Volume 89, Issue 2, March 2013 ISSN 0022-1996

Journal of INTERNATIONAL ECONOMICS

89 (2) 271–538
(2013)

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REGULAR ARTICLES

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Journal of International Economics 89 (2013) 432–440

Contents lists available at SciVerse ScienceDirect

Journal of International Economics

journal homepage: www.elsevier.com/locate/jie

The arm's length principle and distortions to multinational firm organization ☆

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ARTICLE INFO

Article history:
Received 5 October 2010
Received in revised form 28 July 2012
Accepted 23 August 2012
Available online 6 September 2012

JEL classification:
D23
H25
F23

Keywords:
Corporate tax
Transfer prices
Arm's length principle
Corporate finance

ABSTRACT

To prevent profit shifting by manipulation of transfer prices, tax authorities typically apply the arm's length principle in corporate taxation and use comparable market prices to ‘correctly’ assess the value of intracompany trade and royalty income of multinationals. We develop a model of firms subject to financing frictions and offshoring of intermediate inputs. We find that arm's length prices systematically differ from prices set by independent agents. Application of the principle distorts multinational activity by reducing debt capacity and investment of foreign affiliates. Although it raises tax revenue and welfare in the headquarter country, welfare losses may be larger in the subsidiary location, leading to a loss in world welfare.

1. Introduction

With the increasing importance of multinational enterprises (MNEs), collecting corporate taxes has become a challenging task. One important problem is that by shifting profits from high tax to low tax countries, MNEs can reduce their overall tax liability. One method of doing so is to manipulate the transfer prices at which goods and services are exchanged between elements of the MNE that are resident in different countries.

To protect the tax base, authorities have adopted arm's length (AL) pricing as the central principle in taxing MNEs. The principle is set out in Article 9 of the OECD Model Tax Convention and governs the prices at which intracompany transfers are set for tax purposes. Such transfers can be of intermediate goods, produced by one affiliate company and sold to another, or they can include a licence or royalty fee paid for the right to use intellectual property owned by another part of the group. The AL price is the price at which the transaction would take place between independent firms. In many cases, it is difficult in practice to identify a price for the same product actually transferred between two independent agents. This paper, however, is not concerned with the practical difficulties of implementing the AL principle, but rather with the underlying rationale. This rationale is based on the implicit assumption that AL prices observed in trade between independent firms are the ‘correct’ ones for assessing the value of intracompany trade. The key point is that the AL principle might be an inappropriate benchmark and thus may introduce new distortions in the taxation of multinational firms.

The paper analyzes the AL principle in a model with offshoring of component production for the assembly of final goods in a high tax country (the ‘North’). Final goods producers in the North can offshore to the ‘South’ either by entering an outsourcing relationship with an independent firm, or establishing a wholly owned subsidiary via foreign direct investment (FDI). The model endogenously explains AL prices paid in outsourcing to independent firms, and also the transfer prices set by MNEs when importing the same components from foreign affiliates. These prices are different from each other, even in the absence of taxation. Imposing AL prices for tax purposes in the case of FDI distorts investment decisions and creates a welfare loss, at least in the South, and possibly globally.

The key element of the model is a financing constraint due to capital market frictions, along the lines of Tirole (2001, 2006) and Holmstrom

☆ We appreciate financial support by the Swiss National Science Foundation (100014-129556/1) and the Economic and Social Research Council (RES-060-25-0033). We appreciate comments at the University of St. Gallen, the Annual Symposium of the Oxford Centre for Business Taxation, the CEPR European Research Workshop in International Trade (Erwit), the CESifo Area Conference in Public Sector Economics, the CESifo Venice Summer Institute, and by M. Kolmar, E. Janeba and M. Stimmelmayr. We are grateful to Kala Krishna and two anonymous referees for very constructive comments.
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http://dx.doi.org/10.1016/j.jinteco.2012.08.007

and Tirole (1997). All firms – including the parent company in the North – are endowed with limited own resources and hence need to raise funds on the external capital market. The more funds that each firm can raise externally, the greater the investment that can be undertaken, and the higher is profit. But external funds are limited by the amount of income that can be pledged to the lender. Pledgeable income differs between the two cases considered. In the case of outsourcing, the parent company must extract profit generated by the outsourcing firm in the South through a royalty payment. The requirement to make the royalty payment reduces pledgeable income in the outsourcing firm, and hence reduces its borrowing and investment. In the case of direct investment, however, the parent has the opportunity to extract profit in the form of a dividend, which does not reduce pledgeable income. In this case, the parent can increase pledgeable income in its Southern subsidiary by foregoing a royalty, and also by increasing the price it pays for the purchase of an intermediate component from the subsidiary. This increased pledgeable income leads to higher borrowing, higher investment and higher surplus in the subsidiary, compared to the case of the outsourcing firm. As a result, and even in the absence of tax, optimal contracts specify higher component prices and lower royalty fees for intracompany trade compared to AL relationships. Profit shifting occurs for economic reasons, allowing MNEs to overcome financing problems and invest on a larger, more efficient scale.

In this situation, the AL principle is a flawed benchmark in the taxation of MNEs. It imposes a tax penalty on MNEs by forcing them, for tax purposes, to assess the value of imports at lower AL prices and to declare fictitious royalty income as observed in outsourcing relationships. The results of imposing the AL principle are: (i) the tax penalty leads to lower transfer prices and less profit shifting; (ii) it reduces debt capacity and subsidiary investment; (iii) it strengthens tax revenue and raises national welfare in the North; (iv) it strongly reduces tax revenue and welfare in the South; (v) it can lead to a loss of world welfare. The last result is due to the fact that tax authorities, when observing AL prices, misinterpret high transfer prices and low royalties as a result of tax induced profit shifting while, in fact, these choices are an efficient way to cope with financial frictions.

Section 2 reviews the literature and Section 3 develops the model. Section 4 analyses the consequences of imposing the AL principle on the scale of investment and production as well as tax revenue and welfare in the world economy. Section 5 concludes.

