\tau^*_t = \Big(1 - \delta_t\big(I[D_{imt} > 0]\big)\Big)\big(\tau^c_{mt} - \tau^c_{it}\big) + \tau^c_{it}$$

When qualifying dividends, D_{imt}, are zero, or when δ_t, the proportion of foreign earnings that are deductible from domestic tax obligations upon repatriation, is zero, τ^*_t reduces directly to τ^c_{mt}. Under the 85 percent DRD, however, $\delta_t = 0.85$ for years 2004-2006. As a result, conditional upon election of the tax holiday provisions in a given year,[28]

$$\tau^*_t = (1 - 0.85)(\tau^c_{mt} - \tau^c_{it}) + \tau^c_{it} = 0.15\tau^c_{mt} + 0.85\tau^c_{it}$$

which is less than τ^c_{mt} by the assumption that the foreign subsidiary is located in a low-tax jurisdiction. The first term in (3.9), $\beta(\tau^c_{mt} - \tau^c_{it})$, thus captures the effect

[28]The binary indicator $I[D_{imt} > 0]$ corresponds to switching on and off the favorable AJCA tax treatment for affiliates with positive qualifying dividend payments.

of the ordinary tax savings associated with reallocating domestic profits to a low-tax subsidiary (without remittance) while the second term, $\gamma(\tau^c_{mt} - \tau^*_t)$, reflects the impact of tax savings through round-tripping.

The cost of reallocating income from the U.S. parent to the foreign affiliate is captured by the function $g(\mathbf{X_{imt}})$ in expression (3.9), where the vector of arguments $\mathbf{X_{imt}}$ includes both the opportunity cost of income reallocation—captured by domestic and foreign rates of return—along with firm characteristics that are associated with real costs of tax avoidance. Harris et al. (1993) and Grubert and Slemrod (1998) document the role of intangible assets and related proxies including research and development (R&D) and advertising expenses in mitigating these costs, presumably by reducing the probability of punishment by the tax authority. For example, this could be due to the difficulty of implementing the arm's-length criterion for evaluating transfer prices when multinationals transact heavily among themselves in services and intangibles for which no competitive market exists. Consequently, $\mathbf{X_{imt}}$ should also be thought to include measures of the importance of intangibles to multinational activities. This role is fulfilled by the use of affiliate and parent R&D expenditures in this analysis, alone and interacted with the tax savings terms.

To the extent that this specification of $\mathbf{X_{imt}}$ cannot capture the full-spectrum of idiosyncratic variation in country/affiliate-, parent-, or even year-specific tax avoidance costs, this is accounted for in (3.9) through η_i, ν_m, and μ_t, respectively. An important problem arises in estimating equation (3.9), however, if the unobserved effects η_i or ν_m are correlated with foreign tax rates. This is where the virtue of examining the income reallocation response in the context of the AJCA is most apparent. In particular, differencing of the levels expression for S_{imt} provides a means of controlling for these time-invariant country/affiliate and parent fixed effects that may be correlated with foreign tax rates—such as political stability, legal protections, etc. at the country level and ownership structure at the parent level—without eliminat-

ing cross-country variation in the tax savings from reallocating income. Differencing around the DRD yields

$$\Delta_{t-2003}S_{imt} = \tilde{\alpha}+\tilde{\beta}\Delta_{t-2003}(\tau^c_{mt}-\tau^c_{it})+\tilde{\gamma}\Delta_{t-2003}(\tau^c_{mt}-\tau^*_t)+\tilde{\phi}\Delta_{t-2003}g(\mathbf{X_{imt}})+\tilde{\mu}_t+\tilde{\varepsilon}_{imt}$$

Assuming that statutory tax rates were constant over the period 2003-2006,[29] this further reduces to

$$\Delta_{t-2003}S_{imt} = \tilde{\alpha}+\tilde{\gamma}0.85(\tau^c_m-\tau^c_i)\cdot I[D_{imt}>0]+\tilde{\phi}\Delta_{t-2003}g(\tilde{\mathbf{X}}_{\mathbf{imt}})+\tilde{\mu}_t+\tilde{\varepsilon}_{imt} \quad (3.10)$$

where $\tilde{\gamma}$ is the approximate panel difference-in-difference estimator involving selection into a continuum of possible treatments spanning the interval [0,0.2975] corresponding to having all foreign affiliates operating in relatively high-tax countries (i.e. $\tau^c_i \geq 0.35$), or at the other extreme, all foreign affiliates operating in tax havens with $\tau^c_i = 0$.[30] The dimensionality of $\mathbf{X_{imt}}$ is also reduced as a consequence of differencing with all observable time-invariant proxies for income shifting costs dropping out. The components of $\tilde{\mathbf{X}}_{\mathbf{imt}}$ hence only include terms interacted with the reduction in the repatriation tax, while the inclusion of changes in domestic and foreign rates of return is debatable.[31]

The remaining econometric challenge in this analysis consists of accounting for the

[29]The assumption that $\tau^c_{it} = \tau^c_i \ \forall t = 2003, ...2006$ should be relatively uncontroversial. The top statutory rate in the U.S. was fixed over this period at 35 percent, while effective foreign tax rates are taken to be those that prevailed in 2003.

[30]Availability of the DRD in only one of multiple consecutive fiscal years requires differencing over unequal intervals at different years in the panel, hence the "approximate" nature of the approach.

[31]The appropriateness of including changes in domestic and foreign rates of return depends upon whether firms are assumed to act on period-specific rates of return in choosing their level of desired dividend remittances and reported foreign earnings—and therefore abide by a fairly short-sighted view of foreign investment—or whether firms instead take a longer view and consider average rates of return smoothed over time. Under the latter characterization, changes in long-run returns on assets are essentially zero and do not belong in $\tilde{\mathbf{X}}_{\mathbf{imt}}$. Under the former, it is clear that reported rates of return in the AJCA period may be endogenous to the dividend repatriation and income reallocation decisions, such that it is necessary to use valid instruments in the estimation strategy. The results that follow include one specification involving changes in the domestic rate-of-return as a basis for comparison, with pre-AJCA returns serving as an instrument.

endogenous decision among U.S. multinationals to exploit the DRD (in a particular period). This is addressed through instrumental variables (IV) estimation using two-stage least squares. One possible instrument for the extensive-margin repatriation decision, and therefore the reduction in the repatriation tax, $0.85(\tau_m^c - \tau_i^c) \cdot I[D_{imt} > 0]$ (henceforth denoted $TaxSavings_{imt}$), is the level of cash and other short term investments held by foreign affiliates. Foley et al. (2007) present evidence implying that cash is retained abroad in large part to avoid triggering U.S. taxation of foreign-source income. Mirroring this finding, proponents of the AJCA argued that a tax holiday would encourage multinational corporations to remit unproductive earnings parked abroad and reinvest such earnings domestically in productive pursuits by lowering the barrier that is the repatriation tax. As such, foreign cash holdings and other liquid assets should have been first in line for repatriation under the DRD as a relatively costless source of funds out of which to finance dividend remittances. The relative proportion of cash and other short term assets to total assets held by foreign affiliates prior to enactment of the AJCA should therefore have had a strong influence on whether a multinational opted to repatriate earnings for the purposes of exploiting the DRD without directly influencing tax avoidance activity. Concretely, the chosen instrument for the endogenous measure of $TaxSavings_{imt}$ is thus the exogenous statutory tax rate reduction available under the AJCA interacted with an indicator for whether the affiliate held a high proportion of total assets as cash or other short term assets in 2003, relative to the median level of such holdings across all affiliates:

$$I[HighCash_{im,2003}] \equiv 0.85(\tau_m^c - \tau_i^c) \cdot I\left[\frac{Cash_{im,2003}}{Assets_{im,2003}} > Med\left(\frac{Cash_{2003}}{Assets_{2003}}\right)\right]$$

Additional instruments are constructed in a similar manner in specifications where interaction terms between $TaxSavings_{imt}$ and R&D expenditures are included in

$\mathbf{X_{imt}}$: namely, as the interaction between $I[HighCash_{im,2003}]$ and the continuous measure of either parent or affiliate R&D spending.

Due to the nature of the activity, shifted earnings S_{imt} are not directly observable in any data; nevertheless, several proxy measures can be constructed from the BEA data and are considered in the empirics that follow. The most commonly-used such proxy in the literature is simply the level of reported pre-tax foreign earnings. This serves as a good benchmark and is reproduced here with the distinction that equity income is stripped from the calculation of affiliate pre-tax net income so as to avoid including dividends received from downstream foreign affiliates or earnings from short-term investments. The resulting measure of non-equity pre-tax affiliate income is fairly indirect, however, and confounds profits shifted from the parent with those shifted from other foreign affiliates.[32]

A set of distinctly more direct proxies for income reallocation instead focus explicitly on the transfer pricing and earnings stripping channels for manipulating reported earnings. The cleanest of these measures exploits information on intrafirm trade in goods to calculate the difference between the affiliate's trade balance vis-à-vis the U.S. parent versus its trade balance with unaffiliated U.S. parties (i.e. related party versus arm's-length transactions).[33] Where transfer pricing prevails, related party affiliate trade balances should be largest relative to arm's-length affiliate trade balances in low tax countries (assuming similar trade volumes). This measure of the trade balance differential, TBD_{imt}, offers a very direct approach for inferring profit reallocation activity (albeit not quite as direct as using transaction price data, were it available), and speaks exclusively to the extent of round-tripping induced by the DRD between U.S. parents and their affiliates.

[32]Contrary to the revenue consequences of the round-tripping of domestic earnings, income reallocation among foreign affiliates in response to the DRD could conceivably raise U.S. tax revenue at the expense of foreign governments by reducing the amount of foreign tax credits owed.

[33]Clausing (2001) uses a similar measure of income shifting constructed from aggregate country-level data.

If income reallocation occurs primarily through the pricing of intangible goods (recorded as sales of services by the BEA) rather than through the manipulation of tangible goods prices for which competitive markets exist, then TBD_{imt} may nevertheless fail to capture the intended transfer pricing effects. A closely-related measure of sales of goods and services to the U.S. parent as a proportion of an affiliate's total U.S. sales is therefore also considered. On the downside, the BEA data do not include service purchases by affiliates, hence the unilateral nature of this measure. Moreover, only a small fraction of foreign affiliates report non-zero sales of services to their parent corporations in any given year. A final proxy measure for income shifting instead ignores transfer pricing and focuses on a form of earnings stripping, computed as affiliate interest payments net of receipts (i.e. net interest paid). This is intended to capture an alternative strategy for reallocating earnings involving issuance of high-interest short-term loans from affiliates based in low-tax jurisdictions to other related parties (including the U.S. parent) in more highly-taxed countries.

Beyond the regressor of interest and controls for income shifting costs described above, several additional covariates appear under certain empirical specifications so as to account for features of firm structure not captured by the theoretical model in which multinationals consist exclusively of a single parent and foreign affiliate. These include indicator variables for whether a multinational was in an excess foreign tax credit position (to establish whether firms might have had lower-cost alternatives for repatriating earnings than under the DRD), or whether the affiliate was a holding company and/or directly-held.[34] All regression terms measured in nominal quantities

[34]The BEA defines holding companies as affiliates belonging to NAICS industry 5512 with more than 50 percent of net income earned through equity investments. Holding companies need not therefore be directly-held nor the converse. The use of holding companies is commonly associated with multinational tax avoidance strategies whereby foreign earnings can be redeployed without transiting through the U.S. (and triggering the repatriation tax), as shown in Altshuler and Grubert (2003) and Desai, Foley and Hines (2003). The latter paper finds, for example, that investment in directly-held affiliates is much less affected by local foreign tax rates than among affiliates held through holding companies or other intermediaries, the interpretation being that indirect ownership provides a buffer from U.S. worldwide taxation.

are translated into 2004 dollars and scaled by pre-AJCA (2003) affiliate assets to account for firm size heterogeneity. Cross-country currency fluctuations over the differenced periods are furthermore controlled for in all specifications using changes in bilateral exchange rates over the corresponding span of years so as not to confuse increases in reported foreign earnings due to tax avoidance with differential patterns of foreign currency appreciation. Year fixed effects absorb any additional macroeconomic variation that is common to all affiliates in the years in which the DRD could be implemented. In a last step, the sample is winsorized to exclude observations outside the 1st through 99th percentiles of the distribution of the dependent variable (largely the result of vastly disproportionate reported assets).

Taken together, the foregoing discussion yields a primary regression specification of the form

$$\begin{aligned}\Delta_{t-2003}\frac{S_{imt}}{Assets_{im,2003}} &= \tilde{\alpha} + \tilde{\gamma}E[TaxSavings_{imt}|\mathbf{Z_{imt}}] \\ &+ \beta_0\Delta_{t-2003}\frac{ExchangeRate_{imt}}{ExchangeRate_{im,2003}} \\ &+ \beta_1 I[ExcessFTC_{m,2003} > 0] + \beta_2 I[HoldingCompany_{imt}] \\ &+ \beta_3 I[IndirectlyHeld_{imt}] + \tilde{\phi}\Delta_{t-2003}g(\tilde{\mathbf{X}}_{\mathbf{imt}}) + \tilde{\mu_t}\mathbf{Year_t} + \tilde{\varepsilon}_{imt}\end{aligned} \tag{3.11}$$

where the $E[\cdot|\mathbf{Z_{imt}}]$ terms denote predicted values from first stage IV regressions of the endogenous regressor(s) on the vector of instruments, $\mathbf{Z_{imt}}$.

Preliminary OLS and IV results from estimating several variants of this differenced income reallocation specification involving the benchmark proxy of non-equity pre-tax income as the dependent variable are presented in Tables 3.6 and 3.7. Repatriations are defined under the pass-through approach for identifying the source of qualifying dividends, and all standard errors are clustered by multinational entity. As shown in Table 3.6, without taking the simultaneity of the repatriation decision into account (or other endogeneity issues involving additional covariates), the

change in the repatriation tax induced by the DRD is associated with a consistent and statistically-significant positive effect on reported affiliate earnings. A 1 percentage point reduction in the U.S. tax on foreign-source income (i.e. increase in tax savings due to round-tripping) is thus correlated with an increase in reported non-equity pre-tax affiliate income of roughly 0.2 cents per dollar of affiliate assets, or approximately 0.07 percent for the average affiliate.

In addition, it is also worth noting in the specifications of columns 3 and 4 of Table 3.6 that the AJCA tax savings term interacted with pre-AJCA R&D expenditures have positive effects on reported affiliate income at both the affiliate and parent level (although imprecisely-estimated for the latter). Under specification (3), a one standard deviation increase in the affiliate R&D-to-assets ratio implies a further increase in post-AJCA earnings per dollar of 2003 assets of approximately 0.2 cents for an affiliate with average DRD tax savings. Alternatively, a one percentage point decrease in the repatriation tax yields a 0.05 cents increase in reported income per dollar of assets for an affiliate with the average R&D-to-assets ratio through the tax savings interaction. Thus, the evidence is supportive of the conjecture that firms that rely more heavily on intangibles were more actively engaged in income reallocation.[35] The negative estimated effects associated with affiliates organized as holding companies are likewise consistent with tax-motivated income reallocation, since such affiliates may lack scope for shifting non-equity income given the limited nature of their real operations.

In contrast, the positive correlation between changes in parent non-equity earnings and the dependent variable under specification (4) appears to run counter to the round-tripping hypothesis. Indeed, it suggests that more profitable firms—domestically

[35]Conditional on having elected to exploit the tax holiday, application of these same coefficient estimates to the average dividend-repatriating affiliate yields considerably larger effects. Concretely, a one standard deviation increase in the ratio of R&D expenditures to assets for an affiliate with mean AJCA tax savings in this group is associated with a 2.4 cent increase in reported earnings per dollar of assets.

and abroad—were perhaps more likely to have use for the DRD by having more real earnings to remit and by being better positioned to do so with more affiliates located in low-tax jurisdictions. The direction of causality may thus run in reverse, such that the observed positive effect of AJCA tax savings on affiliate earnings may have had more to do with real firm activity driving the repatriation decision than domestic profit shifting. On the other hand, if the incentives due to the reduction in the repatriation tax were less about round-tripping than about income reallocation among foreign affiliates, the positive effect of increased domestic earnings on reported affiliate earnings need not preclude a tax avoidance response.

Concerns such as the foregoing as well as the simultaneity of the dividend repatriation, income reallocation, and other financial decisions taken by multinationals strongly suggest the use of instrumental variables. The IV results in Table 3.7 are mainly consistent with their OLS counterparts but may now be given a causal interpretation: namely, reductions in the repatriation tax under the AJCA had a significant positive impact on the level of reported affiliate earnings in the year in which firms opted to apply the DRD. A 1 percentage point increase in tax savings due to round-tripping in this context would have increased reported non-equity pre-tax income by roughly 1.3 cents per dollar of affiliate assets according to the specifications in columns 3 and 4, more than six times the corresponding OLS estimates. Contrary to the OLS results, however, the interaction of pre-AJCA R&D expenditures and repatriation tax savings at both the parent and affiliate level (instrumented analogously to the main tax savings term) have an imprecisely-estimated indeterminate impact on inferred income reallocation, while changes in the reported domestic rate of return on total assets (instrumented using pre-AJCA levels) are no longer associated with increased affiliate earnings, as shown in column 4. As such, the IV results provide evidence of a more substantial average income reallocation response, but in a manner unrelated to the intensity of R&D activity.

First-stage results for the IV specification in column 3 of Table 3.7 are presented in Table 3.8 and provide reasonable validation of the instruments used, although a weak instruments problem is readily apparent with respect to the interaction term between affiliate R&D and the endogenous repatriation tax reduction, as evidenced by the pattern of instrument F statistics.[36] Weak instrument-robust estimation techniques are unfortunately unavailable for the case of multiple endogenous regressors, but estimation of the IV model by limited-information maximum likelihood (LIML) produces virtually identical coefficient estimates to those obtained under the more familiar two-stage least squares (2SLS), thereby suggesting that weak instrument bias under 2SLS is not a serious concern.

