Domestic Taxes and Inbound Acquisitions*

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Abstract

U.S. corporations face higher tax burdens than those in many other countries, potentially influencing merger and acquisition activity – the key channel for foreign direct investment. If tax rather than productivity differences drive M&A activity, global wealth will be lower, given that ownership will not be arranged to maximize the pre-tax value of assets. I build a theory with both tax and productivity differences among potential acquirers which yields two testable implications: that, relative to high-tax domestic bidders, low-tax foreign bidders will specialize in both high profitability target firms and those with few tax deductions. I test for these effects using the universe of all public U.S. M&As from 1990-2010. My empirical strategy exploits both cross-sectional variation in target profitability and industry-level variation in the generosity of investment allowances due to the bonus depreciation tax reform after 2001. I find clear evidence in support of both predictions. First, a one standard deviation higher target profitability increases the probability that the acquirer will be foreign by 16% (or 2.8 percentage points). This result is robust to controlling for non-tax bidder differences using minority transactions, and is stronger for foreign acquirers resident in tax havens. Second, difference-in-differences estimates imply that the increase in allowances from bonus depreciation caused a 5.3 percentage point drop in foreign acquisitions in the post-reform period, which led to a loss in aggregate wealth on the order of 5% of assets, or $360B. These two dimensions of sorting suggest new ways in which domestic taxes can affect FDI and have important consequences for the productivity of assets.

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1 Introduction

Cross-border mergers and acquisitions are a major component of foreign direct investment, rising above one trillion U.S. dollars in 2013. This corresponds to about two thirds of aggregate foreign direct investment and almost half of all worldwide merger and acquisition activity (Bloomberg and UNCTAD). Given the sheer scale of these flows, an understanding of how taxes affect equilibrium in the market for corporate control, which gives rise to mergers and acquisitions (M&A), is a key input to optimal policymaking. Furthermore, since the ownership of an asset or firm is an important determinant of its productivity,[1] there could be significant consequences for aggregate wealth arising from any tax distortions of the equilibrium in this market. Specifically, if some potential acquirers have a purely tax-derived comparative advantage in acquiring certain assets, they may be able to outbid other potential acquirers that could make more productive use of the assets. Since an acquirer's post-deal tax savings are completely offset by government revenue losses at the global level, such a situation represents a clear deadweight loss, as the real productivity of the stock of assets is not maximized.

To investigate this issue, I develop a simple model that focuses on the competition among potential acquirers to buy a specific target firm. The model is especially concerned with how the tax rates of the potential acquirers, which are assumed to vary due to differential abilities to shift income to lower tax jurisdictions, interact with the characteristics of the target firm and the domestic tax system. The assumption that international acquirers have tax advantages relative to domestic acquirers is consistent with evidence presented by Markle and Shackelford [2012], who document significant differences between the effective tax rates of multinationals resident in different countries, and particularly high rates for U.S. firms. Given such tax rate differences, my model gives rise to two testable implications: that low-tax foreign bidders are more likely to acquire more profitable target firms than are domestic bidders, and that increases in available tax deductions lead to decreases in the probability of foreign acquisition.[2]

These predicted dimensions of sorting show how the effects of tax rate differences can be tested even without reliable measures of company-level effective tax rates. This is particularly useful as companies have an incentive to obscure their tax planning practices as much as

[1] For example, Becher et al. [2012] find that productivity gains are the main source of excess returns from utility mergers, while Chen [2011] finds significant dispersion in labour productivity gains for those employed at the targets of FDI, depending on the source of the FDI.

[2] The model works equally well for the alternative scenario where it is domestic bidders that have the tax advantage. In this case, the comparative statics would flip signs. Then the two tests detailed in the text can be thought of as also testing for the sign of the tax difference between domestic and foreign bidders. The data support my assumption of an advantage for foreign bidders.

possible so as to avoid attracting the attention of national revenue authorities. Furthermore, even if raw tax rates can be observed, what matters for corporate behaviour is the *effective* tax rate, which must include the transactions costs associated with tax planning, and these are inherently difficult to discern from accounting disclosures.

Using data on acquisitions of U.S. public companies from 1990-2010, I test these two theoretical implications and find strong evidence in support of the existence of tax clienteles consistent with the theory. In the first test, using cross-sectional variation over target firms, I find that a one standard-deviation increase in the profitability of the target leads to a 16% increase in the probability that the acquirer will be foreign. The main empirical difficulty is that this sorting may be due to non-tax differences between foreign and domestic bidders. To address this issue, I use two distinct strategies, beyond controlling for a variety of observable target characteristics, including industry and time effects. First, I use minority transactions, wherein the bidder acquires less than 50% of the target, as a control group to account for non-tax motivations for equity investments. It seems reasonable to assume that majority and minority transactions are driven by similar non-tax motivations, such as geographic diversification or technology transfer, but that income-shifting and the lower tax rate it brings is only possible for majority owners – those who make the financial and operating decisions. It turns out that minority foreign transactions actually target less profitable targets than do domestic minority transactions. Hence the effect of profitability on the probability of foreign majority acquisitions is actually higher using this control group. The second strategy employed is to split the foreign winners into tax-haven residents and non-tax haven residents. In the comparison of tax haven vs. domestic bidders, the effect of profitability is much stronger than in the non-tax haven vs. domestic comparison. This also provides strong evidence that taxes are the economically relevant difference between bidders, given the likely primacy of tax considerations in the decision to locate or incorporate in a tax haven.

To test the second key implication of the theoretical model – that foreign bidders have a comparative disadvantage in acquiring firms with high levels of tax deductions – I implement a difference-in-differences strategy using plausibly exogenous industry-level variation in the generosity of investment allowances due to the bonus depreciation tax reform after 2001. In particular, a one standard deviation increase in depreciation allowances (relative to the distribution of changes induced by the reform) yields an 18% decrease in relative foreign acquisitions. In line with the nature of the reform, the reduction was largest for industries with high levels of investment in equipment, such as transportation, and minimal for industries like real estate, which invest mostly in land and structures.

The theory delivers an expression for the probability of foreign takeover in equilibrium

that can be readily taken directly to the data, which allows me to go beyond the comparative statics in several interesting ways. First, I use the implications of the model to identify how bidders' discount rates vary with their tax rates and income-shifting opportunities. This extension shows that these discount rates reflect almost the full difference in relative tax rates, which has important implications for optimal policy. Specifically, the effect of the tax base, rather than just the tax rate, on inbound acquisition activity is of first order importance, despite receiving relatively little attention in the literature or popular press. To quantitatively investigate this conclusion, I also use the model to conduct a counterfactual experiment, which shows that ownership patterns were significantly changed by the institution of bonus depreciation in 2001. In particular, foreign acquirers were disadvantaged by the reform, leading to a probability of foreign takeover that was 5.3 percentage points less than it would otherwise have been. The model also allows for the calculation of the loss in wealth due to this change in foreign takeovers. Conservatively, the reform costs on the order of $36 billion per year through this ownership channel, or 5% of the total assets traded in the M&A market.

Overall, these results draw attention to a nontrivial tax distortion in the U.S. acquisition market, whereby the ultimate owner of a domestic firm may be determined by skill in avoiding taxes rather than skill in making productive use of the assets. As these two identified tax effects influence foreign acquisitions in different directions, the aggregate effect of income-shifting on inbound merger activity is theoretically ambiguous. However, regardless of the net effect, foreign firms are specializing in high-profit targets which have relatively few available tax deductions. Therefore, even if the aggregate probability effect were negligible, the set of firms that is targeted by international acquirers is not the productivity-maximizing one. This violation of production efficiency decreases aggregate wealth through a reduction in the productivity of assets. Furthermore, the theory and empirical evidence show that these clienteles are shaped by domestic tax rates and rules, and so offer important guidance for domestic policymaking. For instance, base-broadening reforms intended to increase tax revenue by limiting allowable tax deductions may have the unanticipated effect of encouraging foreign acquisitions.

The potential erosion of the U.S. corporate tax base and the implied consequences for the competitiveness of U.S. firms are important current policy issues. In particular, a 2007 report from the United States Treasury Department (Report to the Congress on Earnings Stripping, Transfer Pricing and U.S. Income Tax Treaties) was commissioned by Congress to investigate "the potential for exploitation of inappropriate income-shifting opportunities to erode the U.S. corporate tax base." It was specifically concerned with foreign-controlled domestic corporations using earnings stripping through debt or transfer pricing of intangibles

and finds evidence consistent with the use of these techniques. The strongest evidence they find for lower tax liabilities for foreign-owned corporations is from the case of so-called 'corporate inversions' – a type of transaction where a domestic corporation rearranges its ownership structure so that it becomes headquartered in a tax haven (for example, Bermuda, which levies no corporate tax), with the old domestic parent now a subsidiary. This is a purely tax-motivated transaction and may involve tax savings on the foreign earnings of the multinational, since the United States taxes the worldwide earnings of its companies while Bermuda does not. In addition, taxes may be reduced on domestic earnings, as these can to some extent be shifted away from the U.S. to the new headquarters country. Desai and Hines [2002] find that market reactions to corporate inversions imply that market participants expect the transaction to result in both foreign and domestic tax savings. Albeit on a small sample, Seida and Wempe [2004] find direct evidence of tax savings on the order of a third of pre-inversion effective tax rates, mostly explained by domestic U.S. tax savings. Importantly, these tax savings were *legally* accomplished, predominantly through intragroup debt, despite provisions of the U.S. tax code, such as anti-earnings stripping, that were specifically designed to protect the domestic tax base.[3] Corporate inversions and foreign takeovers, especially by tax haven residents, lead to similar opportunities to avoid U.S. taxes on both foreign and domestic earnings, and so this evidence is directly related to the key assumption in my study, regarding U.S. vs. foreign effective tax rate differentials.

1.1 A Case Study

The takeover battle for the U.S. electronics manufacturer AMP in 1998 illustrates the potential for tax considerations to affect ownership pivotally, in a way that is directly related to my research design of predicting whether the successful acquirer of a particular target will be foreign.

Tyco and Allied Signal were the putative bidders, and were very similar on most margins, such as assets, sales and specific industry. However, though both companies had been long-time U.S. residents, Tyco had inverted in 1997 to become a Bermuda resident.[4] In the end, Tyco's winning margin was approximately $1B (or 10%), which is of the same order of magnitude as the potential tax savings from applying Tyco's tax rate to AMP's earnings,

[3]Inverted corporations appeared to save a very significant amount of U.S. tax while staying under the 1.5:1 safe harbour debt ratio.

