SUBSTITUTABLE TAX SHIELDS *

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Tax shields offer firms opportunities to limit their tax liabilities. When firms have multiple tax shields available, the choice of tax shield may have minor immediate effects on fiscal revenue, but major economic effects on wider market outcomes. This paper considers these issues by comparing two commonly used tax shields, financial leverage and offshore profit shifting. These tax shields are widely used and are often substitutable. In one stylised example, the fiscal consequences of the two tax shields are near identical. However, these two tax shields have dramatically different wider economic consequences.

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INTRODUCTION

When multiple tax shields are present, elimination of one of these shields will have little effect on the total tax receipts collected from affected firms. Firms can substitute one tax shield for another. But this substitution can have affect the income streams of stakeholders; these changes may affect tax receipts if the affected income streams are taxed differentially. Further, the shift in behaviour from one tax shielding activity to another may have sizeable economic costs or benefits in a wider context. As an example to explore these ideas, we consider substitution between two corporate income tax shields: offshore relocation of intangible assets and financial leverage.

The messages of this paper are the following: First, where substitutable tax shields or avoidance opportunities are present, commonly derived "tax gap" measures of the fiscal costs of any given tax scheme are likely to over-estimate the fiscal costs of the scheme. Firms can substitute between multiple tax shields, some of which are more or less frowned upon by authorities even when they have similar fiscal costs. Second, while the immediate fiscal costs of any given tax shield may be lower than typical estimates, the wider economic consequences of firms' choices of tax shields are likely to be understated. It matters which tax shield is employed. Third, the direct fiscal consequences of offshoring and financial leverage are less clear cut than might be assumed. High return investments are likely to be undertaken regardless of the presence of tax shields, and the tax shield reduces their associated tax receipts. Investment projects with moderate returns are encouraged when tax shields are present, generating taxable income in high tax countries that would not have been earned in the absence of the tax shield. This increases tax receipts. However, the offshoring tax shield can also encourage low return investments that generate tax losses in high tax countries, reducing tax receipts.

Tax havens offer opportunities for the reduction of firms' corporate income tax liabilities. For our purposes, a *tax haven* is defined as a jurisdiction with zero corporate income tax. A multinational firm with operations in high tax jurisdictions as well as tax havens may choose to transfer intangible assets including intellectual property from high tax countries to tax havens, where the income accrued by the intangible asset will not be taxed. Transfer pricing rules ensure that some of this

income is realised in the high tax country, although as we will see, standard transfer pricing guidelines still allow some scope for reductions in the total tax liability arising from the income of the asset.

Financial leverage also offers an opportunity to reduce firms' corporate income tax liabilities. Debt interest payments are deductible from corporate income for tax purposes. An incorporated firm that issues debt to repurchase outstanding shares reduces their corporate income tax liability by the product of the additional interest cost incurred and the corporate income tax rate. This higher leverage is not necessarily costless from the perspective of the firm. High leverage increases the risk of bankruptcy and reduces the amount of free cash flow available for investment. However, when the tax benefits of greater leverage exceed the economic costs, we would expect firms to use leverage as a means to reduce their tax liability.

Financial leverage and offshore relocation of intangible assets are substitutes. Graham and Tucker (2006) show that firms using offshore tax shields operate with lower leverage than otherwise similar firms who do not use offshore tax shields. This is intuitive and is supported by our theoretical analysis in the following section. At first glance, the fiscal consequence of substitution between leverage and offshoring is limited. One tax shield is being replaced by another, keeping the tax liability of a given firm low. The choice between financial leverage and offshoring does have an impact on the form of distributions to investors. Notably, financial leverage increases the share of interest payments relative to distributions to shareholders through dividends and buybacks, and this may have an effect on the personal tax liabilities of investors if these income streams have differential tax treatment at the personal level.

There are also wider consequences of the choice between the two substitute tax shields. In general equilibrium, excessive financial leverage gives rise to credit cycles. Credit cycles are the mechanism through which widespread financial leverage both amplifies and increases the likelihood of booms and busts (see for example Duncan and Nolan, 2015, for a literature review). Firms with high leverage face an increased likelihood of bankruptcy during recessions. When leverage ratios are high across firms, economic slumps can turn into depressions with widespread bankruptcies and high unemployment. Offshore tax shields also exert economic costs over and above the fiscal costs of lost revenue. Desai and Dharmapala (2006) study the

use of offshore tax havens by US corporate firms. They find that the use of tax havens makes it easier for corporate executives to extract rents from firms, to the cost of other stakeholders including shareholders. The use of tax havens decreases transparency; this reduction in transparency increases costs associated with information asymmetries between executives and shareholders. In a wider context, the general equilibrium cost of increased information asymmetries is the reduction of returns to household savers and increases in the cost of tax administration. Over time, this is likely to reduce household savings, wages and economic growth. Additionally, our analysis below shows that offshoring can result in the investment in inefficiently low return intangible assets. These low return investments can generate tax losses in high tax countries that can be offset against other income streams. These tax losses make the investments worthwhile from the firm's perspective, even if the return on the investment is so low that the investment is inefficient.