Leaving aside the collective weakness of the IV strategy for multiple endogenous regressors, the proportion of affiliate assets held as cash in the pre-AJCA period relative to the median affiliate appears to be a decent predictor of multinational repatriation decisions at the extensive margin. However, a possible concern with using the high cash holdings indicator in constructing the primary instrument(s) has to do with the instrument exogeneity assumption upon which it is premised. If highly profitable firms (on the basis of real operations) are more likely to retain earnings in the form of cash, and the growth of earnings reflects a persistent process, then it may be that lagged cash holdings are not appropriately exogenous to affiliate income in the period in which the tax holiday was exploited. Large amounts of cash amassed abroad may thus signal high income growth potential. Under these conditions, the effect of predicted repatriation tax savings from first-stage regressions involving the

[36] As a rule of thumb, a weak instruments problem exists in the presence of a single endogenous regressor whenever a Wald test of the exclusion restriction(s) yields an F statistic of less than 10 (Staiger and Stock, 1997). The relevant threshold in the context of multiple endogenous regressors is considerably higher for the complete system of first stage regressions (Stock and Yogo, 2002), such that weak instruments are assuredly an issue in the present analysis of specification (3). Although the first and second stage IV results are qualitatively unchanged under the model specification of column 4, the weak instruments problem is not surprisingly compounded by the addition of a fourth endogenous regressor. Conversely, the instrument F statistics of 43 obtained under both specifications (1) and (2) with a single endogenous regressor readily reject weak instruments as a problem.

cash instrument on the change in reported affiliate profits may confound the true tax response (i.e. round-tripping) with a more innocuous pattern of persistent earnings growth. As a result, this will tend to bias upwards the estimated income reallocation response.

In contrast, under the trapped equity view, high cash holdings might instead signal that profitable foreign investment opportunities have been exhausted, such that foreign earnings are constant or downward trending. In this case, the response of reported affiliate earnings to tax savings under the DRD will tend to be dampened. The theoretical direction of bias in the IV results is therefore ambiguous if the exclusion restriction is invalid for either of these signalling reasons. In practice, there appears to be little conclusive evidence of any direct relationship between earnings growth and one-, two-, or three-period lagged cash holdings over the 2003-2006 period (results not shown). If anything, lagged affiliate cash holdings may exert a negative influence on the growth of non-equity pre-tax income—consistent with the trapped equity view—but the measured effects are very imprecisely estimated and are not statistically distinguishable from zero.

Viewing the simultaneity of multinational income reallocation and repatriation decisions as primarily an omitted variables problem (i.e. where reallocated earnings are themselves unobserved), failure to account for the endogeneity of the repatriation decision at the extensive margin should tend to yield positively-biased estimates of the tax savings effect. This follows from the fact that the greater the scope for reallocating earnings, the more likely it is that an affiliate will choose to remit earnings under the DRD—hence switching on the reduction in the repatriation tax—and the larger will be the observed change in reported foreign earnings. From this perspective, the downward-biased income reallocation response evidenced by the disparity in OLS and IV estimates constitutes somewhat of a puzzle. Viewed as a problem of unobserved changes in *real* returns on foreign activity, however, the reverse relation-

ship between earnings growth and AJCA tax savings is entirely probable when the endogeneity of the repatriation decision is ignored. Affiliates experiencing the largest increases in profit rates on real activity would likely have been precisely those on which multinational corporations would wish to focus their foreign investment, with retained earnings displacing more costly sources of financing.[37] Affiliates of this type would have therefore found the DRD least attractive of all—especially those subject to lower effective foreign tax rates (i.e. higher foreign after-tax rates of return)—thereby biasing downwards OLS estimates of the income reallocation response.

In addition, absent any tax avoidance motives and assuming perfect capital mobility, equalization of marginal after-tax rates of return across countries suggests that firms should require higher pre-tax returns on assets in relatively high-tax jurisdictions (conditional on investment horizon and hence duration of deferral), thereby driving a negative correlation between AJCA tax savings and the *level* of non-equity income per dollar of affiliate assets in any given period. By differentially reducing the effective tax burden on foreign-source income with the largest repatriation tax savings in the least-taxed foreign jurisdictions, the DRD would have likewise differentially amplified firms' foreign rate of return requirements, thus conceivably yielding a spurious negative correlation between AJCA tax savings and *changes* in affiliate earnings over the AJCA period through this mechanism as well. Lastly, a further partial explanation for the negative bias implied by the OLS and IV results could lie in the failure of the instrument exogeneity assumption of the first type described wherein cash-rich affiliates are also characterized by high growth, though as previously-discussed, this possibility is unsubstantiated by the data.

Concerns regarding the validity of the cash holdings instrument are largely avoided

[37] Round-tripping of equity as conventionally-defined would only be preferable to retaining earnings in this context if the benefits from the reduction in the repatriation tax (net of any compliance costs with respect to the domestic reinvestment requirements of the AJCA) exceeded those of deferral. The longer the investment horizon and the greater the foreign rate of return, as characterized in (3.7), the more valuable would be retained earnings.

where the dependent measure of income reallocation is taken to be one of the more direct proxies. There is very little reason to believe, for example, that pre-AJCA cash holdings could in any way affect changes over time in affiliate related party versus arm's-length trading patterns, *except* as a response to the increased attractiveness of reallocating U.S. earnings for immediate repatriation. As shown in Table 3.9, none of the estimated results involving measures related to transfer pricing or earnings stripping provide strong statistical support for the hypothesis of round-tripping under either OLS or IV, and this is true regardless of which measure of qualifying dividends is employed to allocate remittances among multinational affiliates, whether the directly-held (results not shown) or pass-through measures.[38] The absence of statistically-significant income reallocation responses via the transfer pricing channel may in part reflect the prevalence of affiliates reporting zero bilateral trade with the U.S. (i.e. approximately 75 percent of all affiliates in the sample), thereby reducing the extent of useable variation associated with the trade or sales proxies, while the absence of any effect via the earnings stripping channel may reflect the inability to distinguish related party interest payments and receipts from arms'-length payments and receipts in the annual data used.

In the aggregate, the results thus offer only relatively indirect evidence of an income reallocation response via changes in reported earnings and preclude a determination as to the source of any shifted earnings. The IV estimates of the effect of repatriation tax savings on affiliates' non-equity pre-tax income therefore provide an upper bound on the true amount of domestic profit shifting induced by the AJCA, first because income reallocation between parents and subsidiaries cannot be distinguished from reallocation among foreign subsidiaries and second because the IV point estimates may be overstated if high cash holdings serve as a predictor of fu-

[38] *A priori*, the use of pass-through dividends ought to have been more likely to reveal unusual transfer pricing activity. The estimated tax savings effect on non-equity pre-tax income is similarly unaffected by the choice between the two dividend measures that avoid double-counting.

ture earnings potential such that instrument exogeneity conditions are violated. An approximate measure of this upper bound can be obtained as a first pass by tallying predicted increases in reported affiliate earnings due to the DRD tax incentives on the basis of the IV coefficient estimates drawn from specifications (3) or (4) and applied to firms' observed $TaxSavings_{imt}$ and 2003 assets, for a total of $157 billion in shifted earnings across all repatriating affiliates. In contrast, the corresponding figure derived from the OLS coefficient estimate in specification (3) is $24 billion. Both of these totals, however, are heavily influenced by a handful of very large foreign affiliates with predicted amounts of shifted earnings far in excess of actual dividend remittances, in contradiction with having successfully measured the income reallocation response. Focusing instead on the median dividend-repatriating affiliate and assuming all other dividend-paying affiliates to behave identically, the magnitude of total earnings reallocated due to the DRD is reduced to $32 billion on the basis of the IV coefficient estimates—one sixth of total AJCA remittances identified in the data—and $5 billion for OLS.[39]

Framed as an upper bound on DRD-induced round-tripping, the IV estimate of a $32 billion aggregate effect of AJCA tax savings on affiliates' reported pre-tax earnings suggests a relatively modest, though non-trivial, tax avoidance response. Despite this and despite the indeterminacy of the IV results involving R&D expenditures as a reflection of income reallocation capabilities, it stands to reason that transactions in certain industries may have been more amenable to manipulation than others, such that there may have been wide variation in the degree to which the AJCA round-tripping incentives were exploited across industrial sectors. In lieu of seeking to capture firm-specific income reallocation costs through the inclusion of

[39]As evidenced by the disparity between mean and median firm characteristics shown in Table 3.5, the implicit assumption of a symmetric distribution of affiliate assets and AJCA tax savings around the median is clearly imperfect. Nevertheless, the alternative application of average estimated effects to outlying firms for the purpose of calculating predicted profit reallocation visibly produces counterfactual results, and it is reasonable to conclude that the coefficient estimates obtained are not valid at the tails of the firm distribution.

R&D expenditure and tax savings interactions, I address the possible heterogeneity of response by repeating the basic analysis within industrial sectors as well as within industry groups categorized according to trade pricing characteristics as defined in Rauch (1999).

Table 3.10 presents the results from OLS estimation of specification (4) excluding R&D terms for the 15 industrial sectors at the NAICS 3-digit level with the greatest affiliate representation in the data.[40] As shown, the strongest statistical evidence of an income reallocation effect in terms of changes in affiliate non-equity pre-tax earnings arises in the wholesale and retail trade sectors as well as mining and food manufacturing, while transportation equipment manufacturing and retail trade also exhibit statistically-significant negative effects on net interest payments, consistent with earnings stripping. To the extent that affiliates in the wholesale or retail trade sectors are merely resale arms of their parent corporations, such that the cost of resold items purchased from the parent or other foreign subsidiaries is largely arbitrary, then the importance of the estimated income reallocation responses in these sectors is unsurprising. This is partially contradicted by the negative effect of AJCA tax savings on affiliates' related-party trade balances (relative to arm's length bilateral trade) in the retail trade sector, however, and it is moreover noteworthy that high-technology industries do not appear to exhibit more significant income shifting activity given the general perception that such firms have greater scope for multinational tax avoidance due to their reliance on intangibles. This paucity of statistically significant income reallocation patterns by industrial sector is only further amplified in the IV estimates of the same model specification (Table 3.11), with virtually all point estimates of the AJCA tax savings effect being very imprecisely measured. Hence it appears unlikely that the aggregate estimates of DRD-induced income reallocation mask substantial heterogeneity across sectors, at least within NAICS 3-digit industries.

[40]For the Retail Trade and Information sectors, multiple closely-related NAICS 3-digit industrial sectors are combined to yield sufficient useable observations for the empirical analysis (N>30).

Grouping NAICS industries into the three trade pricing categories developed by Rauch (1999) offers an alternative means of evaluating whether firms in sectors with greater presumed transfer pricing flexibility were seen to engage in more round-tripping of domestic profits. By this classification, traded goods emanating from particular industries are categorized as being either homogenously-priced, such as commodities traded on an exchange; reference-priced, such as goods for which no organized exchange exists, but where trade publications nevertheless routinely provide prices for the world market; or differentiated, such as products involving an intellectual property component, sophisticated processing or assembly, etc. Firms in industries classified as falling into this latter group might naturally be expected to be better able to exploit the DRD round-tripping incentives without triggering scrutiny from the tax authority. As shown in Table 3.12, the constellation of OLS and IV results provides very modest evidence in support of this conjecture.[41] While the OLS point estimates suggest potentially larger increases in reported non-equity earnings of affiliates operating in homogenous-pricing sectors, statistically significant evidence of profit reallocation via earnings stripping only manifests itself among affiliates in differentiated products sectors, and under IV, only these firms display a statistically significant income reallocation response of any sort.

3.7 Conclusion

By contrast to other empirical findings in the literature on income reallocation, the results of the previous section indicate that the AJCA triggered at most a moderate increase in tax avoidance by U.S. multinational corporations. Clausing (2009) estimates that U.S. multinationals would have shifted $133 billion into lower-taxed foreign jurisdictions in 2004 alone, dwarfing the $32 billion increase in reported af-

[41] Unfortunately, the sample of firms that can be successfully categorized is severely constrained by imperfect matching between Rauch's SITC-based classification scheme and the NAICS 4-digit codes reported to the BEA.

filiate income due to the AJCA calculated over three years on the basis of median firm characteristics.[42] Ignoring the endogeneity of AJCA tax savings, this disparity in aggregate results is only further amplified, with OLS estimates of the AJCA income reallocation response of $5 billion. The source of these differences in aggregate results is evident from a comparison of the estimated semi-elasticities of affiliate rates of return with respect to effective foreign tax rates. In particular, whereas Clausing (2009) finds a semi-elasticity of -3.6 in a panel cross-country setting, the IV coefficient estimates for specification (3) of the empirical difference-in-difference model studied here yield a semi-elasticity of -0.5 for the average affiliate.[43]

At the heart of these differences—and those with the literature more generally—are two important distinctions which follow from previous studies' reliance on variation in cross-country profits or profit rates to identify income reallocation activity. First, the prior literature is inherently incapable of fully accounting for the existence of non-tax unobserved country-specific determinants of firm profitability. Consequently, to the extent that these are correlated with tax rates, estimates of income reallocation will be biased, with the typical concern being that these will be overstated due to a positive association between policies designed to promote favorable business environments. Second, even in studies with a time series dimension, the cross-country approach amounts to examining firm behavior in a long-run equilibrium with respect to U.S. tax treatment of foreign-source income. In contrast, by adopting a difference-in-difference approach to quantifying income reallocation behavior around the AJCA tax holiday, the present analysis is able to account for all country fixed

[42]Other previous estimates of annual profit reallocation by U.S. multinationals are reviewed in Gravelle (2009) and present relatively comparable figures to Clausing (2009), with revenue loss estimates ranging from around $10 billion to $60 billion. Using direct evidence on multinational rates of return on assets from corporate tax return data, Christian and Schultz (2005) identify $87 billion of shifted earnings in 2001, identical to Clausing's 2002 estimate of total U.S. earnings shifted (domestic and foreign multinational corporations combined).

[43]A 1 percentage point increase in foreign tax rates corresponds to a 0.85 percentage point reduction in the repatriation tax under the AJCA. The implied semi-elasticities with respect to AJCA tax savings are thus 0.6 for the average affiliate and 2.2 at the median. The corresponding measures on the basis of OLS estimates are 0.07 and 0.3.

effects and focuses on firms' short-run responsiveness to large differential reductions in repatriation taxes.

The identification strategy proposed in this paper presents a clear improvement over the prior literature insofar as it avoids an important source of bias, which may explain the weaker income reallocation response found here. The apparent tradeoff is that the measured behavior does not speak directly to the long-term consequences of reducing the repatriation tax in a permanent manner, as would occur in switching to a territorial tax regime. It is hence conceivable that the absence of concrete evidence of round-tripping behavior as measured against relatively-direct proxies of income reallocation and only modest indirect evidence are merely reflections of the average firm's inability to respond to the tax incentives provided under the DRD on a short-term basis. However, given the magnitude of the reduction in the repatriation tax and the widely-held presumption that multinational corporations already had in place the necessary structures to effectively reallocate earnings well before the tax holiday, it does not follow directly that a weak short-run response should be expected, perhaps especially because of the temporary nature of the policy change. Evidence of no strong round-tripping response is thus highly informative in two important respects. From a policy evaluation standpoint, it appears that the AJCA did not lead to large reductions in domestic corporate tax revenue by reason of round-tripping, as may have otherwise been feared. Furthermore, for the purposes of contemplating international tax reform more broadly, it also appears unlikely that moving to a territorial tax system in the U.S. would lead to a massive increase in reallocation of domestic profits for tax avoidance purposes, at least in the short run.

One possible explanation for the weakness of the income reallocation response despite the strong incentives is that the U.S. tax enforcement system may in fact be relatively successful at deterring outright tax evasion while imposing constraints on legitimate tax avoidance, either through the use of advance pricing agreements

or the threat of sanctions. This would bode well for the ability of the system to deter tax avoidance and evasion over the longer-term following implementation of a territorial tax regime. Naturally, it could very well be the case that repatriating multinationals feared that election of the tax holiday would by itself attract special scrutiny from the tax authority, thereby dampening incentives for tax avoidance, in which case implications for longer-term activity are less direct. A similar caveat applies if multinationals were reluctant to book any tax expenses—even if greatly reduced under the tax holiday—on earnings that could otherwise be designated as indefinitely reinvested abroad. Of course, concerns involving accounting effects such as this imply that firms should have had no desire to repatriate real foreign earnings either, such that this justification may better explain the extensive margin of dividend repatriation behavior rather than tax avoidance among multinationals having elected to exploit the DRD.

Presumptions notwithstanding, it is also possible that firms truly did not dispose of enough time to implement income reallocating procedures if, for example, transaction prices or borrowing terms are established over long horizons. Attempts to exploit modest differences in the number of months over which firms could undertake round-tripping in the analysis lend no support to this possibility (results not shown), but it nevertheless represents a caution against interpreting the results in too optimistic of a light with respect to the tax avoidance consequences of a territorial tax system.

Finally, the absence of conclusive round-tripping effects might also reflect the use of sophisticated triangulation arrangements whereby the tracing of shifted earnings through the ownership chain is prevented. For instance, shifted domestic profits could in principle transit from a first downstream recipient to one or more intermediate foreign affiliate parents as a royalty payment before being paid out as remitted earnings from a tax haven holding company to the parent for preferential treatment under the

DRD.[44] In such a case, the data used thus far in the analysis would be silent as to the round-tripping involved due to the break in the link between earnings shifted and "foreign" earnings remitted to the parent. Further work using the full scope of information with respect to ownership chains identified in the data may help to address this possibility and represents a fruitful avenue for further research.