2. Review of the literature

There is considerable evidence that taxes induce profit shifting, see Devereux (2006) for a survey. Huizinga and Laeven (2008) find that profit shifting substantially redistributes tax revenue. They estimate a semi-elasticity of reported profits with respect to the top statutory tax rate of 1.3 which is substantial. Bartelsman and Beetsma (2003) calculate that more than 60% of the additional revenue resulting from a unilateral tax increase are lost due to income shifting.[1] Other research more directly studies how taxes affect transfer prices. Bernard and Weiner (1990) distinguish between imports from a third party and an affiliate and find systematic differences between transfer and AL prices. Swenson (2001) estimates significant but relatively small effects of tax rates on transfer prices but her data do not allow differentiation between intrafirm and AL prices. Clausing (2003) reports that a 1% lower foreign tax rate is associated with 0.94% lower intrafirm export prices and 0.64% higher import prices, relative to the tax effects for non-intrafirm goods. Bernard et al. (2006) document that export prices of U.S. multinationals for intrafirm transactions are significantly lower than prices for the same good sent to an AL customer. On average, the AL price is 43% higher than the related-party price. A decrease in the corporate tax rate of one percentage point raises the gap between AL and related-party prices by 0.56–0.66%.

However, the empirical literature does not explain which part of the price gap is due to taxes and whether a gap would remain in the absence of tax. A substantial literature in accounting has studied the role of transfer prices. Harris and Sansing (1998) and Sansing (1999) investigate the determination of AL and transfer prices and a firm's choice of supplying the market either by staying vertically integrated or selling to an independent distributor. The transfer pricing rules of the U.S. Treasury (comparable uncontrolled price method) can distort organizational choice and production efficiency. The analysis abstracts from financial frictions. Holmstrom and Tirole (1991) study the choice of transfer prices when incentive problems arise due to unobservable managerial investments in quality and cost reduction. Taxes and financial frictions are not part of the analysis. Smith (2002) focusses on the use of transfer prices both for tax minimization and managerial incentives. While most papers consider the case of one set of books, Baldenius et al. (2004) and Hyde and Choe (2005) study transfer prices when there are two books, one used to guide incentives and the other for tax purposes. The key insight is that the two prices are importantly related. Tax authorities can easily inspect economic books whenever there is a need to check transfer prices reported for tax purposes.[2] Our analysis is based on one book.

Much of the tax literature does not address the role of transfer prices for the internal organization of vertically integrated firms as compared to trade among independent firms. It studies the AL principle only in reduced form if at all, focussing instead on tax induced profit shifting, see Haufler and Schjelderup (2000), for example. Nielsen et al. (2008) or Gresik and Osmundsen (2008) discuss strategic considerations in choosing transfer prices, assuming a well defined 'true' price for intracompany shipments. Elitzur and Mintz (1996) adopt the same assumption. Firms use the transfer price to minimize global tax liabilities and to control the decisions of a self-interested manager in a subsidiary firm. Their focus is on the interaction of transfer pricing and tax competition.

The present paper is unique in studying the AL principle when firms can trade with either independent firms (outsourcing) or with wholly owned subsidiaries (FDI). It analyzes new distortions introduced by forcing MNEs to use AL prices for tax purposes when, in fact, different prices are optimal for economic reasons. Another key innovation is to integrate the incentive problems studied in corporate finance in a model of MNE decisions. Antràs et al. (2009) have derived predictions from a corporate finance model and tested them with firm-level data to explain how financing frictions can affect FDI flows and the scale of multinational activity.[3] Manova (2008, 2011) finds that credit constraints affect trade flows. Importantly, Manova et al. (2011) provide evidence that foreign-owned affiliates perform better than private domestic firms, especially in financially dependent sectors, which is consistent with foreign affiliates being financially less constrained. Desai et al. (2004) found that MNE affiliates are financed with less external debt in countries with underdeveloped capital markets which points to the importance of financial frictions in influencing MNE decisions. Carluccio and Fally (forthcoming) derive a prediction that firms are more likely to integrate suppliers located in countries with poor financial institutions. Consistent with our theory, they find robust evidence that financial frictions favor vertical integration and lead to higher shares of intrafirm imports from those countries.

[1] See also Grubert and Mutti (1991). These papers do not distinguish different channels of profit shifting, either by transfer pricing or internal debt. The debt channel is documented in Desai et al. (2004), Huizinga et al. (2008), Mintz and Smart (2004) and Egger et al. (2010), among others.

[2] Czechowicz et al. (1982) report that 89% of U.S. multinationals use the same transfer price for both purposes. A survey by Ernst and Young (2003) indicates that over 80% of parent companies use a single set of transfer prices for management and tax purposes.

[3] They consider an inventor who organizes investment and production in several locations. There is no transfer pricing since no good or input is shipped across units.

3. Firm organization and transfer pricing

We set out a model in which firms in the North offshore components manufacture to the South, either through outsourcing to an independent Southern firm, or through direct investment in a wholly owned subsidiary. A key element of the model is the need for both types of firm to raise external finance at the margin to undertake investment. We begin by setting up the basic structure of the model, common to both forms of organization. We then consider, in turn, the cases of outsourcing and direct investment and derive measures of welfare.[4] In the next section we consider the implications of imposing the AL principle in the case of direct investment.

3.1. Basic assumptions

Our analysis rests on several assumptions. Firms in the North offshore component production to the South which uses capital and labor. Labor, capital and output markets are fully competitive and so factor prices and final output prices are fixed. Interest rates for loans and deposits are the same in both locations, with the deposit rate being normalized to zero. The corporate tax rate in the North is higher than or equal to the Southern rate. In each form of organization, the parent company is able to choose the price that it pays for the component and the royalty that it charges. It chooses these prices to maximize profits. In dealing with a subsidiary, an MNE has the additional flexibility that profits can be repatriated as dividends.

Firms have own funds A in the South and A^n in the North. When dealing with an independent supplier in the South, the Northern firm invests own funds on the deposit market. When sourcing from a fully owned subsidiary, it commits own funds A^n to self-finance subsidiary investment. These funds are insufficient to cover investment, and so both types of firm in the South need external funding. This is provided by local banks that consider subsidiaries to be separate legal entities, and which earn zero profits. The availability of local borrowing is constrained by moral hazard, and rises with the size of own funds committed and future pledgeable earnings. A key issue is that in the case of direct investment the parent is able to boost the pledgeable income of the subsidiary above that available to the independent firm in the outsourcing case, by changing the royalty and the price paid for the component.

Suppose that a mass 1 of firms assembles final output in the North, $y_j = \beta x_j$, sourcing an input x_j from the South, where β is a fixed coefficient. The index $j \in \{o,i\}$ denotes organizational form: outsourcing to independent subcontractors (index o) or sourcing from own subsidiaries (index i). Components $x_j = f(l_j) I_j$ are produced with capital I_j and labor l_j. Given organizational form, component production follows a sequence of events. (i) Invest I_j which is financed with own funds and levered with local borrowing. (ii) The subsidiary manager or the independent subcontractor chooses high or low effort, leading to high p or low p_L. (iii) When successful, firms hire labor, produce and ship components to Northern firms which assemble final output. We solve by backward induction.

