

DIVIDEND TAXES AND INTERNATIONAL PORTFOLIO CHOICE

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Abstract

This paper investigates how dividend taxes influence portfolio choices, using the response to the distinctive treatment of a subset of foreign dividends in the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA) of 2003. An open-economy after-tax capital asset pricing model is used to derive the hypothesis that JGTRRA should lead to a portfolio reallocation by US investors towards equities in tax-favored countries. A difference-in-difference analysis that compares US equity holdings in affected and unaffected countries finds a substantial portfolio reallocation towards the former. This effect cannot be explained by several potential alternative hypotheses, including differential changes to the preferences of American investors, differential changes in investment opportunities, differential time trends in investment, changed tax evasion behavior, or changes in stock prices associated (or contemporaneous) with JGTRRA.

Keywords: Dividends, Portfolio Choice, Taxes, Tax Treaties, Foreign Portfolio Investment
JEL Codes: F21; G11; H24

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1. Introduction

In 2003, Congress enacted the Jobs and Growth Tax Relief Reconciliation Act (JGTRRA), dramatically altering the dividend tax regime facing US investors. This paper uses one particular provision of JGTRRA – its treatment of foreign dividends received by US residents – to investigate the impact of personal taxes on portfolio choices in an open-economy setting. Specifically, JGTRRA lowered the dividend tax rate to 15% for American equities and extended this tax relief to dividends from companies domiciled in only a subset of foreign countries. Thus, JGTRRA can be interpreted as a quasi-experiment in which those countries experiencing a reduced US personal tax rate constitute a treatment group relative to equities held in the control group of other non-tax-favored countries.¹

As Poterba (2001, 2002) notes, empirical efforts to isolate how taxation influences portfolio choice have produced mixed results. Investigating the relationship between cross-sectional heterogeneity in marginal tax rates and asset holdings is complicated by the incomplete nature of most household portfolios and because income levels can influence both risk preferences and marginal tax rates. Investigating how portfolios change after tax reforms must overcome the possibility that such changes may reflect endogenous supply responses or other general equilibrium effects that can confound the influence of taxation on portfolio choices. This paper seeks to overcome these empirical difficulties by analyzing a tax reform that differentially changed the tax treatment of otherwise similar instruments in a manner that is unlikely to have produced any endogenous supply response. By investigating the effects of dividend taxes in an explicitly open economy setting, the paper also provides some of the first evidence on dividend taxes in a setting of integrated global capital markets that more closely approximates today's reality.

JGTRRA lowered the dividend tax rate to 15% for American equities and extended this tax relief to dividends from companies domiciled in only a subset of foreign countries, namely those with a suitable tax treaty with the U.S. (hereafter referred to as “treaty countries”). This paper interprets JGTRRA's reforms in the light of a simple open-economy version of the after-

¹ JGTRRA's reduction in dividend taxes has given rise to a substantial literature, focusing primarily on the question of whether the reform induced higher dividend payments by US firms (e.g. Chetty and Saez, 2005). However, the impact of the differential treatment of foreign dividends has not previously been analyzed empirically.

tax capital asset pricing model (CAPM).² This framework predicts a portfolio reallocation by US investors towards equity issued by firms domiciled in treaty countries. This prediction stands in contrast to arguments that taxes on portfolio income, and particularly foreign portfolio income, are easily avoided or evaded, or are unimportant given other portfolio considerations. If investors engage in widespread evasion of home country taxes on foreign dividend income, then the only tax borne by these investors would be the withholding tax levied by foreign governments; a change in the US tax rate would have no impact on portfolio choices.³ In a more sophisticated vein, investors could engage in trading strategies around the time of firms' dividend payments that would result in the avoidance of home country dividend taxes.⁴ More generally, tax considerations are often claimed to play a limited role in portfolio decisions in relation to nontax factors such as the risk and return characteristics of assets.

This paper employs data on patterns of outbound U.S. foreign portfolio investment (FPI) from the Treasury International Capital (TIC) reporting system to investigate whether treaty countries experienced a disproportionate increase in US equity FPI relative to non-treaty countries in the aftermath of JGTRRA. This analysis reveals a significant increase for treaty countries relative to non-treaty countries that is consistent with a substantial portfolio reallocation. This effect is robust to the inclusion of a number of control variables that measure changes in the quality of the financial markets in treaty versus nontreaty countries.

This analysis leaves open the possibility that unobservable nontax factors correlated with treaty status resulted in a changed environment for equity FPI. To test for this, it is possible to control for equity FPI originating in the rest of the world (i.e. outside the US). Similar patterns do not hold for non-US equity FPI, and the effect for US equity FPI is robust to controlling for changes in non-US equity FPI, casting doubt on the alternative explanation that opportunities for

² The after-tax CAPM framework was originally developed by Brennan (1970); see also Litzenberger and Ramaswamy (1979), Gordon and Bradford (1980), Auerbach and King (1983), and Bond, Devereaux and Klemm (2007a).

³ Guttentag and Avi-Yonah (2006) consider the international setting and compute a revenue loss to the US of \$50 billion a year as a result of this type of tax evasion (i.e. the evasion of US taxes on foreign income generated by offshore assets held by portfolio investors resident in the US).

⁴ For instance, taxable US investors could sell their foreign equities cum-dividend (immediately prior to the dividend payment) to a party that is not taxable in the US, and then buy back the shares ex-dividend (shortly after the dividend payment). This strategy would eliminate US taxation of the dividends, although the counterparty would still be subject to the foreign government's withholding tax. More generally, Miller and Scholes (1978) propose a "tax irrelevance" hypothesis that suggests that investors can avoid all taxes on (domestic as well as foreign) stock returns.

equity portfolio investment changed in a manner correlated with treaty status. Similarly, it is possible that American investor preferences changed across treaty status around this time. Controlling for alternative forms of US investment – US debt FPI and foreign direct investment (FDI) by US firms – does not change the baseline results. Finally, differences in underlying time trends in FPI going to treaty and nontreaty countries do not appear to explain these results, as cross-sectional analyses of annual changes in FPI show no differential changes for treaty countries, except in the period immediately around JGTRRA.

One particularly important set of considerations in this setting is changed tax evasion behavior that is coincident with JGTRRA or triggered by it. As discussed below, the fact that information sharing provisions were the dimension along which treaties were designated to be suitable suggests that such an alternative explanation is unlikely. Moreover, excluding tax havens or treaty countries with low levels of tax compliance suggests that changed evasion patterns cannot explain the basic result. A variety of other alternative explanations also cannot account for the results. Excluding countries with recent (and hence potentially endogenous) tax treaties, transition economies where the dynamics of portfolio investment may be different, and countries that allied with the US in the 2003 Iraq war similarly does not affect the results.

Because the TIC data reports the value (rather than the quantity) of FPI holdings, it is possible that the results may be confounded by differential stock price changes in treaty and nontreaty countries around the time of JGTRRA. Indeed, the theoretical model in Section 2 predicts that JGTRRA would lead to an increase in stock prices in treaty countries (and the US), relative to nontreaty countries. Specifically, the model shows that in an integrated global capital market, the dividend tax that is capitalized into equity prices is a weighted average of the dividend taxes faced by stock market investors around the world (where the weights represent investors' wealth endowments). However, the model also suggests that the magnitude of any price response should be quite small, as it depends on the wealth of (taxable) US investors relative to aggregate global wealth. An analysis of movements in stock market indices shows no significant change in equity prices in treaty countries (or the US), relative to nontreaty countries, in 2003. As such, it does not appear that the basic result on portfolio choice is driven either by stock price changes due to JGTRRA, or by contemporaneous price changes unrelated to the reform. More generally, there does not appear to be a significantly distinctive stock market return environment in treaty countries in 2003.

These results build on disparate traditions in the public economics and finance literature on how taxes influence portfolio choice. The public economics literature has typically used cross-sectional analyses of the link between either income or estimates of the relevant marginal tax rate and observed portfolio choices (e.g. Feldstein (1976), King and Leape (1998), Hubbard (1985), Agell and Edin (1990), Scholz (1994)). Several studies emphasize that the incomplete nature of most household portfolios makes it critical to separately isolate effects of taxes on the probability of owning assets and on portfolio shares. This literature has typically emphasized the influence of taxation on the probability of asset ownership with only mixed evidence on the effects of taxation on portfolio shares. For example, Poterba and Samwick (2002) analyze recent versions of the Survey of Consumer Finances and find some evidence for modest effects of taxation on ownership and allocation dimensions. In the finance literature, these questions have typically been addressed by investigating the relevance of dividend clienteles (e.g. Graham and Kumar, 2006; Grinstein and Michaely, 2003) or by examining how trading behavior responds to taxes on stock returns (e.g. Ivkovich, Poterba and Weisbenner, 2005). The impact of shareholder taxes on asset prices and equity returns has been analyzed by a substantial body of literature (e.g. Sialm, 2008; Dai, Maydew, Shackelford and Zhang, 2008).

The empirical design in this paper addresses a number of issues with these results. Cross-sectional links between presumed tax preferences and portfolio choices must ensure that other variables that influence portfolio choice are included, in order to avoid confounding the tax rate effects. Of particular concern is the role of income in both determining marginal tax rates and exerting an independent effect on portfolio allocation. Similarly, evidence on trading behavior leaves open the question of how taxes shape portfolio choices in steady state. The relevance of such effects is particularly important for the growing literature on how taxes influence optimal portfolio location and allocation, as in Dammon, Spatt and Zhang (2001, 2004).

Tax reforms hold the promise of circumventing such concerns by investigating changes in portfolios to help control for unobservable factors that might cloud cross-sectional analyses. Scholz (1994) employs the Survey of Consumer Finances panel from 1983 and 1989 to investigate the effects of the Tax Reform Act of 1986 (TRA86). TRA86 was a significant enough to generate strong predictions on portfolio changes across households. Scholz (1994), however, finds limited evidence of changes in household portfolios. Unfortunately, hypothesized responses to such dramatic reforms can be confounded by supply responses or

other general equilibrium effects as firms change issuance and payout decisions, especially for a reform as wide-ranging as TRA86. Ideally, a tax reform with clear consequences for investor after-tax returns and with no effects on supply decisions would more conclusively isolate tax effects.

JGTRRA's changed treatment of international dividends provides an empirical setting that approximates this ideal. First, as described below, the reform had clear consequences for American investor after-tax returns across countries. Second, the division of countries into two separate groups was driven by regulatory concerns and was unrelated to future changes in investment opportunities or other regulatory efforts to change investment in these countries differentially. Finally, given the relatively small share of their stocks held by American investors, it is unlikely that supply responses by foreign firms would be large. It is similarly unlikely that the effects of the reform on US investors' portfolios would have been offset by clientele effects in asset markets. JGTRRA applied only to US investor returns, leaving non-US investor tax rates and asset demands unaffected.