Limited evidence of a short-run income reallocation response does not preclude the possibility that the AJCA rewarded firms that had historically engaged in extensive profit reallocation for tax avoidance purposes, as has been alleged by critics of the DRD. This is the subject of Chapter IV examining investor reactions to the proposed and subsequently rejected renewal of the DRD under the terms of the 2009 American Recovery and Reinvestment Act. Furthermore, the fact that the average short-run income reallocation response was limited does not, of course, imply that individual firms did not respond in a sizeable way, and it remains to be explained why pharmaceutical and other high-technology firms exploited the tax holiday so much more heavily than firms in other sectors. The results of the statistical analysis are rather mixed in this respect, with OLS estimates giving reason to believe that affiliate R&D expenditures play an important role in facilitating profit reallocation, while affiliates falling into wholesale or retail trade may also have greater flexibility in absorbing shifted earnings than in other sectors. Accounting for the endogeneity of the repatriation decision, this is also true of affiliates associated with the production of differentiated products relative to those producing more homogenous goods. Hence, although it appears clear that the AJCA did not induce extensive reallocation of domestic corporate profits—such that adoption of a territorial tax regime would likely not unleash tax avoidance activity of the proportions often feared—further attention

[44]Precisely this type of arrangement was established by Forest Laboratories in 2005, as documented in the press (Drucker, 2010a). This is coincidentally the same year that the firm received over $1.2 billion in qualifying dividends from overseas under the terms of the AJCA, as reported on its financial statement to shareholders. As noted in Drucker (2010b), Forest Labs has since been audited for its transfer pricing practices.

to income reallocation practices in particular sectors may be warranted.

Table 3.1: Residence-Based Taxation with Foreign Tax Credits - A Numerical Example

		Ordinary Rules	2005 Tax Holiday
(1)	Subsidiary pre-tax earnings	$100.00	$100.00
(2)	Foreign income tax payment: 12.5 percent of (1)	$12.50	$12.50
(3)	Dividend payment to U.S. parent (by assumption)	$87.50	$87.50
(4)	Foreign withholding tax payment: 0 percent of (3)	$0.00	$0.00
(5)	After-tax dividend received by U.S. parent: (3)-(4)	$87.50	$87.50
(6)	Pre-tax dividend received by U.S. parent	$100.00	$100.00
(7)	Dividend deduction under AJCA: 85 percent of (6)	n.a.	$85.00
(8)	U.S. tax liability: 35 percent of (6)-(7)	$35.00	$5.25
(9)	Foreign tax credits	$12.50	$1.88
(10)	Residual U.S. tax liability	$22.50	$3.37
(11)	Total tax liability: (2)+(4)+(10)	$35.00	$15.87

Table 3.2: Aggregate Dividend Repatriations under the AJCA ($ Billions)

	Fiscal Year			
	2004	2005	2006	2004-2006
Total Repatriations:				
Naive	66	329	28	423
Directly-held	14	183	16	213
Pass-through	14	183	16	213
Memo item: Tax return data	n.a.	n.a.	n.a.	362
Qualifying Repatriations:				
Naive	57	278	25	360
Directly-held	10	166	15	191
Pass-through	10	166	15	191
Memo item: Tax return data	n.a.	n.a.	n.a.	312

Table 3.3: Top 10[a] Countries by AJCA Tax Savings (2005)

	$ Billions			Number of		
Country:	Qualifying Dividends	Tax Savings	Non-Equity Pre-tax Income	Remitting Affiliates	Total Affiliates	Tax Haven[b]
Switzerland	14.2	3.13	8.97	20	187	✓
Singapore	14.1	2.94	5.28	19	101	✓
Ireland	8.89	1.90	25.0	18	159	✓
Bermuda	6.09	1.81	8.59	30	146	✓
United Kingdom (U.K.)	12.6	1.45	32.4	68	764	
U.K. Islands - Caribbean	3.23	0.96	1.97	15	112	✓
China	2.62	0.57	3.94	22	88	
Hong Kong	1.76	0.35	3.77	19	103	✓
Canada	5.21	0.16	19.4	50	423	
Australia	1.86	0.13	6.77	20	171	

Repatriation tax savings are calculated as the product of qualifying dividends (measured according to the pass-through method for allocating affiliate remittances) and 85 percent of the domestic-foreign tax rate differential.

[a] Country list excludes those for which the underlying data used to construct these measures must be suppressed to avoid the disclosure of information for individual companies.

[b] Tax havens defined as in Hines (2010).

Table 3.4: Top 10[a] NAICS 3-Digit Industries by AJCA Tax Savings (2005)

	$ Billions			Number of	
	Qualifying Dividends	Tax Savings	Non-Equity Income	Remitting Affiliates	Total Affiliates
Parent Industry:					
Chemical Manufacturing	74.9	16.5	36.2	83	851
Petroleum and Coal Products Manufacturing	29.3	5.15	83.9	116	601
Computer and Electronics Manufacturing	23.5	4.30	11.7	43	434
Food Manufacturing	5.26	1.06	8.24	31	257
Professional, Scientific, and Tech. Services	3.58	0.68	13.3	18	148
Transportation Equipment Manufacturing	3.53	0.50	9.39	51	762
Paper Manufacturing	2.60	0.30	2.37	22	87
Securities, Commodity Contracts, and Other Fin. Investments and Related Activities	2.14	0.29	8.83	18	265
Insurance Carriers and Related Activities	2.00	0.24	13.6	29	243
Utilities	0.86	0.23	-0.25	13	128
Affiliate Industry:					
Holding Companies	104	22.4	-0.60	97	1063
Professional, Scientific, and Tech. Services	7.40	1.36	16.8	22	134
Computer and Electronics Manufacturing	7.60	1.35	9.09	28	182
Chemical Manufacturing	7.71	1.30	23.2	45	382
Merchant Wholesalers, Nondurable Goods	4.23	0.80	26.6	61	356
Oil and Gas Extraction	5.45	0.53	58.1	37	202
Securities, Commodity Contracts, and Other Fin. Investments and Related Activities	2.90	0.43	14.4	28	422
Insurance Carriers and Related Activities	2.45	0.39	14.1	34	219
Transportation Equipment Manufacturing	3.15	0.34	-1.41	31	236
Credit Intermediation and Related Activities	1.37	0.26	6.93	18	310

Repatriation tax savings are calculated as the product of qualifying dividends (measured according to the pass-through method for allocating affiliate remittances) and 85 percent of the domestic-foreign tax rate differential.

[a] Industry lists exclude those for which the underlying data used to construct these measures must be suppressed to avoid the disclosure of information for individual companies.

Table 3.5: Affiliate Characteristics by Repatriation Status (2005)

	Non-Repatriaters		Repatriaters		t
	Mean	Median	Mean	Median	Statistic[a]
Millions of dollars:					
Qualifying dividends	0	0	252.1	35.5	-3.10
Dividends	5.9	0	266.0	42.7	-3.20
Assets	1489.3	348.0	1721.1	349.6	-0.72
Sales	509.8	180.0	773.2	273.3	-3.05
Cash assets	45.2	2.8	45.5	7.6	-0.03
R&D expenses	4.4	0	4.2	0	0.14
Retained earnings	168.9	37.6	379.0	54.9	-1.78
$\Delta_{2005-2003}$ Pre-tax income	11.8	2.8	148.5	14.3	-3.64
$\Delta_{2005-2003}$ Non-equity pre-tax income	9.9	1.5	58.7	9.7	-3.53
Percent of affiliate assets (2003):					
Sales	140.1	52.0	155.5	94.2	-1.04
Cash assets	5.3	0.9	7.4	2.2	-3.55
R&D expenses	0.7	0	0.8	0	-1.03
Retained earnings	14.1	11.0	20.2	17.8	-3.11
$\Delta_{2005-2003}$ Pre-tax income	3.8	0.9	8.4	4.7	-4.64
$\Delta_{2005-2003}$ Non-equity pre-tax income	2.3	0.4	6.3	2.9	-4.78
Tax savings rate	10.9	11.4	13.1	11.4	-4.71
N	3252		466		

Repatriating affiliates are identified according to the pass-through method.
[a] t-statistics are for tests of equal means across repatriating and non-repatriating groups allowing for unequal variances.

Table 3.6: Income Reallocation and Dividend Repatriation:
OLS Results (2004-2006)

$Y = \Delta_{t-2003} \frac{NonEquityPretaxIncome_{imt}}{Assets_{im,2003}}$	(1)	(2)	(3)	(4)
$TaxSavings_{imt}$	0.220***	0.224***	0.199***	0.187***
	(0.051)	(0.053)	(0.073)	(0.069)
$\Delta_{t-2003} \frac{ExchangeRate_{imt}}{ExchangeRate_{im,2003}}$	0.022	0.023	0.023	0.016
	(0.025)	(0.026)	(0.025)	(0.024)
$I[ExcessFTC_{m,2003} > 0]$	-	-0.008	-0.008	-0.006
	-	(0.008)	(0.008)	(0.007)
$I[HoldingCompany_{imt}]$	-	-0.035***	-0.035***	-0.035***
	-	(0.005)	(0.005)	(0.005)
$I[IndirectlyHeld_{imt}]$	-	-0.003	-0.003	-0.003
	-	(0.006)	(0.006)	(0.006)
$TaxSavings_{imt} \cdot \frac{R\&D_{im,2003}}{Assets_{im,2003}}$	-	-	7.006***	6.876***
	-	-	(2.551)	(2.466)
$TaxSavings_{imt} \cdot \frac{R\&D_{m,2003}}{Assets_{m,2003}}$	-	-	0.018	0.205
	-	-	(1.548)	(1.496)
$\Delta_{t-2003} \frac{NonEquityPretaxIncome_{mt}}{Assets_{m,2003}}$	-	-	-	0.097***
	-	-	-	(0.031)
Constant	0.016***	0.023***	0.023***	0.024***
	(0.003)	(0.003)	(0.003)	(0.003)
N	9878	9878	9878	9878
R-squared	0.008	0.017	0.018	0.025

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors clustered by multinational corporation appear in parentheses. Year fixed effects are included in all specifications.

Table 3.7: Income Reallocation and Dividend Repatriation:
IV Results (2004-2006)

$Y = \Delta_{t-2003} \frac{NonEquityPretaxIncome_{imt}}{Assets_{im,2003}}$	(1)	(2)	(3)	(4)
$E[TaxSavings_{imt} \mid \mathbf{Z_{imt}}]$	1.624***	1.066**	1.302*	1.302*
	(0.492)	(0.459)	(0.672)	(0.670)
$\Delta_{t-2003} \frac{ExchangeRate_{imt}}{ExchangeRate_{im,2003}}$	0.001	0.010	0.008	0.007
	(0.024)	(0.024)	(0.023)	(0.025)
$I[ExcessFTC_{m,2003} > 0]$	-	-0.010	-0.010	-0.009
	-	(0.007)	(0.009)	(0.009)
$I[HoldingCompany_{imt}]$	-	-0.036***	-0.033***	-0.033***
	-	(0.005)	(0.006)	(0.006)
$I[IndirectlyHeld_{imt}]$	-	-0.002	-0.001	-0.001
	-	(0.006)	(0.006)	(0.006)
$E[TaxSavings_{imt} \cdot \frac{R\&D_{im,2003}}{Assets_{im,2003}} \mid \mathbf{Z_{imt}}]$	-	-	66.684	66.417
	-	-	(53.928)	(53.509)
$E[TaxSavings_{imt} \cdot \frac{R\&D_{m,2003}}{Assets_{m,2003}} \mid \mathbf{Z_{imt}}]$	-	-	-16.502	-16.542
	-	-	(10.200)	(10.115)
$E[\Delta_{t-2003} \frac{NonEquityPretaxIncome_{mt}}{Assets_{m,2003}} \mid \mathbf{Z_{imt}}]$	-	-	-	0.009
	-	-	-	(0.060)
Constant	0.009***	0.018***	0.019***	0.019***
	(0.003)	(0.004)	(0.004)	(0.004)
N	9878	9878	9878	9878

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors clustered by multinational corporation appear in parentheses. Year fixed effects are included in all specifications.

Table 3.8: Income Reallocation and Dividend Repatriation:
First-Stage IV Results (2004-2006)

Dependent Variable $= TaxSavings_{imt} \times$	1	$\frac{R\&D_{im,2003}}{Assets_{im,2003}}$	$\frac{R\&D_{m,2003}}{Assets_{m,2003}}$
$I[HighCash_{im,2003}]$	0.056***	-0.000	-0.000
	(0.012)	(0.000)	(0.000)
$I[HighCash_{im,2003}] \cdot \frac{R\&D_{im,2003}}{Assets_{im,2003}}$	-0.168*	0.023	-0.007
	(0.090)	(0.018)	(0.009)
$I[HighCash_{im,2003}] \cdot \frac{R\&D_{m,2003}}{Assets_{m,2003}}$	0.332	0.009**	0.091***
	(0.221)	(0.004)	(0.023)
$\Delta_{t-2003} \frac{ExchangeRate_{imt}}{ExchangeRate_{im,2003}}$	0.010**	-0.000	-0.000
	(0.004)	(0.000)	(0.000)
$I[ExcessFTC_{m,2003} > 0]$	0.003	0.000	0.000
	(0.003)	(0.000)	(0.000)
$I[HoldingCompany_{imt}]$	0.004**	-0.000***	0.000*
	(0.001)	(0.000)	(0.000)
$I[IndirectlyHeld_{imt}]$	-0.002*	-0.000	-0.000
	(0.001)	(0.000)	(0.000)
N	9878	9878	9878
R-squared	0.05	0.03	0.06
Instrument F-statistic	15.1	3.1	12.5

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors clustered by multinational corporation appear in parentheses. Year fixed effects are included in all specifications.

Table 3.9: Repatriation Tax Savings Effects:
All Income Reallocation Measures (2004-2006)

	Specification			
	(1)	(2)	(3)	(4)
Ordinary Least Squares:				
$\Delta_{t-2003}\frac{NonEquityPretaxIncome_{imt}}{Assets_{im,2003}}$	0.220***	0.224***	0.199***	0.187***
	(0.051)	(0.053)	(0.073)	(0.069)
$\Delta_{t-2003}TBD_{imt}$	-0.020	-0.021	0.000	-0.001
	(0.027)	(0.027)	(0.024)	(0.024)
$\Delta_{t-2003}\frac{GoodSales^{RP}_{imt}+ServiceSales^{RP}_{imt}}{GoodSales^{US}_{imt}+ServiceSales^{US}_{imt}}$	-0.098	-0.097	-0.199	-0.208
	(0.130)	(0.134)	(0.187)	(0.186)
$\Delta_{t-2003}\frac{NetInterestPaid_{imt}}{Assets_{im,2003}}$	-0.007	-0.007	-0.003	-0.003
	(0.004)	(0.004)	(0.007)	(0.006)
Instrumental Variables:				
$\Delta_{t-2003}\frac{NonEquityPretaxIncome_{imt}}{Assets_{im,2003}}$	1.624***	1.066**	1.302*	1.302*
	(0.492)	(0.459)	(0.672)	(0.670)
$\Delta_{t-2003}TBD_{imt}$	0.028	0.043	0.255	0.248
	(0.286)	(0.269)	(0.322)	(0.321)
$\Delta_{t-2003}\frac{GoodSales^{RP}_{imt}+ServiceSales^{RP}_{imt}}{GoodSales^{US}_{imt}+ServiceSales^{US}_{imt}}$	1.084	1.094	2.078	1.931
	(1.217)	(1.201)	(2.203)	(2.213)
$\Delta_{t-2003}\frac{NetInterestPaid_{imt}}{Assets_{im,2003}}$	0.027	0.049	0.087	0.086
	(0.055)	(0.056)	(0.073)	(0.071)

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors clustered by multinational corporation appear in parentheses. Year fixed effects are included in all specifications.

Table 3.10: Cross-Industry Heterogeneity in Repatriation Tax Savings Effects: OLS Results (2004-2006) by NAICS Affiliate Industry

	Dependent Variable					
	$\Delta \frac{NonEquityPretaxIncome}{Assets}$		ΔTBD		$\Delta \frac{NetInterestPaid}{Assets}$	
Industry (NAICS):	Coeff.	(S.E.)	Coeff.	(S.E.)	Coeff.	(S.E.)
Mining (210)	0.430**	(0.201)	-0.034	(0.066)	0.012	(0.017)
Food Manuf. (311)	0.678**	(0.273)	0.138	(0.160)	-0.002	(0.055)
Chemical Manuf. (325)	0.381	(0.261)	-0.160	(0.139)	-0.003	(0.022)
Machinery Manuf. (333)	0.843	(0.603)	0.451	(0.322)	-0.032	(0.022)
Computer and Elect. Manuf. (334)	0.289	(0.204)	-0.032	(0.341)	-0.013	(0.013)
Transport Equip. Manuf. (336)	0.134	(0.261)	0.152	(0.258)	-0.070**	(0.029)
Wholesale Durables (423)	0.588*	(0.297)	-0.046	(0.231)	-0.013	(0.009)
Wholesale Non-durables (424)	0.299***	(0.107)	0.021	(0.095)	-0.006	(0.006)
Retail Trade (440 + 450)	1.309***	(0.200)	-0.282***	(0.069)	-0.086*	(0.049)
Information (Old Media) (5111-6)	0.091	(0.491)	n.a.	n.a.	0.028	(0.036)
Credit Intermediation (522)	0.090	(0.062)	n.a.	n.a.	0.009	(0.026)
Financial Investments (523)	0.029	(0.036)	n.a.	n.a.	-0.012	(0.017)
Insurance (524)	-0.021	(0.193)	n.a.	n.a.	-0.030	(0.027)
Professional Services (541)	0.263	(0.177)	n.a.	n.a.	-0.004	(0.014)
Holding Companies (551)	-0.005	(0.026)	n.a.	n.a.	-0.007	(0.010)

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors clustered by multinational corporation appear in parentheses.