Component production in the South yields earnings per unit of capital

$$v\left(z_j\right) = max_{l_j} \quad z_j f\left(l_j\right) - w l_j, \quad z_j f'\left(l_j\right) = w, \quad v'\left(z_j\right) = f\left(l_j\right). \tag{1}$$

The upstream firm faces a wage w and receives a price z_j for components where z_o is the AL price chosen in an outsourcing relationship, and z_i is the internal transfer price chosen to control production decisions of a wholly owned subsidiary.

The parent in the North faces a tax liability T_j^n and earns expected net profit

$$\pi_j^n = \left(\beta - z_j\right) x_j p + r_j p + \pi_j - T_j^n. \tag{2}$$

The first term is the expected profit of the final goods division. With full ownership, the parent can choose to extract profit by means of a royalty $r_i \geq 0$, a repatriated dividend $\pi_i \geq 0$, or both. In the outsourcing case, the expected royalty is $r_o p \geq 0$ but dividend repatriation is zero, $\pi_o = 0$, since ownership rests with the Southern producer.

We assume that, in the same industry, a share n_o of firms operates at arm's length while the other part opts for FDI, $n_o + n_i = 1$.[5] The aggregate net value in the North is

$$\Pi^n = n_o \pi_o^n + n_i \pi_i^n > 0. \tag{3}$$

The key part of the analysis refers to investment, component production and profits in the South where labor cost is low but investment financing is constrained due to financial frictions. We first turn to outsourcing relationships with independent subcontractors.

3.2. Outsourcing

3.2.1. Investment and financing

The outsourcing contract specifies a price z_o and a royalty r_o. The subcontracting firms in the South have own assets A but must borrow $D_o = I_o - A$. If successful, a firm generates cash flow $v_o I_o$, pays back external debt and remits the royalty as well as tax, T_o^e, specified below. In the absence of depreciation, the end of period value is $I_o + v_o I_o$ and the private surplus is

$$\pi_o^e = p V_o^e - A, \quad V_o^e \equiv I_o + v_o I_o - (1+i) D_o - r_o - T_o^e. \tag{4}$$

Banks lend D_o at rate $i > 0$ to cover losses from credit defaults. With perfect competition the banks' surplus of $\pi_o^b = p(1+i)D_o - D_o$ is zero, and so the loan rate is fixed at $(1+i)p = 1$. The entire joint private surplus is therefore captured by the contractor, and is $\pi_o = [(1+v_o)p - 1] I_o - (r_o + T_o^e)p$. Adding expected tax pT_o^e yields a social surplus $\pi_o^* = [(1+v_o)p - 1] I_o - r_o p$.

The subcontractor's tax liability is assumed to be $T_o^e = \tau^s [v_o I_o - i(D_o + A) - r_o]$, i.e. costs of debt and equity finance are both deductible.[6] Noting $I_o = D_o + A$, this is $T_o^e = \tau^s [(v_o - i) I_o - r_o]$. Substituting for tax T_o^e yields a surplus of

$$\pi_o^e = \pi_o = (1 - \tau^s) p [(v_o - i) I_o - r_o]. \tag{5}$$

Since the contractors' surplus rises linearly, they would like to invest as much as possible. However, there is a moral hazard problem. Entrepreneurs could consume private benefits; this would make their success probability fall to $p_L < p$ and render the project unprofitable. Banks therefore fix the loan size to be incentive compatible to prevent shirking. The incentive compatibility constraint is that the rise in expected income due to high effort must exceed foregone private benefits cI_o, that is:

$$(p - p_L) V_o^e \geq c I_o \quad \Leftrightarrow \quad V_o^e \geq \gamma I_o. \tag{6}$$

where $\gamma \equiv c/(p - p_L)$. This requirement in effect limits the amount that the bank is willing to lend relative to the net resources invested by the entrepreneur. Debt capacity is $(1+i) D_o \leq (1 + i - \gamma) I_o + (1 - \tau^s)$

[4] Our working paper (Keuschnigg and Devereux, 2010) considers endogenous organizational choice. In this case the ownership advantage of FDI is partly offset by higher set-up costs, as in the recent literature on firm heterogeneity; see Helpman (2006) for a survey.

[5] The discussion paper (Keuschnigg and Devereux, 2010) endogenizes the oursourcing vs. FDI choice.

[6] A more common tax code would be $T_o^e = \tau^s [v_o I_o - i D_o - r_o]$ which would introduce a constant iA in subsequent analysis. Although more complicated, the results remain qualitatively the same. Since the focus of the paper is not on the tax effects on investment, we adopt this simplification.

$[(v_o - i)I_o - r_o]$. To maximize the surplus, the firm invests until this debt capacity is exhausted, so that investment is:

$$I_o = m(z_o)\cdot\left[A - (1-\tau^s)pr_o\right], \quad m(z_o) \equiv \frac{1}{\gamma p - (1-\tau^s)(v_o - i)p}. \tag{7}$$

This expression says that investment is equal to a multiple of net resources, defined as the initial resources, A, less the expected net cost of paying a royalty to the Northern firm, $(1-\tau^s)pr_o$. The AL royalty r_o therefore directly affects investment. The AL component price z_o affects the multiplier via $v_o = v(z_o)$ as in Eq. (1).

For a well behaved equilibrium, we assume:

$$p\gamma > (1-\tau^s)(v_o - i)p > 0 > (1-\tau^s)(v_o - i_L)p_L + c. \tag{A}$$

The first inequality implies that the multiplier is positive but finite. The second inequality implies that the firm's net value rises linearly with investment where $v_o - i$ is a measure of 'excess return' and reflects credit rationing. It would be optimal to scale up infinitely but the firm is prevented from doing so by the binding financing constraint. The last inequality indicates that if the success probability is low then the marginal net value is negative, even allowing for the private benefits c per unit of investment. This excludes an equilibrium with low effort.

