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Understanding International Differences in Trade and Capital Market Integration.

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CAPITAL MARKET INTEGRATION**

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Understanding International Differences in Trade and Capital Market Integration*

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March 2005

Abstract

International integration in capital markets raises the cost of capital in technology-backward countries, pushing them toward specialization in labor-intensive industries. To avoid specialization and to sustain production of capital-intensive industries, governments either impose tariffs or limit the degree of capital market integration. The idea that trade and capital market distortions are substitutes is apparently contradicted by the empirical evidence, that shows that countries with more open trade regimes are also more integrated to world capital markets. However, after controlling for international productivity and factor endowment differences, I find a negative association between trade and capital market integration, as predicted by the model.

JEL: F15, F41, F42.

Keywords: Tariffs, Capital Markets, Technology Differences, International Factor Price Differences.

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1 Introduction

Why are some countries more open than others? Why do trade openness and the degree of capital market integration differ so much across countries? On the trade side, three main lines of reasoning have been developed to explain the level and sectoral distribution of tariffs: the optimal tariff argument (Johnson, 1965), tariffs as second-best or third-best policies to correct for market inefficiencies (Bhagwati, 1971), and political economy explanations of the distribution of protection across sectors (Grossman and Helpman, 1995). On the financial side, the literature highlights consumption smoothing and risk sharing as the key benefits of capital market integration. However, the optimal degree of financial openness may also depend on the effects of capital flows on monetary policy and financial repression (McKinnon, 1973; Taylor, 1983); on exchange rate policy and currency crises (Tobin, 1978); on increased bank fragility (Detragiache, 2001); and output costs of sudden stops (Calvo, 1998; Caballero and Krishnamurthy, 2004), among others.

Surprisingly few efforts have been made to develop an integrated approach to understand trade and capital market integration, though there are, of course, exceptions. Beginning with Mundell (1957), a now vast literature discusses whether goods and factor flows are complements or substitutes. A separate literature considers the optimal "sequencing" of trade and capital account openness (McKinnon, 1982, 1991; Edwards, 1984, 1989; Edwards and van Wijnbergen, 1986). Other authors have analyzed the role of trade and financial integration in macroeconomic volatility (Backus, Kehoe and Kydland, 1992, 1994; Razin and Rose, 1994).

More recently, Aizenman in a series of papers (2003; 2004) has argued that the degree of financial and trade opening may be determined by public finance considerations. Developing countries, characterized by high costs of tax collection, may opt to use financial repression as an implicit tax on savings, providing a motivation for capital flight. Trade openness limits the effectiveness of financial controls as an implicit tax on savings. Therefore, commercially open countries rationally choose a tax structure that relies less of financial repression: trade openness provides a stimulus to financial openness.

The idea that countries more integrated to world capital markets have also more open trade regimes

finds strong support in the data. Figure 1 presents evidence on this. Panel A plots a traditional measure of trade integration —exports plus imports over GDP— against gross private capital flows over GDP, also a commonly used measure of the degree of capital market integration (Wei and Wu, 2002; Prasad et al, 2003) for 141 countries in 1996. Both series are from World Development Indicators. The positive and significant correlation reveals that countries with more open trade regimes are also countries more integrated to world capital market. Panel B shows the same evidence for a restricted sample of 41 countries. This restricted sample —that constitutes the basis of the empirical analysis performed below— comprises countries with data on sector-specific factor shares for all 28 3-digit ISIC industries in 1996.

[Insert Figure 1, Panels A and B]

In apparent contradiction with this evidence, the central argument of the paper is that trade and capital market integration are substitutes rather than complements. In particular, the paper argues that trade and capital market distortions are alternative means for protecting non-competitive industries: the former affecting relative product prices and the latter distorting relative factor prices. However, the negative association between trade and capital market openness arises after controlling for productivity and factor endowment differences.

International differences in the degree of integration are held to depend on two factors. First, I assume that there are cross-country differences in technologies, meaning that without factor mobility technology-backward countries have both a low wage rate and a low return to capital while the opposite happens in technology-advanced countries.¹ In this scenario, capital market integration raises the return to capital in technology-backward countries, rendering the capital-intensive industry uncompetitive and bringing the economy toward specialization in the labor-intensive sector.

This gives rise to the second building block of the analysis. Although specialization may be welfare improving —as is the case in this paper— I assume governments in technology-backward countries want to avoid the disappearance of the capital-intensive industry. I do not focus on the reasons behind this

¹See Treffer (1993) for empirical evidence on international productivity and factor-price differences. See also Prescott (1998), Hall and Jones (1999) and Caselli (2004).

strategy but rather on its consequences. To avoid specialization, governments can distort product and/or capital markets, introducing a wedge between international and domestic product prices and between the international and domestic return to capital.²

There are however infinite combinations of product and capital market distortions consistent with production of the non-competitive sector. Naturally, each combination will have a different effect on domestic wages, income and welfare. I assume policy makers choose the combination of trade and capital market interventions that maximizes real per capita income. *Constrained* per capita income maximization³ yields an optimal level of trade and capital market openness in which they are alternative means of compensating domestic firms for their technological disadvantages relative to international competitors.

The trade-off faced by the policy maker is that a higher degree of capital market integration increases the cost disadvantage for the capital-intensive industry in the technology-backward country, raising the tariff rate required to sustain its production. Capital market integration increases nominal income both because a rise in the relative cost of capital unambiguously benefits countries that are more capital abundant than the capital requirement in the labor-intensive industry and also because it leads to a fall in technology differences, that have an endogenous component. However, as long as the rise in the cost of capital dominates the productivity gain effect, capital market integration leads to a rise in the tariff rate required to sustain the capital-intensive industry, generating a fall in real income. The relative strength of both effects determines the degree of trade and capital market integration chosen by a country, which depend upon international differences in factor endowment and technology.

The empirical part of the paper has two objectives. I first check whether after controlling for international productivity differences, trade and capital market distortions are substitutes. I find strong support for this. However, further conditions are necessary to make the model consistent with an unconditional positive

²As in Aizenman (2004), capital market distortions sustain a lower domestic return to capital relative to the international rental rate.

³*Constrained* maximization is emphasized to remind the reader that the government's decision is constrained by the need to ensure production diversification. As mentioned in the text, the first best is accomplished with full product and capital markets integration and hence with production specialization.

correlation between trade and capital market integration. The second empirical exercise provides evidence that these conditions are plausible, revealing that the evidence that countries with more integrated trade regimes have also higher degrees of financial openness is consistent with the idea that trade and capital market distortions are substitutes.

Finally, it is important to emphasize that in this paper international capital market integration does not play its traditional role of insurance against idiosyncratic shocks: there is neither uncertainty nor consumption smoothing in the model. In this paper, integration in capital markets' encourages specialization that is welfare enhancing (Krugman, 1993). Governments intervene in product and capital markets to avoid such specialization, keeping a diversified product mix.

The paper is divided as follows. Next section presents the model. Section 3 is empirical, and it is divided into three parts. Sections 3.1 and 3.2 develop and estimate a methodology to measure cross-country differences in capital returns and technologies, that is applied to a sample of 40 developed and developing countries in 1996 across 28 3-digit ISIC manufacturing industries. I use these results to check the empirical validity of the model in section 3.3. Section 4 presents the conclusions.

2 The Model

Consider a small open economy that faces world product prices for the only two goods in this world: x and y . Both products are produced with CRS Leontief technologies using labor L and capital K . Product x is labor-intensive, meaning that $k_x < k_y$, where k_i represents the technologically-determined capital-labor ratio in sector i . I also assume that $k_x < k^c < k_y$ where $k^c (= K/L)^c$ represents relative factor abundance in country c , meaning that without factor mobility both goods are produced.⁴

⁴The Leontief technology does not affect any of the results. It only avoids dealing with second order effects of changes in factor intensities following changes in relative factor prices that result from variations in the degree of capital market integration. The assumption would be however more restrictive if the pre-integration equilibrium –without international factor mobility– were characterized by production specialization. Appendix 1 presents and discusses a graphical representation of the effects of integration in such case.

The zero profit condition in industry i in country c – that must hold for positive domestic production of good i – is given by

$$p_i^w = a_{Li}^c w^c + a_{Ki}^c r^c \quad (1)$$

where p_i^w is the international price of good i and a_{Fi}^c measures the requirement of factor $F = L, K$ to produce one unit of good i . Finally, w^c and r^c refer to the domestic return to labor and capital respectively. I assume that the productivity parameter a differs across countries, meaning that there are cross-country technology differences. In particular, $a_{Fi}^c/a_{Fi}^* = (1 + \delta) \geq 1$, where δ measures the country-specific Hicks-neutral technology gap between country c and a foreign country denoted by $*$ where the international return to capital is set. As a first approximation, I assume that δ is exogenously determined, but this restrictive assumption is relaxed later on. The assumption that $\delta > 0$ means that country c is technology backward relative to the foreign economy as it requires more inputs per unit of output than the foreign economy in both industries.