Much of the previous literature has focused on portfolio composition at the household level. For this study, the nature of JGTRRA suggests that an analysis of aggregate FPI flows is the appropriate methodology. Implicitly, this involves using a representative agent approach that examines changes in the international equity portfolio of US investors in the aggregate. This aggregation comes at some cost, as household level heterogeneity in marginal tax rates and firm-level heterogeneity in payout policy is obscured. As discussed below, losing this heterogeneity is likely to bias against finding any results. On the other hand, this representative agent approach to the question of tax and portfolio choice allows the analysis to circumvent the econometric issues associated with the incomplete nature of most household portfolios.⁵

In addition to estimating the impact of taxes on portfolio choice in general, this paper also contributes to the literature on the taxation of international portfolio income, and on the integration of corporate and personal taxes. While foreign portfolio investment flows have come

⁵ The approach used here – with its focus on patterns of investment rather than on explicit measures of household portfolios – is similar to the methodology employed in the literature on the effects of tax burdens on mutual fund inflows (e.g. Bergstresser and Poterba, 2002). The source of identification here is JGTRRA's differential treatment of assets, rather than variations in the investment styles of mutual fund managers. The fundamental question being addressed, namely the sensitivity of investors to after-tax returns, is the same as that in the household portfolio choice literature.

to eclipse foreign direct investment flows, evidence on taxes and FPI or evidence on dividend taxes in an open-economy setting is very limited. As Graetz and Grinberg (2003) note, a greater emphasis of the effects of taxation on international portfolio flows is required to better inform tax policy in this increasingly important area. For example, economists have long advocated corporate tax integration as a means of reducing distortions created by the corporate tax system (e.g. Hubbard, 1993). However, integration has often been implemented using mechanisms, such as imputation credits, that create a tax advantage to holding domestic rather than foreign equities, and so potentially exacerbate the home bias in asset holdings (Fuest and Huber, 2001). The role of taxes in contributing to home bias has hitherto received little empirical attention,⁶ but the results here indicate that potential tax-induced distortions to international portfolio allocations are likely to be quantitatively large.

The paper proceeds as follows. Section 2 details the provisions of JGTRRA and develops hypotheses about its effects within an open economy, after-tax CAPM model. Section 3 describes the data and the empirical methodology. Section 4 presents the results. Section 5 discusses the implications and concludes.

2. *JGTRRA and Portfolio Choice*

2.1. *JGTRRA's Treatment of International Dividends*

Prior to JGTRRA, dividends were taxed as ordinary income, at a rate of 38.6% for taxpayers in the top tax bracket. JGTRRA stipulated that dividends would be taxed at the same rate as capital gains and reduced the tax rate on capital gains to a maximum of 15%. This lower rate for dividends applies to dividends paid by domestic corporations and by “qualified” foreign corporations for the years from 2003 to 2008. A foreign corporation is deemed to be “qualified” for this purpose if it satisfies one or more of three tests – the “Possessions Test,” the “Market Test,” and the “Treaty Test.” Under the first test, corporations resident in a US possession (such as Puerto Rico) automatically qualify, as do corporations resident in certain former US territories that are treated as possessions for tax purposes. Under the second test, dividends from

⁶ Three exceptions to this are the analyses of trading strategies in Christoffersen *et al.* (2005) and Callaghan and Barry (2003) and the study of the role of withholding taxes in Chan, Covrig and Ng (2005). This paper is most closely related to the analysis by Bond, Devereux and Klemm (2007a, b) of the effects of the 1997 UK tax reform that abolished the preferential treatment of UK pension funds with regard to refundable dividend imputation credits for corporate taxes paid by UK firms. They also interpret this change in the light of an after-tax CAPM, open economy model and explore related predictions.

corporations whose shares are traded in the US are also eligible for the favorable dividend tax treatment. This includes, for instance, corporations that are cross-listed in the US, or whose shares are tradable in the US through American Depositary Receipts (ADRs).

For all other securities, the “Treaty Test” establishes that a corporation resident in a country with which the United States has a tax treaty meeting certain criteria qualifies for the lower dividend tax rate. In particular, the corporation must be eligible for the benefits of the treaty, and the treaty must contain certain information-exchange requirements, and be deemed “satisfactory” by the US Treasury. The IRS released a list of 52 countries that were deemed to satisfy the “Treaty Test”;⁷ these countries are referred to below as “treaty” countries, while those excluded from the list are referred to as “nontreaty” countries.⁸

JGTRRA’s favorable tax treatment of dividends was applied to an extensive, but by no means exhaustive, subset of foreign corporations. For instance, these 52 countries played host to 82% of US outbound equity FPI holdings in 2001 (based on the full sample of 213 countries in the dataset used in this paper). Even so, a number of significant destinations for US investment – such as Argentina, Brazil, Malaysia, Singapore, and Taiwan – are excluded from the favorable tax treatment of dividends. As the empirical approach relies on a within-country comparison of responses to JGTRRA across the two groups of countries, the absolute amounts of investment are less important than the relative changes across the two groups of countries.

JGTRRA’s distinction between treaty and nontreaty countries appears to reflect two concerns among policymakers.⁹ Most importantly, the emphasis on information-sharing provisions was thought to help ensure that cash flows afforded relief were, in fact, truly dividends. Second, there was some concern over allowing dividend tax relief to income that may

⁷ The initial distinction based on the presence of a suitable treaty was made in early 2003 and was featured in the press, including *The Wall Street Journal*, in the summer of 2003. The IRS clarified the precise list of countries in October 2003 - see IRS Notice 2003-69 (“United States Income Tax Treaties That Meet the Requirements of Section 1(h)(11)(C)(i)(II)”). These countries are listed in Table 1.

⁸ In principle, treaties can be revised to meet JGTRRA’s requirements. In November 2006, the IRS issued Notice 2006-101, adding Bangladesh, Barbados, and Sri Lanka to the list of favored countries; however, this occurred after the end of the sample period used in this paper.

⁹ The legislative history is not altogether clear on the rationale for this distinction. This discussion is based on exchanges with several policymakers involved in the process. These exchanges suggest that the distinction was also partly an accident. The initial version of the legislation only afforded relief to domestic corporations. After an adverse reaction to this aspect of the proposal, the Treaty test was suggested as a simple way of covering most foreign investment without including all foreign corporations.

not have been taxed at the corporate level.¹⁰ Moreover, the use of treaty status was thought to be a relatively simple and administratively feasible approach to determining which countries would be eligible for the favorable tax rates. For the purposes of this analysis, the clarity of the distinction and the fact that it remained fixed (with no changes to the list of treaty countries until 2006) are important. Of particular significance is that the distinction appears to have been unrelated to future changes in investment opportunities, or to other regulatory efforts that may have affected investment patterns.

In this study, JGTRRA is conceptualized as a natural experiment that changed the personal tax treatment of assets located in treaty countries but not that of assets located in nontreaty countries. Consider a representative US portfolio investor who faces the top US income tax rate (38.6% prior to JGTRRA) and holds shares in a corporation resident in a foreign country F . Suppose that the foreign corporation pays a (pretax) dividend of \$1. This would typically be subject to a withholding tax by country F . In addition, the US personal tax applies to the investor's dividend income (but with a foreign tax credit allowed for withholding taxes paid to F). However, it is generally the case that foreign withholding tax rates are no higher than the US personal tax rate on dividends, and so the former can be ignored in this analysis.¹¹ Thus, the US investor would receive an after-tax return of \$0.614 from the \$1 dividend before JGTRRA. Consider the impact of JGTRRA if F happens to be a treaty country: the US personal tax rate on dividends becomes 15%, and the investor's after-tax return is thus \$0.85.¹² On the other hand, if F happens to be a nontreaty country, then the applicable tax rate remains equal to the top rate on ordinary income. Under JGTRRA, this rate fell (albeit much less than did the rate for qualified dividend income) from 38.6% to 35%. Thus, the investor's after-tax return would be \$0.65.

¹⁰ Nontreaty status may have been thought to be a rough proxy for those countries with low or zero corporate tax rates. Although most tax havens are in the nontreaty category, many nontreaty countries have relatively high corporate tax rates, so it is not clear that there exists a clear correspondence between treaty status and corporate tax rates.

¹¹ Most withholding tax rates imposed by foreign countries on dividends paid to US shareholders are no higher, and often lower, than 15% - see Anderson (2006, Chart 9.1). Thus, withholding tax rates were *a fortiori* lower than t^{US}_p prior to JGTRRA.

¹² A few treaty countries impose withholding tax rates that exceed 15% - see Anderson (2006, Chart 9.1). For such countries, the post-JGTRRA returns would be less than \$0.85. Including these countries among the treaty countries merely creates a bias against the paper's findings. Furthermore, in the empirical analysis below, reclassifying these countries as nontreaty countries does not affect the basic results.

Thus, the personal tax burden on stock of corporations in treaty countries fell substantially more than did the corresponding burden on stock of corporations in nontreaty countries.¹³

Although JGTRRA's distinction between treaty and nontreaty countries may appear to be an obscure technicality, it was highly salient to tax and investment professionals. The IRS notice clarifying the set of countries eligible for the new tax rate was itself issued partly in response to concerns expressed by this constituency about the lack of clarity in the original legislation.¹⁴ News accounts in the business press highlighted the potential importance of the law's distinctive treatment of foreign dividends.¹⁵ Thus, JGTRRA's rules were widely understood among the relevant practitioners, creating the potential for a substantial portfolio response.¹⁶

2.2 *The Portfolio Choice Problem for U.S. Investors*

This section adapts the after-tax CAPM framework to an open-economy setting that is tailored to highlight the distinctive nature of JGTRRA.¹⁷ Assume a world with a large number of investors, with aggregate wealth \bar{W} . The investors include a representative investor resident in the US, with wealth endowment W_{US} . The investors have available a riskless asset (bonds yielding a return r) and two risky assets: equity issued in treaty countries and equity issued in nontreaty countries. Investor i 's holdings of bonds are denoted by B_i , her holdings of treaty

¹³ An alternative interpretation involves comparisons with the returns from investing in domestic US firms. Under this interpretation, the nontreaty countries constitute a "treatment" group that experiences an increased personal tax rate relative to that for US assets, while the treaty countries constitute a "control" group for which the personal tax rate is unchanged relative to that for US assets. However, the substantive implications of the results (in terms of the *relative* changes in US holdings of assets in the two groups of countries, and the elasticity of asset holdings with respect to the personal tax rate) are identical under both interpretations of the quasi-experiment.

¹⁴ See e.g. Yuka Hayashi "Dividend Plan Puzzles Managers - Law Is Unclear on Extent Tax Cut Will Help Investors In International Funds" *The Wall Street Journal*, 9 July, 2003 for an account of this initial lack of clarity.

¹⁵ One such account suggests that: "The tax cut also will apply to U.S. investors, including investors in mutual funds, who buy stocks in countries with comprehensive tax treaties with the U.S. Asian countries that don't have such treaties include Hong Kong, Malaysia, Singapore and Taiwan, which might put them at a disadvantage in attracting capital" and highlights the contrast between Hong Kong and China: "Hong Kong, with no comprehensive tax treaty with the U.S., . . . has aspirations to be the major financial center for China, which does have one." (Sarah McBride "Dividend Tax Cut Could Help Asia" *The Wall Street Journal*, 20 June, 2003).

¹⁶ For example, it was reported that: "Vivian Lewis, an ADR investment specialist and the editor of newsletter Global-Investing.com, recently removed the Hong Kong conglomerate Cheung Kong Holdings Ltd. from her recommended stock list because Hong Kong doesn't have a comprehensive tax treaty with Washington. Instead, she is now looking to add a company from mainland China, which does have a tax agreement with the U.S." (Yuka Hayashi "Dividend Plan Puzzles Managers - Law Is Unclear on Extent Tax Cut Will Help Investors In International Funds" *The Wall Street Journal*, 9 July, 2003).

¹⁷ This model builds on the work of Brennan (1970), subsequently developed by Litzenberger and Ramaswamy (1979), Gordon and Bradford (1980), Auerbach and King (1983), and Bond, Devereaux and Klemm (2007a). This version is closely related to the model in Bond, Devereaux and Klemm (2007a), which is explicitly framed in an open-economy setting; however, the model here is adapted to highlight the distinctive features of JGTRRA.

country stock by T_i , and her holdings of nontreaty country stock by N_i . There are two periods. In the first period, investors choose their portfolio allocation among these three assets. The price of bonds is normalized to 1, and the period-one prices of stocks are given by p_T and p_N , respectively. In the second period, the bonds pay a deterministic return of r , and the equities pay deterministic dividends of D_T and D_N per share, respectively. The (stochastic) second-period equity prices \mathbf{P}_T and \mathbf{P}_N are realized (random variables are denoted using bold letters). The second-period price for treaty country stock has expected value $E[\mathbf{P}_T]$ and variance σ_T^2 , while the second-period price for nontreaty country stock has expected value $E[\mathbf{P}_N]$ and variance σ_N^2 . It is assumed that the second-period prices of the two types of stock have zero covariance. For the main results below, this is largely an innocuous simplification; however, the effects of relaxing this assumption will be remarked upon below.