3.2.2. Outsourcing contract

With outsourcing, the Northern firm invests her assets A^n on the deposit market and buys from a subcontractor by offering a contract z_o and r_o. The Northern firm collects royalty income, earns profits from its final goods unit, and pays tax $T_o^n = \tau[(\beta - z_o)x_o + r_o]p$. The expected profit is π_o^n as in Eq. (2) except that there are no repatriated dividends. Substituting the tax yields

$$\pi_o^n = (1-\tau)[(\beta - z_o)x_o + r_o]p. \tag{8}$$

When offering a contract z_o and r_o, the final producer fully anticipates the subcontractor's behavior resulting in a delivery $x_o = f(l_o)I_o$. The contract must also fulfill the subcontractor's participation constraint, $\pi_o \geq 0$. The Appendix proves

Proposition 1. The optimal outsourcing contract z_o, r_o satisfies

$$z_o = \beta, \quad r_o = (v_o - i)I_o. \tag{9}$$

The Northern firm pays a price for the component, $z_o = \beta$, that generates optimal employment in the outsourcing firm, since $\beta f'(l_o) = w$, and which implies that the Northern firm makes no profit from its own production (since there is no mark-up over the price of the component). Instead the entire surplus is generated from royalties. This royalty is equal to the entire surplus of the outsourcing firm, so that $\pi_o^e = 0$, and so no tax is paid in the South. The Northern firm's surplus from outsourcing is then:

$$\pi_o^n = (1-\tau)pr_o = (1-\tau)p(v_o - i)I_o. \tag{10}$$

This depends on the level of investment which in turn is constrained by Assumption (A). Substituting the royalty Eq. (9) into the investment condition Eq. (7) yields

$$I_o = A/(\gamma p). \tag{11}$$

The optimal choice of the AL price and royalty therefore leaves supplier investment dependent only on the probability of success and the scale of private benefits.

3.3. Direct investment

3.3.1. Tax liability

When assessing a multinational, the government in the North observes AL prices z_o and royalties r_o by outsourcing firms. We show that the optimal prices for MNEs are different for purely economic reasons, even in the absence of tax, and that $z_i > z_o$ and $r_i < r_o$. The prices chosen by the MNE do have the effect of shifting profits to the South, but that is in order to finance greater investment, not simply to reduce tax. The tax liability of the parent is

$$G_i^n = \tau p[(\beta - \phi_z z_i)x_i + \phi_r r_i + (1-\phi_r)r_o], \quad \phi_z, \phi_r \leq 1. \tag{12}$$

If the ϕ-coefficients are set to unity, transfer prices and royalties of the MNE are not disputed, leaving $G_i^n = \tau p[(\beta - z_i)x_i + r_i]$. However, in reducing ϕ below unity, the government marginally applies the AL principle by using observed market prices and royalties in outsourcing relationships to calculate the tax liability of the MNE. In the extreme case, if $\phi_z = z_o/z_i$ and $\phi_r = 0$, the tax liability becomes $G_i^n = \tau p[(\beta - z_o)x_i + r_o]$, meaning that the AL principle is fully imposed by recognizing only observed market prices rather than prices chosen by the MNE firm. Following practice in the vast majority of countries, repatriated dividends are assumed to be tax exempt.[7]

Subsidiary profit in the South (indexed by s) is paid back to the Northern parent either as a tax exempt dividend π_i^s or as a royalty r_i which is subject to tax. An MNE's global value is then $\pi_i^n = p[(\beta - z_i)x_i + r_i] + \pi_i^s - G_i^n$ or, using Eq. (12), it is

$$\pi_i^n = \pi_i^s + [(1-\tau)\beta - (1-\phi_z\tau)z_i]px_i + (1-\phi_r\tau)r_i p - (1-\phi_r)\tau r_o p. \tag{13}$$

As in the case of outsourcing, the MNE sets a transfer price and a royalty fee. Given z_i and r_i, the subsidiary manager chooses effort and investment.

3.3.2. Subsidiary investment

The subsidiary earns $v(z_i)$ per unit of capital as shown in Eq. (1). The parent fully allocates all own funds A^n to the subsidiary to internally finance part of investment in the South. In addition, the subsidiary borrows locally.

In case of success, the subsidiary generates end of period income V_i^s, where

$$\pi_i^s = pV_i^s - A^n, \quad V_i^s \equiv (1+v_i)I_i - (1+i)D_i - r_i - T_i^s. \tag{14}$$

where the subsidiary's tax liability is $T_i^s = \tau^s[(v_i - i)I_i - r_i]$.

Banks lend $D_i = I_i - A^n$, earn $\pi_i^b = p(1+i)D_i - D_i = 0$ and hence charge a loan rate, $(1+i)p = 1$ as before. The subsidiary therefore captures the whole of the joint surplus of $\pi_i^s = \pi_i = [(1+v_i)p - 1]I_i - (r_i + T_i^s)p$. Adding tax pT_i^s yields a social surplus $\pi_i^* = [(1+v_i)p - 1]I_i - r_i p$.

Given an FDI contract z_i and r_i, the ex post incentive constraint is $V_i^s \geq \gamma I_i$ also as before. Incentives for high effort in managing affiliate investment depend on income V_i^s of the subsidiary and not

[7] As of 2009, the USA and Japan are the only large countries to maintain taxation of worldwide income, instead of primarily exempting foreign source dividends. Allowing for alternative ways of taxing foreign dividends would not affect the key point that MNEs set different transfer prices.

on profits in other locations of the MNE. The incentive constraint limits the subsidiary's debt capacity to $(1+i)D_i \le (1+v_i)I_i - r_i - T_i^s - \gamma I_i$. Substituting debt and tax liability yields a maximum scale of investment of[8]

$$I_i = m(z_i) \cdot \left[A^n - (1-\tau^s) r_i p\right], \quad m(z_i) \equiv \frac{1}{\gamma p - (1-\tau^s)(v_i - i)p}. \tag{15}$$

This has the same form as for the outsourcing case in Eq. (7). However, the size of investment depends on the choice of z_i and r_i by the parent.

3.3.3. FDI contract

By acquiring ownership, the MNE can extract the subsidiary's surplus either as dividends or royalties. It sets a transfer price and a royalty to maximize global value, anticipating the induced behavior of the subsidiary. The Appendix proves

Proposition 2. With $\tau \ge \tau^s$, the optimal contract for direct investment is

$$z_i > z_o = \beta, \quad r_i = 0 < r_o. \tag{16}$$

A royalty reduces pledgeable income, thereby undermining financing capacity and reducing investment. Since the parent firm can collect the surplus as a dividend, it therefore optimally sets the royalty to zero. This option is not available with outsourcing.