The graphical representation of the initial equilibrium with no international mobility of labor and capital is shown in the traditional Lerner-Pearce diagram in Figure 2, that depicts unit-value isoquants of goods x and y for the technology-backward domestic economy (continuous lines) and the technology-advanced country (dotted lines). If relative factor endowment k belongs to the cone of diversification $k_x k_y$, both tradable goods are produced, and domestic factor prices are given by r_a^c and w_a^c , where $(r_a^c/r^*) = (w_a^c/w^*) = 1/(1 + \delta) < 1$.

[Insert Figure 2]

Integration of c to world capital markets leads to a rise in the domestic return to capital –that converges to r^* – and a fall in domestic wages to w_1 , rendering the capital-intensive industry y uncompetitive. As a consequence, the internationally immobile factor –labor– faces all the burden of the technology gap, and the domestic labor market clears with capital outflows equal to $\overline{k k_1}$.

To avoid specialization in the labor-intensive industry, countries introduce distortions in product and/or capital markets. As will become clear below, the first best is always to embrace full integration to the world

economy, meaning that welfare is maximized with full capital market integration and no tariffs. I assume this option is not available, meaning that governments protect uncompetitive industries. For that, they can introduce trade or capital market distortions. Specifically, countries can impose a tariff on imports of good y such the product price faced by domestic producers rises above the international price to a level consistent with zero-profits. In this case, the tariff shifts the domestic unit-value isoquant of good y toward the origin until point A.

Alternatively, policy makers can limit the degree of capital market integration, introducing a wedge between the domestic and international capital return. Capital market distortions limit the convergence of the domestic return to capital to r^* , damping the cost effect on domestic producers in the capital-intensive industry. Graphically, capital market distortions shift the new domestic unit-value isocost line clockwise around point B until the autarky equilibrium is reached. Of course, combinations of product and capital market distortions are also consistent with production diversification, and each one yields a different equilibrium level of domestic wages and welfare.

Following Harberger (1980), the degree of capital market integration of a country is measured as the policy-driven ratio between the domestic return to capital and the international return $\lambda^c = r^c/r^*$. A country is considered relatively integrated to world capital markets if its domestic return to capital is similar to the international return; while a country is poorly integrated to world capital markets if there is a significant gap between the domestic capital return and r^* . This approach to measuring capital market integration using price-based measures contrasts to the quantity approach followed by Feldstein and Horioka (1980), who studied capital market integration looking at correlations between saving and investment. In the context of this paper, a price-based approach is more meaningful because it provides a direct measure of the impact of capital market distortions on relative costs of domestic producers *vis-à-vis* foreign competitors.

Before proceeding, I extend the framework to allow for endogenous technology differences. In particular, I assume that cross-country productivity differences have a country-specific exogenous component and an endogenous policy-driven component that depends upon the degree of integration of each country to world capital markets. Specifically, I assume that $(1 + \delta^c) = b^c \cdot f(\lambda^c)$ where $b^c \geq 1$ measures the country-

specific exogenous component of technology differences. Function $f(\lambda)$ is continuous and strictly convex, meaning that the technology gap decreases the more financially integrated the domestic country is.⁵ Also, $f(1) = 1$, meaning that with full capital market integration international productivity differences are given by b^c and $f'(1) = 0$, so that as λ approaches 1 there are no productivity gains of further capital market integration. The productivity gap between any country and the foreign economy is therefore bounded between $bf(\lambda_a) > (1 + \delta) > b > 1$. (Hereafter I eliminate the superscript c unless needed for presentation purposes.)

Because technology differences depend upon the policy-determined degree of capital market integration λ , the autarky situation represents an equilibrium where the policy maker chooses a degree of capital market integration equal to λ_a and zero import tariffs. In such case, the domestic zero-profit conditions in both industries are

$$1 = bf(\lambda_a) [\theta_{Lx}^* \gamma_a + \theta_{Kx}^* \lambda_a] \quad (2)$$

$$1 = bf(\lambda_a) [\theta_{Ly}^* \gamma_a + \theta_{Ky}^* \lambda_a] \quad (3)$$

where θ_{Fi}^* is the share of factor F in value-added in industry i in the foreign country and $\gamma_a = w_a/w^*$.⁶ The solution to (2) and (3) is $\lambda_a = \gamma_a$ such that $\lambda_a = [bf(\lambda_a)]^{-1} = (1 + \delta_a)^{-1} < 1$. It is straightforward to check that the sign of $\partial \lambda_a / \partial b$ depends upon the sign of $\partial(\lambda f) / \partial \lambda = (f + \lambda f')$. If $f + \lambda f' > 0$, technology-backward high- b countries have lower autarky factor prices. I assume this is the case.

Starting from the autarky equilibrium, integration into world capital markets brings the domestic return to capital to the international level. Because labor is internationally immobile, the rise in the relative cost of capital renders domestic producers uncompetitive in the capital-intensive industry. Therefore, the post-integration zero-profit conditions in both sectors can be expressed as (for analytical simplicity I hereafter

⁵Because equilibrium tariffs τ and the degree of capital market integration λ are tightly linked, $(1 + \delta) = f(\lambda)$ may be derived from a more general specification $(1 + \delta) = f(\lambda, \tau)$ where $\tau = g(\lambda)$ is the equilibrium tariff rate on the importing sector.

⁶Equations (2) and (3) assume that $\tau_x^* = \tau_y^* = 0$. This assumption that not affect any of the results, and it is lifted in the empirical section.

assume that $\theta_{Kx}^* = \theta_{Ly}^* = \theta < 1/2$, but none of the results depend upon this assumption)⁷

$$1 = bf(\lambda) \left[(1 - \theta) \frac{w}{w^*} + \theta \lambda \right] \quad (4)$$

$$(1 + \tau) = bf(\lambda) \left[\theta \frac{w}{w^*} + (1 - \theta) \lambda \right] \quad (5)$$

The domestic tariff rate in industry y is denoted by τ and it measures the degree of product market distortions, and the level of capital market distortions is reflected in the policy-driven ratio of domestic to foreign return to capital $\lambda = r/r^*$. It is evident that with full product and capital market integration, i.e., $\tau = 0$ and $\lambda = 1$, equation (5) does not hold, revealing that the capital-intensive industry y is not competitive, and its production must be supported with trade and/or capital market distortions. This is of course not the case if the country chooses its autarky equilibrium, with $\lambda = \lambda_a$ and $\tau = 0$, in which case both (4) and (5) hold.

There are however infinite combinations $\{\tau, \lambda\}$ that are consistent with positive production of both goods, and each one yields a different level of domestic wages and welfare. In particular, each pair $\{\tau, \lambda\}$ satisfies

$$(1 + \tau) = \frac{\theta + (1 - 2\theta)\lambda(1 + \delta)}{1 - \theta} = \frac{\theta + (1 - 2\theta)\lambda bf(\lambda)}{1 - \theta} \quad (6)$$

where $\partial(1 + \tau)/\partial\lambda = [(1 - 2\theta)/(1 - \theta)] \cdot b \cdot (f + \lambda f') > 0$. Deeper capital market integration (a higher λ) has two effects on equilibrium tariffs. A direct impact follows from the increase in production costs for domestic producers relative to foreign ones in the capital-intensive industry y that results from the raise in the relative cost of capital at any given level of b . Therefore, higher tariffs are required to support the uncompetitive sector. However, a raise in λ also generates a fall in the technology gap ($f' < 0$). Although the fall in δ raises domestic wages and hence production costs in sector y , this effects is unambiguously dominated by the productivity gain in that industry, meaning that the cost gap between domestic and foreign producers fall, and so does the tariff rate that supports industry y . I denote this the indirect effect. Because $(f + \lambda f') > 0$, the direct effect always dominates, meaning that there is a positive association

⁷Recall that x is the labor-intensive industry.

between τ and λ : a high degree of capital market integration must be accompanied with a low degree of trade integration in order to compensate the cost disadvantage of domestic firms in the capital-intensive industry. Therefore, trade and capital market distortions are substitutes.

From all possible combinations of $\{\tau, \lambda\}$ I assume the policy maker chooses the one that maximizes welfare of the representative consumer of the domestic economy. Assuming a log-linear utility function where α represents the share of consumption of good y in income, welfare can be expressed as an increasing function of real income per capita $R = I/P = (rk + w)/P$ where I is nominal per capita income and $P = \left((1 - \alpha)^{1-\alpha} \alpha^\alpha\right)^{-1} \cdot p_x^{1-\alpha} p_y^\alpha$ is the relevant price index. From (4) and (5) we can express domestic real income per capita as $R = (\lambda r^* k + w(\lambda))/P(\lambda)$, where $\partial w/\partial \lambda < 0$ and $\partial P/\partial \lambda = \partial P/\partial \tau \cdot \partial \tau/\partial \lambda > 0$. Intuitively, the decision on λ affects nominal income because of its direct impact on factor rewards and indirectly through its productivity effect. Also, λ affects real income through its impact on tariffs, as described in equation (6).