1 TAX AND THE EFFICIENCY OF INVESTMENT DECISIONS

Taxation on corporate income reduces the returns to firms of investment, below the gross return of the investment. When corporate income taxes are high, only investments with very high gross returns are undertaken by firms. This is inefficient, it means that the savings rate of the economy is not high enough to satisfy the population's desire to save for future consumption.[1] We can plot intangible investment projects' after-tax returns against their before-tax returns. Projects with before-tax returns exceeding the firm's discount rate ρ are *efficient*, and would ideally be accepted by firms and undertaken. Projects with after-tax returns exceeding firm's discount rate will be accepted by firms. Figure 1 presents the space of returns before and after tax. When both before- and after-tax returns of a project exceed the discount rate ρ, this project is efficient and will be accepted by the firm. Efficient projects can be rejected by firms if the after-tax return is less than ρ. Even inefficient projects may be accepted by firms if their after-tax return exceeds the discount rate ρ.

[1] Alternatively, if marginal gross returns are less than discount rates, the economy is saving too much. When the marginal investment returns the discount rate, we can say that the *marginal rate of substitution* between consumption now and in the future is equal to the *marginal rate of transformation* between savings and future consumption.

Figure 1: Project efficiency and investment choice

2 OFFSHORING INTANGIBLE INVESTMENT

The first tax shield we analyse is the "offshoring" of intangible assets. This involves the transfer of intangible assets between subsidiaries of multinational firms, from subsidiaries in high tax jurisdictions to subsidiaries in low tax jurisdictions. These asset transfers between subsidiaries require a Transfer Price to be paid to the selling subsidiary by the purchasing subsidiary. A higher transfer price means higher revenues and taxable income for the home country subsidiary. From the perspective of the consolidated firm, the transfer price has little effect on consolidated income, but does affect the consolidated tax liability of the firm, which depends on the incomes of subsidiaries based in different jurisdictions. Higher transfer prices shift income from low tax jurisdictions to high tax jurisdictions, increasing the consolidated tax burden of the firm.

TRANSFER PRICING RULES

The widely adopted OECD Transfer Pricing Guidelines require that prices charged for within-firm transfers are equal to the prices that would have resulted through trade between unrelated parties. This is referred to as the Arms-Length Principle. In practise, the Arms-Length Principle is difficult to apply. Intangible assets transferred within firms seldom resemble assets freely traded between firms. Further, where a hypothetical Arms-Length transaction could be imagined and generates economic surplus for both firms, the price would be result of bilateral negotiation. It follows that the price would largely determined by the bargaining power of the seller and purchaser.

The negotiation-based approach we undertake here does not assume that a unique Arms-Length Price exists. In this way, our approach differs from the standard "concealment cost" approach. Analyses based on the concealment cost approach assume that firms can pay some resource cost to hide the true Arms-Length price from tax authorities. The concealment cost approach is a version of the celebrated Allingham and Sandmo (1972) model. It is used, for example, by Davies et al. (2014) and Huizinga and Laeven (2008). The concealment cost model can also be thought of as an example of the Costly State Falsification framework described by Lacker and Weinberg (1989). Becker and Davies (2014) consider an alternative to concealment

cost transfer pricing. In their model, firms post a transfer price, which is then open for negotiation between the revenue authorities of the high tax and low tax countries. The high tax, asset exporting country, would prefer a higher transfer price, boosting the firm's tax liability in the high tax country.

For the present paper, our transfer pricing approach is based on two considerations. First, there is little formal appreciation in the existing literature of the range of possible Arms-Length prices for intangible assets. Intangible assets, including intellectual property, are by nature unique, with few potential buyers and sellers. The resulting price of any Arms-Length transaction would be the result of negotiation, with bargaining power determining which price results from within the *bargaining set*.[2] Any price within the bargaining set is consistent with Arms-Length trade. Our second consideration is that the concealment cost approach is a model of tax evasion: the posted price is not equal to the true Arms-Length price, and improvements in tax authority auditing would reveal the evasion. The transfer pricing rule that we propose in this paper is consistent with the Arms-Length principle considered to be the lawful standard. Arguably, firms in our model are operating in a way that is consistent with the letter and the spirit of the law. Nevertheless, profit shifting still occurs in our model.

2.1 Minimum Transfer Pricing

For our benchmark analysis, we assume that the Arms-Length Purchaser has all the market power in this hypothetical negotiation. That is, the Transfer Price is the lowest price acceptable to the seller. While this price allocates surplus unequally across the hypothetical purchaser and seller, it is still consistent with an Arms-Length transaction as described by the OECD guidelines. Allocating the bargaining power with the hypothetical purchaser has the effect of reducing the transfer prices charged, and thereby increasing the value of the tax shield. After exploring this example, we later consider an alternative Transfer Pricing Rule which allocates all the market power with the seller: this adjustment does have an effect on some of our results, but still offers a tax shield to the multinational firm.

[2] In any bilateral negotiation, the bargaining set is the set of prices which result in non-negative surpluses for both agents. Any price within the bargaining set is acceptable to both agents.

Minimum Transfer Pricing Rule: The Minimum Transfer Price leaves the home country seller of the asset indifferent between holding the asset or selling the asset.

Figure 2 plots before- and after-tax returns of projects under Zero Taxation (ZT), Tax Shielding under the Minimum Transfer Pricing Rule ($\underline{T}$) and No Shielding (NS). The Zero Taxation schedule is the 45 degree line: before- and after-tax returns are equal. The No Shielding schedule describes the after-tax returns of projects under home country corporate income tax rate τ. When the home country tax rate τ are high, the slope of the No Shielding schedule is shallow. The tax shielding schedule ($\underline{T}$) describes the after-tax returns of projects when the intangible asset is transfered to a zero tax jurisdiction under the transfer pricing rule. The returns to the consolidated firm under offshoring with the Minimum Transfer Pricing Rule are derived in Appendix B. The schedule $\underline{T}$ is described by Equation 2.