In order to focus attention on the effects of dividend taxation, it is assumed that the only applicable taxes are on dividends; interest and capital gains income face zero taxes, and there is no corporate tax. To accommodate JGTRRA's distinction between different types of assets, the dividend tax rate is allowed not only to vary across investors, but also to be asset-specific. The tax rate on treaty country dividends received by the US investor is denoted by t_{US}^T ; the corresponding tax on nontreaty country dividends is denoted by t_{US}^N . Of course, prior to JGTRRA, $t_{US}^T = t_{US}^N$, but the two rates diverged following JGTRRA.

In period one, the US investor chooses holdings T_{US} and N_{US} of each type of stock. The US investor's holdings of bonds, denoted B_{US} , are determined residually *via* the wealth constraint:

$$B_{US} = W_{US} - p_T T_{US} - p_N N_{US} \quad (1)$$

These choices are assumed to maximize the utility function:

$$U_{US} = E[\mathbf{Z}_{US}] - \frac{\gamma}{2W_{US}} \text{Var}[\mathbf{Z}_{US}] \quad (2)$$

where \mathbf{Z}_{US} is a random variable denoting the US investor's wealth at the end of the second period, and γ is a risk-aversion parameter. It is assumed that all investors have utility functions of this form, and hence that an investor's risk aversion is inversely proportional to her wealth. Again, this is a largely innocuous simplification, and leads to a particularly intuitive characterization of the equilibrium. $E[\mathbf{Z}_{US}]$ can be expressed as follows:

$$\begin{aligned} E[\mathbf{Z}_{US}] = & (1 + r)[W_{US} - p_T T_{US} - p_N T_N] + [E[\mathbf{P}_T] + (1 - t_{US}^T)D_T]T_{US} \\ & + [E[\mathbf{P}_N] + (1 - t_{US}^N)D_N]N_{US} \end{aligned} \quad (3)$$

while $Var[\mathbf{Z}_{US}] = T_{US}^2 \sigma_T^2 + N_{US}^2 \sigma_N^2$ (given the assumption of zero covariance).

Assuming that the investor chooses strictly positive holdings of each asset, maximizing Equation (2) to choose T_{US} and N_{US} subject to the constraint in Equation (1) yields the first order condition:

$$T_{US}^* = \frac{W_{US}}{\gamma \sigma_T^2} [E[\mathbf{P}_T] + (1 - t_{US}^T) D_T] - (1 + r) p_T \quad (4)$$

where T_{US}^* is the US investor's optimal choice of holdings of treaty country stock (an analogous expression holds for her optimal holdings N_{US}^* of nontreaty country stock). It follows straightforwardly from Equation (4) that a decrease in t_{US}^T (as enacted under JGTRRA) will lead the US investor to hold more treaty country stock.¹⁸ Under the zero covariance assumption, JGTRRA will have no effect on N_{US}^* . However, more generally, T_{US}^* and N_{US}^* will be determined simultaneously, and it is possible that a change in the holdings of treaty country stock will induce changes in the holdings of nontreaty country equities. For example, if the covariance between the two assets is imperfect but positive, then the investor may wish to hedge the increased risk associated with a higher T_{US} by holding less N_{US} and more bonds.

To derive the equilibrium, assume that treaty and nontreaty country equities are both in fixed supply, with the supplies of each denoted by \bar{T} and \bar{N} , respectively. For the case of treaty country equities, the equilibrium condition is that $\bar{T} = \sum_i T_i$, where the left-hand-side represents the demand for treaty country stocks, aggregated across all investors:

$$\sum_i T_i = \frac{1}{\sigma_T^2} [\bar{W} E[\mathbf{P}_T] + D_T (\bar{W} - \sum_i t_i^T W_i) - \bar{W} (1 + r) p_T] \quad (5)$$

Rearranging the equilibrium condition and solving for the equilibrium period-one price of treaty country equities, denoted by p_T^* , yields:

$$p_T^* = \frac{E[\mathbf{P}_T] + (1 - \bar{t}^T) D_T}{1 + r} - \frac{\gamma \sigma_T^2 \bar{T}}{(1 + r) \bar{W}} \quad (6)$$

where $\bar{t}^T = \frac{\sum_i t_i^T W_i}{\bar{W}}$ is a weighted average of the (asset-specific) tax rates on treaty country dividends faced by all investors around the world. The weights are given by the wealth

¹⁸ This prediction can also be derived from other models of portfolio choice, such as the ‘‘marginal investor’’ framework. However, the marginal investor approach typically does not explicitly take investors’ risk-aversion into account, and so would predict extreme specialization by investors in tax-favored assets, to an extent that is not observed in the real world. For example, it would be difficult to explain within a marginal investor framework why taxable US investors would hold *any* dividend-paying stock in nontreaty countries after JGTRRA. In contrast, the after-tax CAPM approach predicts only incomplete specialization, and highlights the central factor – the diversification of risk- that limits its extent.

endowments of these investors.¹⁹ An analogous expression can be derived for the equilibrium price p_N^* of nontreaty country equities. Thus, equity prices in this model involve the capitalization of dividend taxes, but it is important to note that the dividend tax that is capitalized is a *global* average of investor tax rates, weighted by wealth endowments (and *not* by investors' holdings of the particular asset).²⁰

While JGTRRA decreased t_{US}^T , (and hence the weighted average tax rate \bar{t}^T), the magnitude of the price effect of JGTRRA depends on $\frac{W_{US}}{\bar{W}}$, i.e. the wealth of US investors relative to aggregate global wealth:

$$\frac{\partial p_T^*}{\partial t_{US}^T} = - \left(\frac{D_T}{1+r} \right) \left(\frac{W_{US}}{\bar{W}} \right) \quad (7)$$

More specifically, it is the relative wealth of *taxable* US investors that matters (as JGTRRA only affected taxable US investors). Note also that any decrease in the cost of equity capital for US firms resulting from JGTRRA would, in a globally integrated financial market, be shared among all treaty country firms.²¹ On the other hand, p_N^* would be largely unaffected by JGTRRA, as it depends on $\bar{t}^N = \frac{\sum_i t_i^N W_i}{\bar{W}}$, which fell by only a small amount under JGTRRA (due to the reduction in the top personal tax rate on ordinary income for US residents). This distinction is important to testing whether the results on portfolio choice may be confounded by stock price changes.²²

As noted earlier, this framework is related to that used in the analysis of the 1997 UK tax reform by Bond, Devereux and Klemm (2007a, b). Prior to 1997, UK pension funds received

¹⁹ Note that if investors are severely home biased (so that US stocks are held only by US investors), this weighted average collapses to the tax rate faced by US investors (on dividends from US stocks). However, less extreme forms of home bias can be accommodated by the model without fundamentally changing the conclusions. For instance introducing a taste-based preference for treaty country equities into the utility function in Equation (2) will lead to a higher equilibrium T_{US}^* , but (as long as the investor is not driven to a corner solution) will still leave the US investor indifferent at the margin between treaty and nontreaty country equities; JGTRRA would still induce a portfolio reallocation similar to that described in the text.

²⁰ In more general formulations of this model, investors' levels of risk tolerance may also enter as weights. However, the result that the weights do not depend on actual holdings of the asset is quite general. The intuition is that every investor is "marginal" in this model – i.e. is indifferent at the margin between the different assets.

²¹ For instance, British firms would experience the same price effect as US firms from JGTRRA, even if US investors only own a small fraction of British equities.

²² Of course, the equity price effects of JGTRRA are also of independent interest. This model implies that (in a globally integrated financial market) the appropriate test for whether JGTRRA affected stock prices and the cost of equity capital would involve using equity prices in nontreaty countries as a control in determining whether equity prices in treaty countries (and the US) rose as a result of JGTRRA. As discussed below, however, the volatility of the data on stock prices makes it difficult to reach any firm conclusions.

refundable dividend imputation credits for corporate taxes paid by UK firms. Bond, Devereux and Klemm (2007a, b) argue that, in an open economy setting, the abolition of this system in 1997 (and the consequent increase in the dividend tax burden faced by UK pension funds) should have little impact on UK firms' equity prices and investment behavior. The reason is that the stock market wealth controlled by UK pension funds (although large relative to the UK stock market) represents only a small fraction of aggregate global wealth. On the other hand, the reform should have a substantial impact on UK pension funds' portfolio choices, in particular, their incentive to hold UK rather than non-UK equities.

3. *Data and Empirical Specification*

The Treasury International Capital (TIC) system reports the portfolio holdings of foreign securities by US investors, based on periodic surveys of banks, other financial institutions, securities brokers and dealers.²³ The location of the holdings is defined for each of a large number of countries and territories; the data represent the portfolio holdings of foreign securities by US investors at the end of each of the following years: 1994, 1997, 2001, 2003, 2004 and 2005. The data are divided into three categories – equity FPI (i.e. holdings of foreign stocks), long-term debt FPI, and short-term debt FPI (available only from 2001).²⁴

The TIC data are based on the survey responses of a wide range of financial institutions and securities brokers and dealers, and so are highly comprehensive. Of particular importance to this study is that the location of assets (i.e. the country in which the securities owned by US investors are issued) is likely to be reported very accurately.²⁵ In addition, the data include US holdings of foreign assets through American Depositary Receipts (ADR's). While there are some

²³ These data are available at www.treas.gov/tic/ and are described in more detail in Bertaut, Grier and Tryon (2006).

²⁴ The firm-level data from TIC have previously been used to examine the determinants of US investors' equity holdings in foreign firms (e.g. Ahearne, Grier and Warnock, 2004; Ammer *et al.*, 2006); the country-level data have been used to analyze the role of corporate tax rates and corporate governance institutions on the location of US portfolio investment (Desai and Dharmapala, 2007).

²⁵ Several concerns have been raised for how this data source categorizes FPI *into* the U.S., in particular with respect to custodial arrangements. This difficulty appears less relevant for the case of outbound FPI as there is no reliance on the reporting of other countries and all reporters are U.S. entities. Bertaut, Grier and Tryon (2006, p. A63) argue that: "The country attribution of the portfolio asset surveys should be extremely accurate. The annual position surveys, by design, attempt to collect information by country of issuer . . . precisely identifying each security issuer's country of residence – from information supplied by survey reporters as well as from commercial data sources – is a relatively straightforward task."

limitations of the data, particularly with respect to small investors,²⁶ the TIC data are the best available source of information on FPI by US investors.

The dependent variable in the basic specification is the log of equity FPI held by US investors in country i in year t , measured in millions of US\$. The independent variable of interest seeks to capture those observations (at the country-year level) for which the reduced dividend tax applies. Thus, it is an interaction between an indicator variable ($Treaty_i$) for those countries listed as treaty countries in Table 1 and an indicator ($PostJGTRRA_t$) for the years after the enactment of JGTRRA. As JGTRRA was applied to the 2003 tax year, the latter variable is a dummy for the years 2003, 2004 and 2005.²⁷ The basic empirical specification is thus:

$$\text{Log of Equity FPI}_{it} = \beta(\text{Treaty}_i * \text{PostJGTRRA}_t) + \mathbf{X}_{it}\boldsymbol{\gamma} + \mu_i + \nu_t + \varepsilon_{it} \quad (8)$$

The central hypothesis that Equation (4) tests is whether US equity FPI is higher in treaty countries (relative to nontreaty countries) following JGTRRA: i.e. that $\beta > 0$. The specification in Equation (8) also includes country fixed effects (represented by μ_i) and year effects (represented by ν_t); ε_{it} is the error term.