The maximization problem of the policy maker can be written as

$$\begin{aligned} \max_{\lambda} \ln U &= \ln C + \ln I - \alpha \ln(1 + \tau) = \\ \max_{\lambda} \ln U &= \ln C + \ln \left(r^* \lambda k + \frac{w^*}{1 - \theta} \cdot \frac{1 - \theta \lambda b f(\lambda)}{b f(\lambda)} \right) - \alpha \ln \left(\frac{\theta + (1 - 2\theta) \lambda b f(\lambda)}{1 - \theta} \right) \end{aligned} \quad (7)$$

where C is a combination of parameters that do not vary with λ . The range for possible values for λ is determined by several conditions. First, λ has to be greater than its autarky level λ_a . Otherwise, equilibrium tariffs are negative. Second, the upper limit for λ is determined by two conditions. On the one hand, λ cannot be higher than 1, meaning that the maximum domestic return to capital is r^* . On the other hand, the degree of capital market integration has to be such that domestic wages are positive, restricting λ to be such that $\lambda f(\lambda) < 1/b\theta$. Intuitively, if technology differences are large enough, a high degree of capital market integration might require negative domestic wages for the zero-profit condition in labor-intensive industry x to hold. For simplicity, and without any loss of generality, I assume that $b^c < 1/\theta$ for all c , meaning that for all countries $\lambda_a \leq \lambda \leq 1$.

The optimal value for λ is obtained by solving the first order condition of problem (7), that is $\partial \ln I/\partial \lambda =$

$\alpha \partial \ln(1 + \tau) / \partial \lambda$. It proves useful to analyze each term separately, that are given by

$$I(\lambda; b, k) = \frac{\partial \ln I}{\partial \lambda} = \frac{Fb}{1 + F\lambda bf} (f + \lambda f') - \frac{f'}{f} > 0 \quad (8)$$

and

$$T(\lambda; b) = \frac{\partial \ln(1 + \tau)}{\partial \lambda} = \frac{Gb}{1 + G\lambda bf} (f + \lambda f') > 0. \quad (9)$$

where $F = ((r^*k/w^*)(1 - \theta) - \theta) \in (0, G)$ and $G = (1 - 2\theta)/\theta$.⁸

An increase in λ raises nominal income ($I(\lambda) > 0$) through two channels. First, the fall in w/r following a raise in λ increases income because the capital-labor endowment is higher than the capital-labor ratio in the labor-intensive industry ($k > k_x$). Second, income increases because technology differences fall with λ . The intuition for $T(\lambda) > 0$ emphasizes the substitution between trade and capital market integration: a raise in λ rises equilibrium tariffs because the direct impact of a higher cost of capital dominates the indirect impact on production costs of a lower productivity gap between domestic and foreign producers of good y .⁹

Denoting $\tilde{\lambda}$ the level of λ that maximizes (7) and $\tilde{\tau} = \tau(\tilde{\lambda})$ the corresponding equilibrium level of tariffs, it is straightforward to check that the first best is to embrace full product and capital market integration, and specialize in the production of the labor-intensive good, i.e., $U(\lambda = 1, \tau = 0) > U(\lambda = \tilde{\lambda}, \tau = \tilde{\tau})$. With complete international integration ($\lambda = 1$ and $\tau = 0$), the second term in the right-hand-side of (7) reaches its maximum value (see (8)), and the last term its minimum. Any policy to protect the uncompetitive labor-intensive industry therefore yields a lower welfare level.

To characterize the equilibrium level of capital market integration $\tilde{\lambda}$ we analyze the continuous function $H(\lambda) = I(\lambda) - T(\lambda)$. For simplicity I assume that $\alpha \rightarrow 1$, meaning that the share of the capital-intensive good in consumption approaches 1. None of the conclusions of the paper rests on this simplifying assumption. A unique interior maximum exists if $\partial H(\lambda) / \partial \lambda < 0$, $H(1) < 0$ and $H(\lambda_a) > 0$. A necessary condition for $\partial H(\lambda) / \partial \lambda < 0$ is that $2(f')^2 - ff'' < 0$, meaning that $f(\lambda)$ must be sufficiently convex.¹⁰ If $f'' > 0$ the

⁸The assumption that $k_x < k < k_y$ assures that $r^*k/w^* \in (\theta/(1 - \theta), (1 - \theta)/\theta)$.

⁹Notice the relevance of $f + \lambda f' > 0$. If $f + \lambda f' < 0$, it is always the case that $I(\lambda) > 0$ and $T(\lambda) < 0$, which means that an interior solution is never reached.

¹⁰The sufficient condition for a maximum is $T(\lambda)_{\lambda=\tilde{\lambda}} < \left[\frac{2(f')^2 - ff''}{2f'(f + \lambda f')} \right]_{\lambda=\tilde{\lambda}}$, which implies that a necessary condition for a

rate at which international productivity differences shrink with capital market integration decrease with λ . For f'' sufficiently high, the rate at which nominal income increases with λ is negatively affected relative to the rate at which tariffs rise with λ . Also, $H(1)$ is always negative because $G > F$, meaning that the upper bound for $\tilde{\lambda}$ is never binding.¹¹

Finally, the condition for $H(\lambda_a) > 0$ is that $-[b\lambda^2 f']_{\lambda=\lambda_a} > (G-F)/(G-F+(1+G)(1+F))$. The left-hand-side term is an increasing function of b , meaning that this condition is more likely for high- b countries. A rise in b decreases λ_a and, although we have not said anything regarding the sign of $\partial\tilde{\lambda}/\partial b$, we know that $\tilde{\lambda}$ either increases with b or it decreases at a smaller rate than λ_a ($\partial\tilde{\lambda}/\partial b > \partial\lambda_a/\partial b = -\lambda f/b(f+\lambda f')$). The right-hand-side term is a decreasing function of k , revealing that capital-abundant countries are more likely to have an interior solution with $\tilde{\lambda} > \lambda_a$. Because λ_a does not depend on k , the higher gains of capital market integration in capital-abundant countries unambiguously enhance the likelihood of an interior solution in high- k economies. Graphically, Figure 3 depicts $H(\lambda)$ against λ in two scenarios. In panel (a), an interior is reached with $\lambda_a < \tilde{\lambda} < 1$ while in panel (b) the economy chooses its autarky equilibrium.

[Insert Figure 3]

Before proceeding, notice the relevance of allowing for an endogenous component of productivity differences. If technology differences were totally exogenous, i.e., $f(\lambda) = 1$, then $T(\lambda) = Gb/(1+Gb\lambda)$ and $I(\lambda) = Fb/(1+Fb\lambda)$. If the conditions for an interior solution are satisfied, i.e., $1/b = \lambda_a < \tilde{\lambda} < 1$, the solution is a minimum, meaning that a corner solution is always reached.¹² For α sufficiently high ($\alpha > F/G$), the economy chooses its autarky equilibrium ($\lambda = \lambda_a = 1/b$ and $\tau = 0$), as the price costs of higher tariffs in response to capital market integration always dominate the income gains. Conversely, if $\alpha < F/G$ the economy chooses full capital market integration ($\lambda = 1$ and $\tau = (1-2\theta)(b-1)/(1-\theta) > 0$), revealing that the cost of higher prices is irrelevant if the share of the capital-intensive good in aggregate consumption is

$\partial H(\lambda)/\partial \lambda < 0$ is $2(f')^2 < f f''$.

¹¹ $T(1) = \frac{Gb}{1+Gb} > \frac{Fb}{1+Fb} = I(1)$ as $G > F$.

¹² The optimal degree of capital market integration is given by $\tilde{\lambda} = \frac{\alpha G - F}{bFG(1-\alpha)}$ that is an interior solution if $\frac{F(1+G)}{G(1+F)} < \alpha < \frac{F(1+bG)}{G(1+bF)}$. However, this is always a minimum.

too small.

Back to the case in which technology differences have an endogenous component, we now proceed to analyze how $\tilde{\lambda}$ varies with k and b ? Consider first the effect on the equilibrium level of capital market integration of differences in k . It is straightforward to see that $\partial H(\lambda)/\partial k > 0$. The final effect on λ depends upon whether λ_a is binding or not. If an interior solution is reached, increases in k enhance the gains from capital market integration for all λ . Because differences in k only affect τ through its effect on λ , we have

$$\frac{\partial \tilde{\lambda}}{\partial k} > 0 \quad \text{and} \quad \frac{\partial(1 + \tilde{\tau})}{\partial k} = \frac{1 - 2\theta}{1 - \theta} b(f + \tilde{\lambda}f') \cdot \frac{\partial \tilde{\lambda}}{\partial k} > 0.$$

For a given b , capital-abundant countries choose higher degrees of capital market integration and, as a consequence, they also choose lower degrees of product market integration (high $\tilde{\tau}$) in response to the greater cost disadvantage in industry y . Otherwise, if b and k are such that a corner solution is reached, marginal changes in k neither affect λ nor τ .