The optimal transfer price is higher than the AL price, $z_i > \beta$. There are two reasons. First, there is a direct effect on overall taxation by shifting profit from the high tax North to the low tax South. (This corresponds to the last term in Eq. (16.i) of the proof.)[9] Second, there are two important economic effects as well. To see this, abstract from tax, note $x_i = f(l_i)I_i$ and rewrite Eq. (16.i) in the proof,

$$\frac{d\pi_i^n}{dz_i} = -(z_i - \beta) p I_i f'(l_i) \frac{dl_i}{dz_i} + \left[(v_i - i) - (z_i - \beta) f(l_i)\right] p \frac{dI_i}{dz_i}.$$

A first effect is that paying a higher transfer price distorts employment of the subsidiary and, thereby, intermediate inputs. Starting from $z_i = \beta$, the parent incurs a zero first order loss, leaving $d\pi_i^n / dz_i = (v_i - i) p dI_i / dz_i > 0$. Offsetting this, the second effect is that the transfer price boosts pledgeable income and thereby allows for more borrowing and subsidiary investment. Since the firm is credit constrained, the relaxation of the financing constraint yields a first order increase in subsidiary profits and dividend repatriation equal to $(v_i - i)p$ per unit of capital. This gain reflects the fact that a constrained firm, by assumption (A), earns an excess return $v_i - i$ on investment. By shifting profits to the subsidiary, the parent can relax the incentive constraint, boost investment and thereby raise subsidiary profit. Starting from $z_i = \beta$, the losses from distorting employment are approximately zero while the gains from stimulating investment are strictly positive. When the transfer price is raised further, the losses in the final goods division proportional to $z_i - \beta$ get larger and increasingly offset the higher dividend repatriations. The optimum price trades off the gains from relaxing the financing constraint on investment with the increased distortions to employment per unit of capital.

To further highlight the role of financial frictions, suppose that investment were fixed. In this case, in the absence of tax, the optimality condition would require $z_i = \beta$, implying that MNEs would optimally set transfer prices equal to observed AL prices. In this case, the AL price would be the correct benchmark which could be imposed harmlessly to discourage tax motivated profit shifting. We thus conclude that the existence of financial frictions could be one important reason for MNEs to pay higher transfer prices to allow for a larger investment scale in locations with capital market frictions. Our analysis thus connects to the literature on internal capital markets, e.g. Stein (1997), Gertner et al. (1994) together with empirical evidence by Lamont (1997). As Stein (1997, p. 111) puts it: "… the cash flow generated by one division's activities may be taken and spent on investment in another division where the returns are higher." In our model, the parent allocates its entire own funds A^n to the subsidiary and raises external funds until the incentive constraint $V^s \ge \gamma I$ binds. At that level, investment still earns an excess return $v_i > i$ but cannot be expanded since the financing capacity is exhausted. The parent exploits all possibilities to relax the financing constraint: it allocates all its own funds to the subsidiary and, in addition, pays a higher transfer price in order to strengthen pledgeable income of the subsidiary.

3.4. Welfare

Tax revenue in the North is $G^n = n_o G_o^n + n_i G_i^n$, and in the South is $G^s = n_o T_0^e + n_i T_i^s$:

$$\begin{aligned} G^n &= \tau p[(\beta - z_o)x_o + r_o] \cdot n_o + \tau p[(\beta - \phi_z z_i)x_i + (1-\phi_r)r_o + \phi_r r_i] \cdot n_i, \\ G^s &= \tau^s p[(v_o - i)I_o - r_o] \cdot n_o + \tau^s p[(v_i - i)I_i - r_i] \cdot n_i. \end{aligned} \tag{17}$$

We assume that welfare is measured as end of period private wealth plus tax revenue. In the North, this is the sum of the surplus, the endowment and tax revenue:

$$\Omega^n = A^n + \Pi^n + G^n, \quad \Pi^n = n_o \pi_o^n + n_i \pi_i^n. \tag{18}$$

Given that the asset endowment, A^n, is fixed, welfare depends on Π^n and G^n. Since the surplus is captured by the Northern firm in both organizational forms, welfare in the South is equal to wages, plus the endowment and tax revenue:

$$\Omega^s = wL + A + G^s$$

Given that the asset endowment, A, and wages, wL, are fixed, Southern welfare depends only on tax revenue, G^s. Global welfare is the sum of the two: $\Omega^* = \Omega^n + \Omega^s$.

4. Implications of the arm's length principle

The AL principle is not relevant for outsourcing relationships but directly affects MNEs. From the definition of the tax liability of the parent in the case of direct investment in Eq. (12), moving towards the AL principle implies marginal reductions in the two parameters ϕ_z and ϕ_r. We assume that tax rates do not change.

4.1. Investment and profit

Imposing the AL principle makes it costly to set internal prices in excess of AL prices, and leads MNEs to set lower ones. Using a hat

[8] Banks consider subsidiaries as separate legal entities. Credit is based on internal funds A^n and on pledgeable earnings of the unit which partly depends on the MNE's choice of the transfer price. The MNE cannot raise additional credit in the North since all assets are committed to the subsidiary and profits of the final goods unit are zero if $z_i = \beta$, and become negative when it sets a higher price.

[9] Profit shifting leads to a loss in the final goods division and a tax rebate. If there were other earnings, profit shifting would reduce a positive tax liability. To simplify, we set other earnings to zero but allow the parent to claim a tax rebate of an equivalent amount.

to indicate the percentage change relative to the initial situation, e.g. $\hat{x} \equiv dx/x$, then (with proof in the Appendix):

Proposition 3. The transfer price under FDI falls when the tax authority applies the AL principle in assessing the value of components ($\hat{\phi}_z<0$),

$$\hat{z}_i = \varepsilon_\phi \cdot \hat{\phi}_z, \quad \varepsilon_\phi > 0. \tag{19}$$

Applying the AL principle on royalty income ($\hat{\phi}_r<0$) has no impact on transfer prices.

Forcing the parent to pay tax on fictitious royalty income as observed in outsourcing relationships, $\hat{\phi}_r<0$, is like imposing a lump-sum tax with no consequence for subsidiary profit and investment (see the proof in the Appendix). However, the lower transfer price reduces subsidiary employment and cash flow. Noting $v'(z_i)=f_i$ yields

$$\hat{v}_i = (z_i f_i / v_i) \cdot \hat{z}_i. \tag{20}$$

The lower transfer price reduces profit shifting, not only because firms charge and report a lower price but also because they produce and import less. With $r_i=0$, Eq. (15) gives $I_i=m_i A^n$, leading to

$$\hat{I}_i = \hat{m}_i = (1-\tau^s) m_i p z_i f_i \cdot \hat{z}_i. \tag{21}$$

When the lower AL price is imposed, this tax penalty leads MNEs to set a lower transfer price. The reduced pledgeable income restricts external leverage and affiliate investment.