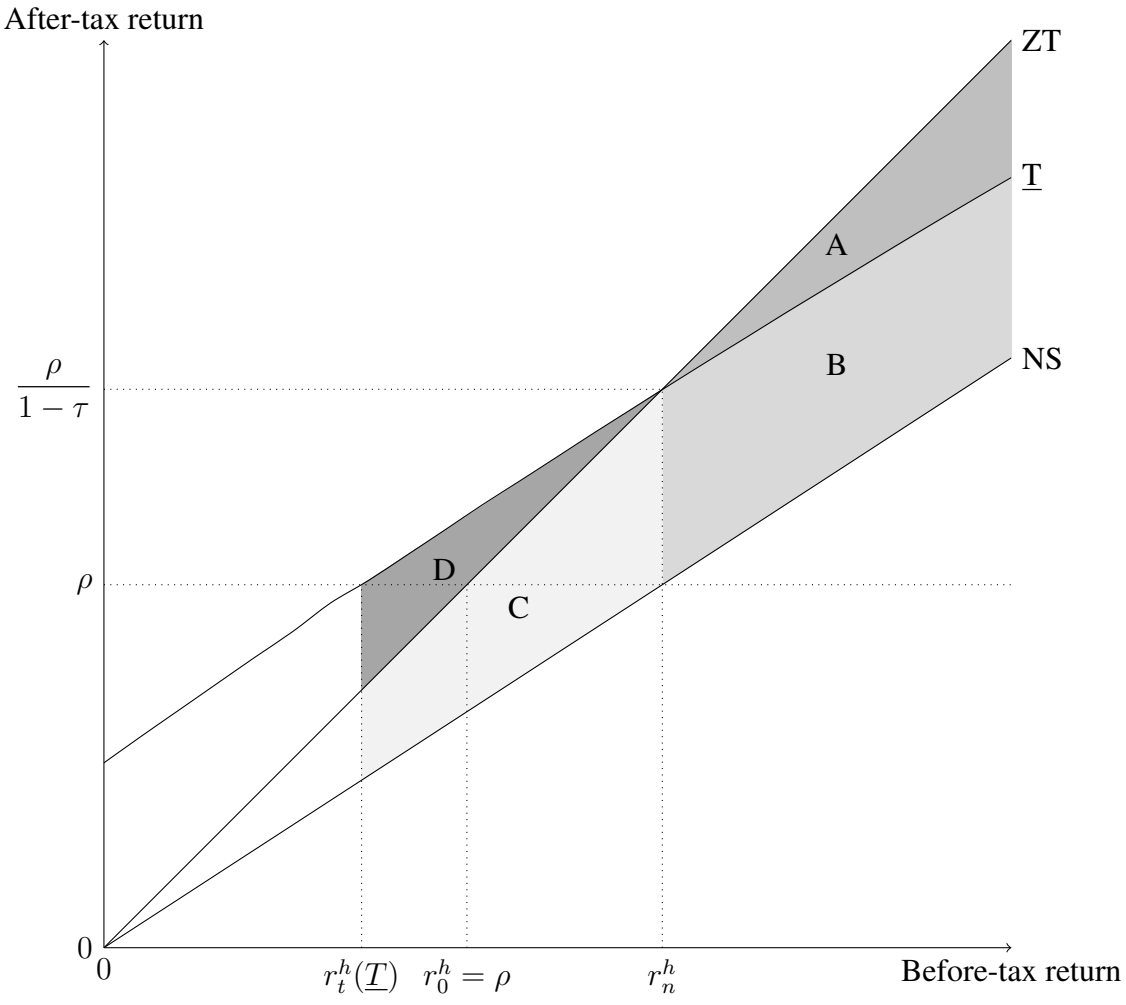
Under No Shielding, total tax due on any given project is captured by the vertical distance between the 45 degree line (ZT) and the No Shielding schedule (NS). That is, taxation due is indicated by shaded regions A and B. Region C is not available to tax authorities, as under No Shielding the projects in region C are unlikely to be accepted by firms—these projects have after-tax returns that are less than the firms' discount rate ρ.

The tax shielding schedule ($\underline{T}$) crosses the Zero Taxation (ZT) schedule at $(\rho/(1-\tau), \rho/(1-\tau))$. At this point, the Transfer Price of the intangible asset is equal to the cost of the project; consequently, the tax paid in the home country under tax shielding is zero. Projects with before-tax return exceeding $\rho/(1-\tau)$ enjoy a Transfer Price exceeding the cost of the project, resulting in a positive tax liability in the home country, indicated by the shaded region A. Projects with before-tax return less of less than $\rho/(1-\tau)$ enjoy a Transfer Price that is less than the cost of the project. This generates tax losses in the home country that can be used to offset taxable profits. The implicit subsidy drawn from these projects is indicated by the region D. In sum, the total tax paid by the firm under Tax Shielding is difference between the tax liabilities indicated by the region A and the tax assets indicated by the region D.[3]

Under Zero Taxation, all efficient projects are accepted, and all inefficient projects

[3]The areas do not correspond to total monetary values, as there are no quantities on this diagram.