Table 3.11: Cross-Industry Heterogeneity in Repatriation Tax Savings Effects: IV Results (2004-2006) by NAICS Affiliate Industry

	Dependent Variable					
	$\Delta \frac{NonEquityPretaxIncome}{Assets}$		ΔTBD		$\Delta \frac{NetInterestPaid}{Assets}$	
Industry (NAICS):	Coeff.	(S.E.)	Coeff.	(S.E.)	Coeff.	(S.E.)
Mining (210)	2.181	(1.707)	-0.727	(0.571)	0.068	(0.071)
Food Manuf. (311)	1.676	(3.207)	4.032	(5.440)	0.135	(0.631)
Chemical Manuf. (325)	0.977	(2.796)	-2.465	(2.157)	-0.284	(0.260)
Machinery Manuf. (333)	7.383	(9.601)	1.882	(4.554)	0.755	(0.726)
Computer and Elect. Manuf. (334)	1.078	(0.908)	0.537	(1.217)	-0.010	(0.065)
Transport Equip. Manuf. (336)	0.038	(2.469)	-0.066	(1.030)	-0.272	(0.258)
Wholesale Durables (423)	-0.008	(1.317)	3.094	(2.101)	-0.144	(0.199)
Wholesale Non-durables (424)	1.160	(0.771)	-0.913	(1.034)	0.121	(0.096)
Retail Trade (440 + 450)	4.701	(3.776)	0.171	(1.057)	-0.439	(0.577)
Information (Old Media) (5111-6)	-2.007	(2.220)	n.a.	n.a.	0.185	(0.208)
Credit Intermediation (522)	3.044	(17.131)	n.a.	n.a.	6.977	(39.249)
Financial Investments (523)	0.569	(2.988)	n.a.	n.a.	1.786	(3.435)
Insurance (524)	-0.859	(2.870)	n.a.	n.a.	-2.183*	(1.242)
Professional Services (541)	16.862	(133.511)	n.a.	n.a.	-0.101	(0.243)
Holding Companies (551)	-0.222	(0.846)	n.a.	n.a.	0.098	(0.216)

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors clustered by multinational corporation appear in parentheses.

Table 3.12: Cross-Industry Heterogeneity in Repatriation Tax Savings Effects: OLS and IV Results (2004-2006) by Rauch Pricing Classification

	Pricing Classification (Conservative)		
	Homogeneous (N=497)	Reference-Priced (N=968)	Differentiated (N=2138)
Ordinary Least Squares:			
$\Delta_{t-2003}\frac{NonEquityPretaxIncome_{imt}}{Assets_{im,2003}}$	0.460**	0.377*	0.215*
	(0.197)	(0.2)	(0.110)
$\Delta_{t-2003}TBD_{imt}$	-0.106	0.049	-0.039
	(0.071)	(0.062)	(0.125)
$\Delta_{t-2003}\frac{NetInterestPaid_{imt}}{Assets_{im,2003}}$	0.016	0.006	-0.022**
	(0.015)	(0.016)	(0.009)
Instrumental Variables:			
$\Delta_{t-2003}\frac{NonEquityPretaxIncome_{imt}}{Assets_{im,2003}}$	-1.115	10.17	1.321**
	(4.431)	(12.68)	(0.634)
$\Delta_{t-2003}TBD_{imt}$	0.055	-121.24	0.256
	(0.887)	(3265.6)	(0.595)
$\Delta_{t-2003}\frac{NetInterestPaid_{imt}}{Assets_{im,2003}}$	-0.231	-1.274	-0.010
	(0.253)	(1.676)	(0.059)

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Standard errors clustered by multinational corporation appear in parentheses.

CHAPTER IV

Investor Responses to the Proposed 2009 Boxer-Ensign Dividends Received Deduction: Rewarding Multinational Tax Avoidance?

4.1 Introduction

The American Jobs Creation Act of 2004 is credited with having prompted the repatriation of $362 billion in foreign earnings by U.S. multinational corporations, of which $312 billion qualified for the temporary 85 percent dividends received deduction (DRD) enacted under that bill (Redmiles, 2008). Three and a half years after its expiration, Senators Boxer (D.-Calif.) and Ensign (R.-Nev.) sought to introduce an amendment to the American Recovery and Reinvestment Act (i.e. the 2009 fiscal stimulus bill) renewing the Internal Revenue Code §965 temporary DRD that would have again reduced the maximal U.S. tax rate on foreign-source earnings from 35 percent to 5.25 percent in the name of promoting domestic reinvestment of earnings from abroad, albeit with ostensibly tighter restrictions on the authorized uses for repatriated funds.[1] While speculation about a repeat of the 2004 measure arose as soon as the precedent was established, a search of the LexisNexis Academic research

[1] A widespread criticism of the original dividend tax holiday enacted under the American Jobs Creation Act of 2004 was that multinationals were able to circumvent its domestic reinvestment requirements due to the fungibility of cash. Indeed, several studies have shown that earnings remitted at the time were primarily used to facilitate payments to shareholders, especially through share repurchases (see e.g. Blouin and Krull (2009); Clemons and Kinney (2008); Dharmapala, Foley and Forbes (2010); or Graham, Hanlon and Shevlin (2010))).

database indicates that the Senators' decision to formally propose a DRD amendment to the 2009 stimulus bill only became public on January 28, 2009 (Heflin, 2009). The Boxer-Ensign proposal was then discussed on the Senate floor on February 3, 2009 and was rejected at 8:15 p.m. by a 55-42 margin following critiques from Senators Levin (D.-Mich.) and Dorgan (D.-N.D.) (among others) that yet another DRD for U.S. multinationals would encourage further outsourcing of domestic jobs (Lochhead (2009); US Fed News (2009)).

A related concern is that a DRD would also provide incentives for merely reporting income as being earned abroad without any need for modifying the location in which jobs are physically performed, consequently enlarging the drain on government revenues. To the extent researchers and policymakers have considered this, their focus has been on the reward which a dividend tax holiday would provide for past tax avoidance or as an inducement to future tax avoidance. However, as I argue in Chapter III, the 2004 DRD also provided an important short-run incentive for the round-tripping of domestic earnings via the shifting of income into low-tax foreign jurisdictions followed by immediate dividend repatriation so as to exploit the preferential terms of the DRD and escape the ordinary U.S. corporate tax base. Hence, the cost of such a tax holiday in terms of foregone revenues may be considerably larger than otherwise thought.

The purpose of this paper is to assess investors' valuations of the tax benefits expected to accrue to U.S. multinationals under a new dividend tax holiday by examining abnormal stock market returns around the January 28, 2009 announcement and February 3, 2009 Senate amendment rejection dates following the widely-used Fama and French (1993) event study methodology. In so doing, I aim to identify the extent to which U.S. multinational corporations were expected to benefit differentially from a new 85 percent DRD as a function of firm characteristics that have elsewhere been shown to facilitate income reallocation, such as intangible assets and proxies thereof,

thereby providing a measure of the reward to engaging in international tax avoidance as perceived by investors. Understanding the magnitude of the tax avoidance response has significant implications for the efficiency of international investment and the revenue cost to the U.S. government of not only a temporary tax holiday, but also of moving towards a territorial tax system more generally, wherein foreign-source income is entirely exempt from domestic taxation.

While consistent in many respects with predictions regarding investors' valuations of a renewed DRD, the results of the analysis are ultimately inconclusive as to the anticipated tax savings that such a policy would provide due to the widespread imprecision and occasional mutual inconsistencies in estimated effects. Among the stronger results, a one standard deviation increase in research and development expenses—assumed to be negatively correlated with profit shifting costs—is associated with an approximately $64 million increase (0.53 percent) in stock market capitalization on February 3 for the average multinational, largely through tax savings on reallocated earnings. However, the pattern of results on surrounding trading days makes it difficult to support the interpretation of this result as only reflecting investors' valuations of future tax avoidance opportunities afforded by the proposed DRD, unless stock market participants responded sluggishly to announcement of the amendment's rejection. In addition, investors appear to have punished firms with larger apparent direct savings from the temporary reduction in the repatriation tax (relative to repatriating the same income subject to ordinary U.S. rules), suggesting that they may have believed such income to be permanently reinvested abroad, as declared, but feared that firms would be tempted by the DRD to incur previously-unrecognized tax obligations and subsequently squander repatriated earnings on inferior domestic investment projects. Examination of investor responses over a longer horizon suggest that many of the apparent inconsistencies and overall weakness in the daily results may reflect information leakage prior to the identified event dates, such that these

may not have in fact induced major revisions to investor expectations.[2] A further possibility (and most optimistic from a tax policy perspective) is that the announcement and rejection of the Boxer-Ensign proposal were indeed salient events but that the scope for multinational tax avoidance in response to a temporary reduction in the repatriation tax is very limited, consistent with the results of Chapter III. The correct interpretation of the results presented herein may very well reflect a combination of these explanations.

The remainder of the paper proceeds as follows: Section 4.2 briefly describes the U.S. tax system as it applies to multinational corporations and summarizes the features of a DRD, Section 4.3 reviews the most relevant related literature, Section 4.4 develops the model of investor valuations with respect to a dividend tax holiday and the tax avoidance opportunities afforded therein, Section 4.5 characterizes the data used, Section 4.6 presents the empirical results, and Section 4.7 concludes.

4.2 U.S. Multinational Taxation

Under the United States' current residence-based tax system, U.S. multinational corporations are taxed on their worldwide income, regardless of its origin.[3] Most foreign-source earnings, however, are only taxed upon repatriation such that deferral of U.S. taxes may represent a profitable opportunity for firms operating overseas, thereby distorting the timing of repatriations.[4] In addition, U.S. multinationals may claim credits for income and withholding taxes paid to foreign governments in order to offset their domestic tax obligations on repatriated earnings. The resulting foreign tax credits may in turn be averaged across multiple foreign subsidiaries (subject to

[2]Though the 2009 fiscal stimulus package contained a variety of measures that might have affected stock market returns, there appears to have been little in the way of new information released on either January 28 or February 3 to confuse with effects of the DRD proposal.

[3]For a more complete description of the U.S. tax system as it applies to foreign-source income, see Chapter III or Desai, Foley and Hines (2001).

[4]Subpart F provisions stipulate that certain types of income be "deemed repatriated" in the period earned, thereby limiting incentives for locating all passive investments in zero-tax jurisdictions.

falling into the appropriate income "baskets") and applied against tax liabilities in past or future periods. Relative to a territorial tax system in which foreign-source earnings are entirely exempt from domestic taxation and are hence only subject to prevailing foreign tax rates, the U.S. tax system is intended to mitigate distortions to the location of international investment by domestic multinationals.

Just as the DRD provision under the American Jobs Creation Act of 2004 (AJCA) before it, the Boxer-Ensign dividend tax holiday proposal would have temporarily enabled U.S. multinationals to exclude 85 percent of the extraordinary dividends received from their controlled foreign corporations (i.e. majority-owned foreign subsidiaries) from domestic taxation.[5] Under ordinary period-t rules, U.S. tax liability per dollar of repatriated after-foreign-tax earnings (i.e. the "repatriation" tax, τ_r) is equal to the U.S. statutory corporate income tax rate, τ_c, minus the corresponding average foreign tax rate including all applicable income and withholding taxes, τ^*, on the grossed-up pre-tax dividend:

$$\tau_{rt} = \frac{\tau_c - \tau^*}{1 - \tau^*} \tag{4.1}$$

The practical consequence of the proposed DRD tax break would be to reduce the repatriation tax to 15 percent of its usual level, such that

$$\tau_{r,DRD} = (1 - 0.85)\frac{\tau_c - \tau^*}{1 - \tau^*} \tag{4.2}$$

for a net tax savings of

$$\Delta\tau_{r,DRD} = 0.85\frac{\tau_c - \tau^*}{1 - \tau^*} \tag{4.3}$$

[5]Extraordinary dividends under the AJCA were defined as dividends in excess of average remittances over the median three of the last five years leading up to the AJCA. At the upper end, maximum qualifying remittances were capped at the greater of $500 million or the quantity of earnings designated as being permanently reinvested abroad on the latest financial statement dated prior to June 30, 2003.

Dividends remitted by a tax haven subsidiary subject to zero percent taxation would therefore trigger a maximal U.S. repatriation tax of 5.25 percent under the DRD rather than 35 percent ordinarily. More generally, residual U.S. tax liability would be below 5.25 percent due to the availability of foreign tax credits earned on the non-deductible 15 percent portion of dividends paid.

By slashing the repatriation tax in this dramatic manner, the proposed DRD could be viewed as a short-term experiment with 85 percent territoriality, albeit with restrictions on permissible uses of repatriated funds.[6] Debate regarding a possible DRD therefore fundamentally revolves around the nature of the distortions to firm activity inherent to either worldwide or territorial tax systems. As presented, the Boxer-Ensign DRD proposal would have relieved the intertemporal misallocation of retained earnings by dramatically reducing the benefits of deferral in the period of the tax holiday. On the other hand, by reinforcing expectations that such tax holidays might become a recurring feature of U.S. tax policy, the proposed DRD would have strengthened incentives for allocating future earnings to relatively low-tax jurisdictions through either real foreign investment activity or income shifting and for leaving earnings accruing to such operations parked overseas in anticipation of another tax break. Consideration of these latter consequences ultimately led to the defeat of the Boxer-Ensign proposal but not before investors had an opportunity to assess the expected value to U.S. multinational corporations of a large temporary reduction in the repatriation tax. The focus of this paper is to quantify investors' valuations of the

[6]Under the AJCA, firms were required to have Board of Director-approved Domestic Reinvestment Plans specifying the types of projects to which repatriated earnings would be applied. Authorized expenses included hiring or training of U.S. staff, increased employee wages and benefits (excluding executive compensation), U.S. research and development, infrastructure or other capital investments, certain types of debt repayment, advertising or marketing, and acquisitions (including of foreign entities). Unauthorized uses of repatriated earnings included share repurchases, shareholder distributions, portfolio and other types of passive investments, and tax payments, among others (Redmiles, 2008). Due to the aforementioned concerns with regards to compliance, the 2009 Boxer-Ensign proposal would have limited the types of permissible expenditures while encouraging clean energy initiatives and would have furthermore mandated audits of firms' uses of funds within two years of firms electing to adopt the tax holiday.

perceived tax benefits from an 85 percent DRD—especially as they pertain to income reallocation—as information regarding large apparent changes in the probability of enactment of a new DRD became available.

4.3 Literature Review

The original dividend tax holiday "experiment" enacted under the AJCA has drawn extensive attention from academics and policymakers. Among the many studies written on its consequences and implications, two have applied an event study methodology, though neither with an eye to considering issues related to tax avoidance.[7] Oler, Shevlin and Wilson (2007) examine stock market responses cumulated over the twelve months leading up to the enactment of the AJCA in order to evaluate whether investors believe the permanently reinvested earnings designation frequently made by multinationals on their financial statements to avoid having to make provisions for future U.S. tax obligations on foreign-source income. The primary result to emerge from their work is that investors re-priced firms' deferred tax liabilities in anticipation of their repatriating the maximum permissible amount under the preferential terms of the AJCA, as if ordinary repatriation taxes had already previously been capitalized into stock prices. Increased stock market valuations for firms with low foreign effective tax rates thus suggest that investors do not believe permanently-reinvested designations as literally implying infinite horizons for foreign investment out of retained earnings.

Brennan (2008) instead focuses on a 20-day event window centered around the dates on which Congress passed the AJCA followed by its signing into law in an attempt to assess competing theories of capital markets by considering investors' val-

[7] Among papers to consider income shifting and multinational tax avoidance, only Collins, Kemsley and Lang (1998) has sought to exploit stock market valuations. However, their research is more about using investor responses to domestic versus foreign reported earnings as a diagnostic test for income shifting than as a means of quantifying the tax savings generated by firms' income shifting activity.

uations of a positive cash shock. In contrast to Oler, Shevlin and Wilson (2007), he finds that those firms which ultimately repatriated larger amounts relative to market value were disproportionately penalized by investors in this time period. Using supporting evidence on the primary uses for repatriated funds, Brennan (2008) interprets his results as investors punishing the anticipated squandering of repatriated earnings due to agency problems.[8]

A possible explanation for the observed discrepancy in results between Oler, Shevlin and Wilson (2007) and Brennan (2008) which does not require this latter interpretation owes to the differing event windows examined. If one takes seriously the point estimates in Oler, Shevlin and Wilson (2007) suggesting overcapitalization of the DRD tax savings in the twelve-month lead-up to the AJCA, then the negative stock market valuations observed by Brennan (2008) in October 2004 (though not in direct relation to the magnitude of potential tax savings) may simply reflect corrections to investors' valuations as clearer details of the AJCA became known. In principle, the analysis in this paper could also consider investors' perceived valuations of the reward for tax avoidance around the AJCA dates, but the wide disparity in event windows used by Oler, Shevlin and Wilson (2007) and Brennan (2008) and correspondingly different results highlights the difficulty in determining the appropriate dates to use in that context given the relatively lengthy period over which expectations of an impending dividend tax holiday may have evolved.[9] Careful selection of event dates in the present context is thus critical.

As described in Chapter III, indirect measures of the income reallocation response

[8]Brennan (2008) finds that among new expenditures, acquisition spending and executive compensation were among the most highly correlated with dividend remittances. This is difficult to reconcile with the results in Blouin and Krull (2009); Clemons and Kinney (2008); Dharmapala, Foley and Forbes (2010); and Graham, Hanlon and Shevlin (2010), each demonstrating that repatriated earnings were predominantly devoted to share repurchases and dividend payments. These latter uses of funds arguably do not reflect managerial capture.