[4]This type of 'endogenous' location was associated with significant transaction costs and so was never common; furthermore, in 2004, future inversions were effectively shut down for a time by the American Jobs Creation Act. More recently, inversions have once again become popular. However, no members of the S&P 500 inverted through the end of my sample period in 2010 (and less than one a year on average in total) so this rise is of limited relevance to the takeovers in this paper.

rather than Allied Signal's. The reason that this estimate is so large is that AMP was among the most profitable firms in its industry, yielding a large amount of profit that could be shifted out of the United States. This simple estimate of Tyco's tax advantage approximately matches the size of the projected tax benefits of inverting reported in public filings by Cooper Industries in 2001 and Stanley Works in 2002.[5] Tyco's aggressive tax strategies had certainly been noticed in the business press:

> CEO Dennis Kozlowski ... moved Tyco to Bermuda (in 1997), then set up an elaborate machine to finance his empire, in which most debt was issued by a Tyco subsidiary based in Luxembourg. It was an intricate but legal scheme to shave Tyco's tax bills to an absolute minimum. In fact, this tax-avoidance mechanism continues to be one of Tyco's most powerful competitive advantages (Business Week, 2006).

The model and empirics in this paper explore the general ownership implications of multinational tax avoidance strategies.

1.2 Prior Literature

An extensive literature in corporate finance has investigated the importance of tax benefits in driving merger and acquisition activity in the domestic context. Kaplan [1989] finds that increased interest deductions (along with other tax effects) can account for anywhere between 21% and 143% of the premium paid in management buyouts of public U.S. firms. Hayn [1989] reports further evidence which suggests that tax considerations motivated acquisitions in the 1980s, while Erickson [1998] finds that these same considerations are a key determinant of the deal structure. Devos et al. [2009] investigate a small sample of large mergers and find that tax-related synergies are positive and can account for about 16% of the combined equity gain between the target and the acquirer following the transaction; tax savings appear to be a more important factor in diversifying mergers.

A more recent literature has begun to address similar questions in an international context by extending optimal tax models to settings where cross-border capital flows take the form of transfers of ownership of existing assets. Desai and Hines [2003] propose the welfare benchmark of capital ownership neutrality, whereby the world tax system should ensure that different potential acquirers face similar relative tax burdens, so that the pattern of asset ownership is not determined by tax considerations. These ideas are formalized and investigated by Becker and Fuest [2010], who build a model of a multinational corporation embarking

[5] A typical estimate of tax savings from the recent wave of inversions, that of AbbVie's purchase of Shire, is a decline in effective corporate tax rate from 22% to 13%.

on acquisitions both in its home market and a foreign market. They derive repatriation tax systems under which the multinational's private decisions are nationally or globally optimal. My model differs from theirs by taking the tax system as given (subject to income-shifting) and showing how these tax provisions interact with target firm heterogeneity.

There are several recent empirical papers that address related international tax issues using data on mergers and acquisitions. Huizinga and Voget [2009] provide an empirical investigation of the importance of potential repatriation tax burdens after a cross-border merger. They find an economically and statistically significant discouraging effect of the potential repatriation tax burdens on the headquarters location after the merger. These estimates are conditional on the specific target and acquirer and so do not address possible distortions in real ownership patterns since the parties to the deal are taken as given. Feld et al. [2014] directly investigate tax-induced distortions to the benchmark of ownership neutrality, using recent reforms to the international tax systems of Japan and the United Kingdom. They find large effects from the Japanese reform, due to Japan's relatively high statutory tax rate, on the order of a 30% increase in international acquisitions with a Japanese acquirer, causing a $500M yearly gain in efficiency. In contrast, my study uses inbound acquisitions to assess the competitive effects of the domestic, or target company, tax system.

Arulampalam et al. [2014] also use firm-level merger data to investigate whether taxes in host country i affect the probability that a multinational corporation resident in home country j will choose to make an acquisition in country i. Their theoretical starting point is the decision of a single parent company choosing which host countries to make an acquisition in.[6] They find that higher host country taxes discourage inbound acquisitions in that country. My approach is similar in spirit to theirs but takes the perspective of a single target firm and multiple potential acquirers, which is necessary in order to study competition among bidders in the merger market. Belz et al. [2014] present evidence using international M&A data that target firms' effective tax rates decline following an acquisition; this decline is particularly large when the acquiring firm is tax aggressive, and seems to arise through income shifting. Using a similar empirical approach to my study, Bird et al. [2015] show that the possibility of accessing the stock of 'locked-out' foreign earnings of U.S. firms drives inbound foreign acquisitions, and that this effect is stronger for acquirers from countries which use a territorial system.

Of particular relevance to my study, Swenson [1994] uses a number of U.S. tax reforms from the 1980s to study the general equilibrium tax mechanism suggested by Scholes and

[6]This focus on the acquirer is shared by well known models in the international trade literature, such as that of Head and Ries [2008] which models cross-border acquisitions as trading off the benefits of control with the costs of monitoring by the acquirer, and the heterogeneous firms model of Nocke and Yeaple [2007], which focuses on the acquirer's mode of entry.

Wolfson [1990]. They emphasize the distinction between explicit and implicit taxes, where the latter arise from changes to pre-tax asset returns. In the context of FDI, investors from countries with worldwide tax systems should prefer to buy assets with high explicit taxes and low implicit taxes, since they would receive a tax credit for any explicit taxes paid. Swenson finds empirical confirmation for this relative preference using differences in FDI flows across countries following tax reforms which changed the explicit/implicit tax mix. Hines [1996] also finds evidence for this mechanism by exploiting state-level tax changes and consequent changes in the investment shares of investors from countries with worldwide tax systems.

The issue of foreign-controlled domestic corporations paying lower taxes than comparable domestic corporations has also been an important issue in the economics and accounting literatures for some time. Grubert et al. [1993] first documented this issue using confidential U.S. corporate tax returns from 1980-1987. They found that foreign-controlled domestic corporations tended to report relatively low levels of taxable income, which fluctuated around zero on average. This is consistent with the use of strategic transfer pricing to lower tax burdens. A number of papers followed, some confirming the original observation and some refuting it; the main issue has been how to control for the endogenous selection of ownership – my study addresses this directly. A recent example is the case study of Blouin et al. [2005], which looked at post-merger tax returns for a small sample of 31 comparable domestic and foreign targets and found no discernible differences in taxable income reporting. Overall, this remains an unresolved question, to which my study provides new insight.

The rest of the paper proceeds as follows: Section 2 develops a simple theory of the market for corporate control, leading to two key testable implications, Section 3 describes the empirical strategy for estimating the profitability effect and the data employed, Section 4 presents the corresponding results, Section 5 discusses the empirical strategy for estimating the tax shields effect, and Section 6 shows the results from estimation of the full model as well as counterfactuals and aggregate wealth calculations. Section 7 concludes.

2 Theoretical Model

The objective of the model I develop in this section is to show how target firm characteristics and tax considerations interact in the market for corporate control to determine the ownership of that target firm. To that end, the focus is on bidders' valuations of the target firm, as these will determine the winning bidder in any efficient bargaining process, taking as given that the reservation price of the original owners will be met.

Consider a potential acquisition target, with pre-tax income consisting of profit Y and available tax deductions z (such as depreciation allowances), so that the target has taxable

income $Y^T \equiv Y - z$. There are two potential acquirers: a representative domestic bidder and a representative foreign bidder, indexed by subscripts d and f, respectively. They are each characterized by a nontaxable, idiosyncratic benefit of control, $\theta_i + \epsilon_i$ where θ_i is a fixed component and ϵ_i is a stochastic component, and a discount rate, r_i. Note that this characterization allows for differential fixed costs of acquisition for the different bidders through differences in the θ_i. The assumption that the benefits of control are untaxed simplifies the presentation of the model–any differences in taxation are subsumed by the bidder-specific θ_i and underlying distributions of the ϵ_i. Furthermore, it is assumed that the foreign bidder has access to an income-shifting technology (Gordon and Hines [2002]).

The technology works as follows: if the foreign bidder acquires the target firm, it can shift some profit from the home country, with tax rate τ_d, to a low-tax jurisdiction, which has a corporate tax rate of $\tau_h < \tau_d$. This could be accomplished using intragroup debt or by manipulating transfer prices of intangible assets, like patents or trademarks. However, the firm faces non-deductible compliance costs to shift ω of income.[7] The cost is convex and decreasing in existing taxable income (say, because of higher probability of audit for low reported taxable income, or because of liquidity constraints), given by $\frac{\gamma}{2}\frac{\omega^2}{Y^T}$. Then the optimal amount of profit to shift is a constant fraction of original pre-tax income. The effective tax rate for the foreign acquirer can be shown to be $\tau_f = \tau_d - \frac{(\tau_d - \tau_h)^2}{2\gamma} < \tau_d$. Hence the income-shifting technology leads the foreign bidder to face a lower effective tax rate on the income of the target, so that $\tau_d - \tau_f > 0$.[8] Then the valuation of the target firm by bidder i is:

$$V_i = \frac{(1-\tau_i)Y + \tau_i z}{r_i} + \theta_i + \epsilon_i$$

This valuation is composed of three parts: the after-tax profit, the value of available tax shields and the nonpecuniary benefits of control. Note that each bidder uses its own tax rate, rather than the domestic tax rate, to value the tax shields, which is a direct consequence of the income shifting technology–in particular, the fact that the cost of shifting income is proportional to taxable income, $Y - z$, rather than just Y. An alternative rationale for the difference in valuation of the tax shields would be the well-known model of DeAngelo and Masulis [1980], based on a higher likelihood of tax exhaustion with a lower tax rate, so that an additional dollar of deductions would be less valuable.

An equilibrium in the market for control consists of an allocation, which is a probability

[7] In principle, shifting costs are likely at least partially deductible in either the domestic or foreign jurisdiction. The assumption of non-deductibility simplifies the algebra without qualitatively affecting inferences–if costs were deductible there would be more income shifting, the moreso if they are deductible domestically.

[8] This ordering of the tax rates is the key output of the income-shifting technology and could be delivered using different technological assumptions. For instance, both bidders could have the ability to shift income, with the foreign bidder able to do so at relatively low cost, $\gamma^f < \gamma^d$.

of foreign ownership conditional on target and bidder characteristics, and a price function, which dictates how any surplus in the deal is shared between the target and the acquirer. However, as long as the allocation awards the target to the firm with the higher (after-tax) valuation, the price function can be ignored in deriving the results that follow.

So, assuming only that the bargaining process is efficient[9] in the sense that acquirer f obtains the firm if and only if $V_f - V_d \geq 0$, we can write the probability that the acquirer will be foreign as:

$$P_{foreign} = P\left(\epsilon_f - \epsilon_d > -\left[\frac{1-\tau_f}{r_f} - \frac{1-\tau_d}{r_d}\right] Y - \left[\frac{\tau_f}{r_f} - \frac{\tau_d}{r_d}\right] z - \theta\right)$$

with $\theta \equiv \theta_f - \theta_d$.