Figure 2: Taxation of projects



are rejected. Under tax shielding, all efficient projects are accepted, and some inefficient projects are also accepted; this is a result of the tax subsidy associated with transfer prices that can fall below the cost of production. Under No Shielding, some efficient projects are rejected when the tax liability associated with the project pulls the after-tax return below the firm's discount rate; all inefficient projects are rejected.

Figure 3 presents the effects of a reduction in the discount rate ρ. This example is pertinent to recent downward trends in interest rates. The Zero Taxation (ZT) and No Shielding (NS) schedules are unaffected by the change in discount rates. The Tax Shielding ($\underline{T}$) schedule is affected, moving downward toward the No Shielding schedule. As the discount rate falls, the Transfer Price T increases toward the total revenues of the investment project. This increases home country taxable corporate income, which is the difference between the Transfer Price and the cost of the investment. Under Tax Shielding, the minimum Before-Tax return for an acceptable project decreases from $r_t^h(\underline{T})$ to $r_t^h(\underline{T})'$.

Figure 4 considers a fall in the home country's corporate income tax rate from τ to τ'. This fall in the corporate income tax rate increases the slope of the No Shielding (NS) schedule. The proportion of before-tax returns retained by No Shielding firms increases from $(1-\tau)$ to $(1-\tau')$. Under No Shielding, the minimum before-tax return for acceptable projects decreases from r_n^h to $r_n^{h\prime}$; a greater share of efficient projects are undertaken. After the reduction in corporate income tax rates, the slope of Tax Shielding ($\underline{T}$) schedule is steeper and the vertical intercept is smaller. The reduction in the corporate income tax rate reduces the tax shield and implicit tax subsidy for low return projects, this reduces the vertical intercept of the Tax Shielding schedule. The reduction in the corporate income tax rate also reduces the amount of tax paid on high return projects; where the transfer price significantly exceeds the cost, this increases the slope of the Tax Shielding schedule. In the limit as the corporate income tax tends to zero, both the No Shielding (NS) and the Tax Shielding schedules would converge to the Zero Taxation (ZT) schedule. For Tax Shielding firms, the minimum before-tax return for acceptable projects increases from $r_t^h(\underline{T})$ to $r_t^h(\underline{T})'$, fewer inefficient projects are accepted. Also, for Tax Shielding firms, projects with before-tax returns between $r_n^{h\prime}$ and r_n^h earn tax subsidies under the original tax rate τ. Under the new, lower tax rate τ' these same projects

Figure 3: Fall in ρ to ρ'.