Differences in b affect $H(\lambda)$ through two mechanisms. A raise in b rises the marginal income gains of capital market integration: $\partial I(\lambda)/\partial b > 0$. This is because the productivity gains following a marginal rise in λ are greater in technology-backward countries, i.e., $\partial^2(1 + \delta)/\partial \lambda \partial b = f' < 0$. However, the marginal effect on equilibrium tariffs of capital market integration is also greater in technology-backward countries, meaning that $\partial T(\lambda)/\partial b > 0$. The direct impact on tariffs of deeper capital market integration—that increases with b —dominates the higher productivity gains that are also greater in high- b countries. Analytically,

$$\frac{\partial H(\lambda)}{\partial b} = (f + \lambda f') \cdot \left[\frac{F}{(1 + Fb\lambda f)^2} - \frac{G}{(1 + Gb\lambda f)^2} \right] \geq 0. \quad (10)$$

The effect of differences in b on $\tilde{\lambda}$ will depend upon the sign of (10). If $\partial H(\lambda)/\partial b < 0$ the tariff effect dominates the income effect, and technology-backward countries choose a lower degree of capital market integration, i.e., $\partial \tilde{\lambda}/\partial b < 0$. The opposite happens if $\partial H(\lambda)/\partial b > 0$.

The condition for $\partial H(\lambda)/\partial b < 0$ is $FG(b\lambda f)_{\lambda=\tilde{\lambda}}^2 < 1$. Although we cannot get an analytical solution for $\tilde{\lambda}$, we can characterize this condition by focusing on extreme values. Notice first that $1 \leq b\lambda f \leq b$, which means that $FGb^2 < 1$ is a sufficient condition for $\partial H(\lambda)/\partial b < 0$. Second, because $b < 1/\theta$,

$G = (1 - 2\theta)/\theta$ and $F \in (0, G)$, a sufficient condition for $FGb^2 < 1$ is that $(1 - 2\theta)^2 < \theta^4$, which holds if $\theta > .41$. As k falls, the minimum value for θ consistent with $\partial H(\lambda)/\partial b < 0$ falls, and it converges to zero as $F \rightarrow 0$. Alternatively, as b approaches 1 and $F = G$, $\partial \tilde{\lambda}/\partial b$ is negative if $\theta > 1/3$, and this value decreases as the country becomes more labor-abundant. Therefore, unless θ is sufficiently small, technology-backward countries choose lower degrees of capital market integration, meaning that the price costs of greater technology backwardness dominate the income gains due to greater productivity.

An alternative way to evaluate the sign of $(FGb^2 - 1)$ follows from noticing that this expression defines a negatively sloped threshold in the plane (b, k) below which $FGb^2 < 1$. This condition is more likely to hold if technology-backward high- b countries are also low- F labor-abundant economies. This association between b and k need not be a structural relationship –indeed; the model is silent about it– but rather an empirical regularity.

The sign of $\partial \tilde{\lambda}/\partial b$ is relevant for two reasons. Its first implication is related to the effect that changes in b have on equilibrium tariffs. Totally differentiating (6) yields

$$\frac{\partial(1 + \tilde{\tau})}{\partial b} = \frac{1 - 2\theta}{1 - \theta} \cdot \left[\lambda f + b(f + \lambda f') \frac{\partial \tilde{\lambda}}{\partial b} \right].$$

Changes in b have two effects on tariffs. A direct effect is reflected in the first term in square brackets, which shows that a rise in b must be accompanied by a rise in tariffs at any given level of λ because the cost disadvantage of domestic producers increases. The right-hand-side term inside the square parenthesis reflects the indirect impact that changes in b have on tariffs through changes in the degree of capital market integration. If $\partial \tilde{\lambda}/\partial b < 0$ a rise in b generates a fall in the level of capital market integration, pressuring tariffs downward. The opposite happens if $\partial \tilde{\lambda}/\partial b > 0$. However, we know that $\partial \tilde{\lambda}/\partial b > -\lambda f/b(f + \lambda f')$, which means that $\partial(1 + \tilde{\tau})/\partial b > 0$, meaning that the direct effect always dominates the indirect one regardless on the sign of $\partial \tilde{\lambda}/\partial b$. Therefore, technology-backward countries have higher tariffs.

The sign of $\partial \tilde{\lambda}/\partial b$ is also crucial to obtain predictions with regard to the association between trade and capital market integration. Although to sign $\partial \tilde{\lambda}/\partial b$ we need to specify a particular functional form for f , the model is general enough to predict different unconditional relationships between trade and capital market

openness for alternative values of the parameters. To check this, it is useful to summarize the predictions of the model in the following way

$$d(1 + \tilde{\tau}) = \frac{1 - 2\theta}{1 - \theta} \left[\lambda f + b(f + \lambda f') \frac{\partial \tilde{\lambda}}{\partial b} \right]_{\lambda=\tilde{\lambda}} \cdot db + \frac{1 - 2\theta}{1 - \theta} \left[b(f + \lambda f') \frac{\partial \tilde{\lambda}}{\partial k} \right]_{\lambda=\tilde{\lambda}} \cdot dk, \quad (11)$$

$$\begin{aligned} d\tilde{\lambda} \cdot \left(\frac{\partial H(\lambda)}{\partial \lambda} \right)_{\lambda=\tilde{\lambda}} &= \frac{(f + \lambda f')(G - F)}{(1 + Fb\lambda f)^2(1 + Gb\lambda f)^2} \left[1 - (\lambda b f)^2 FG \right]_{\lambda=\tilde{\lambda}} \cdot db \\ &\quad - \left[\frac{b(f + \lambda f')}{(1 + Fb\lambda f)^2} \frac{\partial F}{\partial k} \right]_{\lambda=\tilde{\lambda}} \cdot dk \end{aligned} \quad (12)$$

where $(\partial H(\lambda)/\partial \lambda)_{\lambda=\tilde{\lambda}} < 0$.

Consider first the case in which countries only differ in their relative factor endowment k . Capital abundant countries unambiguously choose higher degrees of capital market integration (high λ) and have higher tariffs. As discussed above, a high capital-labor endowment enhances the income gains of capital market integration at the cost of raising the tariff requirement for the uncompetitive industry. Therefore, the model predicts a positive correlation between $\tilde{\lambda}$ and $\tilde{\tau}$, meaning that financially integrated countries will have more closed trade regimes $\left(d(1 + \tilde{\tau})/d\tilde{\lambda} = [d(1 + \tilde{\tau})/dk] / [d\tilde{\lambda}/dk] > 0 \right)$.

Alternatively, suppose that countries only differ in their exogenous technological component b . Because $\partial(1 + \tilde{\tau})/\partial b > 0$, the correlation between trade and capital market integration depends solely on the sign of $\partial\tilde{\lambda}/\partial b$. If $\partial\tilde{\lambda}/\partial b > 0$ countries with more open financial regimes—that happen to be technology backward—are less integrated to world product markets, both due to the higher technological gap and also because the cost of capital is higher. Conversely, if $\partial\tilde{\lambda}/\partial b < 0$ technology-backward countries choose lower degrees of capital market integration, and a positive association between trade and capital market openness arises $\left(d(1 + \tilde{\tau})/d\tilde{\lambda} = [d(1 + \tilde{\tau})/db] / [d\tilde{\lambda}/db] < 0 \right)$. As discussed above, this condition is more likely if there is a negative association between capital intensity and technology levels, meaning that technology-backward countries are also labor abundant.

Finally, assume that there are international differences both in b and k . Even if $\partial\tilde{\lambda}/\partial b > 0$, the model is capable of delivering a negative unconditional correlation between λ and τ if b and k are negatively correlated. In particular, it is possible that high- k low- b countries choose higher degrees of capital market integration,

because the effect of differences in factor endowments on the degree of capital market integration dominates the effect of productivity differences. Also, if tariff differences are dominated by productivity differences rather than differences in capital market integration, labor-abundant technology-backward countries choose low degrees of capital and product market integration, while the opposite happens to capital abundant technology-advanced countries, meaning that financially open countries have also more open trade regimes.

Notice that the possibility that the model delivers a positive unconditional correlation between trade and capital market integration is not contradictory with the idea that capital market distortions are substitutes of trade distortions. It just emphasizes the relevance of controlling for cross-country differences in technology and factor endowments. This is exactly the objective of the empirical section, which is divided into three parts. First, I develop a methodology to estimate cross-country differences in factor returns, that are used as measures of capital market integration. Second, I use these estimates to calculate international productivity differences. Finally, I test two implications of the model. First, I test whether after correcting for productivity differences; trade and capital market distortions are substitutes, as emphasized in the model. Second, I analyze the plausibility of the conditions that allow the model to deliver a positive unconditional correlation between trade and capital market integration.