[9]A first attempt to pass an 85 percent DRD failed in 2003 after the House rejected such a measure (despite having already passed the Senate by a 75-25 margin). It is therefore unclear when investors would have substantially revised their expectations with respect to the likely passage of the AJCA.

due to the AJCA indicate that up to one-sixth of total qualifying dividends identified in the data, or $32 billion, were financed out of newly-reallocated earnings. This estimate of short-term profit shifting lies near the bottom end of previous estimates in the literature, as summarized in Gravelle (2009), and well below the $180 billion of baseline shifted earnings estimated in Clausing (2009) for the year 2004. By contrast to this last result and with those of a wide range of additional statistical analyses of the cross-sectional responsiveness of reported earnings to foreign tax rates,[10] the relative weakness of the estimated AJCA round-tripping effect may in part be explained by the short-run versus long-run nature of the measured tax avoidance activity. In particular, although the incentives for round-tripping should have been exceptionally strong under the DRD, the limited duration of the tax holiday may have constrained firms in their ability to accelerate or intensify their transfer pricing or other methods of income reallocation. To the extent that this distinction affects the external validity of the measured income reallocation response, examination of stock market returns around the proposed renewal of a temporary DRD under IRC §965 holds promise for distinguishing the value of tax savings on accumulated shifted earnings from expected future savings over the short- and longer-term (assuming investors might begin to perceive dividend tax holidays as a recurring policy).

In addition to my own work in Chapter III, Markle (2010) offers a rare example of empirical research from which to infer the likely tax avoidance consequences of switching between worldwide and territorial tax systems. Contrasting firm-level reported pre-tax income as a function of the tax treatment of the multinational parent in their country of domicile, he finds that a one standard deviation increase in the tax incentive for outbound profit shifting (a composite tax term weighting shifting opportunities to all related parties, including the parent) is associated with territorial firms

[10]Studies of this sort include Grubert and Mutti (1991); Hines and Rice (1994); Klassen and Shackelford (1998); Bartelsman and Beetsma (2003); or Mintz and Smart (2004). Translated to a common basis, de Mooij (2005) identifies an average semi-elasticity across all five of these studies of -2.0.

reporting roughly 7.5 percent lower pre-tax earnings in 2006, equal to $176,000 for the average firm. This corresponds to a substantially greater degree of tax avoidance among multinationals subject to territorial taxation, although obtaining an estimate of aggregate tax avoidance and revenue losses due to territorial versus worldwide taxation is complicated by the measure of income shifting incentives used given its symmetric treatment of profit reallocation between all related parties.

From a domestic policy perspective, profit reallocation among foreign subsidiaries is likely to be of less interest than that between such subsidiaries and their domestic parent. Neither Markle (2010) nor the proposed event study approach that follows are capable of precisely distinguishing among both types of income reallocation. However, the event study does not presume the reallocation of parent profits into low-tax foreign jurisdictions to be valued in the same manner as intra-affiliate income shifting[11] and moreover places a special emphasis on the role played by the domestic tax rate as a determinant of the tax savings resulting from DRD-induced tax avoidance. Hence the reward to tax avoidance implied by fluctuations in investor valuations around the time of the DRD proposal may more accurately and directly capture the magnitude of the policy-relevant round-tripping response.

4.4 Investor Valuations

Assuming efficient markets and that the domestic reinvestment requirement under the 2009 Boxer-Ensign DRD proposal would have been non-binding,[12] the value of a firm prior to the implementation of a new dividend tax holiday should be fully

[11]These may in concept be valued very differently by investors, if for instance, transfer pricing arrangements involving the U.S. parent are subject to greater scrutiny from the tax authority than those among indirectly-held foreign subsidiaries.

[12]Despite the addition of a mandatory audit clause to the 2009 version of the DRD, firms would not have been constrained to complete their reinvestment projects within any specified time frame. Thus, it is not clear from the language of the proposed Senate amendment—not surprisingly given the fungibility of money—that firms would have found themselves any more restricted in their capital expenditures than under the AJCA.

captured by the expression

$$V_{-1} = E_0[\Pi] + \rho_{-1} E_0[\Pi_{DRD}] \tag{4.4}$$

where ρ_{-1} denotes the probability that a temporary 85 percent DRD would be enacted in the next period, $t = 0$, and $E_0[\Pi_{DRD}]$ is the expected present value of the corresponding tax savings. $E_0[\Pi]$ is the expected present value of after-tax earnings holding the tax treatment of foreign-source income unchanged. Absent prospects for future tax avoidance, $E_0[\Pi_{DRD}]$ is bounded from below by zero and from above by the maximum qualifying dividend amount prescribed by law (i.e. the greater of $500 million or permanently reinvested earnings as reported on the latest financial statement dated prior to June 30, 2009) multiplied by the reduction in the repatriation tax in (4.3), minus any costs associated with financing repatriations. Beyond this, even larger savings are feasible if a DRD renewal were interpreted as a signal of future reductions in repatriation taxes and hence incentives for future tax avoidance.[13]

Upon the unexpected enactment of a tax holiday, the value of the firm should adjust nearly instantaneously, such that

$$\Delta V = \Delta\rho E_0[\Pi_{DRD}] \tag{4.5}$$

Proper interpretation of the coefficients from an empirical model of firm valuation requires market reactions to events which radically alter investor uncertainty (e.g. $|\Delta\rho| \approx 1$). Otherwise, any estimates will confound changes in firm valuations with unknown changes in investors' probabilistic assessments of the likelihood of a policy change. The rejection of the DRD amendment on February 3, 2009 therefore likely

[13]It is also conceivable that investors might have perceived a second DRD as a substitute for adopting a territorial tax system as part of fundamental tax reform. If so, the value of the future tax avoidance opportunities afforded under a DRD is more uncertain, especially if firms are unequal in their ability to defer repatriation under the current system and thereby stand to benefit differentially from recurring dividend tax holidays versus a permanent exemption for foreign-source earnings.

constitutes the cleaner event from which to draw conclusions about the benefits of international income reallocation (rather than the announcement of the amendment's planned inclusion on January 28, 2009 which may have only partially reduced investor uncertainty).[14]

With $\Delta\rho \approx 1$, $E_t[\Pi_{DRD}] \approx \Delta V_t^i$ can be estimated by calculating the abnormal stock market return AR_t^i for firm i in period t as the deviation from the risk-adjusted return predicted by the Fama/French three-factor model.[15] Under this approach, predicted returns are obtained in a first step by estimating a separate regression for each firm i of the observed daily return, r_t^i, calculated as the percent change in total stock market capitalization net of the risk-free rate (i.e. the one-month Treasury bill rate), on three daily stock market factors over the pre-event period, chosen here to be the set of all trading days between January 1, 2007 and December 31, 2008:

$$r_t^i = \alpha^i + \beta_1^i MKT_t + \beta_2^i SMB_t + \beta_3^i HML_t + \epsilon_t^i \tag{4.6}$$

MKT represents an overall value-weighted market return on all NYSE, NASDAQ, and AMEX stocks net of the risk-free rate, SMB is a factor related to firm size calculated as the difference between the average return on three small-cap portfolios (value, neutral, and growth) and the average return on three large-cap portfolios, and HML is a factor related to book-to-market ratios calculated as the difference between the average return on two value portfolios versus two growth portfolios. Firm-specific coefficient estimates from this first step are subsequently used to compute

[14]Rejection is by no means definitive, however, as seen by the failure of a first DRD proposal to make it through the House in the year prior to implementation of the AJCA. Hence, neither the January 28 nor the February 3 event likely implied full resolution of market uncertainty, and this will be reflected in coefficient estimates of smaller magnitude than would result from $\Delta\rho \in \{-1, 1\}$. This is an important consideration when examining results in Section 4.6.

[15]MacKinlay (1997) offers a good review of differing event study methodologies. Since its writing, the literature appears to have converged on two primary stock return models: the Fama/French model, which performs well in terms of model fit but lacks economic foundations, and the single factor market model derived from capital asset pricing theory (i.e. CAPM). Examples of both methodologies and comparisons of their associated results can be found, for instance, in Auerbach and Hassett (2005); Brennan (2008); or Friedman (2009).

out-of-sample predicted returns over the relevant event window on the basis of the contemporaneous values of the three Fama/French market factors and compared with the observed returns to obtain a measure of estimated abnormal returns:

$$\begin{aligned} \hat{AR}_t^i &= r_t^i - \hat{r}_t^i \\ &= r_t^i - (\hat{\alpha}^i + \hat{\beta}_1^i MKT_t + \hat{\beta}_2^i SMB_t + \hat{\beta}_3^i HML_t) \end{aligned}$$

Of special interest to this paper is the relationship between abnormal stock returns and firm characteristics associated with expenses related to reallocating domestic corporate profits abroad for the purpose of avoiding the U.S. corporate income tax in favor of the exceptional repatriation tax. Consistent with intuition, the two-period model in Chapter III of foreign investment with a discontinuous repatriation tax shows that (1) the decision of whether or not to exploit the dividend tax holiday depends on the attractiveness of deferral in relation to the tax savings from the up-front reduction in tax cost of remitting foreign earnings, and (2) income reallocation should always proceed until its marginal benefit is just equal to its marginal cost. The value of deferral in turn depends upon relative rates of return at home versus abroad and the duration of the investment horizon, while the marginal cost of profit reallocation is likely to reflect firm-specific characteristics related to the ease with which transfer prices on related-party transactions may be manipulated without drawing scrutiny from the tax authority. In addition, the opportunity cost of foregone earnings resulting from distorted capital allocations ought to further influence income reallocation behavior, much as capital adjustment costs (i.e. the cost of financing remittances) should affect the level of desired dividend payments.

Under a DRD, the net benefit from shifting U.S. earnings into a low-tax foreign country is expanded as a result of creating an opportunity for round-tripping, whereby income earned domestically may be reported as being earned abroad and immediately

repatriated. Each dollar round-tripped in this manner thus avoids the domestic corporate tax and saves 85 percent of the difference between the U.S. corporate tax rate and the foreign tax rate (corporate income and withholding taxes combined, where applicable): $0.85(\tau_c - \tau^*)$, henceforth TS. In contrast to the usual scenario, income shifting coupled with immediate repatriation does not distort the location of retained earnings, such that the only costs associated with round-tripping are those related to the direct manipulation of reported profits (e.g. legal and other professional fees, the cost of establishing physical structures for routing earnings, etc.). To the extent that firms might expect dividend tax holidays to become routine occurrences following the passage of a second DRD, then this would furthermore modify profit shifting activity over the longer-term as a consequence of lowering the effective opportunity cost of retaining earnings in otherwise suboptimal locations.

Reflecting these considerations, changes in firms' stock market valuations due to the proposal and subsequent rejection of the Boxer-Ensign DRD amendment can be decomposed into two sources of tax savings. The first source of savings (assuming firms do not literally intend to leave their earnings indefinitely reinvested overseas) is roughly captured by the product of the temporary reduction in repatriation tax that would occur and the amount of previously-taxed foreign income eligible for repatriation:[16] $0.85\frac{\tau_c - \tau^*}{1-\tau^*} PRE = TS\frac{PRE}{1-\tau^*}$. As acknowledged in some Senators' critiques of the Boxer-Ensign DRD proposal, these savings may in part constitute a reward for past tax avoidance. The second source of savings that might be expected to accrue from a renewed DRD arise directly from the short-term round-tripping opportunities afforded by such a provision, plus savings from longer-term ongoing profit reallocation and real investment performed with the expectation of being able to exploit another such tax holiday in the future. The empirical analysis that follows in Section 4.6 at-

[16] An even more accurate characterization would take into consideration the expected investment horizon for earnings designated as indefinitely reinvested abroad. Absent any such information, this measure assumes that permanently reinvested earnings, PRE, would be repatriated immediately, even if not for the tax holiday.

tempts to separate both sources of tax savings from a DRD, with a special emphasis on investors' valuations of the second.

4.5 Data

In order to assess the relationship between abnormal stock market returns around the time of the proposed DRD renewal and firm characteristics, consolidated balance sheet and income statement data for the universe of publicly-listed U.S. firms for the period 2004-2008 are drawn from Compustat's Fundamentals Annual database and are merged with financial market information from the Center for Research in Security Prices (CRSP) Daily Stock File spanning the period January 1, 2006 - December 31, 2009. Daily Fama/French factors for the overall U.S. stock market along with the one-month Treasury bill rate (i.e. the risk-free rate) for the corresponding date range are obtained directly from Kenneth French's webpage.

Firms whose stocks were delisted due to acquisition or merger or whose price ever fell to $0 at any point over this time period are excluded from the sample, as are any other firms without complete stock price and market capitalization information on every single trading day over the historical returns estimation window. These data are further complemented with hand-collected information gleaned from the SEC 10-K filings of 1398 U.S. multinational corporations on their 2004-2006 remittance behavior with respect to the AJCA dividend tax holiday as well 2006-2008 permanently reinvested earnings data for a separate sample of 841 U.S. multinationals, courtesy of Michelle Hanlon. Merged together, the data collectively cover 2069 domestic firms and 1762 multinationals, of which 629 are found to have made explicit mention of their AJCA remittance plans, 610 have known reported permanently reinvested earnings amounts for at least one fiscal year over the period 2006-2008, and 415 have both. An additional 347 firms failed to make any mention of the AJCA DRD provision as documented by a search of their 10-K filings for fiscal years 2004-2007. Given the

mandatory nature of these statements, these firms may be assumed to have made zero remittances under the tax holiday. Of these, 80 firms have known amounts of earnings designated as indefinitely reinvested abroad. The hand-collected data thus account for a total of $900 billion in permanently reinvested earnings by the end of fiscal 2008 which firms would have been eligible to repatriate under a tax holiday and $250 billion in qualifying AJCA dividend remittances across 275 repatriating multinationals—roughly 80 percent of the amount identified from tax return data following the previous DRD.

Descriptive statistics are presented in Table 4.1 and reveal the sample of multinational corporations, on average, to be significantly larger in terms of absolute dollar figures than their domestic counterparts in virtually every dimension. Only dollar-valued cash holdings, domestic pre-tax income, or total assets do not differ in a statistically-significant manner across both groups of firms. Controlling for market capitalization as of January 2, however, multinationals are in fact significantly smaller than their domestic counterparts in terms of intangible assets ($INTAN$) and advertising expenses (ADV) and are statistically indistinguishable in terms of their R&D expenditures ($R\&D$). Likewise, average domestic rates of return on assets ($DROA$) do not appear statistically different across both groups of firms. Mean and median tax savings rates on round-tripped earnings—naturally only available for multinationals—are similar at just under $0.10 per dollar of domestic income shifted abroad for immediate repatriation.

Figure 4.1 depicts average abnormal returns around the January 28 and February 3 event dates for domestic and multinational firms.[17] As shown, abnormal returns for domestic and multinational corporations tended to move in opposite directions over the period of interest, with domestic firms experiencing initially more positive

[17]Financial sector firms (i.e. NAICS 3-digit industry codes 522-525), of which many of the largest are categorized as domestic-only, are excluded from the calculation so as to avoid capturing the confounding effects of a January 28 pronouncement by the U.S. Treasury Department with regards to its intentions in dealing with banks' toxic assets.

abnormal returns following announcement of Senator Boxer and Senator Ensign's decision to propose a new DRD amendment and subsequently more negative abnormal returns following the amendment's rejection. In contrast, the same comparison involving market capitalization-weighted abnormal returns using January 2, 2009 capitalization data (Figure 4.2) indicates that positive abnormal returns for multinational corporations instead tended to exceed those of domestic firms in the period immediately surrounding the announcement of the DRD proposal as well as following the amendment's rejection. Notably, the swings in abnormal returns observed over the event window in either figure are not dramatically larger than those further away from the event dates, and moreover, it also appears that abnormal returns across domestic and multinational firms begin to track very closely at one week in either direction from the event window. This suggests that the investor response to the Boxer-Ensign proposal may have spanned a much wider number of trading days than the January 28-February 3 period, with information arriving as early as one week before the January 28 announcement date and producing persistent effects in the aftermath of the proposal's rejection.

An even more nuanced picture appears where domestic firms and multinationals are further grouped by domestic pre-tax income percentile in order to avoid confounding multinational status with firm size effects, as shown in Figure 4.3. Among firms in the most profitable third of the domestic income distribution, the pattern is much as described for the overall difference in weighted-average returns for multinationals versus domestic firms, albeit somewhat muted. Most striking is the wide deviation in abnormal returns immediately following rejection of the DRD among firms falling in the middle tier of the domestic earnings distribution, with weighted-average abnormal returns rising sharply among multinationals and falling sharply among domestic firms. Thus, it appears from these simple graphical representations that investors did not dramatically bid up the stock prices of multinationals relative to domestic firms of

similar size around the time of the Boxer-Ensign DRD proposal. If anything, investors rather tended to bid up stocks of multinationals in a disproportionate manner following *rejection* of the proposal, though less so among those that were the least profitable domestically.[18] A more rigorous empirical approach is necessary for understanding why this might be or what important relationships between firm characteristics and abnormal returns this might mask.

4.6 Empirical Methods and Results

In order to identify the perceived benefits to shareholders from an acceleration of income reallocation activity, the estimation strategy in this paper emphasizes the interaction effects between the measure of taxes avoided per dollar round-tripped and firm characteristics related to income shifting ability. It is commonly asserted that ownership of intangible assets reduces the cost of transfer pricing, whereby firms are able to reallocate income by minimizing related-party transaction prices in one direction and maximizing related-party transaction prices in the other (relative to the arm's length prices that would otherwise prevail). This is due to the fact that whenever transactions involve "goods" with a substantial intangible or intellectual property component–such as patented or trademarked products that are unlikely to ever be traded between unrelated parties–the arm's length criterion that tax enforcement agencies use to distinguish legitimate versus illegitimate practices may be very difficult or even impossible to apply. Building on evidence consistent with this assertion (see e.g. Grubert and Slemrod (1998) or Harris et al. (1993)), the full empirical model that follows includes measures of intangible assets, R&D expenditures, and advertising spending alone and interacted with TS, the notion being that the mechanism

[18]This latter set of firms could in concept include firms that are outright small (e.g. in terms of sales or operating revenues), firms that are large but unprofitable (e.g. due to high costs), or large profitable multinationals that are able to skillfully allocate income to low-tax foreign countries, either through physical investment or through transfer pricing and other profit shifting mechanisms.

whereby these measures impact abnormal returns—conditional on a given tax savings rate—must reflect investor valuations of firms' differential tax avoidance abilities.