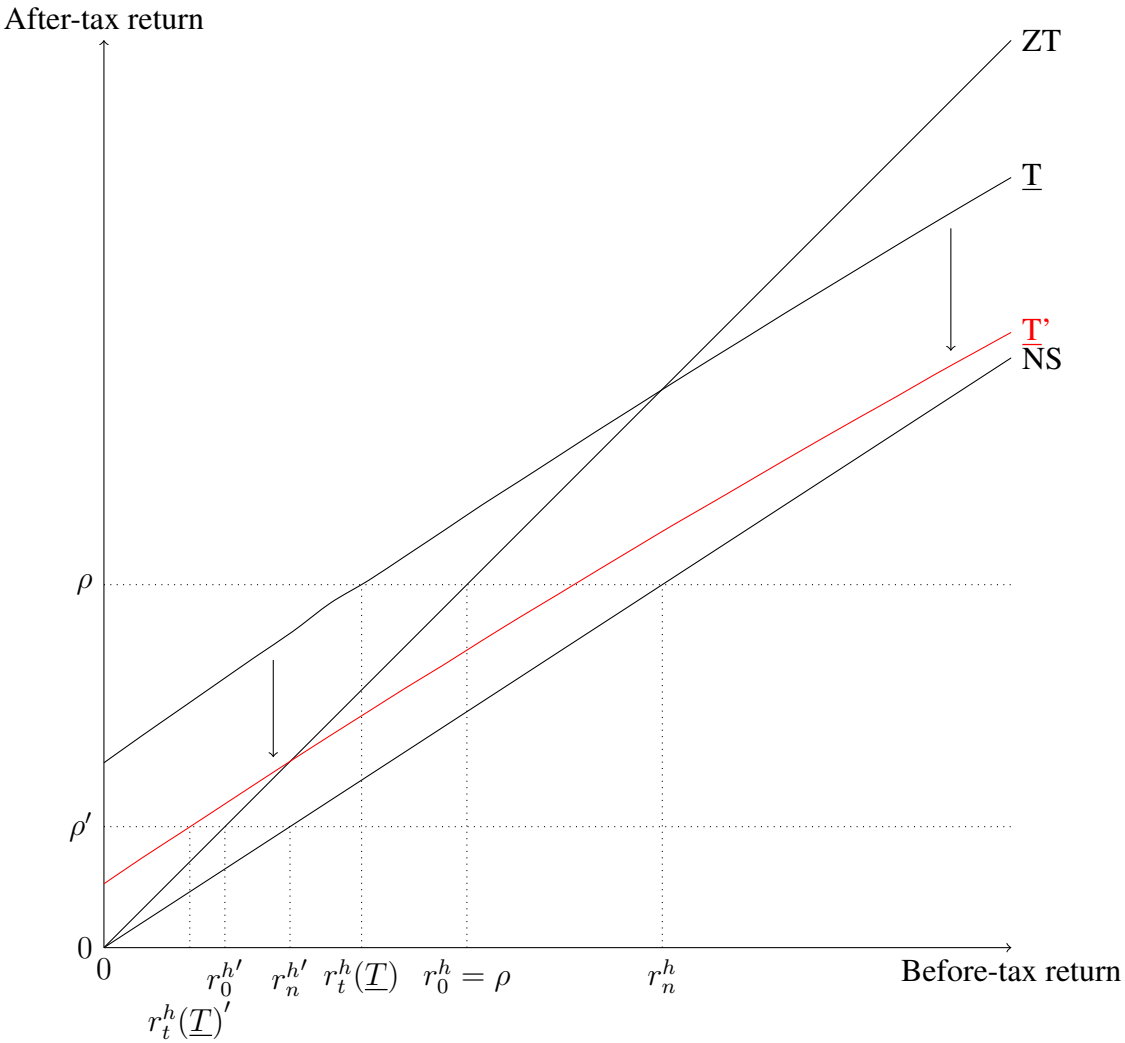
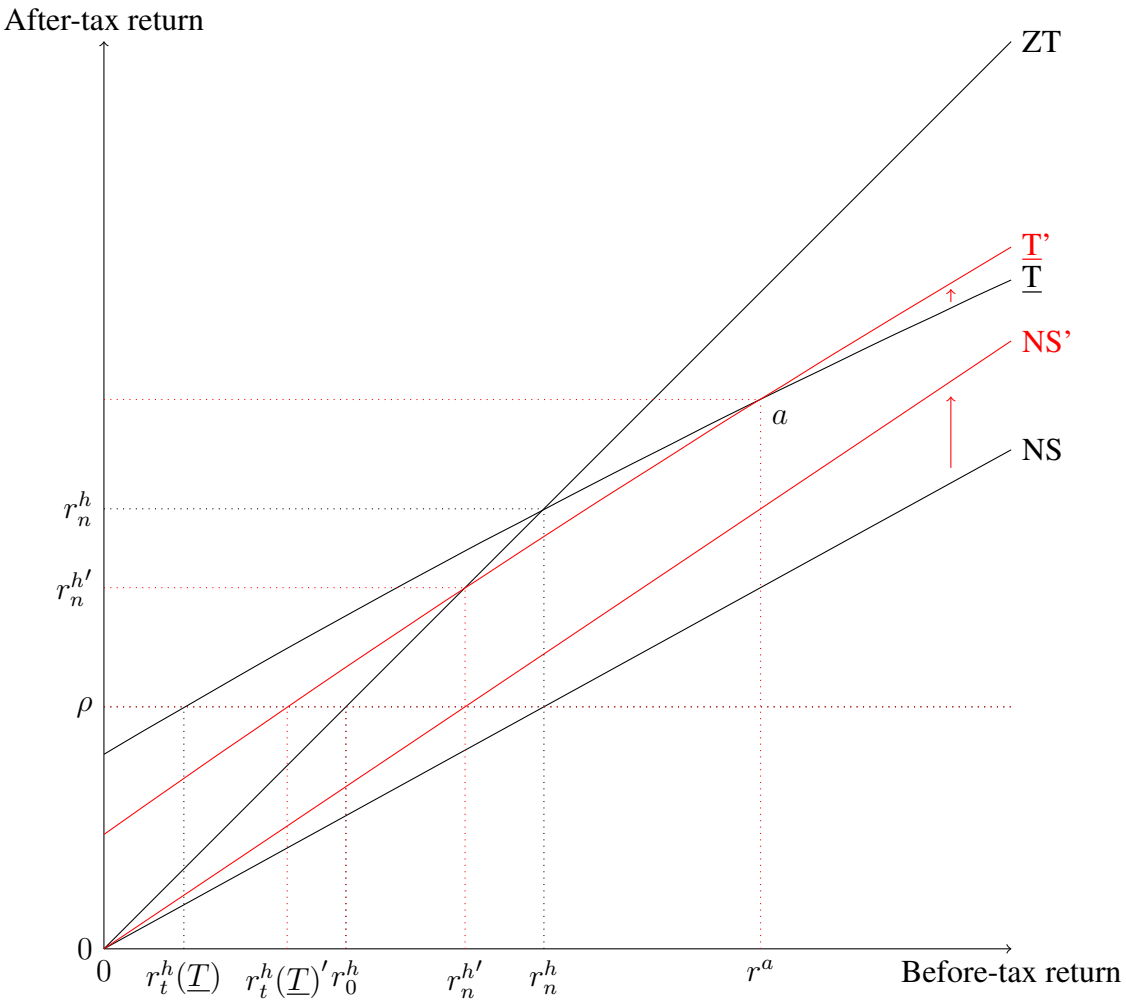


Figure 4: Fall in τ to τ'.



incur a positive tax liability.

The immediate fiscal consequences of the decrease in corporate income tax rates are ambiguous. Point a marks the project where the after-tax returns are equated for a Tax Shielding firm before and after the decrease in tax rates. The before-tax return of this project is r^a. For projects with before-tax returns exceeding r^a, the tax due from a Tax Shielding firm is greater under the higher tax rate τ than under the lower tax rate τ'. For projects with before-tax returns less than r^a, the tax due from a Tax Shielding firm is actually less under the higher tax rate τ than under the lower tax rate τ'. Projects with before tax returns between r_n^h and r_n^h earn tax loss assets under the higher tax rate τ, but incur tax liabilities under the lower tax rate τ'. The reduction in the tax rate reduces the value of the tax shield, which is high when returns are low. In this way, reductions in corporate tax rates can actually result in increases in corporate tax receipts when firms can offshore intangible assets under the given Transfer Pricing Rule.