With $r_i=0$, subsidiary profits are $\pi_i^s=(1-\tau^s)p(v_i-i)I_i$. Taking the differential yields $d\pi_i^s = \pi_i^s \cdot \hat{I}_i + (1-\tau^s) p I_i v_i \cdot \hat{v}_i$. Substituting Eq. (20) and Eq. (21) and using the incentive constraint $1+(1-\tau^s)(v_i-i)pm_i=\gamma pm_i$, implies

$$d\pi_i^s = \gamma p m_i \cdot (1-\tau^s) p z_i x_i \cdot \hat{z}_i. \tag{22}$$

In sum, imposing AL prices for tax purposes induces the parent to set a lower transfer price which cuts earnings and erodes subsidiary investment and profits.

Since the MNE optimally chooses the transfer prize, a small variation of z_i has no impact on consolidated profit in Eq. (13). Again with $r_i=0$ the effect on the parent profit is

$$d\pi_i^n = \phi_z \tau p z_i x_i \cdot \hat{\phi}_z + \phi_r \tau p r_o \cdot \hat{\phi}_r. \tag{23}$$

Imposing the AL principle raises the parent's tax and erodes global firm value in the FDI mode. In making FDI less profitable relative to outsourcing, the AL principle clearly discriminates against FDI.[10]

Proposition 4. (a) Imposing the AL principle on component prices ($\hat{\phi}_z<0$) reduces MNE transfer prices, tightens the financing constraint and reduces affiliate investment. The policy discriminates against FDI. (b) Imposing the AL principle on royalty income ($\hat{\phi}_r<0$) reduces MNE profit and discriminates against FDI.

4.2. National welfare

To evaluate the welfare consequences of moving towards the AL principle, the Appendix computes the change in tax revenues, see (A.1–4). Enforcing the AL principle leads MNEs to set lower transfer prices, resulting in less profit shifting and a smaller loss in the home division, thus raising tax revenue in the North. In contrast, a lower price erodes subsidiary profits and shrinks tax revenue in the South. World tax revenue declines not only because profits are shifted from the high tax to the low tax country but also because the policy discourages investment and employment and thereby erodes pretax earnings.

The policy affects Northern welfare through its impact on the surplus of MNEs and on Northern tax revenue, $d\Omega^n = n_i(dG_i^n + d\pi_i^n)$. Using Eq. (23) and (A.2) and cancelling mechanical effects, yields

$$d\Omega^n = -\tau[\phi_z + (\phi_z z_i - \beta)\xi_i] p z_i x_i n_i \varepsilon_\phi \cdot \hat{\phi}_z. \tag{24}$$

Forcing to declare fictitious royalty income ($\hat{\phi}_r<0$) imposes a tax penalty which reduces MNE value. However, this reduction in private value exactly nets out with the corresponding increase in tax revenue to leave a zero welfare effect. It does not affect investment, employment or affiliate value and, thus, avoids any behavioral distortion.[11]

Tightening the AL principle on transfer prices of components, $\hat{\phi}_z<0$, boosts national welfare in the North. The tax penalty leads firms to reduce the price z_i. In the MNE optimum, global profits are unaffected at the margin. The smaller loss in the home division is just offset by reduced dividends since the lower transfer price shrinks subsidiary profits. However, for any given price z_i, the policy directly boosts revenue since only a smaller part of the total cost $z_i x_i$ of components can be deducted from tax. The rise in tax liability corresponds to the term ϕ_z in the square bracket of Eq. (24). The fiscal gain is magnified as the lower transfer price reduces the supply of components by $\hat{x}_i = \xi_i \hat{z}_i$ which limits the losses at home (which are proportional to $\phi_z z_i - \beta$) and, thus, boosts tax revenue.

Proposition 5. Imposing the AL principle ($\hat{\phi}_z, \hat{\phi}_r<0$) unambiguously raises tax revenue and national welfare in the North.

4.3. Global welfare

As noted above, welfare in the South is equal to wages, assets and tax revenue, but is independent of profit income. The effect of moving towards the AL principle on Southern welfare depends only on the effects on tax levied in the South, given by (see (A.3)):

$$d\Omega^s = \tau^s [1 + (1-\tau^s)(v_i - i) p m_i] p z_i x_i n_i \varepsilon_\phi \cdot \hat{\phi}_z. \tag{25}$$

In the absence of the AL principle, the higher transfer price $z_i>\beta$ swells profits and taxes of subsidiaries. Tightening the AL principle discourages profit shifting, reflected in a lower transfer price, and further erodes affiliate earnings by reducing investment (the second term in the square bracket). For both reasons, the policy reduces tax revenue and welfare in the South.

Proposition 6. When the North tightens the AL principle on transfer prices and royalties ($\hat{\phi}_z<0$ and $\hat{\phi}_r<0$), welfare in the South declines.

The change in world welfare is $d\Omega^* = dG + n_i d\pi_i^n$, reflecting the policy impact on world tax revenue and aggregate profit income in the North. Substituting Eq. (23) and (A.4) and expanding the resulting term $[\tau^s - \phi_z \tau]$ results in

$$d\Omega^* = [(1-\phi_z)\tau - (\tau - \tau^s)] \chi_i p z_i x_i n_i \varepsilon_\phi \cdot \hat{\phi}_z. \tag{26}$$

The square bracket disentangles two consequences of the AL principle. First, if tax rates are asymmetric and the high tax country starts to enforce the AL principle ($\hat{\phi}_z<0$), global welfare rises in proportion to $\tau - \tau^s$. Reducing profit shifting raises tax revenue in the North by more than it loses revenue in the South. The transfer price distortion

[10] Keuschnigg and Devereux (2010) explicitly compute the reaction on the extensive margin.

[11] If there were an endogenous choice between outsourcing and FDI, imposing the AL principle on royalties would push some firms from FDI into outsourcing, see Keuschnigg and Devereux (2010).

is zero when starting at $\phi_z = 1$. Second, when prices are already distorted, $\phi_z < 1$, and tax authorities further tighten AL pricing, world welfare falls in proportion to $(1-\phi_z)\tau$. If tax rates are not too asymmetric, this term dominates, i.e. overly tight AL pricing reduces world welfare. The policy interferes with the efficient organization of MNEs which set transfer prices not only to coordinate production but also to shift profits where they are needed most, for example, to overcome financial frictions. Forcing them to deviate from optimal transfer pricing erodes global profits and imposes a welfare loss.