This expression reveals two possible channels for taxes to affect ownership – either from the direct effect of taxes on cashflows, or via tax-induced differences in the discount rates. After-tax cashflow is composed of $(1-\tau_i)Y$, which is clearly *decreasing* in the tax rate, and also the value of the tax shield from z dollars of deductions, $\tau_i z$, which is *increasing* in the value of z and *increasing* in the tax rate.

In general, we would expect that the tax advantage of the foreign bidder would lead to a relatively higher discount rate or cost of capital, reflecting a higher opportunity cost (since the foreign bidder can take advantage of its low tax rate on alternative investments as well). To proceed further, we need to make an assumption about just how much discount rates are affected by the differing tax rates of the two bidders. A mild but sufficient restriction on this relationship for what follows is:

$$1 \leq \frac{r_f(\tau_f)}{r_d(\tau_d)} \leq \frac{(1-\tau_f)}{(1-\tau_d)}$$

This just means that tax differences are partially shifted back to capital suppliers, so that discount rates are decreasing in tax rates. At one extreme – perhaps because of perfect capital markets – both bidders face identical discount rates, despite their differing tax rates. The other extreme, which would arise with segmented, symmetric capital markets where capital is in fixed supply, is that savers capture all the benefits of reduced tax rates. In between these extremes, the elasticity of capital supply is positive and finite. Given this mild assumption, which basically just rules out overshifting, there exist ϕ and ψ, both greater than zero, such that:

$$P_{foreign} = H(\phi Y - \psi z + \theta) \tag{1}$$

[9]This is unlikely to be an exact description of reality, given the empirical success of behavioural models of takeovers such as Shleifer and Vishny [2003]; a necessary condition for the results that follow is just that the probability of the foreign bidder winning is increasing in its real valuation advantage.

where $H(\cdot)$ is the cumulative distribution of $\epsilon_d - \epsilon_f$. Then we have the following two key comparative static implications of the model:[10]

1. An increase in target profitability (Y) *increases* the probability that the acquirer will be foreign, except for the extreme case of full backward shifting of taxes onto capital suppliers.

2. An increase in the availability of tax shields (z) *decreases* the probability that the acquirer will be foreign.

It is these two predictions of the model that will be tested empirically in Sections 4 and 6. The intuition for the first case is that for fixed profitability Y, post-tax cashflow will be higher for the low-tax bidder except in the limiting case where this advantage is fully offset by a higher discount rate. This effect is stronger the closer are the two bidders' costs of capital. The second result reflects the fact that the tax-deductibility of z means that its value is just $\tau_i z$, which is obviously increasing in the bidder's tax rate. Since the domestic bidder also has a cost of capital no higher than the foreign bidder, it also discounts these higher tax savings at a lower rate than the foreign bidder, which reinforces the direct effect of the tax savings.[11]

To understand what is going on in the model, it is helpful to examine the two extreme cases for the discount rates:

1. Discount rates are identical, $r_d = r_f$, then $\phi = -\psi > 0$; the effects of Y and z on probability foreign will be equal in magnitude but opposite in sign.

2. Discount rates fully reflect differences in tax rates, $\frac{r_d}{1-\tau_d} = \frac{r_f}{1-\tau_f}$ then $\phi = 0$ and $\psi < 0$; only tax shields will affect the equilibrium probability.

The first case embodies the idea (as in Scholes and Wolfson [1990]) that investors facing relatively low tax rates will have a comparative advantage in acquiring assets that face relatively high explicit taxes. Since tax payments are increasing in pre-tax income, $Y - z$, this intuition suggests that foreign investors, facing a lower tax rate, will have an advantage in acquiring high-profit firms. It is also clear that profitability and tax shields have a symmetric

[10] Note that both of these results flip signs if in fact it is the domestic bidders which have the tax advantage. In this sense, the signs of the empirical estimates of ϕ and ψ can be thought of as jointly testing the sign of $\tau_d - \tau_f$, rather than relying on the assumption of a foreign tax advantage.

[11] Since both effects go in the same direction, the second result is robust to an alternative income-shifting technology whereby both bidders deduct z at the same effective tax rate (despite differences in the taxation of Y). This would eliminate the difference in the actual cash savings from foregone tax, but would leave the effect of different discount rates intact.

effect on the foreign probability, as increasing either by a dollar directly changes the valuation difference between the bidders by the difference in their tax rates.

The second case is that envisioned by Desai and Hines [2003] with the idea of capital ownership neutrality. The advantage of a lower tax rate is completely offset by a higher discount rate. Loosely, the intuition is that though such a bidder would indeed derive higher after-tax cashflows from the same before-tax cashflows as a bidder with a higher tax rate, it could get the same relative tax benefit from acquiring any other asset, all else equal. Then there is no direct comparative tax advantage. However, as discussed above, the difference in discount rates leads to different valuations of tax shields, thus giving the advantage to domestic bidders in the case of firms with high levels of tax shields.

Examining the relationships between ϕ and ψ in the two extreme cases suggests that the ratio $\frac{\phi}{\psi}$ reveals information about the relative discount rates. If this ratio is one, then we have the case of equal discount rates; as the ratio decreases towards zero, we get closer and closer to full backward shifting, as envisioned in the second extreme case.

3 Empirical Strategy: Profitability

The estimating equation is exactly the empirical counterpart of equation (1):

$$P(foreign_i) = \Phi(\phi Y_i - \psi z_i + \eta X_i + u_i) \tag{2}$$

assuming a normal distribution for the difference in idiosyncratic productivities, and writing the fixed component $\theta_i \equiv \eta X_i + u_i$, which can be thought of as the non-tax related valuation difference between the two bidders. In other words, there are observable and unobservable components of this difference, which will be the focus of the empirical strategy. As is typically the case in discrete choice settings, the above model is characterized by scale invariance, so that rather than estimating the actual parameters of interest, I will be estimating the parameters normalized by the variance of the productivity difference. This issue is irrelevant in terms of testing the statistical significance of the model or for estimating the magnitude and direction of tax-induced sorting, but will be important in calculating changes in aggregate wealth in Section 6.

3.1 Data

Thomson SDC Platinum is a comprehensive database of cross-border and domestic business transactions. I take all majority transactions (where the acquirer ends up with $> 50\%$ of the company) and minority stake purchases (acquirer ends up with $< 50\%$) that involved

a publicly-traded U.S. target from 1990-2010. Given a transaction from SDC, the target company is matched to Compustat to get the necessary accounting variables. Most cases without a successful match are due to the fact that though the target is public, it is not listed on an exchange covered by Compustat.

For a transaction to make it into the main estimation sample, the target company must have a match in Compustat with nonmissing total assets, earnings, debt and intangibles. This last requirement is the one that shrinks the sample the most. Furthermore, deals that are valued at less than one million dollars or that target companies with less than ten million dollars in total assets are dropped. Further details related to the construction of the estimation sample are discussed in Appendix A.

The general approach is to take the set of target firms as given, and then predict whether the successful acquirer will be foreign using characteristics of the target. Hence, the focus is on the probability foreign, conditional on the target being successfully taken over.

The dependent variable in equation (2), $foreign_i$, is a dummy variable that is equal to one if the acquirer in the deal was foreign, and zero if the acquirer was a domestic taxable entity. This means that deals with acquirers that were domestic but effectively nontaxable (or at least face a much lower rate than the domestic statutory tax rate), such as government-related entities, pension funds and private equity, are excluded from the analysis. The key assumption is that the group of acquirers with $foreign_i = 1$ faces a lower tax rate than those with $foreign_i = 0$. Given these criteria, 15.9% of the majority sample has a foreign acquirer; in the full sample, which includes both majority and minority transactions, the mean is 16.4%.

The main measure of profitability is earnings before interest, taxes, depreciation and amortization (EBITDA), divided by total assets. This is a very broad measure that should not be affected by most tax planning techniques (which come into play when transforming EBITDA into taxable income). The other accounting controls which are used are intangible assets and long-term debt, both normalized by total assets, log total assets and a dummy variable equal to one if profitability is negative, as a proxy for loss carryforwards.

The main profitability measurement issue that must be confronted is that only pre-takeover profitability is observed (at $t-1$), since the target firm is almost always taken private following the deal, which occurs at time t, ending the obligation to report public results. Based on the theoretical model, what we would like is profitability at the time that the takeover decision is made, which could be up to a year after the last publicly available accounting disclosure. To deal with this issue, I use lagged accounting variables and year/industry dummies to construct a very simple forecasting model for future profitability. Specifically, I regress the first lag of profitability (the most recent available) on the second

lag of profitability and other accounting variables and dummies. This produces a model of profitability in period $t-1$ in terms of information available at time $t-2$. I then use period $t-1$ covariates to predict the unobserved profitability in period t, at the time of the merger decision. Using further lags of profitability yields very similar predictions, and is not done in the base case since this cuts the estimation sample. This procedure is quite similar to a measurement error methodology, wherein each lag of profitability is viewed as a measure of future profitability plus some independent error.[12]

Table 1 presents summary statistics for the main sample of target firms as well as the universe of firms in Compustat over the same period. The takeover sample appears to be similar to the population of public firms in the United States.

The empirical estimation will proceed as follows. To begin, the focus is on estimating the profitability effect correctly (controlling for the tax shields effect with industry dummies) using several techniques to deal with omitted variable bias. After presenting the profitability results, I then discuss the difference-in-differences strategy for estimating ψ. Finally, I estimate equation (1) in one step and use it to do a counterfactual policy and wealth simulation.

3.2 Empirical Issues: Profitability

The main empirical complication in estimating ϕ is the possibility that profitability, Y, itself may belong in the set of X variables, describing non-tax valuation differences between the two types of bidders. This may be the case, for example, because of asymmetric information between domestic and foreign acquirers, of the kind investigated by Gordon and Bovenberg [1996].[13] In particular, one might expect it to be easier for a domestic acquirer to pick out targets with low current profitability but good future prospects, using their superior knowledge of local market conditions. Or there could be differences in the 'multinational' composition of the two acquirer groups, domestic and foreign. This could be concerning given the relatively high productivity of multinationals and the possibility of a complementarity between acquirer productivity and real transaction-related synergies.[14] In general, the concern is that bidders would sort on target profitability for reasons other than tax differences, so that we would observe such sorting even if all potential bidders faced the same tax

[12] Variations on this forecasting method, including the simplest method of using lagged profitability directly, or using further lags of profitability as instruments to correct measurement error yield very similar results throughout the rest of the paper, as can be seen in Table 4.