3 Empirical Estimation

3.1 International Factor Price Differences

Using the notation of section 2, the zero-profit condition for any domestic firm in sector i is

$$p_i = a_{Hi}w_H + a_{Ki}r. \quad (13)$$

where a_{Hi} is the inverse of average human capital productivity ($H = L \cdot h$ where L is the number of workers and h is the average quality of workers) in industry i and w_H is the return per efficiency unit of labor. I explicitly consider efficiency units of labor (effective labor) rather than number of workers to obtain estimates of productivity and factor price differences that do not reflect differences in labor quality. For

space considerations I do not report the results of the estimations assuming $h = 1$ (that are available upon request to the author), but all the results that follow do not depend upon the specific measure of labor input used.¹³

The ratio of average effective labor and capital productivity between domestic and foreign firms in any industry i can be expressed as

$$\frac{a_{Hi}}{a_{Hi}^*} = \frac{\theta_{Hi} w_H^* (1 + \tau_i)}{\theta_{Hi}^* w_H (1 + \tau_i^*)} \quad \text{and} \quad \frac{a_{Ki}}{a_{Ki}^*} = \frac{\theta_{Ki} r^* (1 + \tau_i)}{\theta_{Ki}^* r (1 + \tau_i^*)}. \quad (14)$$

Assuming Hicks-neutral technology differences and controlling for cross-country differences in relative factor prices, a second order Taylor approximation of a foreign firm isoquant around the foreign country factor price ratio implies that (14) can be written as¹⁴

$$(1 + \delta_i) \left(1 - \theta_{Ki}^* \sigma_i (\omega - 1) + \frac{1}{2} \theta_{Ki}^* \theta_{Hi}^* \sigma_i (\omega - 1)^2 \right) = \frac{\theta_{Hi} w_H^* (1 + \tau_i)}{\theta_{Hi}^* w_H (1 + \tau_i^*)} \quad (15)$$

$$(1 + \delta_i) \left(1 + \theta_{Hi}^* \sigma_i (\omega - 1) + \frac{1}{2} \theta_{Ki}^* \theta_{Hi}^* \sigma_i (\omega - 1)^2 \right) = \frac{\theta_{Ki} r^* (1 + \tau_i)}{\theta_{Ki}^* r (1 + \tau_i^*)} \quad (16)$$

where $\omega = (w_H/r)/(w_H^*/r^*)$ is the ratio of relative factor prices between the domestic and foreign economies and σ_i is the sector-specific elasticity of substitution between labor and capital. Combining both expressions we get

$$\frac{\left(1 - \theta_{Ki}^* \sigma_i (\omega - 1) + \frac{1}{2} \theta_{Ki}^* \theta_{Hi}^* \sigma_i (\omega - 1)^2 \right)}{\left(1 + \theta_{Hi}^* \sigma_i (\omega - 1) + \frac{1}{2} \theta_{Ki}^* \theta_{Hi}^* \sigma_i (\omega - 1)^2 \right)} = \frac{\Phi_i}{\omega} \quad (17)$$

where $\Phi_i = (\theta_{Hi} \theta_{Ki}^*) / (\theta_{Ki} \theta_{Hi}^*)$. Equation (17) is a non-linear equation on ω . Assuming equalization of relative factor prices across industries within each country, we can estimate (17) to obtain the value of ω consistent with cross-country cross-industry differences in average factor productivity using sectoral data on factor shares and elasticities of substitution.

¹³Neither I correct for differences in the quality of capital, that according to Caselli (2004) could be an important source of cross-country income differences.

¹⁴The definition of the elasticity of substitution between effective labor and capital is $\sigma_i = d \ln \tilde{k}_i / d \ln (w_H/r)$ where $\tilde{k} = K/H = k/h$ is capital per unit of effective labor. The percentage change in a_{Hi} and a_{Ki} for changes in relative factor prices are $\widehat{a_{Hi}} = -\theta_{Ki}^* \sigma_i (\omega - 1) + \frac{1}{2} \theta_{Ki}^* \theta_{Hi}^* \sigma_i (\omega - 1)^2$ and $\widehat{a_{Ki}} = \theta_{Hi}^* \sigma_i (\omega - 1) + \frac{1}{2} \theta_{Ki}^* \theta_{Hi}^* \sigma_i (\omega - 1)^2$, from which (15) and (16) follow.

Table 1 reports estimates of ω for 40 countries using the United States as the reference country.¹⁵ Data on factor shares in 1996 are obtained from UNIDO’s Manufacturing Statistical Database at 3-digit ISIC level¹⁶ and data on elasticities of substitution between labor and capital σ_i are from Claro (2003). All estimates of σ_i with the exception of Tobacco industries –with an estimated value for $\sigma_i = 2.12$ – are in the neighborhood of 1, and the results do not change if we assume different values for σ_i close to 1.

[Insert Table 1]

All values of ω are positive and half of them significant. As expected from traditional macroeconomic theory, capital-abundant countries have higher wage-rental rate ratios; indeed, the correlation coefficient between ω^c and $\tilde{k}^c/\tilde{k}^* = k^c/k^* \cdot h^*/h^c$ is .46 significant at 1%, where k^c/k^* is the ratio of real capital per worker between each country and the United States from Penn World Tables and h^*/h^c is the ratio of a measure of quality of labor between the U.S and each country, both from Caselli (2004).¹⁷ However, it is not the case that capital-abundant countries have a high wage rate and a low return to capital. Using the estimates of ω I compute the rental rate ratio r/r^* as $\lambda = (w/w^*) \cdot (h^*/h) / \omega$ where w is the wage rate per worker measured as average yearly wages in manufacturing industries obtained from UNIDO’s Statistical Yearbook (notice that the wage rate per effective unit of labor w_H is equal to w/h). The unconditional correlation between λ and $\tilde{k}/\tilde{k}^*$ is .7, significant at 1%, revealing that capital-abundant countries have relatively higher capital returns.¹⁸ The evidence that most countries have low wages and low capital returns (relative to the United States) –even after correcting for differences in labor quality– suggests the existence of international technological differences.

Are these measures of rental rate differences reasonable? In terms of the model, λ is meant to capture different degrees of capital market integration. This approach is similar to Harberger’s (1980), who argued

¹⁵The values for ω are estimated assuming a starting value for ω of 1. However, none of the results depend upon the starting value chosen for ω unless it is in the neighborhood of 8.

¹⁶The sample includes only countries for which data on factor shares are available for all 28 industries in 1996.

¹⁷The correlation coefficient between ω^c and k^c/k^* is .46, also highly significant.

¹⁸The rental rate gap unconditional on international differences in human capital can be computed as $(w/w^*)/\omega$. The correlation between $(w/w^*)/\omega$ and k/k^* is .77, significant at 1%.

that the degree of international capital market integration is better quantified by looking at international factor price differences rather than international factor flows (Feldstein and Horioka, 1980). A comparison with more standard measures of capital market integration –like capital flows as share of GDP reveals that λ is a reasonable measure of capital market integration. Figure 4 shows a positive and significant association between λ^c and gross private capital flows as a share of each country’s GDP in 1996.

[Insert Figure 4]

Although it is not the objective of this paper to gauge an overall degree of capital market integration, the results in Table 1 tend to support Feldstein and Horioka’s conclusion that the degree of capital market integration is low. This is because international rental rate differences are significantly different from 1 and similar to international wage differences. Finally, Figure 5 plots average manufacturing tariffs (from UNCTAD, Nicita and Olarreaga, 2001) against λ . The evidence that high-tariff countries have also greater rental rate gaps reveals that the quantity-based positive correlation between trade and capital market integration depicted in Figure 1 also holds using price-based measures of international integration.

[Insert Figure 5]

3.2 International Technology Differences

The industry-specific Hicks-neutral technological gap between each country and the United States is estimated from the zero-profit conditions. Given country-specific differences in factor-price ratios, there is a unique level of δ_i that fits perfectly the zero-profit condition in industry i in each country. Combining (13), (15) and (16) we obtain

$$\frac{(1 + \tau_i)}{(1 + \tau_i^*)} = (1 + \delta_i) \frac{w_H}{w_H^*} \left(\frac{1 + \theta_{Hi}^*(\omega - 1) - \frac{1}{2}\theta_{Hi}^*\theta_{Ki}^*\sigma_i(\omega - 1)^2 + \frac{1}{2}\theta_{Hi}^{*2}\theta_{Ki}^*(\omega - 1)^3}{\omega} \right). \quad (18)$$

With sector-specific values of factor shares in the United States (obtained from UNIDO Statistical Data base), labor-quality-adjusted wage data w_H/w_H^* (from UNIDO and Caselli, 2004) and estimated values for ω reported in Table 1 we can compute the value of δ_i that fits perfectly equation (18). The results are

reported in Table 2. The calculations assume that $(1 + \tau_i)/(1 + \tau_i^*) = 1$ to obtain measures of technology differences that do not depend on tariff differences. This is to avoid a spurious correlation between tariffs and productivity differences, relationship that is exploited later on. In any case, the values of δ_i do not change significantly if we include sector- and country-specific tariffs (not reported).¹⁹

Table 2 shows sector-specific values for δ as well as a "country-specific" value for $(1 + \delta)$ computed as the unweighted average of $(1 + \delta_i)$. Although there are cross-industry within-country differences in productivity gaps, it is evident that the cross-country variance is much greater. These measures are very similar to alternative estimates of international technological differences. For example, the last two columns reports cross-country productivity differences from Treffer (1995). The correlation with $(1 + \delta)$ is .82 for the neutral model and .97 for the unrestricted model.