Proposition 7. Tightening the AL principle (i) raises world tax revenue and welfare by reducing tax induced profit shifting from high to low tax countries, but (ii) reduces global MNE profits and welfare by distorting the optimal transfer price.

5. Conclusions

Collecting corporate tax from multinational firms has become a difficult task. Unlike national companies, these firms can minimize tax by shifting profits to low tax locations. One important channel is transfer pricing for intracompany trade. A parent company might overpay for components imported from lightly taxed foreign subsidiaries. Following the OECD Model Tax Convention, the standard approach of tax authorities is to invoke the AL principle and assess the value of intracompany trade based on prices in comparable arm's length relationships. The implicit assumption is that these prices are the 'correct' ones since trade among independent firms is free from any profit shifting motive.

The present paper argues that the arm's length principle introduces a flawed benchmark in the taxation of multinationals. Transfer prices serve economic functions and are not merely a tool for tax minimization. Forcing multinationals to assess the value of intermediate imports at lower arm's length prices and to declare fictitious royalty income leads to the following consequences in our framework: (i) the tax penalty results in lower transfer prices and less profit shifting; (ii) it reduces, in turn, external debt capacity and subsidiary investment; (iii) it strengthens tax revenue and raises national welfare in the North; (iv) it strongly reduces tax revenue and welfare in the South; (v) it can reduce world welfare. The welfare loss emerges since tax authorities tend to misinterpret high transfer prices and low royalties as a result of tax induced profit shifting while, in fact, these choices reflect efficient decisions to overcome financial market imperfections.

Appendix A

Proof of Proposition 1

The optimal contract z_o, r_o solves $\pounds = \pi_o^n + \mu_o \pi_o$. Suppressing the index o for the moment, the Lagrangean is

$$\pounds = (1-\tau)[(\beta-z)x + r]p + \mu\cdot(1-\tau^s)[(v(z)-i)I - r]p.$$

Note the solutions $l(z)$, $I(z,r)$, $x(z,r) = f(l(z))I(z,r)$ as well as $v'(z) = f(l)$. In general, $\tau \neq \tau^s$. The optimality conditions for the contract are

$$z: [1-\tau-(1-\tau^s)\mu]x = (1-\tau)(\beta-z)\frac{dx}{dz} + \mu(1-\tau^s)(v-i)\frac{dI}{dz}, \quad \text{(i)}$$

$$r: [1-\tau-(1-\tau^s)\mu] = -(1-\tau)(\beta-z)\frac{dx}{dr} - \mu(1-\tau^s)(v-i)\frac{dI}{dr}. \quad \text{(ii)}$$

The royalty r does not affect l, $f(l)$ and v. Using $(1+i)p = 1$, we have

$$\frac{dm}{dv} = (1-\tau^s)m^2p, \quad \frac{dI}{dz} = (1-\tau^s)mpx, \quad \frac{dI}{dr} = -(1-\tau^s)mp. \quad \text{(iii)}$$

Using (iii), the effect on output of components, $x = f(l)I$, is

$$\frac{dx}{dz} = (1-\tau^s)f(l)mpx + If'(l)l'(z), \quad \frac{dx}{dr} = -(1-\tau^s)mpf(l). \quad \text{(iv)}$$

Evaluating the optimality conditions yields

$$\begin{aligned} \frac{1-\tau-(1-\tau^s)\mu}{(1-\tau)(1-\tau^s)} - \mu m\frac{(1-\tau^s)(v-i)p}{1-\tau} &= (\beta-z)\cdot\left[mpf + \frac{f'l'}{(1-\tau^s)f}\right], \\ \frac{1-\tau-(1-\tau^s)\mu}{(1-\tau)(1-\tau^s)} - \mu m\frac{(1-\tau^s)(v-i)p}{1-\tau} &= (\beta-z)\cdot mpf. \end{aligned} \quad \text{(v)}$$

The left hand side is the same in both equations, and so must be the right hand side. Since $f'l' > 0$, this is possible only if

$$z_o = \beta, \quad \mu_o = \frac{(1-\tau)/(1-\tau^s)}{1+(1-\tau^s)(v_o-i)pm_o}. \quad \text{(vi)}$$

Given $\mu_o > 0$, the participation constraint yields the royalty in Eq. (9) such that $\pi_o = 0$.

Proof of Proposition 2

Given z_i and r_i, the subsidiary sets $l(z_i)$ and $I(z_i,r_i)$, produces $x_i = f(l_i)I_i$ and earns $\pi_i^s = (1-\tau^s)[(v_i-i)I_i - r_i]p$. Further, $v'(z_i) = f(l_i)$. Suppressing index i for the moment, contract terms affect global profits in Eq. (13) by

$$\frac{d\pi_i^n}{dz_i} = [(1-\tau)\beta-(1-\phi_z\tau)z]p\frac{dx}{dz} + (1-\tau^s)(v-i)p\frac{dI}{dz} + (\phi_z\tau-\tau^s)px, \quad \text{(i)}$$

$$\frac{d\pi_i^n}{dr_i} = [(1-\tau)\beta-(1-\phi_z\tau)z]p\frac{dx}{dr} + (1-\tau^s)(v-i)p\frac{dI}{dr} - (\phi_r\tau-\tau^s)p. \quad \text{(ii)}$$

The last terms reflect gains from direct profit shifting. The royalty r does not affect l, $f(l)$ and v. We note $dm/dv = (1-\tau^s)pm^2$, leading to

$$\frac{dI}{dr} = -(1-\tau^s)mp, \quad \frac{dI}{dz} = (1-\tau^s)mpx. \quad \text{(iii)}$$

The effect on component output $x = f(l)I$ is

$$\frac{dx}{dr} = -(1-\tau^s)mpf, \quad \frac{dx}{dz} = (1-\tau^s)f(l)mpx + If'(l)l'(z). \quad \text{(iv)}$$

Evaluating $d\pi_i^n/dz_i = 0$ by substituting the derivatives in (iii-iv), the optimal transfer price in the FDI mode satisfies

$$(1-\phi_z\tau)z-(1-\tau)\beta = \frac{(\phi_z\tau-\tau^s) + (1-\tau^s)(v-i)(1-\tau^s)mp}{(1-\tau^s)pmf + f'l'/f} > 0. \quad \text{(v)}$$

In Eq. (12), we argued that tax authorities recognize at least a transfer price of β, i.e. $z \geq \beta$. Expanding the l.h.s. yields $(1-\phi_z\tau)z - (1-\tau)\beta = (1-\tau)(z-\beta) + (1-\phi_z)\tau z > 0$.