[13] By building a model of cross-border investment with endogenous information acquisition, van Nieuwerburgh and Veldkamp [2009] show that this information 'home bias' persists in equilibrium.

[14] Rhodes-Kropf and Robinson [2008] find that mergers pair together firms with similar market to book ratios, which they attribute to complementarity interacting with search frictions in the market for corporate control.

rate.

To deal with confounding issues of this nature, it is helpful to use minority purchases, defined as ownership changes where the acquirer ends up with less than 50% of the target after the transaction, as a control group. A minority, or stake, purchase provides many of the same benefits in terms of acquiring ownership of part of the income stream as a majority transaction without involving actual control of the target. Importantly, without control, the acquirer cannot use income-shifting strategies since these require changing financial and even operational decisions of the firm. Hence, such transactions could be used as a control for other motives for cross-border transactions[15] and so help to identify any tax-specific effects more precisely. Specifically, if non-tax sorting works in the same way for both majority and minority transactions, then observed sorting on profitability that is unique to majority purchases must be due to the tax difference. This strategy should at least reduce any omitted variable biases inherent in the cross-sectional tests. Intuitively, this strategy can be thought of as one of difference-in-differences using majority transactions as the treatment group and minority transactions as the control group.

A potential remaining issue is that the documented profitability differences across types of acquirers are not due to tax differences. To address this concern, it is useful to employ a comparison between different types of acquirers where the tax differences are starker and more likely to be of first order importance. Specifically, consider the case of tax haven-resident acquirers. Such firms face very low or non-existent taxes levied by their home countries, which is typically the key motivation to locate in such a country, given that tax havens themselves typically have small populations and markets.

Hence, define $haven_i = foreign_i$, but exclude any deals where the foreign acquirer was not resident in a tax haven,[16] as the relevant indicator to be explained by target firm characteristics. In this case, the statutory tax difference between the two groups is approximately 35%, the U.S. corporate tax rate, notwithstanding transaction costs.

This larger tax rate difference implies a larger direct cashflow benefit for haven acquirers relative to domestic acquirers, and so a comparison of domestic versus haven acquirers should yield stronger profitability sorting than domestic vs. non-haven foreign acquirers.

[15]This distinction could be weakened if stake purchases are generally preludes to acquisition of full control – a so-called 'toehold' transaction. In this case, stake purchases should be targeting similar targets as mergers. However, there is an empirical literature analyzing the toehold phenomenon which suggests that this is not a concern, and in any case would bias the results against finding a difference. According to Betton et al. [2009], using data on public company transactions from 1973-2002, 13% of all bids for control had any toehold, with only 3% having been acquired within six months of the takeover bid announcement.

[16]The tax haven characterization is taken from Hines and Rice [1994], although is mostly driven by acquirers from Bermuda and Switzerland, which would be on any reasonable list of tax havens.

4 Results: Profitability

Table 2 shows the results from estimating equation (2) using cross-sectional target firm variation to examine the effect of target profitability on the probability of the acquirer being foreign.

Looking at the first row of column (1), which includes the accounting controls and year dummies, the semi-elasticity of probability foreign with respect to profitability is 2.20 (standard error: .49). For a one standard deviation increase in profitability, all else equal, this semi-elasticity corresponds to an increase in the chance of foreign acquisition of 4.9 percentage points. This positive effect of profitability on probability foreign matches the prediction of the theoretical model.

A key possible confounding concern is the possibility that cross-country differences in industrial composition or differences in regulation across industries may mean that foreign acquirers on the whole have an affinity for takeovers in certain industries,[17] which may just happen to have higher profitability. However, it is also possible, and indeed likely, for the tax effect to manifest itself in terms of both inter- and intra-industry sorting. The former can be seen in Figure 1, where there is clearly a positive relationship between median industry profitability and mean probability of foreign takeover. How much of this sorting one is willing to attribute to taxes dictates how much weight to put on the decrease in the estimated effect in column (2), which includes 20 industry dummies based on industry sector definitions from the North American Industry Classification System (NAICS). The estimated effect is still positive and significant, corresponding to an increase in the probability foreign of 2.8 percentage points for a one standard deviation in profitability. A comparison of the results in columns (1) and (2) confirms that foreign acquirers both preferentially sort into more profitable industries as well as to more profitable firms within those industries. In the same vein, controlling for differential industry time trends or even interacting industry and year effects yields similar results.

4.1 Majority vs. Minority Transaction Comparison

Columns (3) and (4) of Table 2 implement the difference-in-differences style majority-minority transaction comparison. Specifically, each of the independent variables in the model is also included as an interaction with a dummy for a majority transaction. If the assumption about similar non-tax motivations for both types of transactions is valid, then the coefficient on the majority interacted profitability variable corresponds directly to ϕ from the model,

[17] Harford [2005] and Gorton et al. [2009], among many others, highlight the importance of industry-level variation in explaining merger activity.

which captures the extent of profitability sorting that is driven by tax differences between bidders. The coefficient on the non-interacted profitability variable then describes non-tax motivations for sorting on profitability.

Looking at the first row of column (3), we can see that profitability sorting is stronger than in the baseline model of column (1), with the semi-elasticity increasing from 2.20 to 3.00 (standard error: .78). This is directly related to the non-interacted profitability semi-elasticity of the second row, which is negative. Hence, it appears that in the absence of tax differences, foreign acquirers would actually prefer lower profitability targets. This is consistent with the result in Kotter and Lel [2011] that sovereign wealth funds, a group of investors typically facing no home country taxation, tend to target poorly performing firms facing financial difficulties for their portfolio investments. The pattern of effects by industry also provides some suggestive evidence that this difference is most pronounced for high-tech firms, which may be explained by a particularly strong technology transfer motivation for deals by foreign acquirers.

Going across the table to column (4), which adds industry dummies, the estimate again drops somewhat, though remaining positive and significant, reflecting similar sorting both within and across industries. Figure 2 gives a graphical representation of inter-industry sorting for this comparison.

The effects of the control variables are largely as expected, since the higher fixed costs of foreign acquisitions should lead foreign acquirers to prefer larger target firms. The debt ratio and the intangibles ratio do not have strongly significant effects, particularly in the majority-minority sample. The effect of the loss dummy, which increases foreign acquisitions in columns (1) and (2), appears puzzling given that losses give rise to tax shields, which should be valued more highly by domestic acquirers. However, this effect disappears for majority acquisitions in the majority vs. minority specification, which provides additional evidence that foreign firms have an idiosyncratic non-tax preference for poorly performing firms, all else equal.

4.2 Tax Haven Acquirer Comparison Results

Table 3 splits the observed profitability sorting from the main results into comparisons between domestic acquisitions and two mutually exclusive groups of foreign acquirers.[18] The first row of results shows the semi-elasticity of probability foreign with respect to profitability where the sample excludes tax haven acquirers, while the second row shows the same quantity excluding non-tax haven acquirers.

[18]Similar results obtain using a multinomial logit model with three possible acquirer types, one domestic and two foreign.

With or without industry controls, and using the baseline sample or the majority-minority comparison, profitability more strongly predicts the probability of foreign takeover for the set of tax haven acquirers than for foreign non-tax haven acquirers. Specifically, the tax haven group shows about twice as strong a preference for more profitable targets than does the latter. Had both groups exhibited similar magnitudes of sorting, the concern would have been that the observed effect was driven by some other difference between foreign and domestic bidders. Overall, this table provides significant additional evidence that the observed profitability sorting is due to tax differences between the bidders, since the relative tax rates of haven and non-haven acquirers are very different.

4.3 Extensions and Robustness

Table 4 presents results from a number of extensions and robustness checks to the profitability sorting result. Row (1) shows the baseline profitability estimates with accounting and year controls, as in the first column of Table 2.

An important potential barrier for an acquirer attempting to shift income out of a target company is the presence of minority oppression rules in the United States. These dictate that a majority shareholder cannot enter into transactions that directly disadvantage minority shareholders, at least without offering compensation. This would definitely be a hurdle for a transaction which shifted income from one company to another company owned by the majority shareholder, since this transfers income away from the minority shareholder. For this reason, one would imagine that an income-shifting motivation would lead to purchases of the whole target company (and thus buying out any existing minority shareholders).[19] This suggests looking at an alternative sample of deals, consisting of only purchases of 100% of the target company. In such a sample, the tax effects should be magnified, and row (2) shows this to be the case. This is not surprising, since including transactions where income-shifting was not possible or was more costly should bias the result downwards.

A possible concern is that different size acquirers have differential preferences over target firm types, and, in turn, foreign and domestic acquirers vary in size, perhaps because higher fixed costs preclude smaller foreign firms from making acquisitions in the United States. To check this, row (3) includes a control for the log of acquirer total assets. The coefficient estimates are similar to the baseline case. However, due to relatively poor availability of this variable (the sample size drops from 5355 to 3814), mainly due to non-publicly traded acquirers, it is otherwise not included in the models considered in this study.

[19]This idea is consistent with Mintz and Weichenrieder [2005], who find that the leverage of German multinational subsidiaries is sensitive to host country tax rates, but only for wholly-owned subsidiaries.

One important difference between foreign and domestic acquirers is in the type of consideration used: foreign acquired are more likely to pay cash for the target (49% of takeovers) than are domestic acquirers (29% of takeovers), which is consistent with Faccio and Masulis [2005]. To the extent that this difference is correlated with target profitability, perhaps because relative bargaining strengths dictate that the bidder has to use cash to pay for the highest quality targets, one might be concerned that it is driving my results. In row (4), I include a dummy variable for cash-only deals, and find that it decreases the profitability effect slightly, though it remains large and significant.

The sign and significance of the profitability effect is also preserved by using different measures of profitability, such as pre-tax income, in row (5). Alternatively, in row (6), rather than use the forecasting method described in Section 4, the profitability measure is just the lagged ratio of earnings before interest, taxes, depreciation and amortization to total assets, and a similar effect is estimated. The somewhat smaller magnitude is also expected, given the likely presence of attenuation bias due to measurement error. Row (7) proceeds in the opposite direction, by adding a second lag of profitability to the future profitability forecast – the results are essentially unchanged.

An interesting observation is that dropping the smallest target firms from the sample, in rows (8) and (9), substantially increases the estimated profitability effect. This provides some compelling evidence against the asymmetric information story discussed earlier. It seems reasonable that the larger the target firm, the more information about the firm and its prospects would be available because of greater media and analyst coverage. In other words, asymmetric information would seem to be most important for the smallest target firms. Rows (8) and (9) show that the effect of profitability on the probability of foreign acquisition is actually much stronger for larger targets.