\mathbf{X}_{it} is a vector of time-varying control variables. In the baseline specification, the following controls are included. The log of GDP per capita (in PPP terms, expressed in nominal US\$) and the log of population are obtained from the World Bank's *World Development Indicators* (WDI) database.²⁸ These variables control for changes in countries' affluence and size. The log of aggregate stock market capitalization (in nominal US\$) controls for changes in the value and amount of equity available for US investors to hold in a given country.²⁹ As

²⁶ While the data achieve comprehensive coverage of US investors' holdings through institutions and other reporting entities, they may not be as comprehensive for small individual investors' non-institutional holdings of foreign assets (Bertaut, Grier and Tryon, 2006, p. A67). Such holdings, however, are likely to be relatively small in magnitude. Second, the data do not include stock swaps and cross-border derivatives positions (although data collection on the latter began in 2005). Finally, the country of location is defined as the legal residence of the entity issuing the securities, and may not correspond to the country where the associated "real" economic activity is carried out. Thus, US investors' portfolio holdings in small offshore financial centers and tax havens are potentially difficult to interpret. However, most such countries are excluded from the estimating sample due to missing data, and (as described in Section 5 below) the results are robust to the exclusion of the remaining havens.

²⁷ Strictly speaking, the treatment countries to which the reduced dividend tax rate applies include not only the treaty countries in Table 1, but also US possessions and certain former US territories. However, no FPI data is available for US possessions, and missing data eliminates the former US territories from the estimating sample. Thus, the "Possessions Test" does not play any role in the empirical analysis.

²⁸ This is available at <http://econ.worldbank.org>. Note that while GDP (and certain other variables) are expressed in nominal terms, the specification includes year effects.

²⁹ As Kho, Stulz and Warnock (2006) argue, much of this aggregate market capitalization may be tied up in controlling blocks and unavailable for purchase by minority shareholders, especially in countries with weak investor

investment decisions may also be affected by stock market performance, an additional control variable is a total stock return index constructed by Morgan Stanley Capital International, and available through Thomson's Datastream database.³⁰ The index measures annual total returns for each country's stock market, assuming that all dividends are reinvested. In addition, a number of additional control variables are used in various robustness checks, as described in Section 4.

The data on equity FPI is available (for the years specified above) for 1259 country-year observations on 213 countries and territories. The majority of these observations involve zero or negligible amounts of US equity FPI.³¹ Moreover, the control variables are not available for many of the observations. In particular, the coverage of the stock return index is limited to those countries with the largest stock market capitalization. Thus, the primary estimating sample is considerably smaller, with 291 observations for the 49 countries listed in Table 1. Of these countries, 38 are treaty countries and the other 11 are nontreaty countries. Summary statistics, using this sample, for the variables used in the analysis are reported in Table 2. This reduced sample includes most countries with substantial stock market activity. It also includes a reasonable mix of treaty and nontreaty countries, with several nontreaty countries that have substantial economies and levels of US investment. The sample also excludes most small tax havens and offshore financial centers, for which the interpretation of FPI is potentially problematic. Finally, because the sample excludes most countries with very small amounts of US equity FPI, the analysis is less subject to random variations in these values over time.

Figure 1 provides a simple descriptive perspective on this empirical test. It shows the mean levels of US equity FPI, scaled by aggregate stock market capitalization, in treaty and nontreaty countries before and after JGTRRA for the 49 countries listed in Table 1. Prior to JGTRRA, treaty countries had a somewhat larger level of US equity FPI, relative to their aggregate stock market capitalization. Following JGTRRA, this difference widened

protections. Investor protection changes little over time, and is essentially incorporated in the country fixed effect here.

³⁰ See www.mscibarra.com for a description of these country level stock returns indices.

³¹ Zero values for equity FPI are reported in the TIC data when there is no equity FPI in that particular country, or when the value of equity FPI is under \$0.5 million. In the analysis, the log of equity FPI is set equal to zero when equity FPI is reported to be zero. In principle, this may create the following problem. Suppose FPI increases from \$0.4 million (reported in the TIC data as 0) to \$0.6 million; this increase in FPI would be associated with a *decrease* in log FPI from 0 to -0.51. Fortunately, there is only one observation in the primary estimating sample for which the TIC data reports zero equity FPI (Jordan in 1994) and all other reported values are above \$1 million. As such, the scope of this potential problem is limited and, moreover, the paper's results are robust to the omission of Jordan in 1994.

considerably, with FPI scaled by market capitalization in treaty countries increasing slightly and the corresponding ratio in nontreaty countries decreasing.

This simple illustration is suggestive that the effects hypothesized above are indeed operative, even though there are a number of factors that would be expected to create a bias against finding any effect. First, some firms do not pay out all earnings as dividends.³² Even though these firms' returns will be burdened by dividend taxes if they are expected to pay dividends at some point in the future, the expiration of JGTRRA's provisions (originally scheduled for 2008, and later amended to 2010) implies that these dividends may not benefit from favorable tax treatment. To the extent that the returns from stock are derived as capital gains, this would simply make it more difficult to find an effect as there was no variation across countries for the reduced capital gains rate. In addition, the uncertainty over the duration of the tax break created by JGTRRA's expiration would also potentially weaken any finding.

Second, the effects of JGTRRA are most pronounced for top-bracket US investors. In reality, some US investors are in lower tax brackets, and much investment occurs through tax-exempt vehicles or in tax-advantaged accounts. The presence of such investors also creates a bias against finding any effect, and the estimated effect can be viewed as a lower bound as it is averaged across all US investors. Third, the exclusion of certain countries under the "Treaty Test" may not matter in practice if the dividends from corporations resident in those countries qualify for favorable treatment under the "Market Test." Again, this would simply create a bias against finding any effect of JGTRRA on international portfolio choices.³³

Finally, it is possible that observed responses in security holdings by American investors might reflect changed payout or stock issuance decisions in response to the tax cut. Endogenous changes in firms' payout policies in response to JGTRRA are unlikely as US portfolio investors generally constitute a small fraction of foreign firms' investors. Nonetheless, it is useful to consider two possible scenarios.³⁴ If firms in nontreaty countries reduced dividend payouts in response to JGTRRA, this would only serve to mitigate the tax penalty for nontreaty country stock, and so would bias against the paper's findings. Alternatively, if firms in treaty countries

³² A large literature (e.g. Bernheim and Wantz, 1995) analyzes the determinants of firms' dividend payout decisions.

³³ As described above, ADR securities are counted as foreign securities in the data employed here.

³⁴ For instance, Figure 1 shows that for a typical country US equity FPI holdings constitute no more than 5-10% of its aggregate stock market capitalization.

increased dividend payouts in response to JGTRRA, this would reinforce the increased attractiveness of these firms to US investors. This potential response does not confound the results as the portfolio reallocation is ultimately attributable to JGTRRA. More generally, such endogenous payout responses are unlikely for the reasons noted earlier. Endogenous issuance responses are similarly unlikely. Any changes in issuance would also be reflected in aggregate market capitalization, which is included as a control.

4. Results

4.1 Basic Results

In order to investigate the effect of JGTRRA on the location of US equity FPI in the most general setting, the specification reported in Column 1 of Table 3 employs the full sample of 213 countries and territories. This specification estimates Equation (8) with country and year effects, but with no control variables. Robust standard errors that are clustered at the country level are reported in this table and in all of the subsequent longitudinal analysis. The effect of JGTRRA on US equity FPI holdings in treaty countries (relative to nontreaty countries) is positive and highly significant.³⁵ Column 2 reports the results of the same specification, with the sample restricted to observations for which the stock return index is available. Again, the effect of JGTRRA is positive and significant. In Column 3, a baseline set of controls – GDP, population, aggregate market capitalization, and stock market returns – is introduced. This has little impact on the coefficient of interest, which remains positive and significant.

It is possible that financial market conditions may have changed differentially in treaty and non-treaty countries at the same time as JGTRRA. For example, changes in the quality and liquidity of financial markets in treaty and non-treaty countries may influence the speed of portfolio adjustment. In order to address this possibility, the regression in Column 4 includes two relevant measures from an updated version of the Beck *et al.* (2000) database of financial variables:³⁶ the value of stocks traded in a given country in a given year, scaled by GDP, and the stock market turnover ratio (i.e. the value of stocks traded in a given country in a given year,

³⁵ As was noted earlier, this sample includes a large number of zero values for equity FPI (which are treated as zeroes when taking the log of FPI). Using a random-effects Tobit specification leads to similar results. Censoring of equity FPI at zero is not as much of a concern in the remainder of Table 3 as there is only one zero value of equity FPI in the sample used in Column 2. Moreover, as noted earlier, all of the paper's results are robust to the omission of this solitary zero observation (Jordan in 1994).

³⁶ This is available at <http://econ.worldbank.org/staff/tbeck>

scaled by stock market capitalization). The attractiveness of equity to US investors may also be affected by changes in the volatility of stock returns. Thus, the measure of volatility described earlier is included. Changes in the availability of domestic debt financing from a country's banking sector may affect the issuance of new equity by that country's firms. Thus, the ratio of financial deposits to GDP, also obtained from the updated version of the Beck *et al.* (2000) database, is included in the model as a proxy for financial depth. Changes in FPI may also depend mechanically on a country's trade deficit; to control for this, the values of exports and imports relative to GDP are obtained from the World Bank's WDI database. Finally, Desai and Dharmapala (2009) argue that foreign countries' corporate tax rates are an important determinant of the pattern of US equity FPI; thus, this variable is obtained from PriceWaterhouseCoopers' *Worldwide Summaries* of corporate taxation for various years.

Column 4 of Table 3 reports the results from a specification that includes these additional controls. The addition of these controls strengthens the estimated effect of JGTRRA in terms of both magnitude and significance with the size of the coefficient increasing from 0.649 in the baseline specification to 0.811.³⁷ As such, the estimated effect from the baseline regression does not appear to reflect other financial market conditions.

Consistent with the portfolio choice framework developed in Section 2, the effect of JGTRRA is stronger among a subset of countries that have a higher correlation with the US economy (as measured by the correlation between a country's annual economic growth rate and the growth rate of the US over the period 1950-2004).³⁸ In other words, when diversification benefits are smaller, investors appear more responsive to tax differentials. However, the difference in the effect across the two subsamples of countries is not statistically significant, perhaps due to the limited variation in the growth rate measure.

The effect of JGTRRA is fairly large in magnitude, despite the various factors discussed in Section 2 that would tend to bias the estimate downwards. In the baseline specification, the estimated coefficient of 0.649 implies that US equity FPI holdings in the average treaty country rose by over 90%, relative to US equity FPI holdings in the average nontreaty country. The

³⁷ The result is unchanged if changes in the quality of a country's communications infrastructure are controlled for, using either the number of telephone mainlines or the number of (fixed and mobile) telephone subscribers. Both variables are from the World Bank's WDI dataset; however, the sample size is reduced due to missing data.