[Insert Table 2]

3.3 Are Product and Capital Market Distortions Substitutes?

The first exercise is to test the idea that trade and capital market distortions are alternative means for protecting uncompetitive sectors. According to (6), conditional on b , $\partial(1 + \tau)/\partial\lambda > 0$. The estimates of $(1 + \delta)$ reported in Table 2 combine however information on exogenous and policy-driven components of international productivity differences, and they do not provide direct measures of b . Instead of identifying cross-country differences in b from $(1 + \delta)$, I exploit the fact that, conditional on $(1 + \delta)$, (6) also predicts that $\partial(1 + \tau)/\partial\lambda > 0$. Controlling for $(1 + \delta)$ rather than b allows us to identify the direct effect of changes in the cost of capital on equilibrium tariffs without changes in the productivity gap. I therefore consider the following specification:

$$(1 + \tau) = \alpha_0 + \alpha_1 \cdot (1 + \delta) + \alpha_2 \cdot \lambda + \alpha_3 \cdot \lambda(1 + \delta) + \varepsilon \quad (19)$$

¹⁹Estimates of δ assuming $(w_H/w_H^*) = (w/w^*)$, i.e. not correcting for differences in human capital- also yield very similar results. Denoting δ_{i1} the technology gap in industry i that accounts for cross-country differences in the quality of labor and δ_{i2} the one that doesn't, it follows that $(1 + \delta_{i1}) = (1 + \delta_{i2}) \cdot (h/h^*)$.

where ε is a standard error term. From (6), I expect $\partial(1 + \tau)/\partial\lambda = \alpha_2 + \alpha_3 \cdot (1 + \delta) > 0$ for all possible values of $(1 + \delta)$, meaning that tariffs are increasing on λ in all countries, and that this effect is greater in technology-backward countries.

Table 3 reports the results for alternative specifications of (19), that either include all countries for which series on τ , λ and δ are available or countries with $(1 + \delta) > 1$, which implies $b > 1$. In all cases I have excluded Egypt from the estimations due to its unusually high average tariff rate, but none of the results vary with its inclusion. The first two regressions reflect the positive and significant unconditional association between product and capital market integration that is evident in Figure 5: countries with high tariffs have greater rental rate gaps (relative to the United States).

Regressions 3 and 4 impose the restriction $\alpha_1 = \alpha_2 = 0$, based on a literal interpretation of equation (6).²⁰ The positive and significant coefficient of $\lambda(1 + \delta)$ reveals that $\partial(1 + \tau)/\partial\lambda$ is significantly greater than zero, meaning that trade and capital market distortions are substitutes. Finally, columns 5 and 6 report the results of unrestricted estimations of (19). Using Delta Method to compute confidence intervals for $\alpha_2 + \alpha_3 \cdot (1 + \delta)$ reveals that $\partial(1 + \tau)/\partial\lambda$ is positive and significant in all countries. Figure 6 plots the mean for $\partial(1 + \tau)/\partial\lambda$ and the 95% confidence interval for different values of $(1 + \delta)$ using the coefficients of regression 5.²¹

[Insert Table 3]

[Insert Figure 6]

The evidence that trade and capital market integration are substitutes is not sufficient though to make the model consistent with a negative unconditional correlation between λ and τ . For that, we need certain conditions on coefficients in equations (11) and (12). The rest of the section explores the plausibility of those conditions.

²⁰ According to (6), $(1 + \tau) = \frac{\theta}{1-\theta} + \frac{1-2\theta}{1-\theta} \cdot \lambda(1 + \delta)$.

²¹ The same conclusions are obtained if the regressions are run using measures of rental rate and productivity differences that do not correct for human capital differences. Also, similar results are obtained if we replace λ in Table 3 by Gross Private Capital Flows as share of GDP (plotted in Figure 1, panel B).

Consider the following structural relationship from which (11) follows: $(1 + \tau) = \beta_0 + \beta_1 \cdot k + \beta_2 \cdot b + \beta_3 \cdot k \cdot b + \mu$. The model predicts $\partial(1 + \tau)/\partial k = (\beta_1 + \beta_3 b) > 0$ and $\partial(1 + \tau)/\partial b = (\beta_2 + \beta_3 k) > 0$. Although b is not observable, it can be expressed as a function of $(1 + \delta)$ and λ , where $b = (1 + \delta)/f(\lambda)$. In particular, I assume $b = (1 + \delta)(a_0 \lambda + a_1 \lambda^2)$ where a_0, a_1 are constants with $a_0 > 0$ and $a_1 < 0$.²² Plugging this function into the equation governing $(1 + \tau)$ yields

$$(1 + \tau) = \gamma_0 + \gamma_1 \cdot k + \gamma_2 \cdot (1 + \delta) \lambda + \gamma_3 \cdot (1 + \delta) \lambda^2 + \gamma_4 \cdot k (1 + \delta) \lambda + \gamma_5 \cdot k (1 + \delta) \lambda^2 + \mu \quad (20)$$

where $\gamma_0 = \beta_0$, $\gamma_1 = \beta_1$, $\gamma_2 = \beta_2 a_0$, $\gamma_3 = \beta_2 a_1$, $\gamma_4 = \beta_3 a_0$ and $\gamma_5 = \beta_3 a_1$.

Table 4 reports results from different specifications of equation (20). The first two regressions run $(1 + \tau)$ against k . There is a significant negative unconditional relationship between tariffs and capital abundance: capital-abundant countries have lower tariff rates. However, this negative association vanishes once we control for technology differences. As shown in columns 3 and 4 –that assume $\beta_3 = 0$ –, controlling for b renders γ_1 insignificant, although not positive as predicted by the model. A second implication of regressions 3 and 4 follows from noticing that $\gamma_2 > 0$ and $\gamma_3 < 0$. Because $a_0 > 0$ and $a_1 < 0$, this implies that $\beta_2 > 0$ ($\partial(1 + \tau)/\partial b > 0$) confirming that technology-backward countries have higher average tariffs.

[Insert Table 4]

The last four regressions include the interacted term $b \cdot k$. Columns 5 and 6 report unrestricted regressions while the last two columns report regressions with the parameter restriction $\gamma_5 = \gamma_3 \gamma_4 / \gamma_2$.²³ Several conclusions can be drawn from these results. Notice first that the sign of $\partial(1 + \tau)/\partial k = (\gamma_1 + \gamma_4 \cdot (1 + \delta) \lambda + \gamma_5 \cdot (1 + \delta) \lambda^2)$ depends upon the specific values for δ and λ . With the results in column 5 I use Delta Method to compute confidence intervals of $\partial(1 + \tau)/\partial k$ for each combination (δ, λ) . There is no significant association (at 95% confidence level) between factor abundance and average tariffs in all but two countries (Costa Rica and Uruguay). Using the results in column 6, in only 9 out of 24 countries there is a negative and significant

²²Conditional on $(1 + \delta)$, $\partial b / \partial \lambda = -(1 + \delta) f' / f^2 > 0$ and $\partial^2 b / \partial \lambda^2 = (1 + \delta) / f^3 \cdot (2f' f' - f f'') < 0$. Recall that $(2f' f' - f f'') < 0$ is a necessary condition for a unique interior maximum.

²³The probabilities of not rejecting the null hypothesis that $\gamma_5 = \gamma_3 \gamma_4 / \gamma_2$ in regressions 5 and 6 are .61 and .25 respectively.

association between capital intensity and average tariffs. Overall, the results reveal that after correcting for productivity differences there is no correlation between factor abundance and tariffs.

A second element to highlight from regressions 5 to 8 concerns the sign of $\partial(1+\tau)/\partial b = (\beta_2 + \beta_3 k)$. Although β_2 and β_3 are not observable, we know that $(\beta_2 + \beta_3 k) = (\gamma_2 + \gamma_4 k)/a_0 = (\gamma_3 + \gamma_5 k)/a_1$. The assumption that $a_0 > 0$ and $a_1 < 0$ are constant implies that the sign and significance of $\partial(1+\tau)/\partial b$, though not its size, is the same as the sign and significance of $(\gamma_2 + \gamma_4 k)$ and $-(\gamma_3 + \gamma_5 k)$. Notice that $\gamma_2 > 0$ and $\gamma_3 < 0$, and also $\gamma_4 < 0$ and $\gamma_5 > 0$, revealing that $\beta_2 > 0$ and $\beta_3 < 0$. Using Delta Method to compute confidence intervals for these expressions yield the following results. With regressions 5 and 6, in around 50% of the countries $\partial(1+\tau)/\partial b$ is positive and significant while in 50% of the cases it is not significantly different from zero.²⁴ Similar results are derived from the restricted regressions with the exception of regression 8, in which case $\partial(1+\tau)/\partial b$ is not significantly different from zero in all countries in the restricted sample.