In non-linear models, such as the probit model, heteroskedasticity in the errors can lead to inconsistency of the coefficient estimates. However, in this case, after accounting for such heteroskedasticity (in the accounting controls) in row (10), the profitability estimates actually get slightly larger.[20] This is also encouraging in the sense that any complementarity between existing profitability and the real takeover surplus would likely manifest itself as heteroskedasticity in profitability.[21] It would be theoretically possible for such a complementarity to drive sorting even in the absence of tax differences, but row (10) shows that this is

[20]The theoretical model can be extended in a straightforward way to allow for heteroskedasticity in the idiosyncratic productivities of the two bidders. This result suggests that any such heteroskedasticity is actually working against the hypothesized results, and so strengthens the original conclusions.

[21]For instance, if the idiosyncratic productivity is multiplicative in the productivity of the target, then we would observe larger 'errors' for more extreme profitabilities. What matters is whether the surplus captured by the acquirer in a takeover is greater for high or low profitability firms, i.e. complementarity vs. 'corporate turnarounds'.

not the case.

Overall, the profitability effects are positive and significant across a wide variety of specifications. Hence, the original cross-sectional estimates appear to be quite robust.

5 Empirical Strategy: Tax Shields

I now return to the strategy for estimating the tax shields term, using bonus depreciation, a recently common (2001-2004, 2008-2010) feature of the U.S. tax code. It allows firms to write off, for tax purposes, an additional 30% or 50% of the cost of new equipment investment in the first year. Because different industries use different types of assets, bonus depreciation affects industries differently, depending on the type of equipment used and the division of investment between equipment, which was eligible for the reform, and structures, which was not.

The general approach is to compare pre-reform (1990-2001Q3) with all post-reform (2001Q4-2010) transactions, given potentially strong anticipation effects from 2005-2007.[22] This suggests a clear difference-in-differences empirical strategy, recalling that the theory says that industries which got a relatively large increase in tax shields from bonus depreciation should experience relative *decreases* in the probability of foreign acquisition following the reform. Note that we would expect to see such an effect even if, as shown by Edgerton [2010], the reform had a minimal effect on marginal investment, because of the susbtantial inframarginal cashflow benefits associated with existing investment.

5.0.1 Construction of tax shields measure

The construction of the bonus depreciation measure is based on Edgerton [2010] and works as follows.

Let j denote an industry and k an asset type, then:

$$\alpha_j^{PRE} = \Sigma_k w_{jk,1997} PV_{k,1997}$$

and

$$\alpha_j^{POST} = \Sigma_k w_{jk,1997}(0.5 + 0.5(PV_{k,1997}))$$

[22] House and Shapiro [2008] report a survey from the National Association of Business Economics taken in January of 2004 which found that 62% of business economists anticipated that bonus depreciation would be extended past 2004.

are the present values of depreciation allowances per dollar of investment pre- and post-reform, respectively.

The asset weights, w_{jk}, for each industry are from the detailed 1997 Capital Flows table from the Bureau of Economic Analysis, and so would not be influenced by bonus depreciation. From the expression, it is clear that the most affected assets are those with the lowest pre-bonus depreciation present value of allowances, which tend to be those with the longest depreciable lives.

This measure of the value of tax writeoffs varies across industry (based on the types of assets in use) and over time *only* due to bonus depreciation. It varies from less than .01 for Oil & Gas Extraction or Real Estate and Accommodation to greater than .05 for Broadcasting and Telecommunications, Forestry and Fishing, Air Transportation, Water Transportation or Paper Products. The distribution of the change in α for post-bonus depreciation targets is shown in Figure 3. Importantly, the cross-industry structure of the reform was determined mechanically by the pre-existing levels of depreciation allowances, as demonstrated by the expression above, and so was quite plausibly exogenous to takeover activity.

To get the total value of future yearly depreciation allowances per dollar of assets for a given firm rather than the value per dollar of investment, embodied in α, I need a measure of investment. Specifically, I use investment rates by industry from 1997 (I_j) to match the investment by asset data used to construct α, and to avoid endogeneity of investment with respect to the reform. Multiplying this investment rate, which is just investment divided by total assets, by α yields the desired measure of future tax shields per year: $z_j \equiv \alpha_j I_j$. The results that follow use the 20 broad sectors from the NAICS, as before.

6 Results: Full Model

To estimate the full model, including possible sorting along the dimensions of both profitability and tax shields, I implement a difference-in-differences framework, which is derived directly from the theoretical model. The estimating equation is:

$$P(foreign_i) = \Phi(\phi Y_i - \psi z_i^{PRE} - \psi POST(z_i^{POST} - z_i^{PRE}) + \theta_i) \tag{3}$$

This is precisely as in equation (1), except that, notationally, I explicitly allow z to vary around the reform. Table 5 presents the results.

The second row of results are all consistent with the theoretical prediction that industries with the highest increases in depreciation allowances should experience relative declines in the probability of foreign acquisitions. In particular, in column (1), the semi-elasticity of

probability foreign with respect to the tax shields measure is -35.41 (standard error: 20.75), which, for a one standard deviation increase in $z^{POST} - z^{PRE}$, amounts to a decrease of 2.2 percentage points in the probability of foreign acquisition. Note that the model of this column is not a full difference-in-differences model, as it includes z^{PRE} as a regressor rather than industry dummies to control for pre-reform differences in probability foreign for different levels of tax shields. Once industry controls are added in column (2), the semi-elasticity actually increases in magnitude to -44.44 (se: 20.71) and is now strongly significant. A possible concern is that this change in probability foreign is driven by industry trends surrounding the reform rather than the reform itself. To that end, column (3) includes 20 industry-specific time trends, and the estimate actually increases significantly, which suggests that secular industry trends in foreign takeovers are actually working against finding an effect from the reform.

Given that bonus depreciation was enacted in 2001 (and was made retroactive to September 11, 2001), one might be concerned that the effect of the reform on foreign takeovers is confounded with heightened regulatory sensitivity to the security implications of such takeovers. To account for such changes, I collect data published by the Committee on Foreign Investment in the United States (CFIUS), which is tasked by Congress with assessing the national security implications of foreign takeovers in the U.S. and potentially blocking them, either overtly or by dissuading the potential acquirer. They reveal, at the three or four digit NAICS level, the distribution of target firms for which a notice was filed. I use this disclosure to encode a dummy variable which is equal to one if CFIUS reported a covered transaction in that target's industry in any year since 2005 (the start of public availability of the data). This is the case for about 58% of the post-reform transactions in my sample. I then include this dummy as well as its interaction with the post-reform dummy as additional controls in θ_i in equation (3) in column (4) of Table 5. The tax shield semi-elasticity is actually somewhat larger than the baseline case of column (2), and neither the additional security dummy nor its post-reform interaction is large or statistically significant.

Additional specifications, where the national security dummy variable is one only if CFIUS covered transactions are above some minimum level relative to the number of transactions in my sample,[23] provide a very similar story, suggesting that changes in concerns about national security are not driving the observed sorting around the bonus depreciation reform.

Examining the first row of Table 5 reveals that the profitability semi-elasticities estimated

[23]The idea is to count only industries with serious security concerns – for example, restricting to industries with at least half as many CFIUS notices as transactions in my sample covers about 25% of post-reform transactions, and yields similar results.

from the full model are very similar to those of the previous section. This is to be expected, as profitability and the change in tax shields from bonus depreciation are basically uncorrelated, conditional on the basic set of accounting controls.

The tax shields estimates can be applied to directly calculate the extensive margin effect of the tax distortions – that is, how much would the fraction of foreign acquisitions change in aggregate from 2001 onwards if bonus depreciation had never been implemented. This involves comparing the actual probability of foreign takeover for each target with the counterfactual probability in the absence of bonus depreciation. This is easily accomplished by setting $z^{POST} = z^{PRE}$ in equation (3) and calculating the new probability, then averaging over industries.

The ownership effects of bonus depreciation, broken up by industry, are shown in Figure 4. The dark bar shows the estimated probability of foreign takeover for each industry, while the addition of the light bar indicates how much higher this probability would have been in the absence of the reform. The difference goes in the same direction for all industries (since the reform always increased z) and is largest for industries with high investment rates and large benefits from the reform, such as the construction and transportation sectors. On the other hand, an industry like real estate, where the prevalence of structures limits the relevance of bonus depreciation on equipment, and which makes relatively little investment per dollar of assets, was not much affected by the reform.

The estimated aggregate effect was to decrease foreign ownership following a takeover by 5.3 percentage points in the post-reform period. Specifically, I find a counterfactual aggregate foreign ownership probability of 24.3%, relative to an estimated 19.0% in the presence of the reform. This roughly corresponds to a change in post-transaction ownership from foreign to domestic of $190B worth of firms (measured by total assets), which constitutes a striking side effect of a tax reform that ostensibly had nothing to do with asset ownership decisions.[24]

6.1 Capital Markets

The preceding sections have examined and verified the two key predictions of the theoretical model in Section 2. However, much more can be learned by comparing the magnitudes of these two effects. In particular, their ratio sheds light on the nature of discount rate differences between bidders, determined in capital markets. Intuitively, this is because both effects can be decomposed into a direct cashflow effect (i.e. more after-tax cash remaining

[24]To put these magnitudes into context, they can be compared to the ownership variation estimated by Huizinga and Voget [2009]. Their counterfactual experiment envisions a U.S. tax reform moving from a worldwide to a territorial system of international taxation and they find that the fraction of cross-border deals involving a U.S. company that end up with a U.S. headquarters would increase from 48% to 56%.

from given profitability for a foreign acquirer or more after-tax cash remaining from given tax shields for a domestic acquirer) and a cost of capital effect. Hence, this ratio can be used to test for the two extreme cases for cost of capital differences. If this ratio is one, then the cost of capital is the same for the two bidders; if it is zero, then costs of capital fully reflect tax differences between the bidders.

The third row of results in Table 5 shows this key ratio as well as its standard error. The estimates are all near zero, and we can always reject the hypothesis that the true value is one with a high degree of statistical significance, which would be the case of identical discount rates for the two bidders. Typically, the hypothesis that the true value is, in fact, zero, cannot be rejected, which means that discount rates approximately reflect the full tax differences across bidders. This means that taxes are fully shifted back to capital suppliers, so that the bidder facing the relatively lower tax rate faces a commensurately higher cost of capital. Another way of expressing this point, which will be important in the wealth calculation that follows, is that the *pre-tax* cost of capital, $r_i^* \equiv \frac{r_i}{1-\tau_i}$ is the same in each country. Hence, for equal tax rates and real productivities, a given level of profitability makes the same contribution to world wealth regardless of the owner of the asset, even though after-tax costs of capital are not equalized across bidders.