³⁸ The correlation of growth rates is computed using data in the Penn World Tables, available at: <http://pwt.econ.upenn.edu/>.

relative decrease in the dividend tax rate for corporations in treaty countries was also large (the rate for treaty countries fell from 38.6% to 15% while the rate for nontreaty countries fell to 35% resulting in a relative decrease of 57%). Consequently, the implied elasticity of equity holdings with respect to the dividend tax rate is about -1.6.³⁹ An alternative approach to characterizing the magnitude of the effect is to calculate the elasticity of asset holdings with respect to investors' net-of-tax share of returns. Using this approach, the implied elasticity of asset holdings with respect to investors' net-of-dividend-tax share is about 2.8.⁴⁰

These elasticities indicate an unambiguously large portfolio reallocation. The portfolio setting of this empirical work, however, leads to an important caveat. The model in Section 2 suggests that, when the simplifying assumption of zero covariance across assets is dropped, US investors' holdings of nontreaty country equities may change as part of an optimal portfolio rebalancing in response to JGTRRA. Thus, it is possible that holdings of nontreaty country equities fell at the same time that holdings of treaty country stocks rose. As a result, the elasticity may be overstated because of a form of "double counting." In the extreme case where all of the increased treaty country holdings represent substitution from nontreaty country holdings, the implied elasticity would be halved (to -0.8 with respect to the tax rate, or 1.4 with respect to the net-of-tax share).

Nonetheless, these elasticities are large relative to some of the estimates in the literature on the responsiveness of portfolio shares to taxes. For instance, Poterba and Samwick (2002) find that the effect of a household's marginal tax rate on its direct equity holdings is only statistically significant in some of their annual cross-sections and those implied elasticities are substantially smaller than those found here. On the other hand, the results in this paper are

³⁹ This estimate is arrived at as follows: recalling that the dependent variable is in logs, the relative increase in treaty country holdings is given by $e^{0.649} = 1.91$ (i.e. an increase of 91% over the pre-JGTRRA period, controlling for the holdings of nontreaty country equities). The elasticity is computed by dividing the relevant percentage changes (0.91 and 0.57).

⁴⁰ Prior to JGTRRA, a top-bracket US investor received 0.614 cents after tax for each dollar of dividends paid by a corporation. As a result of JGTRRA, this net-of-tax share rose to 0.85 (an increase of 38.4%) for dividends paid by corporations based in treaty countries. The corresponding share for dividends paid by corporations based in nontreaty countries rose to 0.65 (an increase of 5.9%). Thus, the net-of-tax share increased by 32.5% more for treaty countries (relative to nontreaty countries), while US equity FPI holdings in treaty countries increased in relative terms by over 90%. The implied elasticity of asset holdings with respect to investors' net-of-dividend-tax share is thus about 2.8.

consistent with the estimates in Agell and Edin (1990).⁴¹ The elasticity estimated in Table 3 is also similar to the estimates of the sensitivity of FDI to foreign corporate tax rates (e.g. Desai, Foley and Hines, 2003). As such, the measured response is large relative to some studies on portfolio choice but is consistent with results on how taxes influence cross-border capital flows.

4.2. *Controlling for Unobserved Changes in Investment Preferences of US Investors*

It is possible that the relative attractiveness to US investors of treaty and non-treaty countries diverged after JGTRRA for some unobserved reason unrelated to the tax reform. For instance, it is conceivable that American investors came to value the diversification opportunities afforded by treaty countries more than those of nontreaty countries around this time. If so, then it would be expected that this trend would have affected not only FPI by US equity portfolio investors, but also debt FPI by US bondholders and foreign direct investment (FDI) by US multinational firms.⁴²

JGTRRA should not have differentially affected incentives to engage in debt FPI across treaty status; the top marginal tax rate on ordinary income (including interest income from debt FPI) fell from 38.6% to 35%, but this change did not differ across treaty and nontreaty countries. Similarly, the favorable dividend tax rates under JGTRRA apply to all US firms regardless of where their foreign investments may be located, so the tax reform should not have affected US firms' incentives to engage in FDI differentially across treaty and nontreaty countries. As such, debt FPI and FDI should not be directly affected by JGTRRA's treatment of international dividends and can be used as controls that capture otherwise unobservable changes in the investment climate for US investors.

Data on FDI are obtained from the Bureau of Economic Analysis (BEA),⁴³ the measure of FDI is the direct investment position, on a historical cost basis (in millions of US\$) of US

⁴¹ Agell and Edin (1990), using Swedish data, find a tax elasticity of holdings of common stock that is comparable to the estimate here. They use an approach that combines responses along the extensive and intensive margins. In contrast to much of the previous literature, the elasticity measured using JGTRRA is based on changes along the intensive margin in asset holdings.

⁴² Equity FPI and FDI can be conceptualized as alternative channels through which US investors can achieve international diversification, by either buying foreign stocks or investing in US multinational firms that engage in FDI overseas (see Gordon and Jun (1993), Errunza, Hogan and Hung (1999) and Desai and Dharmapala (2007)).

⁴³ This is available at <http://www.bea.gov>

firms in each country in a given year.⁴⁴ Debt FPI is obtained from the TIC database and represents the long-term debt holdings of US portfolio investors in millions of US\$.⁴⁵ These controls are included in the specifications in Columns 1 and 2 of Table 4. Adding FDI and debt FPI as controls leads to results very similar to the baseline findings.⁴⁶ As such, it is unlikely that unobserved changes to American investment opportunities that are correlated with treaty status are driving the basic results.

4.3. *Testing for Unobserved Changes in the Environment for Equity FPI*

In addition to the possibility of differential changes in how American investors viewed the general investment climate between treaty and nontreaty countries, it is also possible that the environment for equity portfolio investment more specifically may have changed differentially for treaty and nontreaty countries after 2003. For example, changes to disclosure rules or to the legal rights available to minority shareholders may have been improved in treaty countries relative to nontreaty countries. To some extent, such changes would be reflected in the controls for stock market conditions that are included in the baseline specification. However, any unobserved changes in the climate for equity FPI cannot be tested for simply using US investment patterns, as they would not affect US debt FPI or FDI. However, any such changes would presumably be reflected in the patterns of equity FPI by non-U.S. portfolio investors.

While the TIC data is restricted to US investment, the International Monetary Fund (IMF) collects data on global portfolio holdings through its Coordinated Portfolio Investment Survey (CPIS).⁴⁷ This dataset includes the aggregate equity holdings of foreign portfolio investors in each country; these holdings are also broken down by the country of origin of the investors. Thus, it is possible to compute non-US equity FPI holdings by simply subtracting US holdings from aggregate worldwide holdings in a given country in a given year. The CPIS data only covers the years from 2001 to 2005 (though it includes 2002, unlike the TIC data).

⁴⁴ Note that the sample in Column 5 omits one observation with negative reported FDI; excluding such observations from the baseline specification in Column 3 leads to consistent results.

⁴⁵ Long-term debt is defined as having an original maturity of over one year. The TIC database also includes short-term debt FPI, but this is not available for all years, so only long-term debt is used in the analysis.

⁴⁶ If equity FPI and FDI are chosen jointly, there may be some concern about simultaneity bias in the estimation of the coefficients. However, it is reassuring that the results are very similar both with and without the FDI and debt FPI controls.

⁴⁷ This dataset is available at: <http://www.imf.org/external/np/sta/pi/cpis.htm>

Column 3 of Table 4 reports results controlling for non-US equity FPI. Though the magnitude of the effect is somewhat smaller, the baseline result regarding the location of US equity FPI is robust. Note also that when non-US equity FPI is used as the dependent variable, it does not exhibit the same pattern (i.e. there is no significant increase in non-US equity FPI in treaty countries relative to nontreaty countries after JGTRRA). Thus, it appears unlikely that the estimated effect of JGTRRA on the location of US equity FPI is due to unobserved changes in the environment for equity FPI, rather than to the tax reform.

4.4. *Testing for Differential Time Trends in US Equity FPI*

There still remains a class of alternative explanations for the paper's main result that involve US equity FPI in treaty and nontreaty countries following different time trends. For example, it could be argued that US equity FPI has tended to grow over time due to increasing international financial integration, with all or most of the increase being directed towards treaty countries rather than nontreaty countries because of the more favorable investment climate of treaty countries.

To explore this question further, Table 5 presents a series of cross-sectional regressions examining the extent to which annual changes in US equity FPI are related to countries' treaty status. For each pair of years in the dataset, the specification is:

$$\Delta(\text{Log of Equity FPI})_i = \alpha + \beta \text{Treaty}_i + \Delta \mathbf{X}_i \gamma_1 + \mathbf{R}_i \gamma_2 + \varepsilon_i \quad (9)$$

where $\Delta(\text{Log of Equity FPI})_i$ is the difference between the log of US equity FPI in country i in year t and the log of US equity FPI in country i in year $(t - 1)$, or the closest previous year for which data is available. Treaty_i is an indicator variable for those countries on the IRS list for tax-favored status. $\Delta \mathbf{X}_i$ is a vector of changes in the baseline set of control variables – the logs of GDP, population, aggregate market capitalization, and stock market returns, while \mathbf{R}_i is a vector of regional dummies.⁴⁸ The constant term is represented by α and the error term is ε_i .

The basic idea underlying these regressions is that if differential time trends for treaty and nontreaty countries are driving the basic result, then the annual changes in US equity FPI should generally be higher for treaty countries than for nontreaty countries, even in years unaffected by the tax reform. In other words, it would be expected that $\beta > 0$, and that the effect is generally

⁴⁸ These are based on World Bank classifications; the regions are Europe and Central Asia, Asia and the Pacific, the Americas, and the Middle East and North Africa, with Africa as the omitted category.

statistically significant across all cross-sectional analyses presented in Table 5. In fact, annual changes in US equity FPI are generally unrelated to countries' treaty status, except in 2003, the year that JGTRRA was enacted and came into effect. In 2003, US equity FPI increased more in treaty countries than in nontreaty countries; in other years, however, there appears to be no significant difference in the changes in US equity FPI across treaty and nontreaty countries. This is consistent with a one-time portfolio reallocation towards equity issued in treaty countries as a response to JGTRRA in 2003.⁴⁹ More generally, these results cast doubt on the alternative story based on differential time trends for treaty and nontreaty countries, as a distinctive trend for treaty countries is not apparent in the Table 5 results for years other than 2003.⁵⁰

The point that preexisting time trends are unlikely to account for the estimated effect of JGTRRA can also be seen in Figure 2 which plots the evolution of the share of US equity FPI that is located in treaty countries. Over the sample period, there appears to be a generally *decreasing* trend in this share. Such a preexisting trend would bias against finding any effect of JGTRRA. Moreover, the share of US equity FPI in treaty countries increases in 2003 (contrary to the wider trend) in precisely the manner that would be expected if JGTRRA induced a portfolio reallocation towards treaty country stock.

In addition to being large in magnitude (as discussed earlier), the response to JGTRRA's treatment of international dividends also appears to have been rapid. The results in Table 6 indicate that the differential response of US equity FPI holdings in treaty countries was concentrated in 2003, with some additional adjustment possibly occurring in 2004 and with no subsequent reversal. While this represents a quick response, it appears reasonable given that equity holdings can be readily acquired and liquidated, that JGTRRA created a large tax incentive, and that relatively financially sophisticated investors are involved. Nonetheless, this rapid response stands in contrast to the relatively slow portfolio adjustment process that is

⁴⁹ The only other year for which the treaty country variable is of comparable magnitude (albeit statistically insignificant) is 2004, which is consistent with some delayed portfolio response to JGTRRA.

⁵⁰ The most general approach to addressing alternative explanations along these lines is to add country-specific time trends to the model. When this is done, the estimated JGTRRA effect is no longer statistically significant. This result is likely attributable to the difficulty of separately identifying both country-specific time trends and the effect of JGTRRA. Given the short panel (with only 6 years of data) and the fact that all of the years affected by JGTRRA are in the latter half of the sample period, the JGTRRA effect can easily be confounded with an increasing time trend for treaty countries. For this reason, the annual cross-sectional regressions may be more illuminating. Moreover, an increasing time trend in equity FPI in treaty countries would be expected to affect non-US as well as US FPI, but (as shown in Table 4) this appears not to be the case.

hypothesized (for example in Poterba, 2002) to account for the generally small portfolio choice effects of tax reforms that have been studied in the previous literature.