2.2 Maximum Transfer Pricing

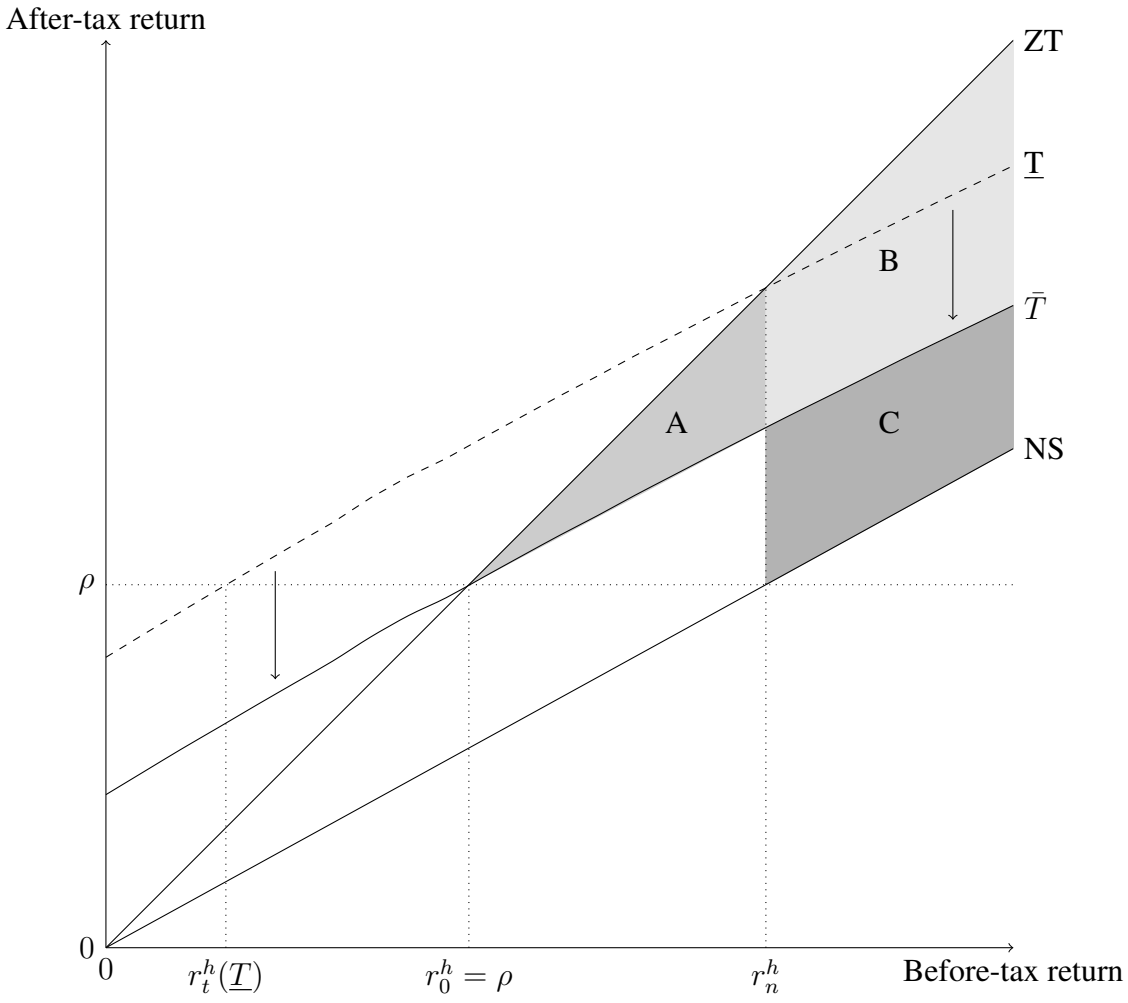
The Transfer Price $\underline{T}$, prescribed by the Minimum Transfer Pricing Rule, is the minimum acceptable price to a home firm operating under domestic taxation. As an alternative rule, we might consider the maximum price that would be acceptable to an arms-length purchaser operating in the Tax Haven. We refer to this alternative transfer price as the Maximum Transfer Price, denoted $\bar{T}$.

Maximum Transfer Pricing Rule: The Maximum Transfer Price leaves the foreign country purchaser of the asset indifferent between purchasing the asset or not.

The arms-length purchaser is willing to pay, at a maximum, a transfer price such that the project returns the discount rate ρ. Appendix C presents further details and derivations. Equation 3 describes the $\bar{T}$ schedule in Figure 6. The $\bar{T}$ schedule has a lower vertical intercept than the TS schedule. The higher transfer price increases the proportion of investment returns that are taxable in the home country, this lowers the after-tax returns of the investment projects.