Prior to turning to this full empirical model, a more rudimentary specification is considered, wherein intangible asset holdings (scaled by January 2, 2009 stock market capitalization), $INTAN$, serves as the only proxy for transfer pricing costs.

$$AR_t^i = \gamma_0 + \gamma_1 I[MNC^i] + \gamma_2 TS^i + \gamma_3 TS^i \cdot INTAN^i + \gamma_4 INTAN^i + \epsilon_t^i \qquad (4.7)$$

Beyond the primary regressors of interest TS and $TS \cdot INTAN$, the tax savings rate on round-tripped earnings and its interaction with firm intangible assets, the only additional covariates include a binary indicator for whether a firm is a multinational, $I[MNC]$, and the level of intangible assets entered independently. This specification is estimated separately for each business day over the period January 27-February 4 using data for all domestic and multinational firms with abnormal returns calculated as described in Section 4.4 falling within the 5^{th} through 95^{th} percentiles, the results of which appear in Table 4.2.[19]

As shown on the basis of this basic specification, investors appeared to take a relatively negative view of the anticipated value of a renewed DRD. Consistent with the main features of the graphical evidence on average abnormal returns, multinational status conditional on additional covariates is associated with relatively lower returns from the time of the DRD proposal through rejection, and subsequently higher returns on February 4, the first trading day following the Senate vote. Taken at face value, this would seem to imply concern on the part of investors that a DRD would

[19] Winsorizing the sample in this manner, as is commonly done (see e.g. Friedman (2009)), reduces the influence of outliers in the estimated abnormal returns distribution. These may include firms having just released exceptional earnings statements or having otherwise been affected by unusual market events. In this context, the stock market response on January 28 and January 29 to developments in the bank bailout is an important confounding factor which is largely eliminated through censoring of extreme observations (as well as the direct exclusion of financial sector firms). A small number of firms may also have been affected by the failure of a $25 billion highway spending bill on February 3.

have disadvantaged multinationals relative to domestic firms conditional on other firm characteristics being equal, including DRD tax savings (necessarily zero for all domestic firms). Unlike the unconditional graphical evidence, this result with respect to the geographic scope of firm operations is less surprising if one imagines multinationals unable to benefit from a dividend tax holiday (i.e. subject to high foreign tax rates) as being more heavily disadvantaged by a DRD vis-à-vis their low-tax multinational competitors than domestic firms.

Beyond multinational status, the effect of the tax savings rate on round-tripped earnings interacted with intangible assets is negative and statistically-significant on both event dates and positive—though less than offsetting—on January 30. Alone, the tax savings rate is associated in a statistically-significant manner with positive abnormal returns on January 28 and again on February 4, after rejection of the DRD proposal, while February 2 returns are negatively affected and fully erase January 28 gains. It therefore appears that if anything, the DRD proposal was viewed as likely to *reduce* shareholder value, especially for those firms more heavily reliant on intangible assets that might have the ability to avoid taxes more effectively, such that *rejection* of the DRD proposal was seen as relatively beneficial to such firms. Given the omission of controls for permanently reinvested earnings and associated direct tax savings, investor responses to variation in TS under this basic specification may reflect all sources of savings from a DRD, not merely round-tripping. Consequently, the general pattern of results could reflect the perception that on balance, the short-term tax savings from round-tripping might be relatively less valuable to firms with otherwise greater flexibility in exploiting deferral and avoiding taxes on an ongoing basis, particularly if investors were wary of such firms incurring larger previously-unrecognized tax expenses on the repatriation of indefinitely reinvested foreign earnings.[20]

[20]Graham, Hanlon and Shevlin (2011) document evidence of this latter concern in a general context as well as in the specific context of the AJCA and find accounting effects of this nature to

Verifying this interpretation requires the introduction of additional covariates into a further intermediate specification to better reflect the sorts of general determinants of the attractiveness of a renewed DRD, such as rates of return and terms related to investment horizon and non-tax repatriation costs discussed briefly in Section 4.4. Continuing to focus on the single proxy for transfer pricing costs without additional controls for R&D or advertising expenses while reserving the introduction of permanently reinvested earnings for a later specification, the resulting estimating equation takes the following form:

$$AR_t^i = \gamma_0 + \gamma_1 I[MNC^i] + \gamma_2 TS^i + \gamma_3 TS^i \cdot INTAN^i + \gamma_4 CASH^i \tag{4.8}$$
$$+ \gamma_5 INTAN^i + \gamma_6 DROA^i + \gamma_7 FROA^i + \gamma_8 I[AJCA^i] + \gamma_9 AJCA\_Div^i + \epsilon_t^i$$

Here, the cost of financing repatriations via alternative channels is partially accounted for by the inclusion of a measure of cash and short-term investments, $CASH$, under the premise that highly liquid assets should provide a virtually costless source of remittances (e.g., relative to borrowing or profit shifting).[21] Moreover, multinationals with disproportionately large cash holdings may have amassed such assets precisely as a response to an ordinarily-burdensome repatriation tax and may therefore be most inclined to implement a DRD.[22] $DROA$, the domestic return on assets, and $FROA$, its foreign counterpart, are equal to pre-tax domestic (foreign) income earned per dollar of consolidated assets. Both terms together are intended to capture the rate-of-return tradeoff inherent to any decision affecting the location of multinational capital and may differ precisely because of investment distortions due to the repatriation tax.

have as much influence over multinational repatriation and FDI behavior as real cash taxes.

[21] Separate reporting of domestic and foreign cash and non-cash assets in firms' financial statements would prove tremendously valuable for the purposes of this paper, as would information on firms' short-term borrowing costs. Alas, publicly-available data of this nature do not exist, such that estimation must be performed with imperfect measures of the desired terms.

[22] Foley et al. (2007) document this effect of the U.S. tax system whereby the repatriation tax leads to earnings being trapped abroad and held as cash or other short-term investments.

Finally, an indicator for whether a firm exploited the previous tax holiday under the AJCA, $I[AJCA]$, as well as the quantity of qualifying dividends paid, $AJCA\_Div$, speak in part to the issue of investment horizon. Multinationals that made extensive use of the AJCA may generally have shorter-term foreign investment objectives and therefore less to gain from deferral. In the alternative, they may also have smaller (or larger) quantities of earnings available to repatriate under a second holiday (e.g. depending on whether firms exhausted their accumulated foreign earnings under the AJCA or ramped up their accumulation thereof in anticipation of another DRD). All regressors are based upon the latest available data from fiscal years 2006-2008, while all terms measured in dollars—as in the previous specification—are scaled by the firm's stock market capitalization as of January 2, 2009 to account for variation in firm size (i.e. $INTAN$, $CASH$, and $AJCA\_Div$).

Table 4.3 presents results corresponding to specification (4.8) estimated analogously to those in Table 4.2. The effect of multinational status is nearly identical to that which is estimated in the more parsimonious specification, but the tax savings effects differ in important ways, suggesting that the omission of key determinants of the desirability of a DRD may have produced misleading estimates under the first specification. Controlling for foreign and domestic rates of return and other such determinants, the tax savings rate on round-tripped earnings, TS, is associated with a relatively strong positive effect on abnormal stock returns on January 28 and again on February 3, possibly the most salient days for investor speculation as to the likelihood of DRD enactment and its resulting effects. A one standard deviation increase in TS of \$0.085 thus produces an approximate 20 basis point increase in stock returns on both days relative to the predictions of the Fama/French three factor model. In addition, in its interaction with intangible asset holdings, $TS \cdot INTAN$, there is less statistical evidence of negative effects on stock returns leading up the Senate vote on the Boxer-Ensign DRD proposal (though there is also no strong evidence

to suggest on the contrary that investors perceived a DRD to provide greater net benefits to more intangible-intensive firms subject to lower repatriation taxes as one might expect if round-tripping and future tax avoidance were believed to be an important source of DRD savings.)[23] Though a statistically-significant positive effect of $TS \cdot INTAN$ on the level of abnormal returns is observed on January 30, this is preceded on January 28 by a negative effect of equal magnitude and additional negative point estimates in the days leading up to February 3. Independently, intangible asset ownership, $INTAN$, has a rather more positive influence on stock returns in the immediate run-up to the Senate vote, with a reversal occurring on February 4. Altogether, it thus seems plausible that investors were rather more optimistic about the tax benefits from a possible DRD renewal than implied by the results of the first rudimentary specification, albeit without placing much weight on the tax avoidance channel.

Returns on assets at home ($DROA$) and abroad ($FROA$) themselves do not generally affect investor valuations in a statistically-significant manner, with the primary exception being that firms with higher domestic rates of return experienced relatively lower abnormal returns on February 3. More broadly, the overall thrust of the point estimates implies a persistent negative effect of $DROA$ and positive effect of $FROA$ over the event window. This pattern is inconsistent with the prediction of the model of foreign investment in Chapter III that is again briefly described in Section 4.4, whereby the dividend repatriation decision in response to a temporary reduction in the repatriation tax depends fundamentally on expected rates of return at home and abroad and hence the present-value benefits of deferral. In the context of the proposed DRD, firms with relatively greater domestic investment opportunities (i.e. higher $DROA$) should have found a DRD more attractive in the short term while

[23] As in the previous specification, this also implicitly tests the claim that the importance of intangible asset ownership is negatively correlated with tax avoidance costs through the facilitation of transfer pricing or other profit reallocation mechanisms.

firms with relatively greater foreign investment opportunities (i.e. higher $FROA$), less so. To the extent that rejection of the Boxer-Ensign proposal on the evening of February 3 produced a downward revision in investor expectations for an impending reduction in the repatriation tax, the February 3 $DROA$ effect (and those of the preceding days) should have been positive, with the reverse holding for the $FROA$ effect.

It is worth noting, however, that these predictions are all premised on marginal rates of return on parent and subsidiary-specific asset holdings, whereas the data only permit calculation of average rates of return on consolidated multinational assets. The observed results therefore need not contradict the theory, if for example, multinationals with relatively low domestic earnings also hold disproportionately few assets, such that larger measures of $DROA$ in the empirical analysis actually mask lower domestic rates of return, and vice versa. Framed in this manner, $DROA$ and $FROA$ may be more accurately characterized as capturing the proportion of total earnings from domestic versus foreign operations, in which case greater foreign earnings might not surprisingly be viewed as a positive determinant of expected DRD tax savings.

Moreover, firms having previously taken advantage of the AJCA dividend tax holiday, (i.e. $I[AJCA] = 1$) are generally rewarded by the market in the lead-up to Senate discussion of its renewal, with larger prior DRD remittances, $AJCA\_Div$, contributing positively to abnormal stock returns before February 3 while depressing returns in a nearly offsetting manner on February 4. The absence of a similar negative effect from the binary AJCA repatriation indicator on February 4 constitutes somewhat of a puzzle if investors were in fact responding to news involving rejection of the DRD proposal and is difficult to interpret as an investment horizon effect. Nevertheless, the overall results from estimation of specification (4.8) lend support to the most basic predictions regarding investor valuations of the proposed DRD if not

to the question of primary interest: namely, the anticipated tax savings from the tax avoidance opportunities afforded by the proposed policy.

A clearer answer to this question is sought through estimation of the final complete empirical model presented below which augments the last specification with a measure of tax savings on accumulated permanently reinvested earnings (grossed-up to a pre- foreign tax amount for the latest reported figure) in order to measure investors' valuations of the direct benefits from a DRD along with additional proxies for income shifting costs and industry fixed effects.[24]

$$\begin{aligned} AR_t^i = {} & \gamma_0 + \gamma_1 I[MNC^i] + \gamma_2 TS^i + \gamma_3 TS^i \cdot \frac{PRE^i}{1-\tau^*} + \gamma_4 PRE^i \\ & + \gamma_5 NONPRE\_CASH^i + \gamma_6 TS^i \cdot INTAN^i + \gamma_7 INTAN^i \\ & + \gamma_8 TS^i \cdot R\&D^i + \gamma_9 R\&D^i + \gamma_{10} TS^i \cdot ADV^i + \gamma_{11} ADV^i + \gamma_{12} DROA^i \\ & + \gamma_{13} FROA^i + \gamma_{14} I[AJCA^i] + \gamma_{15} AJCA\_Div^i + \delta \mathbf{NAICS^i} + \epsilon_t^i \end{aligned} \tag{4.9}$$

As previously-discussed, the inclusion of R&D expenses, $R\&D$, and advertising spending, ADV, alone and interacted with the round-tripping tax savings rate is intended to capture further possible variation in firm-specific tax avoidance opportunities. Both measures are assumed to be equal to zero wherever data are missing, as is conventional. In addition, the full model also replaces the $CASH$ control with a comparable measure of cash and short-term investments net of permanently reinvested earnings, $NONPRE\_CASH$, to better reflect the role of liquidity constraints in funding repatriations, and all terms measured in dollars are yet again scaled by January 2, 2009 market capitalization.

The full set of results from estimation of (4.9) for the sample of winsorized abnormal returns for the period January 27-February 4 are shown in Table 4.4, many

[24]Inclusion of permanently reinvested earnings into the model constrains the sample of multinationals that may be analyzed due to the lack of such information in any publicly-available dataset. Differences in results across estimating equations are therefore due to differences in model specifications as well as in samples analyzed.

of which mirror those of Table 4.3. The most prominent feature to emerge from these results is now the absence of any clear statistically-significant effect of the tax savings rate on round-tripped earnings, TS, coupled with the important negative influence of tax savings attributable to previously-declared permanently reinvested earnings amounts, $\frac{TS}{1-\tau^*} \cdot PRE$, in the period leading up to rejection of the proposed DRD amendment. A possible interpretation of this result, consistent with the aforementioned accounting effects and Brennan (2008), is that investors believed firms' permanently reinvested earnings designations at the time they were reported and consequently failed to capitalize any associated deferred tax charges, assuming these to be zero. Upon learning of a possible DRD, however, investors may have recognized the additional tax liability—reduced due to the tax holiday but nonetheless positive—on earnings which firms would be tempted to remit in pursuit of potentially inferior reinvestment projects.

Table 4.4 furthermore highlights the role of intangible assets, R&D, and advertising expenses in modulating investor responses to the Boxer-Ensign DRD proposal through their postulated effect on income shifting costs. The reward to international tax avoidance in the context of (4.9) is determined by the contribution of each of these proxies interacted with the round-tripping tax savings rate to the observed abnormal returns above and beyond the pure tax effect per dollar of earnings repatriated out of permanently reinvested earnings (however legitimately-accumulated abroad). Unless investors responded sluggishly to the DRD rejection—in which case February 4 abnormal returns may not have captured the full reaction to the Senate decision—the results with respect to these interactions constitute another puzzle, thereby complicating the formulation of a single consistent interpretation. In particular, $TS \cdot INTAN$ is found to have a statistically significant positive effect on abnormal stock returns both before and after rejection of the DRD amendment, while $TS \cdot ADV$ similarly has a negative effect on market returns on either side of the February 3 Senate decision.

In both cases, rejection of the Boxer-Ensign proposal should have induced a sign reversal in these effects around the event date, contrary to what is observed. It is thus unclear whether advertising expenses are negatively correlated with income shifting costs, such that the large negative effect on February 4 abnormal returns is consistent with a model of investors valuing firms' tax avoidance opportunities—in which case a similar negative effect on February 2 prior to DRD rejection is contradictory—or whether firms with greater advertising expenses in fact face higher costs of shifting income, contrary to the literature. Likewise, if the large positive impact on January 30 abnormal returns from $TS \cdot INTAN$ accurately captures investors' valuation of prospective tax savings through future income reallocation, the positive effect implied by the February 4 results is unexpected (although small and only marginally significant). Only $TS \cdot R\&D$ yields a consistent positive effect on abnormal returns leading up to the February 3 decision, but the absence of an offsetting negative effect on February 4 is again difficult to reconcile with the earlier detected effects truly being responses to the DRD proposal.

Taking individual point estimates seriously nonetheless, the coefficients on $TS \cdot R\&D$ and $R\&D$ for the February 3 regression collectively imply that a one standard deviation increase in R&D expenditures scaled by market capitalization would yield a $(0.207)(0.4) = 0.08$ percent increase in abnormal returns through the direct effect of $R\&D$ for the average multinational in the sample along with an additional $(0.207)(23.287)(0.093) = 0.45$ percent increase in abnormal returns due to the R&D tax savings interaction. Translated into dollar terms, this represents an increase in market valuation of nearly \$64 million, the bulk of which (\$54 million) might be attributed to the perceived benefits of the tax avoidance opportunities afforded by a renewed DRD. Viewed differently, each of the tax coefficient estimates for February 3 together imply that a one standard deviation increase in TS of \$0.085 for the average

firm would lead to a 0.08 percent net increase in abnormal returns,[25] or a $10 million increase in market value due to the DRD, with a -$12 million contribution from the expected cost of repatriation taxes on earnings previously declared to be indefinitely reinvested abroad.

Given the ambiguity of the overall results, especially with respect to the mutually-inconsistent effects measured around the February 3 event date and broad lack of statistical precision, these last numbers are best viewed as illustrative rather than as definitive estimates of investor valuations of total tax savings accruing to firms from a proposed DRD. Indeed, results for the first trading day following rejection of the DRD proposal taken at face value would imply a further *increase* in market valuation of nearly $6 million for the average firm. It thus appears that with the possible exception of the R&D tax savings interaction in the full specification, the estimated coefficients in Tables 4.3 and 4.4 may represent more slowly-evolving investor responses to the proposed tax holiday (and hence weaker effects when measured at a daily frequency) than one might expect efficient markets to deliver. If so, this introduces the additional complication that the measured effects on abnormal returns may be capturing investor responses to market information separate from the dividend tax holiday as the event horizon lengthens.