4.5. *Testing for Changed Patterns of Tax Evasion*

There are two possible scenarios in which changes in evasion behavior may confound the paper's results.⁵¹ First, it is possible that there has been a decrease in tax evasion over time for reasons unrelated to JGTRRA (such as stronger enforcement). This may manifest itself in US investors who were previously engaging in evasion through tax haven investments abandoning attempts at evasion and switching their portfolios towards other countries, both treaty and nontreaty. As tax havens are predominantly nontreaty countries, this development may generate a spurious *relative* increase in FPI in treaty countries in the latter part of the sample period. There are few tax havens in the estimating sample, so this effect is unlikely to be large. Moreover, excluding the remaining tax havens (as defined in Dharmapala and Hines (2006, Table 1, Column 3)) from the sample does not affect the basic result, as shown in Column 1 of Table 6. The annual cross sectional results presented in Table 5 are also inconsistent with this hypothesis of a secular change in tax evasion channeling more investment towards treaty countries.

Second, it is possible that FPI in treaty countries was mismeasured prior to JGTRRA due to unreported investments in treaty countries being used for tax evasion purposes. The reduced tax rates established by JGTRRA may have allowed these investments to emerge into "the open." If this were the case, then the results attributed to a behavioral response to JGTRRA would only represent a correction of mismeasurement. It is inherently difficult to test for this possibility, given the inability to measure the hidden investment prior to JGTRRA. Nonetheless, it is possible to test one prediction that would emerge from such an alternative explanation of the results. If assets in treaty countries were merely becoming visible, the effects documented previously should be reliant on those countries where such evasion was most likely. This characteristic can be measured using the tax compliance index in La Porta *et al.* (1999). Originally constructed by the World Economic Forum, this index represents the extent of tax compliance in 1995 in a cross-section of countries. Excluding those treaty countries that have tax

⁵¹ For a discussion of how investors may evade home country taxes on returns from FPI, see for example Gordon and Jun (1993) and Huizinga and Nicodeme (2004).

compliance indices one standard deviation or more below the treaty country mean does not change the basic result, as shown in Column 2 of Table 6.

More generally, it should be noted that it is unlikely that investors would have engaged in evasion before JGTRRA through the purchase of stock in *treaty* countries. The treaty countries are defined precisely in terms of having strong information-exchange provisions in their tax treaties with the US; in addition, most of them impose positive withholding taxes on dividends (e.g. Anderson, 2006, Chart 9.1), which reduce the benefits from evasion, and also generate information that may increase the probability that the evasion of US tax is subsequently detected. To the degree that evasion is operative, it appears more reasonable to assume that evasion would occur through investment in tax haven countries with weak or nonexistent information-exchange provisions and zero withholding taxes, and that the effect of reduced evasion after JGTRRA would manifest itself in the form of a transfer of funds from havens to treaty countries. Such a transfer is part of the JGTRRA effect that this paper seeks to estimate, and represents one of the channels through which JGTRRA increased US equity FPI in treaty countries, rather than being an alternative explanation for the basic result.⁵²

4.6. *Testing for Influential Subsets of Countries*

The previous analyses have considered the possibility that the findings in Table 3 are driven by systematic differences between treaty and nontreaty countries in terms of the investment preferences of American investors, the FPI investment climate, trends in investment generally and market conditions. One final class of alternative explanations is that some other relevant classification of countries overlaps with treaty status, and that this might explain the results in Table 3. In this subsection, these possibilities are considered.

First, the estimating sample includes a number of formerly socialist transition economies, in which US FPI may have grown over time due to institutional changes and growing familiarity, rather than to JGTRRA. Excluding transition economies from the sample leads to consistent results, as shown in Column 1 of Table 7.⁵³ The signing of a tax treaty may also be in

⁵² It is also unlikely that investors simply moved equity held in nontreaty countries to holding companies in treaty countries. JGTRRA specifically denies its favorable tax treatment of dividends to foreign personal holding companies, foreign investment companies, and passive foreign investment companies, even if they are located in treaty countries (Sheppard, 2004). Thus, relocating assets from nontreaty to treaty countries would involve some real cost in terms of changed diversification patterns or various other frictions.

⁵³ Transition economies are defined as those classified by La Porta *et al.* (1999) as having “Socialist” legal origins.

anticipation of significant increases in FPI: countries that have recently signed tax treaties with the US may be precisely those in which future US investment is expected to grow. Thus, Column 2 of Table 7 reports the results using a sample that excludes countries with tax treaties with the US signed after 1990.⁵⁴ The basic result is robust, suggesting that the main finding is not driven by the possible endogeneity of tax treaties.⁵⁵ Third, it is possible that US investors switched their portfolios towards countries that were part of the “coalition” involved in the 2003 Iraq war, and these may have been disproportionately treaty countries. The specification in Column 3 excludes “coalition” countries from the sample and this exclusion does not affect the basic result.⁵⁶ Finally, all of the European countries in the estimating sample are treaty countries, and so it is possible that a trend towards investment in Europe may confound the estimation of the effect of JGTRRA. However, as shown in Column 4 of Table 7, excluding European countries leads to consistent results.⁵⁷

4.7. *Testing for Confounding Changes in Equity Prices*

The basic analysis shown in Table 3 includes a control for equity prices (the total stock return index constructed by Morgan Stanley Capital International). However, because the TIC data reports the value (rather than the quantity) of FPI holdings, it is possible that the results may be confounded by differential stock price changes in treaty and nontreaty countries around the time of JGTRRA. Moreover, the theoretical model in Section 2 predicts that JGTRRA would lead to an increase in stock prices in treaty countries (and the US), relative to nontreaty countries. However, it also suggests that the magnitude of any price response should be quite small, as it depends on the wealth of taxable US investors relative to aggregate global wealth.⁵⁸

⁵⁴ This is based on hand-collected data on tax treaty dates, kindly provided by Jim Hines.

⁵⁵ More generally, it should be noted that the distinction implemented by JGTRRA is not based entirely on the presence of a treaty, but partly on treaty status and partly on the presence of information-sharing provisions. As such, some countries classified as nontreaty have treaties but these treaties do not have suitable information-sharing provisions.

⁵⁶ This test uses the list of coalition countries in the White House press release of March 27, 2003 (available at <http://www.whitehouse.gov/infocus/iraq/news/20030327-10.html>).

⁵⁷ The countries excluded are those in the World Bank region “Europe and Central Asia.”

⁵⁸ The stock market impact of JGTRRA has been analyzed by Auerbach and Hassett (2006, 2007); however, their focus is on comparing different groups of US firms, and not on the aggregate US or global equity price effect. Amromin, Harrison and Sharpe (2008) find no aggregate impact for the US stock market, in part using European stock markets as a control group. However, the model in Section 3 suggests that this control group may be inappropriate, as most European countries are treaty countries, and so were also affected by JGTRRA.

To test whether there are potentially confounding changes in equity prices across the two groups of countries, it is possible to use the total stock return index constructed by Morgan Stanley Capital International as the dependent variable in the following specification:

$$\text{Log of } I_{it} = \beta(\text{Treaty}_i * \text{PostJGTRRA}_t) + \mathbf{X}_{it}\boldsymbol{\gamma} + \mu_i + \nu_t + \varepsilon_{it} \quad (10)$$

where I_{it} is the total stock return index for country i in year t . The independent variable of interest is an interaction between an indicator variable (Treaty_i) for those countries listed as treaty countries in Table 1 and an indicator (PostJGTRRA_t) for the years after the enactment of JGTRRA. \mathbf{X}_{it} is a vector of control variables.⁵⁹ The specification in Equation (10) also includes country fixed effects (represented by μ_i) and year effects (represented by ν_t); ε_{it} is the error term. The hypothesis that Equation (10) tests is whether stock prices (as proxied by the index) rose in treaty countries (and the US), relative to nontreaty countries, following JGTRRA: i.e. that $\beta > 0$. Note that the analysis of Equation (10) includes data on the US (which is coded as a “treaty” country as it was of course affected by JGTRRA’s reduced rates). It also includes more years of data, as the sample is not restricted by the availability of TIC data on FPI.⁶⁰

Table 8 reports the results from estimating Equation (10). Column 1 reports results with country and year effects, but no controls. The estimated price effect of JGTRRA is positive, but statistically indistinguishable from zero. Adding the basic set of controls – the log of GDP per capita and population, and the volatility measure – renders the estimated effect negative, albeit insignificant (Column 2). Excluding the US from the sample leads to essentially unchanged results (Column 3), as does excluding the treaty countries (Column 4). This result (or, more precisely, the absence of an effect) is very similar when using additional controls, such as the value of stocks traded in a given country in a given year, scaled by GDP, and the stock market turnover ratio (i.e. the value of stocks traded in a given country in a given year, scaled by stock market capitalization), both from an updated version of the Beck *et al.* (2000) database of

⁵⁹ The controls are the log of GDP per capita (in PPP terms, expressed in nominal US\$) and the log of population, both obtained from the World Bank’s *World Development Indicators* (WDI) database, and a measure of stock market volatility. The volatility measure is constructed using the Morgan Stanley stock return data, in particular using monthly data on dollar returns. It represents the standard deviation as an annualized measure based on monthly returns for a two year window, including the current year and the previous year.

⁶⁰ In contrast, the analysis of Equation (8) does not include the US, as the TIC system does not directly report data on US holdings of US stock. In any event, it may be the case that the choice between domestic and foreign assets is driven by different considerations than the choice among different foreign assets.

financial variables. It is also unchanged when country-specific time trends are added to the model.

The absence of a price effect may simply reflect the difficulties involved in detecting these types of changes in highly volatile cross-national stock return data.⁶¹ Thus, any conclusions about aggregate stock price effects of JGTRRA must be highly tentative. The primary purpose of this analysis, however, is to determine whether the results on portfolio choices in Table 3 are confounded by changes in stock prices across the affected and unaffected groups of countries. For this purpose, it does not appear that the basic result on portfolio choice is driven either by stock price changes due to JGTRRA, or by contemporaneous price changes unrelated to the reform. There is also no evidence that the wider stock market environment in treaty countries (relative to nontreaty countries) changed significantly in 2003 in a way that might confound the results on either equity prices or the location of US equity FPI. This is tested using a series of (unreported) cross-sectional regressions that examine whether changes in stock market variables in 2003 are related to countries' treaty status. Generally, changes in market capitalization, volatility, the ratio of stock value traded to GDP, and the stock market turnover ratio in 2003 are not significantly different for treaty countries relative to nontreaty countries.⁶² Thus, it does not appear that the results in Table 3 are driven by differential changes in stock market conditions across treaty and nontreaty countries. Unreported tests also confirm that controlling for exchange rate movements similarly do not change the significance or magnitude of the results.⁶³

Finally, as discussed above, one additional possible market response to JGTRRA is a change in use of ADRs by firms in nontreaty countries. Specifically, investing through an ADR would allow an investor to pass the "market test," thereby circumventing the treaty test. Although 2003 was a tumultuous year in the ADR market as it coincided with the effects of the Sarbanes-Oxley Law, it is useful to investigate whether there were material changes in the composition of ADR listings as a possible response to JGTRRA. From 1997 to 2002, nontreaty country companies constituted an average 22.8% of all foreign listings in the U.S. and their share

⁶¹ For instance, Auerbach and Hassett (2006) argue that the cross-country approach of Amromin, Harrison and Sharpe (2008) is insufficiently precise to capture stock price effects of the magnitude that JGTRRA is likely to have caused.