6.2 World Wealth

The striking extensive margin effects from bonus depreciation illustrated in Figure 4 lead naturally to the question of the importance of this channel to shareholder wealth and tax revenues. Given the multinational focus of the model, the natural benchmark is world wealth. The goal is to find an empirically implementable expression for the change in world wealth from a change in the generosity of tax shields. Let s be the share of tax revenue going to the foreign country in case of a foreign acquisition (since some tax revenue would leave the domestic country and possibly accrue to the foreign country through post-merger income-shifting).[25] Then we can write world wealth as the value of the firm plus tax revenues,

[25]Effective tax payments by the acquirer are actually composed of payments to both governments plus transaction costs related to income-shifting. I assume that these extra costs can be thought of as lump-sum transfers to other agents in one of the two countries, so that a fraction s of effective taxes go (lump sum) to foreign agents and $1 - s$ to domestic agents.

discounted by the relevant country-specific pre-tax rate of return:

$$\begin{aligned} WW &= \mathbf{I_f}\left[\frac{1-\tau_f}{r_f^*}Y + \frac{\tau_f}{r_f^*}z + \epsilon_f + \theta_f + (\frac{s\tau_f}{r_f^*} + \frac{(1-s)\tau_f}{r_d^*})(Y-z)\right] \\ &\quad + \ (1-\mathbf{I_f})\left[\frac{1-\tau_d}{r_d^*}Y + \frac{\tau_d}{r_d^*}z + \epsilon_d + \theta_d + \frac{\tau_d}{r_d^*}(Y-z)\right] \\ &= \mathbf{I_f}\left[(\frac{1}{r_f^*} - \frac{1}{r_d^*})Y + \epsilon_f - \epsilon_d + \theta - (1-s)\tau_f(\frac{1}{r_f^*} - \frac{1}{r_d^*})(Y-z)\right] + \frac{Y}{r_d^*} \\ &= \mathbf{I_f}[\epsilon_f - \epsilon_d + \theta] + \frac{Y}{r_d^*} \end{aligned}$$

where $\mathbf{I_f}$ is an indicator variable for a foreign takeover and the last line uses $r_f^* = r_d^*$, as found in the previous subsection.

The final line makes clear that the optimal decision rule (I_f) is to grant the target to the foreign acquirer if $\epsilon_f + \theta > \epsilon_d$; that is, to let the winner be the bidder with the highest *real* productivity, which can only be the case when taxes do not affect ownership. This would be the case if either tax differences were eliminated or the two effects happened to be exactly offsetting. Figure 6 graphically illustrates the change in world wealth from an increase in the generosity of tax shields.

6.3 Empirical Implementation

The preceding results are all independent of the scale parameter, which arises, as in all discrete choice models, because of scale invariance. That is, one could multiply each valuation by some constant and not change any of the results on the extensive margin. In the probit models which have been used to this point, there is an implicit normalization of the error variance to one.

To progress to a concrete estimate, we need the change in wealth going from z^{PRE} to z^{POST} (due to bonus depreciation) expressed in terms of empirically identified parameters. Integrating over $\epsilon \equiv \epsilon_f - \epsilon_d$:

$$\Delta WW = \int_{\phi Y - \psi z^{POST} + \theta}^{\phi Y - \psi z^{PRE} + \theta} [\epsilon + \theta] dF(\epsilon)$$

The issue is the normalization of the errors: $\hat{\epsilon} \equiv \epsilon/\sigma$ which implies $\hat{\phi} \equiv \phi/\sigma$ etc. where the 'hat' parameters are what is produced by the estimation. Substituting yields:

$$= \sigma \int_{\hat{\phi} Y - \hat{\psi} z^{POST} + \hat{\theta}}^{\hat{\phi} Y - \hat{\psi} z^{PRE} + \hat{\theta}} [\hat{\epsilon} + \hat{\theta}] f(\hat{\epsilon}) d\hat{\epsilon} \tag{4}$$

This is the world wealth change, per dollar of target assets, from the ownership effects of the reform.[26] To get the aggregate change, this expression must be multiplied by the total assets of the target and summed over all targets in the market in the post-reform period. There are several important assumptions underlying this expression. First of all, I must assume that the costs of capital are not themselves affected by the reform, though this is consistent with the finding in Desai and Goolsbee [2004] that bonus depreciation led to investment increases of only one to two percent. A related point is that this is the change in wealth from the ownership margin only, and so does not include the potential effect of these induced changes in investment levels.[27]

Regardless of which set of estimates is used to calculate this wealth effect, the result is always a negative number times the (positive) unknown scale parameter. This is not surprising, since the tax shields effect, which discourages foreign acquisitions, outweighs the positive profitability effect in the empirical results, so that the estimated tax distortions always discourage foreign ownership on net. Then, since world wealth is falling in the magnitude of the tax distortion, and bonus depreciation increases the size of this distortion, the net effect is negative. However, for comparative purposes, it is very useful to have an actual dollar measure of the change in wealth, beyond just identifying the direction of the change. For this, an estimate of the scale parameter, σ, is necessary, as the estimation procedure above cannot identify it. Hence, further data are necessary.

6.3.1 Estimation of scale

Intuitively, to transform the estimated quantity distortion into a dollar value, it is necessary to know something about the valuation of the runner-up bidder. Then, given the already estimated tax wedge, one could calculate how much real value was potentially lost by the less productive bidder acquiring the target. With ideal data, it would be possible to estimate a model with an additional equation describing the difference between the two highest bids, which would allow the scale to be identified. Unfortunately, the runner-up's valuation is usually not observed and so this multiple equation approach is not feasible. However, I collect a small sample of losing bids gleaned from SDC and from media descriptions of merger fights, which is sufficient to recover a rough estimate of the necessary parameter.

Exhaustive search yielded a dataset of 300 cases in the original sample with an identifiable

[26] The cutoff productivities are not affected since each component is normalized, so that the cutoff is scale invariant. This is exactly what allows calculation of the counterfactual probabilities without worrying about the scale parameter.

[27] To the extent that the reform actually caused increased investment, the valuation difference between bidders with different tax rates would actually increase, because of the increase in associated tax shields, exacerbating the distortion.

losing bidder and associated bid. Of these, 48 have a foreign winning bidder and domestic losing bidder or vice versa. However, in some specifications, I include the remaining cases with matching winner and loser to increase the sample size. This should bias my estimate downward, because in cases where the winner and loser are both domestic, the difference in their bids should be strictly lower than that between the winner and the unobserved highest foreign bid.

The estimating equation is as follows, where the quantity of interest is the standard deviation of the residual, e_i:

$$P_{di} - P_{fi} = \beta X_i + e_i \tag{5}$$

where P_{di} is the price offered by the top domestic bidder, P_{fi} is the price offered by the top foreign bidder, X_i is a broad set of target level controls, including both tax and non-tax variables, and i indexes the target firm. Both prices are normalized by the total assets of the target. This formulation parallels the valuation difference from the theoretical model. To the extent that some of the surplus in the acquisition is captured by the acquirer, the estimated standard deviation will understate the true variation.[28]

Including various sets of controls, paralleling earlier sections, yields a root mean squared error of approximately 0.38; this estimate is not much changed by the inclusion of deals where both bidders are either domestic or foreign. In the context of the model, this parameter is the standard deviation of the difference in idiosyncratic productivities between domestic and foreign bidders per dollar of assets.[29]

As can be seen from equation (4), the unitless estimates described above must be multiplied by this scale to get a dollar value for the wealth change. This procedure yields a wealth loss of approximately $360 billion from 2001 to 2010, relative to $7,325 billion worth of assets traded in the M&A market in my sample. This corresponds to a novel welfare effect from this reform of $36 billion per year. Alternatively, the aggregate loss is worth about 5% of the total assets of target companies in the bonus depreciation period. It is important to note that the estimated effect comes from taking the set of acquired firms as given, and so does not include changes driven by reform-induced selection into or out of this sample. Since tax effects do not seem to be important to selection in the first place, this alternative

[28] Andrade et al. [2001] survey the literature and perform their own updated empirical analysis to find that approximately all gains from a merger accrue to target firm shareholders, though this is an area of considerable recent debate. For example, Netter et al. [2011] find that the gain to acquirers is usually positive in a very broad sample of takeovers; Savor and Lu [2009] use exogenous takeover failures to show that stock mergers create value for the acquirer's shareholders; Ahern [2012] reports that the average gains to the target and the acquirer in a merger are approximately equal.

[29] I also consider an alternative specification wherein I treat the observed market value prior to the takeover bid as an estimate of the next-best valuation – this allows for a much larger sample size of 3910. In this case, the estimated standard deviation is about 0.5.

channel appears to be relatively less important. Additionally, any positive or negative direct effects of bonus depreciation on capital investment or tax revenues are not included in this estimate, as they are beyond the scope of this investigation.

Figure 5 shows how this wealth loss varies across specifications from Table 5 and for different values of the scale parameter, in terms of both percentage of assets and in dollar terms. Across all specifications and for a wide set of scale parameters, the implied distortion is large, especially in the context of the magnitude and goal of the reform. This wealth change is made up of two parts: tax revenues and shareholder wealth. Since the reform led to a decrease in foreign acquisitions, which are assumed subject to a lower tax rate, tax revenues must have actually increased.[30] Hence, shareholder wealth fell by more than the $360B figure. How this loss was distributed between foreign and domestic shareholders depends on how the takeover price distributes the deal surplus between target and acquirer shareholders. If, for example, target firm shareholders receive approximately the whole surplus, as suggested by Andrade et al. [2001], then the full effect of the shareholder wealth loss accrues to those shareholders through lower transaction values. In this empirically plausible case, domestic wealth falls, underscoring the importance of this channel to domestic policymakers.

7 Conclusion

This paper presents a model of cross-border mergers and acquisitions which gives a set of empirical predictions about the nature of tax clienteles. The empirical results show that foreign acquirers systematically target more profitable firms for acquisitions. As would be expected if this observation is driven by tax differences, the results are strikingly larger for tax haven-resident acquirers. Furthermore, an exogenous increase in the value of tax shields for firms in particular industries leads to relative decreases in foreign acquisitions in those industries most affected by the reform. These results are all consistent with the theoretical model.

The model also implies that the relationship between the magnitudes of these two dimensions of sorting can be used to test for cost of capital differences between the two types of bidders. In particular, the empirical results imply that the tax differences between foreign and domestic bidders are strongly reflected in their discount rates. This has significant implications for optimal tax policy and, in particular, highlights the importance of differential valuation of tax shields in determining ownership of assets, which has been an underappreciated point in previous literature. Increasing the availability of tax shields, perhaps by increasing the generosity of depreciation allowances for given investment, appears to be

[30] This abstracts from the direct effect of the reform on tax revenues, as discussed above.

a powerful way of influencing the market for corporate control to the advantage of domestic acquirers. However, simulations using variation in these allowances from bonus depreciation suggest that the induced shift in ownership towards domestic companies actually has a large, negative effect on world wealth. Whether such a reform is nonetheless good for the domestic economy depends on whether the existing level of foreign ownership is too high or too low, and how transaction gains are shared between target and acquirer shareholders.