Under Tax Shielding with the Maximum Transfer Price ($\bar{T}$), investment deci-

Figure 5: Minimum and maximum transfer prices.



sions are efficient. All efficient projects are accepted, and all inefficient projects are rejected. We can see this in Figure 6, the $\bar{T}$ schedule crosses the 45 degree line and the ZT schedule at (ρ, ρ). Consider a project with before-tax return of ρ: this project will have a Maximum Transfer Price equal to cost, which means that the home country tax liability will be zero. The tax liability due in the home country under $\bar{T}$ is indicated by the shaded regions A and B. We can compare these regions with the tax liability under No Shielding (NS). The tax liability under No Shielding is indicated by the regions B and C. The immediate fiscal consequences of Tax Shielding with the Maximum Transfer Price are ambiguous. If enough investment projects earn low returns, less than r_n^h, then it may be the case that total tax paid by the firm increases when they are able to use the Tax Haven compared with the benchmark of No Shielding. This is the case if the Maximum Transfer Pricing Rule is followed. Alternatively, if enough investment projects earn high returns, greater than r_n^h, then the total tax paid by a Tax Shielding firm will be less than under No Shielding, regardless of which of the two Transfer Pricing Rules considered are enforced.

3 FINANCIAL LEVERAGE

The second tax shield we consider is financial leverage. We propose a simple rule through which the firm can use debt finance to limit the tax liability arising from their investment project. As before, the investment project costs one unit and returns total revenue before tax of $1 + r$. Debtholders discount future payments at the common discount rate ρ. The firm issues debt to finance the proceeds of the intangible investment. The interest expense of the debt is deductible for corporate income tax purposes, reducing the corporate income tax liability of the firm. Appendix D provides further details and working for the Financial Leverage tax shield.

Compare Equation 4 with Equation 3. The after-tax returns under the leverage tax shield are similar to those under the profit shifting tax shield with the maximum transfer pricing rule. The difference in returns between the two strategies relates to the timing of taxation. Under the offshoring strategy, taxes in the home country are due in the initial period, when the asset is transferred to the tax haven. Under the financial leverage strategy, taxes are due upon receipt of revenues in the later

period.

The tax collected under the leverage tax shield is also very close to the tax collected under the maximum transfer pricing rule, and we can use Figure 6 to analyse the fiscal and efficiency consequences of the leverage tax shield as in the previous section. To summarise, when firms employ financial leverage as a tax shield, investment decisions are efficient: all efficient projects are accepted and all inefficient projects are rejected. The total fiscal consequences of the tax shield are ambiguous: projects with very high returns ($r > r_n^h$) incur a smaller tax liability under financial leverage than in the absence of tax shields; projects with moderate returns ($\rho < r < r_n^h$) incur a positive tax liability, and would not have been accepted if the tax shield were not present.

4 DISCUSSION

Different tax shields can have dramatically different economic consequences, even when the immediate fiscal costs appear similar. The tax gap emerging from a given strategy (legal or illegal) may be illusory if substitute tax shields are available. Firms' choices of tax shields matter for wider economic outcomes, including growth and the frequency and amplitude of recessions. We've seen that debt finance can act as a substitute for the offshoring of intangible assets, with the two strategies resulting in similar immediate reductions in tax liabilities for firms. It is not necessarily the case that the presence of tax shields will always and everywhere reduce total tax receipts; sometimes, tax shields can encourage efficient investments that generate tax revenue and would have not been undertaken in the absence of the tax shield. However when firms can offshore assets, current transfer pricing rules can encourage the undertaking of low return intangible investments, which are inefficient and accrue taxable losses.

Figure 6: Offshore transfers versus leverage.