The evidence that $\partial(1+\tau)/\partial b \geq 0$ does not reveal however the sign of $\partial\lambda/\partial b$. If $\partial\lambda/\partial b < 0$ the model is consistent with a negative unconditional correlation between λ and τ unless b and k are positively correlated. Consider first the case where cross-country differences in k are relatively unimportant. Technology-backward countries choose lower degrees of capital market integration and have high tariff rates in response to high b , meaning that financially isolated countries have more restricted trade regimes. If b and k are negatively correlated, meaning that technology-backward economies are also labor abundant, high- b low- k countries choose low levels of capital market integration λ and, if the technology effect dominates the capital market integration effect on determining τ , they also have high tariffs.

The condition that b and k are negatively correlated is necessary for the model to deliver a negative unconditional correlation between λ and τ if $\partial\lambda/\partial b > 0$. If the effect of a low k on λ dominates the effect of a high level of b , technology-backward labor-abundant countries choose low degrees of capital market integration and, if the technology effect dominates the capital market integration effect on determining τ , then financially integrated countries are also trade integrated countries.

Is there direct evidence on the sign of $\partial\lambda/\partial b$? A first approach is to estimate θ from columns 3 and 4

²⁴The only two exceptions are Canada and Hong Kong under specification 6, where $\partial(1+\tau)/\partial b$ is negative and significant.

in Table 3. According to equation (6), the coefficient on $(1 + \delta)\lambda$, that is approximately $2/5$, is equal to $(1 - 2\theta)/(1 - \theta)$, which yields a value of $\theta \approx .45$. As discussed in section 2, the condition for $\partial\lambda/\partial b < 0$ is $FG(b\lambda f)^2 = FG(\lambda(1 + \delta))^2 < 1$, which always hold if $\theta > 2/5$, suggesting that technology-backward countries choose lower degrees of capital market integration. An alternative mechanism is to compute for each country in the sample the minimum value of θ that makes $FG(\lambda(1 + \delta))^2$ smaller than 1. For that, I assume an aggregate labor share in the United States of .7, which implies $r^*k^*/w^* = 3/7$. The results reveal that given the distribution of factor abundance and technology differences across countries, this condition holds for all countries if $\theta > .2$, that is a very small value, suggesting that $\partial\lambda/\partial b < 0$.

With regard to the correlation between factor abundance and productivity differences, I run the following regression:

$$\frac{k}{k^*} = \rho_0 + \rho_1 \cdot b + v = \rho_0 + \rho_1 a_0 (1 + \delta) \lambda + \rho_1 a_1 (1 + \delta) \lambda^2 + v.$$

The results, reported in Table 5, suggest that ρ_1 is negative and significant ($a_0 > 0$ and $a_1 < 0$), and hence that there is a strong negative correlation between productivity differences b and relative capital-labor ratios k/k^* . Together with the evidence that $\partial\lambda/\partial b < 0$, this empirical regularity reinforces the indirect evidence that the model is consistent with a positive unconditional correlation between trade and capital market integration.

[Insert Table 5]

4 Conclusion

In a context where international technological differences play a crucial role in explaining international factor price differences, trade and capital market distortions are alternative means for protecting uncompetitive industries. If governments support uncompetitive industries with capital market distortions, limiting the convergence of the return to capital in technology-backward countries to higher international levels, the pressures for tariff protection are lower. The message that trade and capital market distortions are substitutes contrasts with the overwhelming empirical evidence that shows that financially integrated countries are also

countries with more open trade regimes.

The paper shows that both ideas are however not contradictory. After controlling for international productivity differences there is a strong negative association between trade and capital market integration. However, because countries differ in their levels of technology and factor abundance, the evidence suggests that technology-backward labor-abundant countries choose lower degrees of capital market integration and have high tariffs, revealing a positive unconditional correlation between trade and capital market integration.

These results have important implications for the debate on the effects of global integration for less-developed countries. If international productivity differences are indeed a significant determinant of cross-country income differences, global capital market integration raises the cost of capital in technology-backward countries, pushing technology-backward poor countries toward specialization in labor-intensive products, unless integration is accompanied by sufficiently high technological gains.

Although specialization is welfare improving in the long run, the shift in the production structure may generate high cross-sector factor movements with important employment effects in the short run. Accounting for this short run reallocation costs may enlighten the discussion of why globalization has been resisted in many countries. In a similar vein, without factor movements the costs of international productivity differences are shared by all factors. However, global capital market integration rises the opportunity cost for capital in technology-backward countries, hurting those factors that are internationally immobile, like unskilled labor. In other words, the burden of productivity deficiencies is faced by those factors with less international mobility (Rodrik, 1997). However, it is not globalization the fundamental cause behind this change in relative factor prices –and eventual rise in income inequality– but rather the existence of international technological differences. From a policy perspective, this suggests that promoting policies that enhance technology transfers –like foreign direct investment– may be fundamental to fully enjoy the benefits of globalization.

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APPENDIX 1

Consider the case of a technology-backward small open economy whose relative factor abundance k is such that $k < k_x$ where k_x is the factor intensity in labor-intensive industry x that would prevail if, at international product prices, the domestic economy were to produce both goods. Figure A1 plots unit value isoquants for goods x and y in the domestic economy at international product prices.

[Insert Figure A1]

Without international capital movements the domestic economy specializes in the production of x and the domestic autarky return to capital depends upon the relative labor abundance of the domestic economy. We can identify a level of $k = \tilde{k}$ –with $\tilde{k}$ being the capital-labor ratio such that $r = r^*$ – that determines three alternative cases to analyze. If k is in zone i ($k_x > k > \tilde{k}$), the domestic autarky return to capital is lower than r^* , and hence capital market integration rises the domestic return to capital. The domestic economy remains specialized in the production of good x , although it shifts toward a more labor-intensive production technique due to higher relative capital costs. Production of the capital-intensive good y requires a combination of tariffs and capital market distortions as discussed in the text. Intuitively, trade and capital market integration remain substitutes as greater capital market distortions limit the convergence of the domestic return to capital to r^* and hence dampens the effect on tariffs.

If $k = \tilde{k}$ there are no international differences in capital returns as the effect of the technology gap on the domestic autarky rental rate is exactly offset by the higher labor abundance of the domestic economy. This implies that the only available instrument for protecting industry y is a tariff, and there is no trade off between trade and capital market distortions as only the former is available. The tariff rate shifts the unit value isoquant of good y toward the origin until A , and production of good y requires capital inflows because $k = \tilde{k}$.

Finally, if k belong to zone ii , i.e., $k < \tilde{k}$, the domestic autarky rental rate is higher than r^* , meaning that capital market integration leads to a fall in the domestic return to capital. The economy remains specialized in the production of labor-intensive x , and trade and capital market distortions become complements because

the latter, by impeding the downward convergence of the domestic return to capital to r^* , rise the tariff requirements to protect industry y . Therefore, countries less integrated to world capital markets are also countries less integrated to world product markets. However, an interior solution (partial capital and product market integration) is never reached because capital market integration raises nominal income –both because technology improves and also due to higher relative wages– and domestic consumer prices fall following lower tariff requirements. Therefore, countries choose full capital market integration and the tariff rate is such that the zero-profit condition in industry y holds.