Overall, this paper provides a variety of evidence for the importance of tax factors in the market for corporate control, which significantly affect the pattern of foreign ownership both within and across industries. Several different policies could be pursued to address this distortion. Increasing barriers to income-shifting, either through stronger enforcement or stricter transfer pricing and earnings stripping rules, would address the problem to the extent that differences in discount rates are only due to income-shifting. However, such an approach has already proven difficult, as evidenced by my results, and would have its own costs, in terms of distorting real cross-border production, research and financing decisions. Notwithstanding any associated net revenue losses, a decrease in the statutory corporate income tax rate would directly decrease the incentive for income-shifting, which would decrease the valuation differential between foreign and domestic bidders and so lead to a more efficient ownership pattern and higher aggregate wealth.

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A Sample Construction

A small complication is caused by some cases of multiple transactions associated with one announcement date. To deal with these, all the transactions from the same announcement date, for the same target and acquirer, are aggregated by adding up the transaction values and fraction of shares acquired to yield a single transaction that is included in the estimation sample.

	N	**Value ($B)**
All mergers with U.S. target	145,619	15,298
...target is public	9,970	8,735
...match in Compustat	7,565	8,341
...meet size restrictions	6,809	8,286
...necessary accounting controls	5,939	7,120
...necessary acquirer type	5,383	6,461

Most unmatched public companies are due to being listed on exchanges that are not covered by Compustat. The remaining missing matches are due to changes in CUSIPs and company names in the early 1990s, before SEC EDGAR data were available to aid in the matching. Though the number of transactions declines a fair amount after imposing necessary restrictions, the estimation sample still contains a significant fraction of the relevant deals by transaction value.

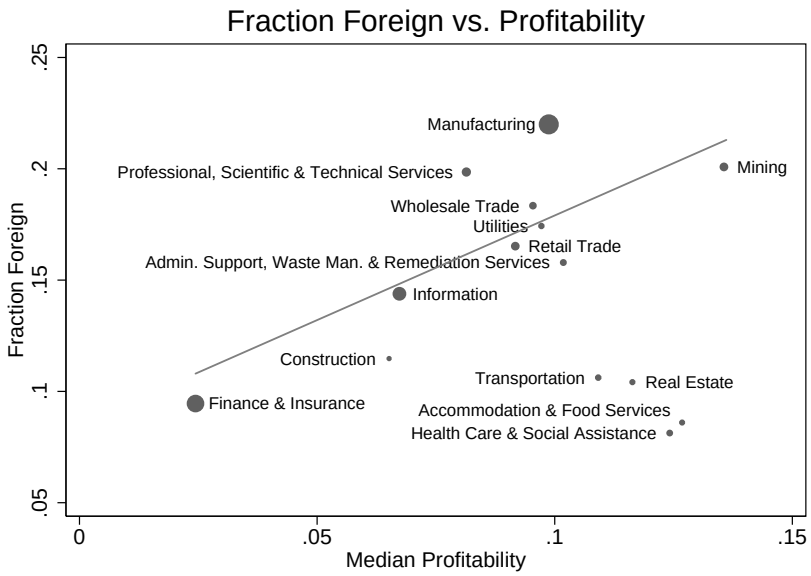

Figure 1: Within 20 NAICS-defined industries, this is a scatter plot of the fraction of targets which were acquired by a foreign bidder against the median profitability in that industry. The size of the datapoint is a qualitative indicator of the number of transactions observed in that industry.

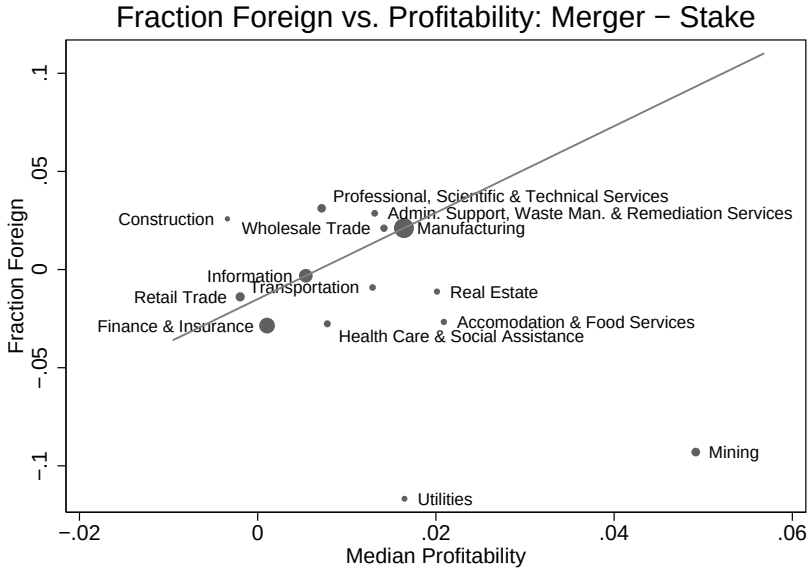

Figure 2: For each of 20 NAICS-defined industries, the y-variable is the difference between the probability of foreign acquisition and the probability of a foreign stake purchase; the x-variable is the relative difference in profitability between majority and minority acquisition targets. The size of the datapoint is a qualitative indicator of the number of transactions observed in that industry.

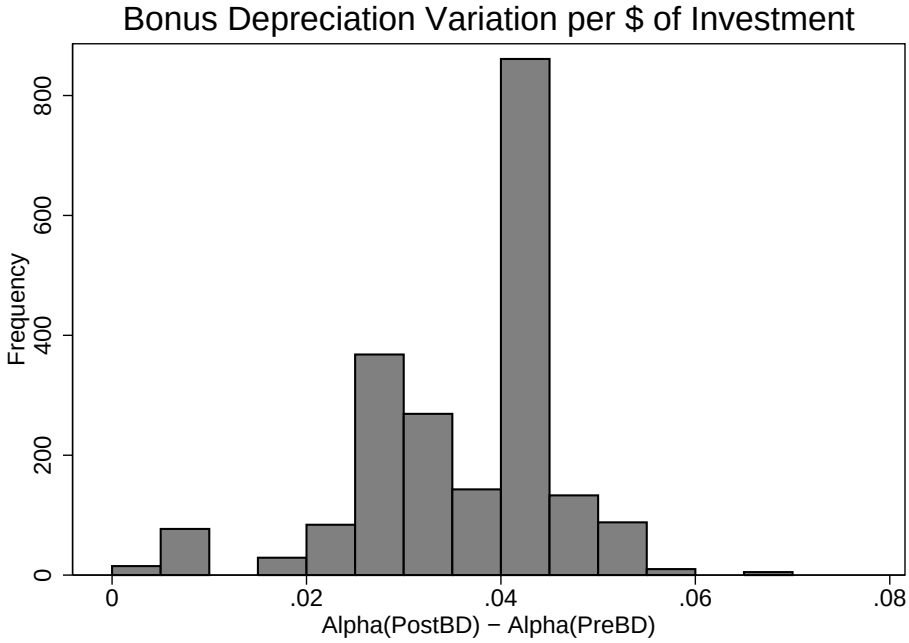

Figure 3: This is a histogram of the bonus depreciation-induced change in the present value of depreciation allowances for all post-reform acquisition targets. It shows the changes in α, the present value of depreciation allowances per dollar of assets, induced by the reform.

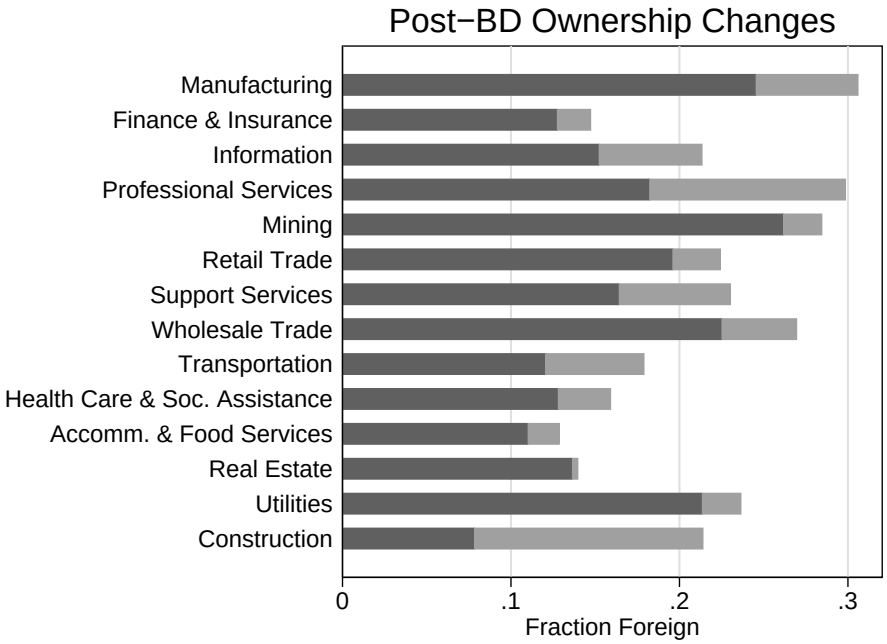

Figure 4: This shows the ownership changes caused by bonus depreciation – the dark line shows estimated foreign probability with the reform and the light line shows the counterfactual effect of removing the reform.