Evaluating $d\pi_i^n/dr_i$ and using (iii–iv) as well as (v) yields, after some manipulations,

$$\frac{d\pi^n}{dr} = (\phi_z-\phi_r)\tau p - [(1-\phi_z\tau)z-(1-\tau)\beta]pf'l'/f < 0 \quad \Rightarrow \quad r = 0. \quad \text{(vi)}$$

In the absence of tax, the derivative is clearly negative, giving a corner solution. Since royalties reduce investment and output, they also reduce global profit and are thus optimally set to zero. In the presence of tax, the square bracket is strictly positive by (v) so that the second term remains negative. But the first term gets positive if $1>\phi_z>\phi_r$. However, the first term cannot dominate if ϕ_z is not much larger than ϕ_r, if ϕ_z, ϕ_r are both close to unity, or if the tax rate is small.

Proof of Proposition 3

Condition (16.i) in proof 2 is $d\pi_i^n/dz_i \equiv \zeta(z_i;\phi_z)=0$. Applying the implicit function theorem yields comparative statics in ϕ_z. The second order condition $d^2\pi_i^n/dz_i^2 = d\zeta/dz_i \equiv \zeta_z<0$ pins down the sign. Using Eq. (16.i,iii,iv) yields

$$\begin{aligned}\zeta(z_i;\phi_z) = {} & (\phi_z\tau-\tau^s)px_i + (1-\tau^s)(v_i-i)p(1-\tau^s)m_ipx_i \\ & : +[(1-\tau)\beta-(1-\phi_z\tau)z_i]\left[(1-\tau^s)f_im_ip + f_i' l_i'/f_i\right]px_i = 0.\end{aligned} \tag{i}$$

A variation of ϕ_r leads to a fixed tax penalty unrelated to output. The transfer price is independent of ϕ_r. Since x_i, I_i and m_i depend only on foreign taxes,

$$\frac{d\zeta}{d\phi_z} \equiv \zeta_\phi = \tau px_i \cdot \left[1 + z_i \cdot \left((1-\tau^s)f_im_ip + f'_i l'_i/f_i\right)\right] > 0. \tag{ii}$$

The implicit function theorem thus implies $dz_i/d\phi_z = -\zeta_\phi/\zeta_z$, which yields Eq. (19) with the elasticity defined as $\varepsilon_\phi \equiv -\phi_z\zeta_\phi/(z_i\zeta_z)>0$.

Change in tax revenue

Tax revenue importantly depends on output. Specifying $f(l) = l^{1-\alpha}$, the employment condition $zf'(l)=w$ yields $\hat{l}_i = \hat{z}_i/\alpha$ and $\hat{f}_i = \hat{z}_i \cdot (1-\alpha)/\alpha$. Note $l'f'/f = (1-\alpha)/(\alpha z_i)$ for later reference. Substituting Eq. (21) results in

$$\hat{x}_i = \xi_i z_i \cdot \hat{z}_i, \quad \xi_i \equiv (1-\alpha)/(\alpha z_i) + (1-\tau^s)m_ipf_i, \tag{A.1}$$

where $\hat{z}_i = \varepsilon_\phi\hat{\phi}_z$ by Eq. (20). Imposing AL prices leads to lower subsidiary investment and output. Tax liability per MNE in the North is $G_i^n = \tau p[(\beta-\phi_z z_i)x_i + (1-\phi_r)r_o]$, where r_o is invariant to the policy change and $r_i=0$. Tax revenue thus changes by $dG_i^n = \tau px_i\left[(\beta-\phi_z z_i)\hat{x}_i - \phi_z z_i\hat{z}_i - \phi_z z_i\hat{\phi}_z\right] - \phi_r\tau pr_o\hat{\phi}_r$. Substituting the output response above and noting $\phi_z z_i \geq \beta$ by the remark following Eq. (12) yields

$$dG_i^n = -\tau\left[(\phi_z z_i-\beta)\xi_i\varepsilon_\phi + \phi_z\left(1+\varepsilon_\phi\right)\right]pz_ix_i \cdot \hat{\phi}_z - \phi_r\tau pr_o \cdot \hat{\phi}_r. \tag{A.2}$$

Enforcing the AL principle thus raises tax revenue. Given a fixed share of firms operating in the FDI mode, aggregate revenue in the North changes by $dG^n = n_i \cdot dG_i^n$.

In the South, foreign subsidiaries run up a tax liability of $G_i^s = \tau^s p(v_i-i)I_i>0$ since the MNE charges no royalties. The affiliate tax liability changes by $dG_i^s = \tau^s p\left[v_iI_i\hat{v}_i + (v_i-i)I_i\hat{I}_i\right]$. Substituting earlier results yields

$$dG_i^s = \tau^s[1 + (1-\tau^s)(v_i-i)pm_i]pz_ix_i \cdot \hat{z}_i. \tag{A.3}$$

A lower transfer price erodes taxable subsidiary profits since it reduces earnings and investment in the South. Total revenue from the source tax changes by $dG^s = n_i \cdot dG_i^s$.

World tax revenue responds by $dG = n_i(dG_i^n + dG_i^s)$. Condition (v) in proof 2 together with $l'f'/f = (1-\alpha)/(\alpha z_i)$, and the coefficient ξ_i defined in (A.1) are related by $[(1-\phi_z\tau)z_i - (1-\tau)\beta]\xi_i = (\phi_z\tau - \tau^s) + (1-\tau^s)(v_i-i)(1-\tau^s)m_ip$. Substitute earlier results, collect ε_ϕ terms, and eliminate ξ_i to get, after some calculations,

$$dG = -\left[\phi_z\tau + (\phi_z\tau-\tau^s)\chi_i\varepsilon_\phi\right]pz_ix_in_i \cdot \hat{\phi}_z - \phi_r\tau pr_on_i \cdot \hat{\phi}_r, \tag{A.4}$$

$$\chi_i \equiv \frac{z_i-\beta+\left[z_i-\frac{\tau-\tau^s}{\phi_z\tau-\tau^s}\beta\right](1-\tau^s)(v_i-i)pm_i}{(1-\phi_z\tau)z_i-(1-\tau)\beta} > 0.$$

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