Examination of the effects of firm characteristics on cumulative abnormal returns partially addresses these concerns and yields additional insights into the perceived benefits of a DRD renewal. In part, it appears that information leakage may have played a more important role than news stories would suggest, thereby confirming the abovementioned possible explanation for the absence of stronger effects on daily returns immediately surrounding the key event dates. Tables 4.5 and 4.6 present results corresponding to estimation of specifications (4.8) and (4.9) with the intermediate and complete complement of regressors, respectively, where the dependent

[25] $(0.085)\left[-0.853+(-3.323)\frac{0.26}{1-0.24}+(2.608)(0.416)+(23.287)(0.067)+(14.654)(0.023)\right]=0.08$

variable is measured as the running sum of abnormal daily returns since January 20, 2009.[26] Looking at these cumulative returns over the four trading weeks centered around January 28-February 3, it is fairly clear that the event dates constitute break points for trends in investor behavior with respect to firm characteristics presumed to be associated with the benefits of a DRD, some of which begin well before January 28.

For example, the negative effect of multinational status on stock returns first manifests itself in a statistically-significant manner on January 26 or 27 (depending on specification) and gradually increases in magnitude until reaching its peak on February 3.[27] Prior qualifying AJCA remittance amounts, meanwhile, exert a virtually immediate positive influence on cumulative returns which also peaks on February 3 under the intermediate specification and thereafter becomes statistically-insignificant. Offsetting this effect is a likewise-immediate and subsequently-persistent negative effect of the extensive margin AJCA repatriation decision whose maximal impact occurs just prior to rejection of the DRD proposal, suggesting a curiously non-linear overall effect of past repatriation behavior which may reflect the tension between firms having already exhausted most DRD benefits versus having responded to the AJCA as an inducement for accelerated accumulation of foreign earnings.

Under both specifications, the intangible assets tax savings interaction is associated with a large positive and significant effect on cumulative abnormal returns beginning immediately on January 20 and gradually increasing before turning statistically-insignificant and diminishing markedly in the week following the Senate vote. At the same time, a greater tax savings rate on round-tripped earnings, TS, initially depresses stock returns in the lead-up to the announcement of the Boxer-Ensign pro-

[26]The rationale for winsorizing is weakened in this context thanks to the smoothing of abnormal returns over time and would moreover drastically restrict the size of the sample available for estimation on later dates. No censoring of the dependent variable is consequently performed.

[27]Even assuming independence of effects estimated on consecutive days, estimated standard errors are such that one can rarely reject the equality of coefficients across periods. The notion of a "peak" impact on cumulative returns here and hereafter does not therefore imply a statistical statement.

posal before implying increasingly large positive returns straight through the end of the time period covered, though it should be noted that this last result is subject to the caveat that few of the effects are precisely estimated. In fact, the near-total absence of statistically-significant effects associated with any of the tax savings terms in the full specification of Table 4.6 beyond the aforementioned intangibles interaction is even more striking than that which could be inferred from looking at daily abnormal returns only.

The primary contributions from the cumulative returns results are thus to highlight investor responses to evolving expectations concerning the possibility of a dividend tax holiday prior to January 28 and gradually reversing beyond February 3, as well as the irrelevance of all tax terms save the intangible assets interaction which may subsume the effects of all other proxies for tax avoidance opportunities. In addition, it appears that accounting effects associated with the capitalization of anticipated tax expenses on remittances out of permanently reinvested earnings play a limited role in terms of investor valuations over a longer horizon. Less important though nevertheless interesting are the distinctions between results across empirical specifications. One especially notable distinction between the estimates presented in Tables 4.5 and 4.6 is in terms of the estimated effects of foreign returns on assets (which, as previously noted, are perhaps better viewed as measures of the proportion of total multinational income earned abroad). Whereas $FROA$ under the full specification is associated with a highly-persistent positive effect on cumulative returns which only begins to lose statistical significance following DRD rejection, under the intermediate specification, $FROA$ instead appears to consistently—if not significantly—depress returns through February 4 and only subsequently influences returns in a positive manner. Differences across specifications may in part reflect the fact that the full specification requires a great deal from the limited sample of multinational corporations for which permanently reinvested earnings data is available, especially given

the inclusion of industry fixed effects. Variation in permanently reinvested earnings, intangible assets, R&D, and advertising expenses may consequently be inadequate for precise identification of their independent effects cumulated over multiple trading days.

4.7 Conclusion

While a single clear conclusion as to magnitude of the perceived reward for multinational tax avoidance from an 85 percent DRD is difficult to reach given the imprecise nature of many estimates and apparent slow incorporation of information regarding prospects for a future dividend tax holiday, there are nevertheless several results worth noting which are independently consistent with investors capitalizing certain tax avoidance benefits from the policy. According to the February 3 results involving daily abnormal returns and the full complement of regressors, a one standard deviation increase in R&D expenditures as a proportion of market capitalization is associated with as much as a 0.45 percent increase in the market valuation of the average firm's future earnings stream through the proposed DRD's rewarding of income reallocation. Similarly, firms which relied more heavily on intangible assets experienced greater cumulative abnormal returns in the lead-up to the DRD rejection by amplifying the net benefits from the reallocation of taxable earnings. However, despite the apparent sudden elimination of a potentially-lucrative income shifting opportunity as a result of the Senate vote on the evening of February 3, investors failed to rapidly reverse their positions with respect to the importance of multinationals' R&D expenditures or intangible asset holdings, contrary to what one would expect if the measured effects on prior dates exclusively reflected the value of tax avoidance opportunities afforded by an 85 percent DRD.

Several explanations for the lack of clearer evidence on investor valuations of anticipated tax savings from the proposed DRD, especially with regards to future tax

avoidance, exist. First, it may in fact be that firms were not expected to be able to exploit the short-term round-tripping incentives inherent to the proposed DRD to any great extent. This is precisely the conclusion of Chapter III and may be due to several factors, including successful tax enforcement, the deterrent accounting effects of booking new tax expenses and thereby raising firms' effective tax rates, and the short time frame over which foreign dividends could have been paid out of shifted profits. However, in contrast to the analysis of Chapter III, which only measures short-term round-tripping activity by design, if a renewal of the DRD were interpreted as a signal of a tax policy shift toward a territorial tax system—concretely or in practice, such as through frequent recurring tax holidays—investor valuations of the DRD proposal should also reveal longer-term tax avoidance responses to anticipated reductions in future repatriation taxes. Based on the evidence presented in this paper, the value of any such longer-term implications of a renewed DRD do not appear to be strikingly large. On the other hand, if one takes seriously the measured effects on daily abnormal returns from the interaction between R&D expenditures and DRD tax savings, neither can the possibility of economically-significant valuations capturing both short- and longer-term tax avoidance benefits be rejected.

A second possible explanation for the absence of a clearer market response to the Boxer-Ensign proposal is that investors' probabilistic assessments of the likelihood of a future reduction in the repatriation tax were not in fact radically altered by either the announcement or rejection of the Boxer-Ensign DRD amendment proposal but instead evolved slowly over a longer horizon. A very modest effect of the round-tripping tax savings rate on daily abnormal returns, for instance, may thus reflect that either investors viewed tax avoidance opportunities as largely irrelevant in this context, or that tax avoidance opportunities were highly relevant but that the subjective probability of a dividend tax holiday being enacted changed little on any given day during the event window. Evidence from the cumulative abnormal return regressions lends

support to this latter interpretation and draws attention to the apparent leakage of information prior to January 28. That investors would have anticipated a possible DRD well in advance of the official announcement of the Boxer-Ensign proposal is perhaps unsurprising given the likely lobbying efforts and other preparatory discussions which would have surely preceded it. Viewed in this light, it is furthermore possible that the January 28-February 3 period may have allowed investors to learn of Senators' positions in advance of their final vote on the Boxer-Ensign amendment and hence the true extent of the opposition. This possibility could further justify the observed lack of a substantial reversal of effects on daily abnormal returns immediately following the Senate vote. Equivalently, although the timing of the events under consideration was relatively precise—thereby favoring the event study approach employed here—it is true that the DRD proposal did not garner extensive attention from mainstream media, especially prior to its February 3 rejection. This fact in and of itself suggests that the prospects for another DRD may never have been seriously considered, such that the dates identified do not constitute sufficiently important market events.

Ultimately, none of the proposed explanations by themselves provide entirely satisfactory justification for the full scope of results obtained, but there is hope in reproducing the analysis presented here with more recent event dates as the data become available. At the time of writing, momentum for a renewed DRD had initially appeared to be gaining as evidenced by ramping-up of corporate lobbying efforts beginning in the fall of 2010 and a statement by Federal Reserve Chairman Ben Bernanke before the House Committee on Financial Services on March 2, 2011 interpreted as being in favor of a tax holiday to encourage dividend remittances from abroad. However, this was followed on March 23, 2011 by a strongly-worded statement by the Assistant Treasury Secretary for Tax Policy, Michael Mundaca, indicating the Administration's firm opposition to a renewed dividend tax holiday in lieu of serious corporate and international tax reform, a view which was subsequently echoed by

ranking Republican members of the House Ways and Means Committee. To the extent that event date uncertainty and information leakage plays a role in clouding the results from the January 28-February 3 period, it will be instructive to contemplate market returns on additional such dates and consider investor responses as they evolve over a longer horizon. It is impossible to conclude from the present work the degree to which a temporary 85 percent DRD would reward past and future multinational tax avoidance, much less a 100 percent exemption (i.e. a territorial tax system) or any other permanent reduction in the repatriation tax, but future work involving additional event data points holds promise for being able to answer this important question, a central feature of the debate on international tax reform.

Figure 4.1: Average Abnormal Returns by Multinational Status: 2009 Boxer-Ensign DRD Proposal

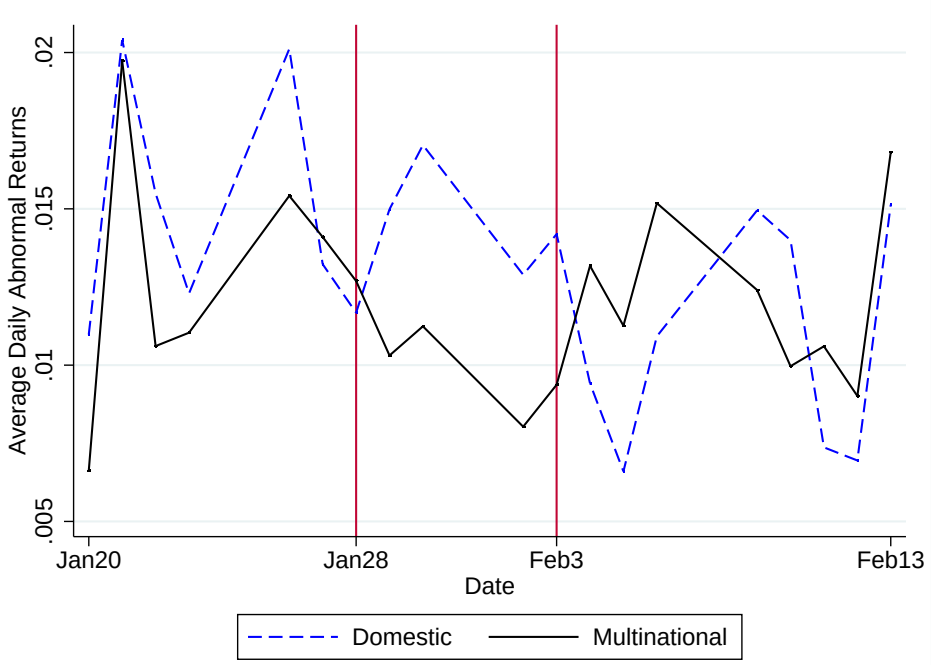


Figure 4.2: Weighted-Average Abnormal Returns by Multinational Status: 2009 Boxer-Ensign DRD Proposal

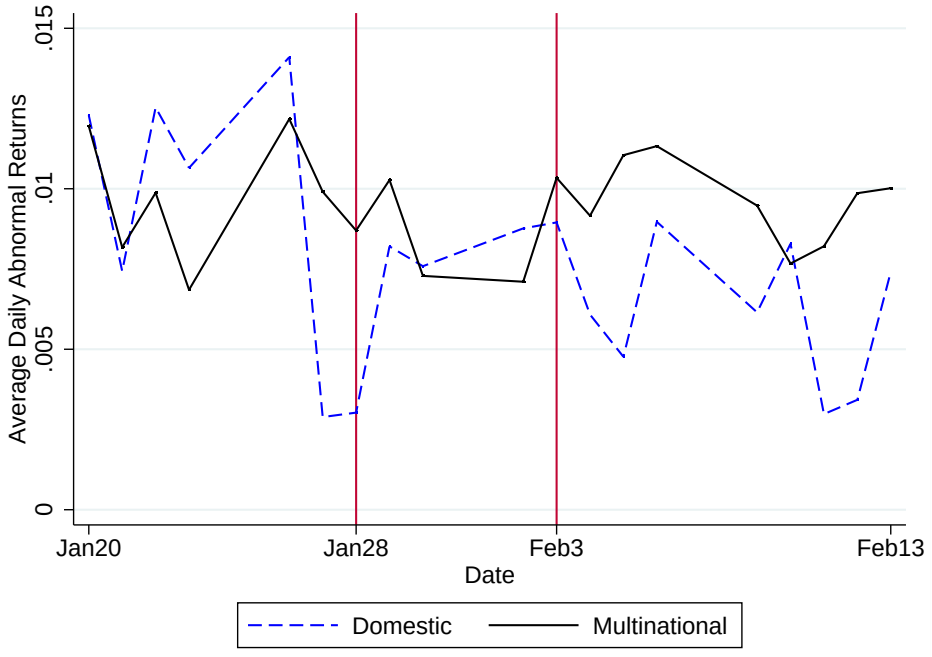


Figure 4.3: Weighted-Average Abnormal Returns by Multinational Status and Domestic Income Percentile: 2009 Boxer-Ensign DRD Proposal

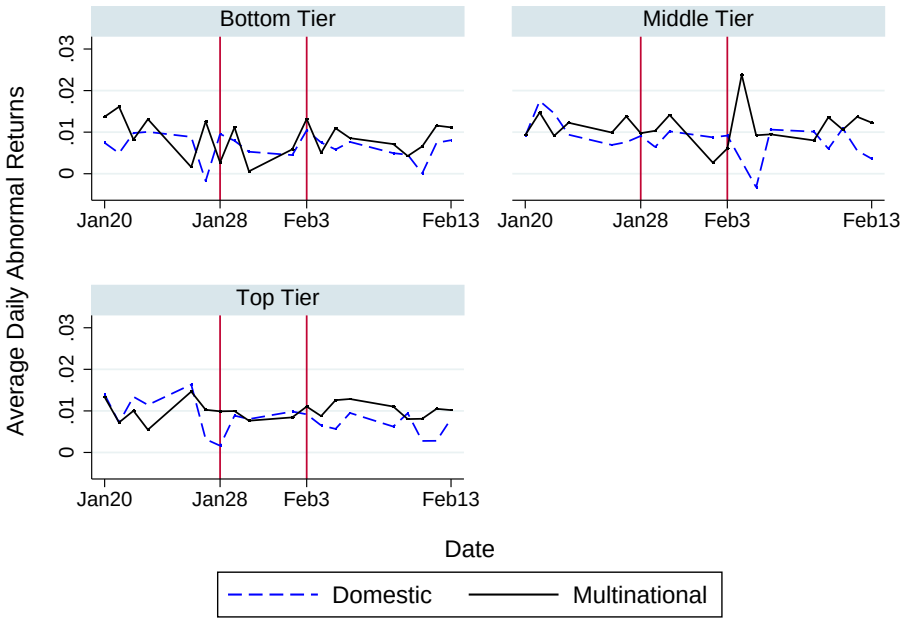


Table 4.1: Firm Characteristics by Multinational Status

Variable	Domestic (N = 1,372) Mean	Median	Std. Dev.	MNC (N = 396) Mean	Median	Std. Dev.	T-test
Variables in $ Millions:							
Permanently reinvested earnings (*pre*)	0	0	0	1753.63	316.90	5324.29	***
Intangible assets (*intan*)	973.87	21.31	6533.85	2921.39	536.96	9386.95	***
R&D expenses (*r&d*)	39.61	0	379.05	368.76	38.84	1140.49	***
Advertising expenses (*adv*)	23.43	0	152.70	167.96	0	661.20	***
Cash and short-term investments (*che*)	1394.00	63.68	11038.69	1506.38	267.24	4410.80	
AJCA qualifying dividends (*ajca_div*)	0	0	0	570.40	0	2498.35	***
Domestic pre-tax income (*dpi*)	277.47	25.12	3061.81	466.83	76.70	2124.44	
Foreign pre-tax income (*fpi*)	0	0	0	767.74	133.88	2398.02	***
Market capitalization (*mcap*)	1684.00	404.51	6747.19	12068.29	2431.14	28672.75	***
Total assets (*at*)	19605.87	1215.45	144975.60	13797.46	3088.73	47458.69	
Variables Scaled by Stock Market Capitalization (January 2, 2009):							
PRE (= pre/mcap)	0	0	0	0.260	0.122	0.707	***
INTAN (= intan/mcap)	0.861	0.065	4.432	0.416	0.237	0.816	***
R&D (= r&d/mcap)	0.070	0	0.485	0.067	0.022	0.207	
ADV (= adv/mcap)	0.049	0	0.407	0.023	0	0.087	**
CHE (= che/mcap)	2.715	0.197	36.948	0.259	0.128	0.789	**
AJCA_Div (= ajca_div/mcap)	0	0	0	0.041	0	0.087	***
Variables Scaled by Total Assets (2008):							
DROA (= dpi/at)	0.007	0.018	1.643	0.028	0.037	0.104	
FROA (= fpi/at)	0	0	0	0.054	0.045	0.046	***
Variables as Savings Rates and Interactions Thereof:							
TS (= 0.85(τ_c-τ^*))	0	0	0	0.093	0.081	0.085	***
TS x PRE (= 0.85(τ_c-τ^*)/(1-τ^*)·PRE)	0	0	0	0.024	0.008	0.064	***
TS x INTAN (= 0.85(τ_c-τ^*)·INTAN)	0	0	0	0.030	0.010	0.050	***
TS x R&D (= 0.85(τ_c-τ^*)·R&D)	0	0	0	0.006	0	0.017	***
TS x ADV (= 0.85(τ_c-τ^*)·ADV)	0	0	0	0.002	0	0.010	***

All variables measured in fiscal year 2008, except *pre* (latest available figure 2006-2008) and *ajca_div*, which refers to repatriation decisions recorded in fiscal years 2004-2006.