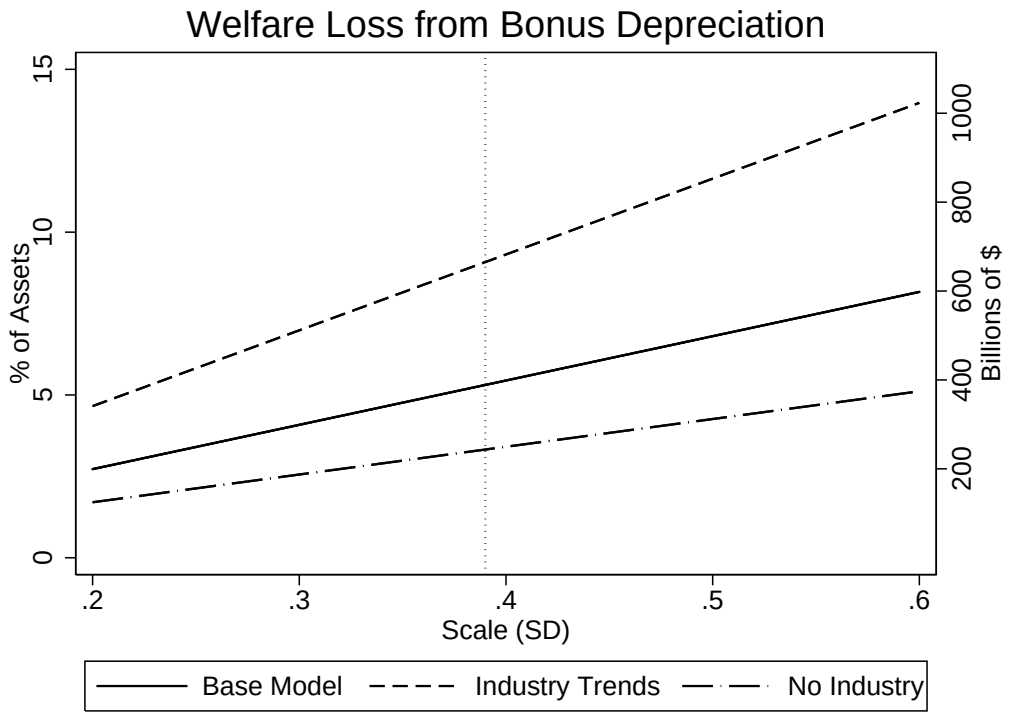

Figure 5: This shows the loss in world wealth from the ownership changes caused by bonus depreciation (for each of the specifications from Table 5 and different values for the σ parameter.

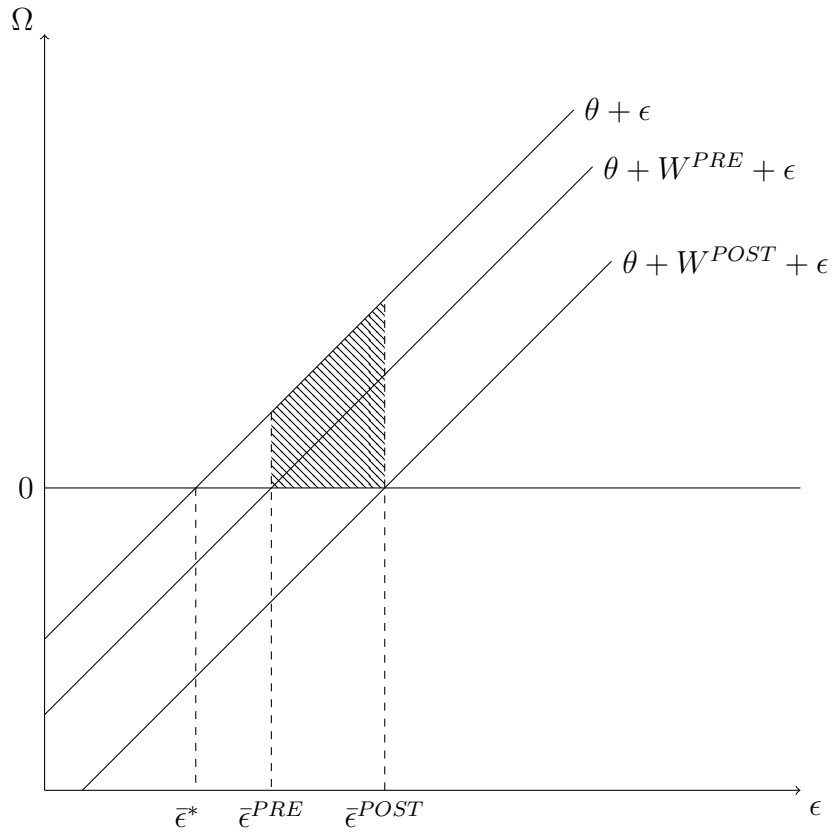

Figure 6: This is a graphical illustration of the change in world wealth (on the y-axis) caused by a change in the tax wedge, with the foreign-domestic productivity difference on the x-axis. In particular, the shaded area is the wealth change caused by a change in the tax wedge from $W^{PRE} \equiv \phi Y - \psi z^{PRE}$ to $W^{POST} \equiv \phi Y - \psi z^{POST}$, with productivity difference $\epsilon \equiv \epsilon_f - \epsilon_d$ and the overbars denoting the cutoff value for each tax wedge. The illustrated case shows a negative initial tax wedge (as is found empirically), which discourages foreign acquisitions, and so leads to a cutoff productivity difference (foreign less domestic) that is higher than is optimal. The increase in tax shields makes the tax wedge more negative and so exacerbates this problem, resulting in a *loss* in world wealth.

	Majority Sample		All Compustat Firms
	Median	**Mean**	**Mean**
Total Assets ($M)	221	2,324	6,222
		(21,179)	(58,681)
Profitability (%)	7.0	5.0	5.8
		(14.0)	(22.6)
I(Prof. < 0) (%)	-	20.2	18.8
Intangibles (%)	1.9	11.0	10.3
		(17.1)	(16.7)
Debt (%)	8.2	17.5	18.9
		(24.8)	(28.5)
Foreign (%)	-	16.0	-
Haven (%)	-	2.0	-
N	5,383	5,383	142,739

Table 1: N = 5,383 for main estimation sample. The 'All Firms' category includes all firms in Compustat from 1990-2010 with greater than $10M in assets and non-missing values for all accounting controls. Standard deviations are in parentheses.

	Majority		Majority - Minority	
Profitability * Majority	2.204***	1.265**	2.996***	2.253***
	(.489)	(.509)	(.775)	(.807)
Profitability	-	-	-0.797	-0.994*
			(.563)	(.594)
Total Assets * Majority	.0285	.0849***	.0204	.04938*
	(.0205)	(.0221)	(.0251)	(.0286)
Total Assets	-	-	.00795	0.0352
			(.0301)	(.0346)
Debt Ratio * Majority	-.557*	-.414*	-.656	-.511
	(.316)	(.234)	(.496)	(.449)
Debt Ratio	-	-	.101	.0983
			(.326)	(.358)
Intangibles * Majority	-.0678	.0236	.118	-.00983
	(.573)	(.419)	(.698)	(.547)
Intangibles	-	-	-.186	.0334
			(.315)	(.358)
Loss Dummy * Majority	.691***	.455**	.222	.0287
	(.122)	(.132)	(.219)	(.234)
Loss Dummy	-	-	.467***	.424***
			(.152)	(.158)
Industry	N	Y	N	Y
N	5,383		8,715	

Table 2: Probits, all containing accounting controls and year dummies. The dependent variable is one for a foreign acquirer and zero for a domestic acquirer. Values are semi-elasticities of probability foreign with respect to each variable. *, **, *** denote significance at 10%, 5% and 1%, respectively. Mean probability foreign is 0.159, and the standard deviation of profitability is 0.140. Standard errors are bootstrapped over 100 repetitions to account for variability in the construction of the profitability measure. The first two columns use the majority only sample, while the third and fourth add in minority transactions.

	Majority		Majority - Minority	
	(1)	(2)	(3)	(4)
Profitability	2.078***	1.040*	2.794***	2.068**
$foreign_i$ = *non-tax haven foreign acquirer*	(.560)	(0.597)	(0.894)	(0.924)
Profitability	4.087***	3.653**	5.468**	4.785**
$foreign_i$ = *tax haven acquirer*	(1.522)	(1.624)	(1.799)	(2.023)
Industry	N	Y	N	Y
N	5,277/4,432		8,480/7,028	

Table 3: Probits, all containing accounting controls (log total assets, intangibles ratio, debt ratio and dummy for negative earnings) and year dummies. The dependent variable is one for a foreign acquirer and zero for a domestic acquirer. Values are semi-elasticities of probability foreign with respect to each variable. Standard errors are bootstrapped with 100 repetitions to account for variability in the construction of the profitability measure. Columns (1) and (2) use the majority only sample, while the values in columns (3) and (4) correspond to the interaction of profitability and majority after including minority deals.

	Profitability		N
(1) Baseline	2.204***	(.489)	5,383
(2) Only Full Control Transactions	2.612***	(.586)	4,738
(3) Control for Acquirer Assets	3.100***	(.687)	3,814
(4) Control for cash deals	2.062***	(.515)	5,383
(5) Y = pre-tax income / assets	1.249***	(.389)	5,383
(6) Y = lagged EBITDA / assets	1.705***	(.373)	5,383
(7) Two profitability lags	2.231***	(.491)	5,383
(8) Total Assets > \$25M	3.006***	(.536)	4,879
(9) Total Assets > \$100M	3.976***	(.859)	3,417
(10) Allowing for heteroskedasticity in profitability	2.483***	(.533)	5,199

Table 4: *, **, *** denote significance at 10%, 5% and 1%, respectively. The dependent variable is one for a foreign acquirer and zero for a domestic acquirer. Values are semi-elasticities of probability foreign with respect to profitability. Standard errors are in parentheses following the coefficient estimates. Each row includes accounting controls (log total assets, intangibles ratio, debt ratio and dummy for negative earnings) and year dummies. Standard errors are bootstrapped with 100 repetitions to account for variability in the construction of the profitability measure.

$$P(foreign_i) = \Phi(\phi Y_i - \psi z_i^{PRE} - \psi \cdot POST(z_i^{POST} - z_i^{PRE}) + \beta X_i)$$

	(1)	(2)	(3)	(4)
Profitability (ϕ)	2.068***	1.191**	1.192**	1.186**
	(.759)	(.470)	(.484)	(.496)
Tax shields ($-\psi$)	-35.41*	-44.44**	-58.02**	-52.16**
	(20.75)	(20.71)	(25.97)	(26.11)
$\hat{\phi}/\hat{\psi}$	.058	.027	.021	.022
	(.047)	(.027)	(.015)	(.019)
Industry	N	Y	Y	Y
Industry Trend	N	N	Y	N
N	5,366	5,366	5,366	5,366

Table 5: *, **, *** denote significance at 10%, 5% and 1%, respectively. The dependent variable is one for a foreign acquirer and zero for a domestic acquirer. All probits include accounting controls (log total assets, intangibles ratio, debt ratio and dummy for negative earnings) and year dummies. Values are semi-elasticities of probability foreign with respect to profitability. Standard errors are bootstrapped with 100 repetitions and clustered at the industry level to account for variability in the construction of the profitability measure and the fact that measured variation in bonus depreciation comes at the industry level. Column (1) includes the pre-reform level of tax shields (z_i^{PRE}) which varies at the industry level, column (2) replaces this variable with industry dummies and column (3) additionally includes industry-specific trends. Column (4) also includes a national security dummy as well as its interaction with the post-reform dummy (unreported, not statistically significant).