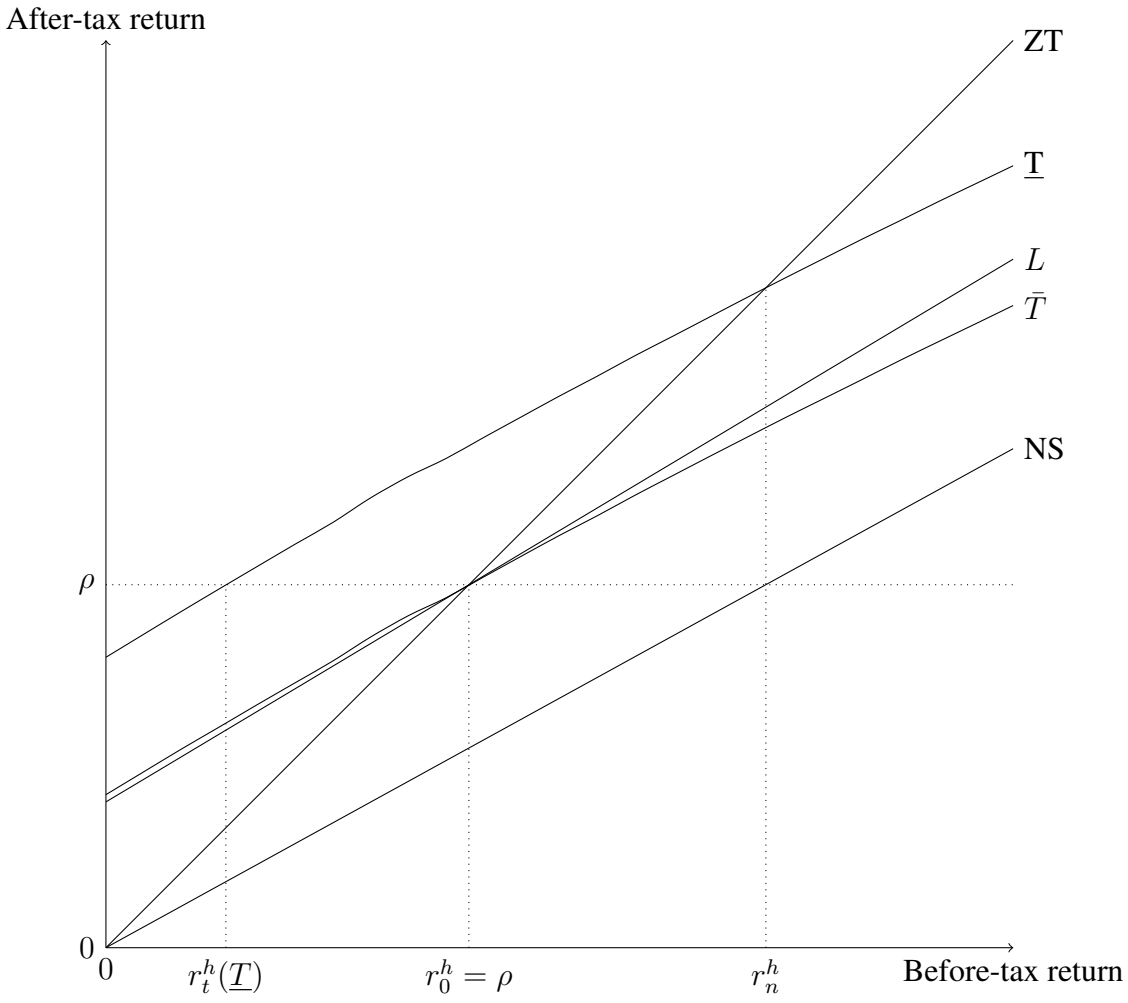


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Table 1: Cash flows for offshoring firm

Time	0	1
Hold asset	$-C - \tau(T - C)$	R

Table 2: Cash flows for home country firm

Time	0	1
Hold asset	$-C$	$R - \tau(R - C)$
Sell asset	$-C + P - \tau(P - C)$	0

A RETURNS TO OFFSHORED INTANGIBLE INVESTMENTS

Consider a firm implementing a strategy of offshoring their intangible asset. After producing their intangible asset at cost C, the asset is transferred from the home country to the tax haven. This transfer incurs a tax liability in the home country of $\tau(T - C)$, where τ is the home country tax rate and T is the transfer price. At time 1, the asset returns revenue R in the tax haven. Table A presents the timing of cash flows for the consolidated firm. The after tax returns to the consolidated firm under a strategy of transferring intangible assets offshore is described as follows:

$$r_t = \frac{R}{C + \tau(T - C)} - 1 \tag{1}$$

B MINIMUM TRANSFER PRICE

The home country firm would be willing to sell the asset if the present value of cash flows from the asset are less than the sale price of the asset S, net of taxes. Table B presents the cash flows to the home country firm under two scenarios: holding the asset to maturity (in the high tax country), and selling the asset at price P.

In sum, the home country would be willing to sell the asset if the following inequality holds:

$$-C + P - \tau(P - C) \geq -C + \frac{1}{1 + \rho}(R - \tau(R - C))$$

At the minimum sale price acceptable to the home country firm, the above inequality binds. We can rearrange to solve for sale price S, which corresponds to the minimum transfer price consistent with arms-length trade, $\underline{T}$:

$$\underline{T}(1-\tau)+\tau C=\frac{1}{1+\rho}(R-\tau(R-C))$$

$$\underline{T}=\frac{1}{1+\rho}\left[R-\frac{\tau}{1-\tau}\rho C\right]$$

Using 1, we can determine that a firm using an offshoring strategy will earn after tax returns $r_t(\underline{T})$

$$r_t(\underline{T})=\frac{(1+r)}{(1-\tau)-\frac{\rho}{1+\rho}\frac{\tau^2}{1-\tau}+\frac{\tau}{1+\rho}(1+r)}-1 \tag{2}$$

C MAXIMUM TRANSFER PRICE

Consider a hypothetical firm based in the tax haven who wishes to purchase the intangible asset from the home country firm. The foreign firm would be willing the purchase the asset at any price that allows them to earn a net return equal to the commonly shared discount rate ρ. Any sale price P must therefore satisfy

$$P\leq\frac{R}{1+\rho}.$$

The right hand side is the present value of future returns from the project. At the maximum transfer price, the above equation binds with equality. The maximum transfer price is therefore

$$\bar{T}=\frac{R}{1+\rho}.$$

Using 1, the after tax returns to the consolidated firm under a strategy of transferring intangible assets offshore under maximum transfer pricing is described as follows:

$$r_t(\bar{T})=\frac{r-\tau\left(\frac{r-\rho}{1+\rho}\right)}{1+\tau\left(\frac{r-\rho}{1+\rho}\right)} \tag{3}$$

D FINANCIAL LEVERAGE

As before, the investment project costs one unit and returns total revenue before tax of $1+r$. Debtholders discount future payments at the common discount rate ρ. The firm issues debt with par value

$$D = \frac{1+r}{1+\rho}.$$

The total interest paid is

$$\rho D = (1+r)\frac{\rho}{1+\rho}.$$

This interest expense is deductible for corporate income tax purposes; the resulting corporate income of the firm is $r - \rho D$. The firm incurs a corporate income tax liability of $\tau(r - \rho D)$. The after-tax return of the project, r_l is described by the following equation

$$1 + r_l = 1 + r - \tau(r - \rho D),$$

which can be rearranged to yield

$$r_l = r - \tau\left(\frac{r-\rho}{1+\rho}\right). \tag{4}$$