⁶² The treaty effect for the ratio of stock value traded to GDP is of borderline significance, but its sign is the opposite of that required to explain the basic result (i.e. the stock value traded *fell* in treaty countries relative to nontreaty countries).

⁶³ Exchange rates are obtained from [Datastream](#) International.

never exceeded 29.0. In 2003, the nontreaty country share jumped to 34.4%. This descriptive evidence provides some confirmation that firms and investors perceived the effects of JGTRRA as significant and that the estimates provided in the paper are indeed lower bounds for the overall response of portfolios to the tax change.

5. *Discussion and Conclusion*

This paper establishes a quantitatively large effect of JGTRRA's differential treatment of foreign-source dividends on US investors' portfolio choices. It shows that in an empirical setting where an exogenous tax change is accompanied by limited scope for endogenous supply responses, it is possible to identify large and significant effects of taxes on portfolio choices. In particular, US investors' holdings of lightly-taxed foreign equities increased significantly in a manner that is consistent with an implied elasticity of asset holdings with respect to the tax rate of as much as -1.6. This elasticity is considerably larger than most estimates of the responsiveness of portfolio shares to tax rates. These portfolio changes also serve to illustrate the importance of dividend taxes to portfolio decisions.

These results suggest several avenues for further research. First, there has been limited empirical work on the role of taxes in limiting gains from international diversification. These results suggest that taxes can play a large role in shaping international portfolio choices. The predictions of the after-tax CAPM open economy model motivating this paper may also be useful in considering the effects of dividend taxation more generally, given the scope of FPI flows today. Typically, analyses of dividend tax reforms (including JGTRRA) ignore open economy considerations, instead focusing on the contrasting implications for firm behavior of the new and old views of dividend taxation. The open economy model in Section 2.2 suggests that firms' investment behavior may be unaffected by domestic dividend taxation in an even wider set of circumstances than is implied by the new view. In such circumstances, the primary effects of dividend tax reforms may well be on portfolio choices, such as those investigated in this paper, rather than on firm behavior.

Second, exploring the heterogeneity of institutional investor responses to JGTRRA's treatment of international dividends may illuminate how different types of institutions respond to tax incentives. Finally, this paper also has implications for tax policies that seek to achieve corporate tax integration. If dividend relief is not fully extended to foreign dividends, corporate tax integration may give rise to significant distortions in international portfolios with consequent

welfare losses. The results in this paper show that these international portfolio effects can be quantitatively large.

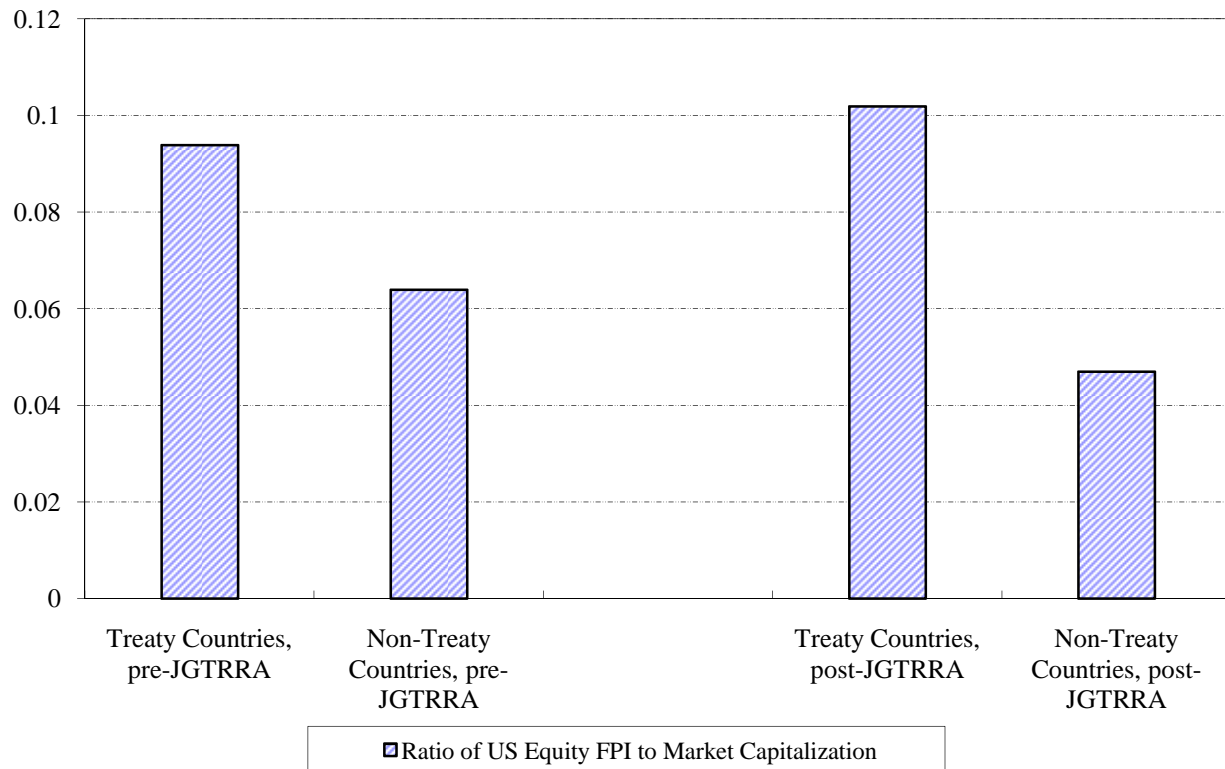
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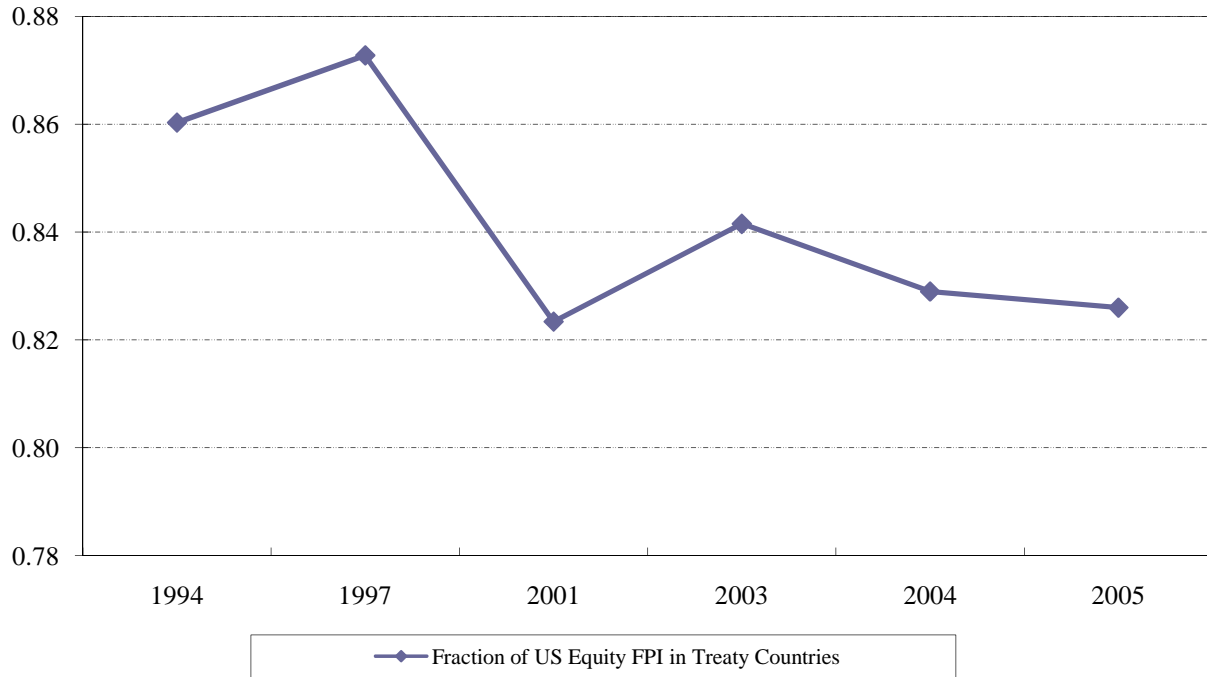
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Figure 1: JGTRRA and the Location of US Equity FPI



Notes: The figure provides the average ratio of aggregate U.S. Equity FPI to Market Capitalization for Treaty and Nontreaty countries for the years prior and subsequent to JGTRRA. This ratio is a weighted average across countries in each year and then averaged across the three years prior to JGTRRA that are available in the sample (1994, 1997 and 2001) and subsequent to JGTRRA (2003, 2004 and 2005).

Figure 2: The Fraction of US Equity FPI in Treaty Countries, 1994-2005



Notes: The figure provides the fraction of aggregate U.S. Equity FPI located in Treaty countries for three years prior to JGTRRA (1994, 1997 and 2001) and three years subsequent to JGTRRA (2003, 2004 and 2005).

Table 1: List of Sample Countries

Note: The sample is based on the availability of data on US equity FPI and the baseline control variables (notably, the stock market return index, which is only available for a limited set of countries). “Treaty” countries are defined based on Internal Revenue Service (IRS) Notice 2003-69 (“United States Income Tax Treaties That Meet the Requirements of Section 1(h)(11)(C)(i)(II)”), issued in October, 2003, and available at: http://www.irs.gov/irb/2003-42_IRB/ar09.html. The sample is based on the availability of data on US equity FPI and the baseline control variables.

<i>Treaty Countries</i>				<i>Nontreaty Countries</i>
Australia	Greece	Netherlands	Switzerland	Argentina
Austria	Hungary	New Zealand	Thailand	Brazil
Belgium	India	Norway	Turkey	Chile
Canada	Indonesia	Pakistan	United Kingdom	Colombia
China	Ireland	Philippines	Venezuela	Hong Kong
Czech Republic	Israel	Poland		Jordan
Denmark	Italy	Portugal		Malaysia
Egypt	Japan	Russia		Peru
Finland	Korea (South)	South Africa		Singapore
France	Mexico	Spain		Sri Lanka
Germany	Morocco	Sweden		Taiwan
<i>Treaty Countries (Not in the Sample)</i>				
Cyprus	Kazakhstan	Romania	Tunisia	
Estonia	Latvia	Slovak Republic	Ukraine	
Iceland	Lithuania	Slovenia		
Jamaica	Luxembourg	Trinidad and Tobago		

Table 2: Summary Statistics

Notes: US equity FPI is from the TIC dataset, and measures US investors' equity portfolio holdings in millions of US\$. Long-term debt FPI is also from the TIC dataset, and measures US investors debt portfolio holdings with a maturity greater than one year. US FDI is the direct investment position of US firms in millions of US\$ (from the BEA dataset). Non-US equity FPI is from the IMF's CPIS dataset, and is obtained by subtracting US equity FPI holdings from worldwide equity FPI holdings. GDP per capita (in US\$, in PPP terms), population and aggregate market capitalization are from the World Bank's WDI database. The stock market return index is drawn from Datastream and is based on MSCI country dollar indices. The volatility of stock market returns is constructed by annualizing a standard deviation based on the trailing 24 months of monthly returns. The ratio of stock market value traded to GDP, the stock market turnover ratio, and the ratio of financial deposits to GDP are taken from an updated version of Beck *et al.* (2000). Exports and imports as a % of GDP are from the World Bank's WDI database. The corporate tax rate is the top statutory corporate rate (from the PWC Worldwide Summaries). $(\text{Treaty}=1) * (\text{Post-JGTRRA})$ is an interaction between an indicator variable for those countries listed as treaty countries in Table 1, and an indicator for the years after the enactment of JGTRRA. All other variables are as defined above.