P-values for the t-test of equal means are 0.01 (***), 0.05 (**), and 0.10 (*).

Table 4.2: Effects on Abnormal Returns from the 2009 Boxer-Ensign DRD Proposal - Basic Specification

Dependent Variable:	Event Date (2009)						
Abnormal Return (Daily % Change)	1/27	**1/28** Proposal	1/29	1/30	2/2	**2/3** Rejection	2/4
$I[MNC]$	0.178	0.021	-0.175	-0.395***	-0.337**	-0.309**	0.371***
	(0.116)	(0.114)	(0.118)	(0.116)	(0.144)	(0.133)	(0.129)
TS	0.356	1.982***	-1.135	-0.243	-1.927**	0.952	1.713**
	(0.741)	(0.744)	(0.790)	(0.798)	(0.933)	(0.873)	(0.841)
$TS \cdot INTAN$	0.230	-1.064***	1.054	0.814**	-0.784	-1.556*	0.283
	(0.488)	(0.337)	(0.669)	(0.375)	(0.764)	(0.931)	(0.729)
$INTAN$	0.008	-0.007	-0.047***	0.001	-0.003	0.060***	-0.019
	(0.008)	(0.010)	(0.011)	(0.011)	(0.015)	(0.011)	(0.012)
Constant	1.126***	1.056***	1.288***	1.518***	1.127***	1.165***	0.806***
	(0.081)	(0.079)	(0.084)	(0.079)	(0.100)	(0.091)	(0.087)
N	2316	2320	2309	2321	2321	2314	2322
R-squared	0.002	0.005	0.009	0.007	0.010	0.010	0.012

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Robust standard errors appear in parentheses.

Table 4.3: Effects on Abnormal Returns from the 2009 Boxer-Ensign DRD Proposal - Intermediate Specification

Dependent Variable:	Event Date (2009)						
Abnormal Return (Daily % Change)	1/27	**1/28** Proposal	1/29	1/30	2/2	**2/3** Rejection	2/4
$I[MNC]$	0.228	0.085	-0.411**	-0.713***	-0.613***	-0.760***	0.432**
	(0.161)	(0.168)	(0.160)	(0.161)	(0.216)	(0.189)	(0.190)
TS	0.845	2.087**	-0.732	1.647	-1.256	2.134*	-0.291
	(0.986)	(1.015)	(1.081)	(1.058)	(1.321)	(1.156)	(1.190)
$TS \cdot INTAN$	0.500	-1.259***	0.504	1.180***	-1.115	-0.578	0.456
	(0.477)	(0.297)	(0.570)	(0.269)	(1.086)	(0.628)	(0.804)
$CASH$	-0.104*	-0.022	0.002	0.056	-0.151**	-0.032	0.099
	(0.062)	(0.046)	(0.050)	(0.057)	(0.060)	(0.057)	(0.065)
$INTAN$	0.026**	0.006	-0.053***	0.004	0.039*	0.067***	-0.042***
	(0.013)	(0.009)	(0.014)	(0.011)	(0.021)	(0.020)	(0.014)
$FROA$	-0.301	0.179	0.575	1.639*	2.203	0.471	2.670
	(1.069)	(1.067)	(0.943)	(0.962)	(1.745)	(1.141)	(1.820)
$DROA$	-0.037	-0.028	-0.013	-0.035	-0.015	-0.055***	0.009
	(0.026)	(0.031)	(0.030)	(0.030)	(0.029)	(0.017)	(0.027)
$I[AJCA]$	-0.101	0.187	0.415**	-0.375*	0.137	0.543**	0.478**
	(0.174)	(0.225)	(0.187)	(0.195)	(0.212)	(0.240)	(0.213)
AJCA_Div	0.781**	-1.298	-0.101	-0.524	1.446***	-0.902	-1.727***
	(0.312)	(1.774)	(0.369)	(0.346)	(0.325)	(1.671)	(0.291)
Constant	1.167***	1.059***	1.290***	1.479***	1.181***	1.176***	0.766***
	(0.084)	(0.082)	(0.088)	(0.082)	(0.105)	(0.094)	(0.090)
N	1688	1691	1673	1692	1696	1687	1689
R-squared	0.011	0.008	0.010	0.025	0.018	0.016	0.027

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Robust standard errors appear in parentheses.

Table 4.4: Effects on Abnormal Returns from the 2009 Boxer-Ensign DRD Proposal - Full Specification

Dependent Variable:	Event Date (2009)						
Abnormal Return (Daily % Change)	1/27	**1/28** Proposal	1/29	1/30	2/2	**2/3** Rejection	2/4
$I[MNC]$	0.493**	0.395	-0.363	-1.136***	-0.853***	-0.447*	0.362
	(0.229)	(0.247)	(0.247)	(0.251)	(0.306)	(0.260)	(0.276)
TS	1.271	-0.261	-0.085	0.689	2.079	-0.853	0.585
	(1.310)	(1.451)	(1.428)	(1.388)	(2.027)	(1.488)	(1.699)
$TS \cdot \frac{PRE}{1-\tau^*}$	-0.651	-2.971*	-2.605*	-0.646	-4.846	-3.323	0.867
	(1.876)	(1.793)	(1.582)	(1.742)	(4.140)	(2.587)	(2.013)
PRE	-0.348**	0.346***	0.001	-0.721***	-0.208	-0.181	-0.194
	(0.140)	(0.133)	(0.115)	(0.264)	(0.615)	(0.133)	(0.140)
$NONPRE\_CASH$	-0.061	-0.007	0.096	0.067	-0.175**	-0.038	0.067
	(0.067)	(0.062)	(0.073)	(0.060)	(0.077)	(0.099)	(0.088)
$TS \cdot INTAN$	-0.101	-0.591	0.362	2.539***	-2.063	2.608	1.390*
	(0.609)	(0.630)	(0.594)	(0.551)	(2.767)	(2.494)	(0.764)
$INTAN$	0.023*	0.018	-0.061***	0.001	0.022	0.082***	-0.035**
	(0.013)	(0.012)	(0.014)	(0.012)	(0.020)	(0.024)	(0.016)
$TS \cdot R\&D$	-3.413	-0.423	3.374	12.985***	7.539	23.287***	2.576
	(3.933)	(5.389)	(2.852)	(3.304)	(13.729)	(8.206)	(7.965)
$R\&D$	0.084	0.071	-0.079	-0.200	0.172	0.400**	0.065
	(0.236)	(0.187)	(0.195)	(0.150)	(0.138)	(0.176)	(0.186)
$TS \cdot ADV$	-0.993	-8.393	-0.844	-3.545	-31.633*	14.654	-47.649***
	(13.711)	(11.317)	(7.804)	(7.719)	(17.921)	(13.351)	(13.466)
ADV	-0.190	-0.411	-0.451**	0.027	0.011	-0.806***	0.206
	(0.186)	(0.339)	(0.200)	(0.198)	(0.318)	(0.144)	(0.163)
$FROA$	-4.772**	1.008	-0.595	5.518***	-0.224	-3.008	3.018
	(2.378)	(2.371)	(2.338)	(1.932)	(2.973)	(2.408)	(2.692)
$DROA$	-0.037	-0.060	0.014	-0.012	-0.043	-0.028*	0.036
	(0.026)	(0.042)	(0.027)	(0.026)	(0.034)	(0.016)	(0.030)
$I[AJCA]$	-0.048	0.058	0.545**	-0.442*	0.427	0.791***	0.075
	(0.209)	(0.266)	(0.232)	(0.236)	(0.271)	(0.276)	(0.268)
$AJCA\_Div$	0.861*	-1.173	0.795***	0.365	2.302***	-1.286	-0.444
	(0.451)	(1.832)	(0.271)	(0.429)	(0.695)	(1.673)	(0.509)
Constant	5.052***	0.481	-0.229	0.613**	-2.049***	-1.190***	0.856
	(0.243)	(0.430)	(0.258)	(0.259)	(0.348)	(0.304)	(0.542)
N	1393	1407	1380	1399	1403	1391	1391
R-squared	0.057	0.062	0.066	0.065	0.061	0.138	0.093

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Robust standard errors appear in parentheses.
Regressions include NAICS two-digit industry fixed effects.

Table 4.5: Effects on Cumulative Abnormal Returns from the 2009 Boxer-Ensign DRD Proposal - Intermediate Specification

Date	$I[MNC]$	TS	$TS \cdot INTAN$	$CASH$	$INTAN$	$FROA$	$DROA$	$I[AJCA]$	$AJCA\_Div$	Constant	R-squared
1/20/09	-0.238	-2.905*	2.275***	-0.095	-0.044***	-1.94	-0.1	0.567**	-0.468	1.136***	0.011
1/21/09	0.095	-1.994	0.498	-0.383***	0.016	-0.032	0.031	-1.323***	3.244***	3.346***	0.014
1/22/09	-0.229	-4.834*	3.158***	-0.481***	-0.065**	-3.653	-0.006	-0.583	0.934	4.964***	0.02
1/23/09	-0.083	-4.748	5.446***	-0.400**	-0.089**	-3.782	0.005	-1.278**	1.673	6.153***	0.019
1/26/09	-0.865	-2.501	6.859**	-0.507***	-0.104*	-6.209*	-0.067	-1.856***	3.615***	8.232***	0.027
1/27/09	-1.083*	0.707	7.721***	-0.724***	-0.044	-3.932	-0.151	-2.215***	4.799***	9.646***	0.026
1/28/09	-0.97	1.384	6.333**	-0.724***	-0.037	-5.238	-0.111	-1.890***	3.002***	10.813***	0.019
1/29/09	-1.857**	4.516	6.278**	-0.652***	-0.004	-4.432	-0.22	-1.859***	2.589**	12.264***	0.018
1/30/09	-2.639***	5.86	6.320**	-0.698***	-0.021	-3.118	-0.261	-2.656***	4.49	14.004***	0.025
2/2/09	-3.026***	5.527	5.979	-0.803***	-0.097*	-4.967	-0.329	-3.060***	6.826	15.376***	0.03
2/3/09	-3.877***	9.05	1.644	-0.837***	-0.027	-6.604	-0.409	-2.699***	8.078**	16.744***	0.03
2/4/09	-3.568***	9.238	3.261	-0.791***	-0.088*	-2.599	-0.385	-2.528***	5.936*	17.690***	0.024
2/5/09	-3.349***	12.855*	2.665	-0.903***	-0.044	0.289	-0.342	-2.743***	5.393	18.430***	0.019
2/6/09	-2.945***	11.578	0.301	-0.740***	-0.059	1.255	-0.232	-2.378**	3.952	19.487***	0.013
2/9/09	-3.346***	11.622*	-1.153	-0.683**	-0.107*	1.899	-0.346	-2.352**	5.533	20.990***	0.016
2/10/09	-3.796***	11.267	-1.445	-0.496	-0.112*	3.214	-0.386	-2.539**	6.702	22.284***	0.017
2/11/09	-3.612***	10.619	-1.082	-0.668	-0.108	0.609	-0.443	-2.220**	6.549	23.113***	0.016
2/12/09	-3.603***	13.514*	0.546	-0.723*	-0.282**	0.342	-0.413	-2.465**	7.002	24.034***	0.021
2/13/09	-3.578***	15.028*	0.899	-0.739	-0.336*	1.043	-0.51	-2.961**	6.896	25.621***	0.023
N = 1870											

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Robust standard errors appear in parentheses.

Table 4.6: Effects on Cumulative Abnormal Returns from the 2009 Boxer-Ensign DRD Proposal - Full Specification

Date	$I[MNC]$	TS	$TS \cdot \frac{PRE}{1-\tau^*}$	PRE	N_CASH	$TS \cdot INTAN$	$INTAN$	$TS \cdot R\&D$	$R\&D$	$TS \cdot ADV$	ADV	$FROA$	$DROA$	$I[AJCA]$	A_Div
1/20/09	-0.55	-1.48	-1.899	0.209	-0.005	3.690***	-0.056***	-19.868**	-0.088	42.114**	-0.152	8.264**	-0.109	0.235	-0.75
1/21/09	-0.844	-3.001	-0.909	0.124	-0.332**	0.749	0.009	12.694*	-0.021	25.581	-0.388	11.185***	-0.005	-1.004**	2.653**
1/22/09	-0.863	-6.135*	1.72	0.104	-0.389**	3.053**	-0.074**	9.756	-0.262	32.409	-0.631	4.846	-0.086	0.06	0.283
1/23/09	-0.467	-5.823	6.407	0.055	-0.326	5.674***	-0.098***	4.534	-0.09	-39.763	-0.497	8.714	-0.114	-0.595	2.667**
1/26/09	-1.911**	-3.924	6.509	0.052	-0.411*	10.041***	-0.117*	6.314	-0.33	-54.988	-0.309	16.178**	-0.128	-1.503**	3.536**
1/27/09	-1.883**	-0.506	3.911	-1.018*	-1.056***	11.478***	0.016	-5.756	2.353	-34.403	-1.403	13.062*	-0.102	-1.812**	4.643**
1/28/09	-1.931**	-0.398	0.621	-0.49	-0.876***	10.911***	-0.015	-9.215	0.887	-64.114	-0.235	15.630**	-0.155	-1.588**	2.146
1/29/09	-3.185***	2.641	-1.914	-0.539	-0.793***	10.771***	0.023	1.77	0.927	-65.019	-0.123	16.779**	-0.2	-1.369	2.664
1/30/09	-4.752***	2.71	-1.748	-1.340**	-0.754**	13.374***	-0.017	15.458	0.355	-92.307	0.572	23.278**	-0.222	-2.026**	3.205
2/2/09	-5.822***	5.119	-3.744	-0.814	-0.976***	15.836***	-0.074	-6.726	0.939	-29.582	0.042	20.271**	-0.299	-1.754	2.461
2/3/09	-6.873***	5.843	-5.608	-0.744	-1.024***	13.301**	0.008	9.976	0.582	-4.451	-0.058	17.976*	-0.336	-1.055	3.654
2/4/09	-6.154***	8.346	-5.57	-1.219	-1.040***	14.053**	-0.052	25.443	0.818	-59.538	0.209	16.799	-0.256	-1.44	3.322
2/5/09	-5.936***	9.495	-2.133	-1.817*	-1.167***	12.981	-0.01	45.981	0.845	-15.04	0.139	22.558*	-0.147	-1.726	2.396
2/6/09	-5.650***	11.729	-9.898	-1.276	-0.851**	12.481	-0.019	13.949	0.441	-59.448	-0.575	22.67	-0.085	-1.409	1.819
2/9/09	-5.711***	12.75	-5.899	-0.829	-0.890**	6.798	-0.064	18.758	0.642	-77.308	-0.343	13.773	-0.193	-1.282	2.886
2/10/09	-6.130***	10.681	-3.951	-1.068	-0.766*	5.5	-0.072	18.617	0.917	-78.223	0.021	18.063	-0.188	-1.459	4.028
2/11/09	-6.072***	10.237	-2.552	-2.595***	-0.988*	7.818	-0.057	23.958	1.557	-58.369	-0.31	20.729	-0.252	-1.517	4.718
2/12/09	-6.141***	16.912	-9.711	-2.669***	-0.961*	9.618	-0.246*	29.349	1.453	-32.28	-0.505	16.751	-0.178	-1.889	5.237
2/13/09	-6.829***	17.587*	-1.257	-3.315***	-1.290**	7.174	-0.272*	30.834	2.736*	18.504	-1.119	13.051	-0.144	-1.955	4.676
N = 1544															

Significance levels are designated according to: *** p<0.01, ** p<0.05, and * p<0.10. Robust standard errors appear in parentheses. Regressions include NAICS two-digit industry fixed effects.

CHAPTER V

Conclusion

The preceding three chapters apply widely-differing approaches to studying individual and firm behavior in response to incentives generated by varying tax provisions. A primary contribution of this dissertation to the understanding of such behavior derives from the careful choice of policy environments and corresponding empirical designs whereby identification of particular distortions due to taxation may be more cleanly performed than in the existing literature. As a consequence, it is my hope that the findings presented herein may foster better-informed policy design, not only in the specific areas of property assessment and taxation or taxation of multinational foreign-source income, but to tax policy and economic policy more generally.

Though ostensibly specific to the Michigan property tax system, the ill-informed or cognitively-biased behavior of homebuyers illustrated in Chapter II, for instance, reflects deviations from rationality that have now been demonstrated in a wide variety of settings—albeit rarely of such financial importance—and are likely to be far more ubiquitous than previously thought. It is therefore reasonable to believe that consideration of cognitive biases ought to play an important role in the formulation of economic policy so as to achieve desired outcomes at the least cost to society. The results of Chapter II further the argument for doing so, especially with regards to the salience of policy details. Similarly, the tax avoidance response among U.S. multinationals studied in Chapters III and IV, while more directly relevant to the adoption

of a territorial tax regime, is more broadly informative with respect to firm behavior and the potentially unintended consequences of the implementation of temporary policies. As governments struggle to support an expanding array of services subject to limited resources and become more deeply engaged in encouraging or discouraging various types of activities, improved knowledge of individual and firm responses to incentives—as this dissertation aims to provide—is becoming increasingly important.

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