<u>Variable</u>	<u>Mean</u>	<u>Standard Deviation</u>	<u>No. of Observations</u>
US Equity FPI (\$ billions)	34.939	73.037	291
US Long-Term Debt FPI (\$ billions)	12.341	26.658	291
US FDI (\$ billions)	27.285	49.724	268
Non-US Equity FPI (\$ billions)	56.108	102.297	235
GDP per capita (PPP, \$ thousands)	16.442	10.653	284
Population (millions)	90.171	227.822	285
Aggregate Market Capitalization (\$ billions)	343.613	629.587	284
Stock Market Return Index (hundreds)	20.293	33.688	291
Volatility of Stock Market Returns	0.253	0.115	287
Ratio of Stock Market Value Traded to GDP	0.493	0.613	291
Stock Market Turnover Ratio	0.720	0.695	290
Ratio of Financial Deposits to GDP	0.656	0.395	279
Exports as a % of GDP	39.080	27.420	247
Imports as a % of GDP	38.450	26.250	247
Corporate Tax Rate	30.090	7.091	280
$(\text{Treaty}=1) * (\text{Post-JGTRRA})$	0.392	0.489	291

Table 3: The Effect of JGTRRA on the Location of US Equity FPI

Notes: The dependent variable is the log of US equity FPI (from the TIC dataset) for each available year. (Treaty=1)* (Post-JGTRRA) is an interaction between an indicator variable for those countries listed as treaty countries in Table 1, and an indicator for the years after the enactment of JGTRRA. Log of GDP per capita (in US\$, in PPP terms), log of population and log of aggregate market capitalization are from the World Bank's WDI database. The log of the stock market return index is drawn from Datastream and is based on MSCI country dollar indices. The volatility of stock market returns is constructed by annualizing a standard deviation based on the trailing 24 months of monthly returns. The ratio of stock market value traded to GDP, the stock market turnover ratio, and the ratio of financial deposits to GDP are taken from an updated version of Beck *et al.* (2000). Exports and imports as a % of GDP are from the World Bank's WDI database. The corporate tax rate is the top statutory corporate rate (from the PWC Worldwide Summaries). The log of US FDI is the direct investment position of US firms (from the BEA dataset). Log of US long-term debt FPI is from the TIC dataset. countries and territories. In column 2 the sample is restricted to observations for which the stock return index is available. Robust standard errors (clustered at the country level) in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

<i>Dependent Variable:</i>	Log of US Equity FPI			
	(1)	(2)	(3)	(4)
(Treaty=1)* (Post-JGTRRA)	0.758 *** (0.151)	0.691 ** (0.303)	0.649 *** (0.234)	0.811 *** (0.237)
Log of GDP per capita (PPP)			1.635 * (0.874)	1.906 (1.145)
Log of Population			1.544 (2.227)	2.466 (1.998)
Log of Aggregate Market Capitalization			0.714 *** (0.109)	0.569 *** (0.166)
Log of Stock Market Return Index			0.302 * (0.143)	0.430 ** (0.171)
Log of Volatility of Stock Market Returns				0.002 (0.050)
Ratio of Stock Market Value Traded to GDP				0.359 * (0.201)
Stock Market Turnover Ratio				-0.402 (0.206)
Ratio of Financial Deposits to GDP				-0.263 (0.353)
Exports as a % of GDP				0.006 (0.011)
Imports as a % of GDP				0.005 (0.012)
Corporate Tax Rate				-0.015 (0.011)
Country and Year Effects?	Y	Y	Y	Y
Sample Period	1994-2005	1994-2005	1994-2005	1994-2005
Observations	1259	291	283	227
Countries	213	49	48	45
R-squared	0.15	0.46	0.72	0.76

Table 4: Tests for Confounding Changes in Investment Patterns

Notes: The dependent variable is the log of US equity FPI (from the TIC dataset) for each available year. (Treaty=1)* (Post-JGTRRA) is an interaction between an indicator variable for those countries listed as treaty countries in Table 1, and an indicator for the years after the enactment of JGTRRA. Log of GDP per capita (in US\$, in PPP terms), log of population and log of aggregate market capitalization are from the World Bank's WDI database. The log of the stock market return index is drawn from Datastream and is based on MSCI country dollar indices. Log of US long-term debt FPI is from the TIC dataset. The log of US FDI is the direct investment position of US firms (from the BEA dataset). Log of non-US equity FPI is from the IMF CPIS dataset. Robust standard errors (clustered at the country level) in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

<i>Dependent Variable:</i>	Log of US Equity FPI		
	(1)	(2)	(3)
(Treaty=1)* (Post-JGTRRA)	0.698 *** (0.221)	0.748 *** (0.255)	0.308 ** (0.134)
Log of GDP per capita (PPP)	1.534 * (0.841)	2.736 ** (1.355)	0.693 (1.055)
Log of Population	0.895 (2.196)	2.122 (1.841)	-0.870 (3.884)
Log of Aggregate Market Capitalization	0.649 *** (0.107)	0.499 (0.334)	-0.058 (0.148)
Log of Stock Market Return Index	0.367 ** (0.140)	0.434 * (0.236)	0.612 *** (0.151)
Log of US Long-Term Debt FPI	0.158 ** (0.072)		
Log of US FDI		-0.091 (0.165)	
Log of Non-US Equity FPI			0.159 ** (0.078)
Country and Year Effects?	Y	Y	Y
Sample Period	1994-2005	1994-2005	2001-2005
Observations	283	260	235
Countries	48	47	47
R-squared	0.74	0.71	0.78

Table 5: Annual Changes in US Equity FPI

Notes: The dependent variable is the change in log of US equity FPI (from the TIC dataset) for each of the periods given. Treaty=1 is an indicator variable for those countries listed as treaty countries in Table 1. Log of GDP per capita (in US\$, in PPP terms), log of population and log of aggregate market capitalization are from the World Bank's WDI database. The log of the stock market return index is drawn from Datastream and is based on MSCI country dollar indices. Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

<i>Dependent Variable:</i>	Change in Log of US Equity FPI from 1994 to 1997	Change in Log of US Equity FPI from 1997 to 2001	Change in Log of US Equity FPI from 2001 to 2003	Change in Log of US Equity FPI from 2003 to 2004	Change in Log of US Equity FPI from 2004 to 2005
	(1)	(2)	(3)	(4)	(5)
Treaty (=1)	-0.260 (0.319)	0.146 (0.292)	0.351 ** (0.164)	0.269 (0.203)	0.013 (0.137)
Change in Log of GDP per capita (PPP)	-0.871 (2.402)	2.447 * (1.402)	1.511 (1.666)	-1.075 (0.994)	0.206 (1.931)
Change in Log of Population	-0.451 (3.139)	2.118 (2.430)	-7.123 (6.234)	13.184 (10.145)	-1.329 (9.322)
Change in Log of Aggregate Market Capitalization	0.928 *** (0.105)	0.291 (0.405)	-0.143 (0.196)	0.311 (0.233)	0.143 (0.171)
Change in Log of Stock Market Return Index	-0.438 * (0.245)	1.193 *** (0.329)	0.739 ** (0.308)	0.620 * (0.339)	0.617 * (0.362)
Constant	1.107 * (0.618)	-0.500 (0.508)	0.136 (0.310)	-0.145 (0.216)	0.158 (0.218)
Regional Dummies?	Y	Y	Y	Y	Y
Observations	45	47	48	48	47
R-squared	0.76	0.65	0.46	0.39	0.54

Table 6: Tests for Changed Patterns of Tax Evasion

Notes: The dependent variable is the log of US equity FPI for each available year. (Treaty=1)*(Post-JGTRRA) is an interaction between an indicator variable for those countries listed as treaty countries in Table 1 and an indicator for the years after the enactment of JGTRRA. Log of GDP per capita (in US\$, in PPP terms), log of population and log of aggregate market capitalization are from the World Bank's WDI database. The log of the stock market return index is drawn from Datastream and is based on MSCI country dollar indices. Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

<i>Dependent Variable:</i>	Log of US Equity FPI	
	Excluding Tax Haven Countries	Excluding Treaty Countries with Low Tax Compliance
	(1)	(2)
(Treaty=1)*(Post-JGTRRA)	0.740 *** (0.261)	0.705 ** (0.268)
Log of GDP per capita (PPP)	1.908 * (0.924)	1.861 (1.365)
Log of Population	0.951 (2.440)	1.576 (2.515)
Log of Aggregate Market Capitalization	0.696 *** (0.116)	0.628 ** (0.288)
Log of Stock Market Return Index	0.339 ** (0.147)	0.409 * (0.219)
Country and Year Effects?	Y	Y
Sample Period	1994-2005	1994-2005
Observations	255	241
Countries	43	41
R-squared	0.75	0.65

Table 7: Tests for Influential Subsets of Countries

Notes: The dependent variable is the log of US equity FPI for each available year. (Treaty=1)*(Post-JGTRRA) is an interaction between an indicator variable for those countries listed as treaty countries in Table 1 and an indicator for the years after the enactment of JGTRRA. Log of GDP per capita (in US\$, in PPP terms), log of population and log of aggregate market capitalization are from the World Bank's WDI database. The log of the stock market return index is drawn from Datastream and is based on MSCI country dollar indices. Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

<i>Dependent Variable:</i>	Log of US Equity FPI			
	Excluding Transition Countries	Excluding Countries with Recent Tax Treaties	Excluding Iraq War Coalition Countries	Excluding Europe
	(1)	(2)	(3)	(4)
(Treaty=1)*(Post-JGTRRA)	0.662 ** (0.257)	0.714 ** (0.290)	0.698 ** (0.282)	0.693 ** (0.268)
Log of GDP per capita (PPP)	1.959 (1.336)	2.255 (1.623)	1.631 (1.043)	2.659 (1.717)
Log of Population	1.268 (2.343)	2.016 (2.696)	1.435 (3.363)	2.687 (3.762)
Log of Aggregate Market Capitalization	0.673 * (0.389)	0.567 * (0.317)	0.698 *** (0.122)	0.555 (0.388)
Log of Stock Market Return Index	0.325 (0.302)	0.447 (0.256)	0.431 ** (0.203)	0.429 (0.274)
Country and Year Effects?	Y	Y	Y	Y
Sample Period	1994-2005	1994-2005	1994-2005	1994-2005
Observations	253	194	187	167
Countries	43	33	32	28
R-squared	0.62	0.63	0.67	0.57

Table 8: JGTRRA and Equity Prices

Notes: The dependent variable is the log of stock return index, which is drawn from Datastream and is based on MSCI country dollar indices. (Treaty=1)* (Post-JGTRRA) is an interaction between an indicator variable for those countries listed as treaty countries in Table 1 and an indicator for the years after the enactment of JGTRRA. Log of GDP per capita (in US\$, in PPP terms) and log of population are from the World Bank's WDI database. The volatility of stock market returns is constructed by annualizing a standard deviation based on the trailing 24 months of monthly returns. Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

<i>Dependent Variable:</i>	Log of Stock Return Index			
	All Countries	All Countries	Excluding US	Excluding Treaty Countries
	(1)	(2)	(3)	(4)
(Treaty=1)* (Post-JGTRRA)	0.050 (0.137)	-0.108 (0.166)	-0.104 (0.167)	-0.229 (0.127)
Log of GDP per capita (PPP)		0.279 (0.792)	0.265 (0.788)	-0.175 (1.301)
Log of Population		-2.778 * (1.476)	-2.787 * (1.481)	0.088 (3.085)
Volatility of Stock Market Returns		-0.928 *** (0.287)	-0.937 *** (0.285)	-0.371 (0.526)
Country and Year Effects?	Y	Y	Y	Y
Observations	593	576	564	132
Countries	50	49	48	11
R-squared	0.40	0.46	0.47	0.50

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