Figure 1 - Panel A
Trade and Capital Flows: 1996

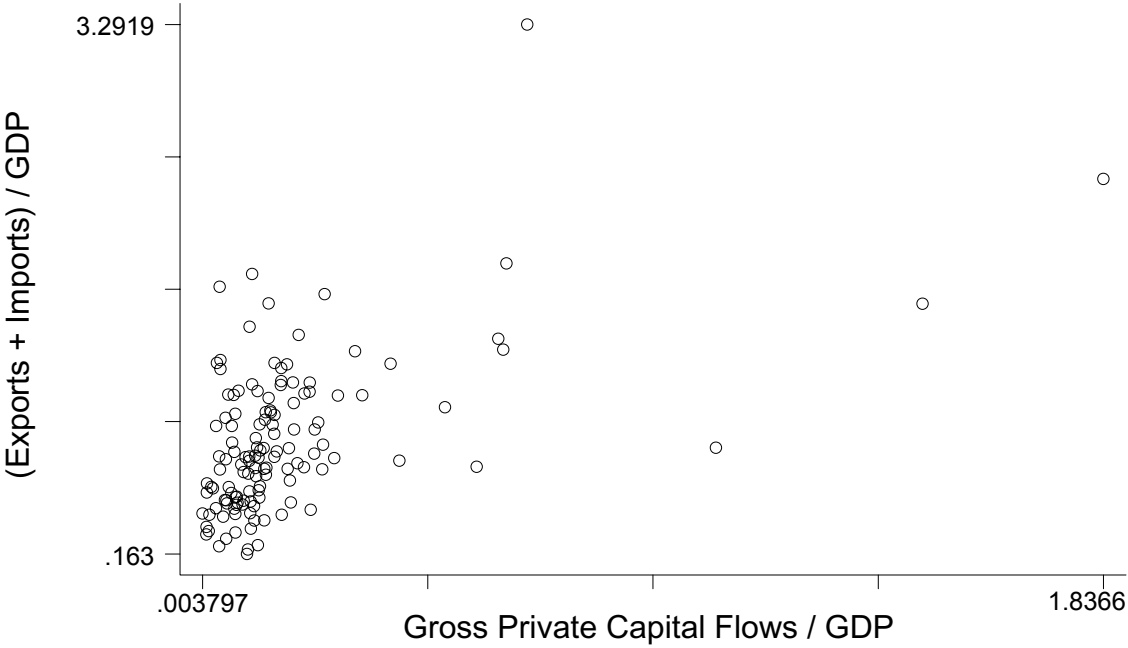
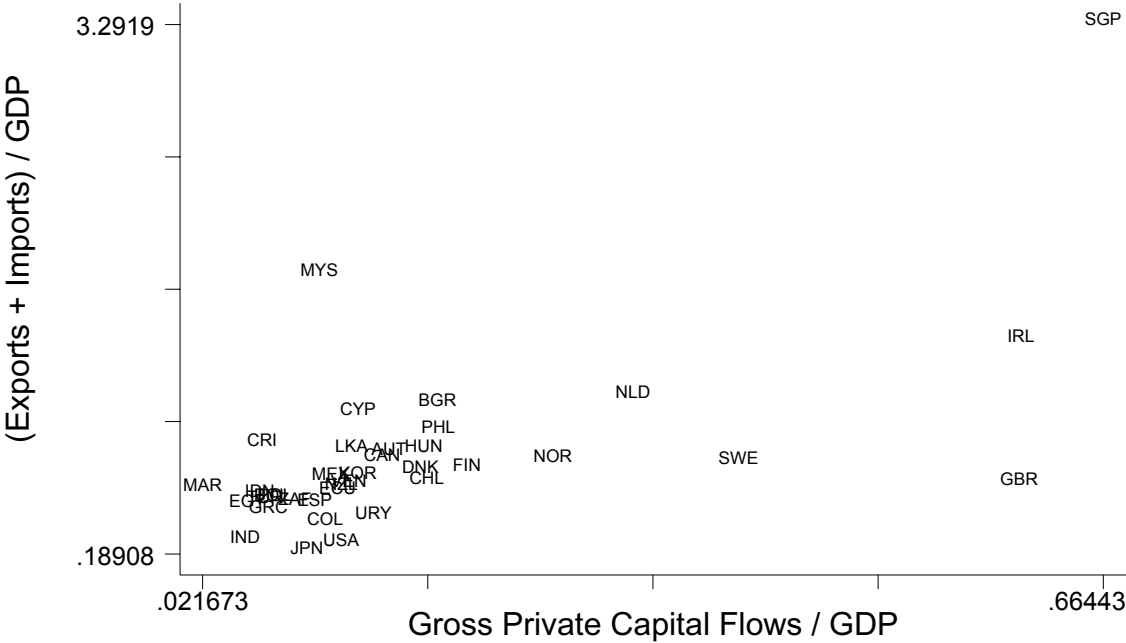


Figure 1 - Panel B
Trade and Capital Flows: 1996



Source: World Development Indicators

Figure 2: Lerner-Pearce Diagram

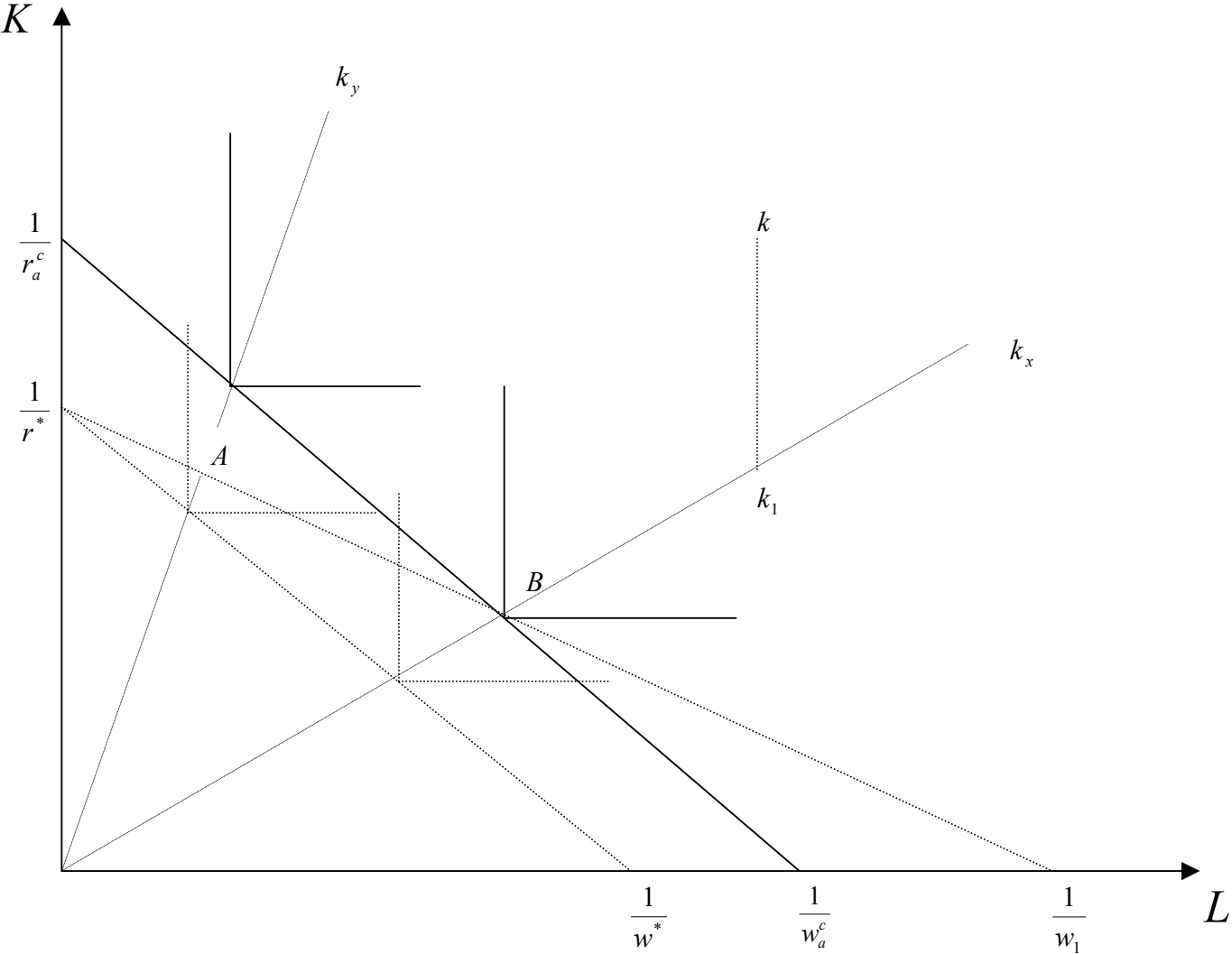
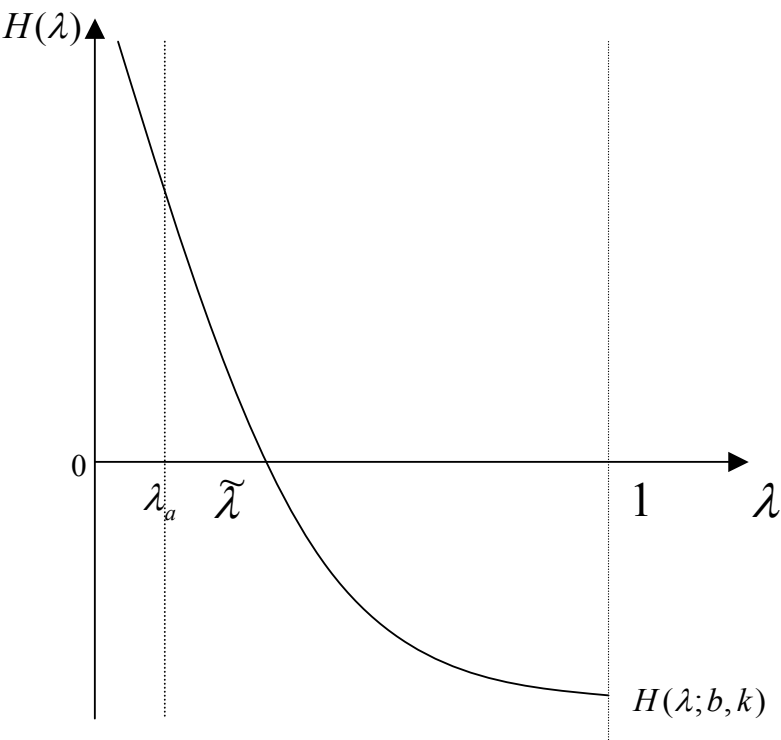


Figure 3: Optimal Level of Capital Market Integration
Panel (a): Interior Solution



Panel b: Corner Solution

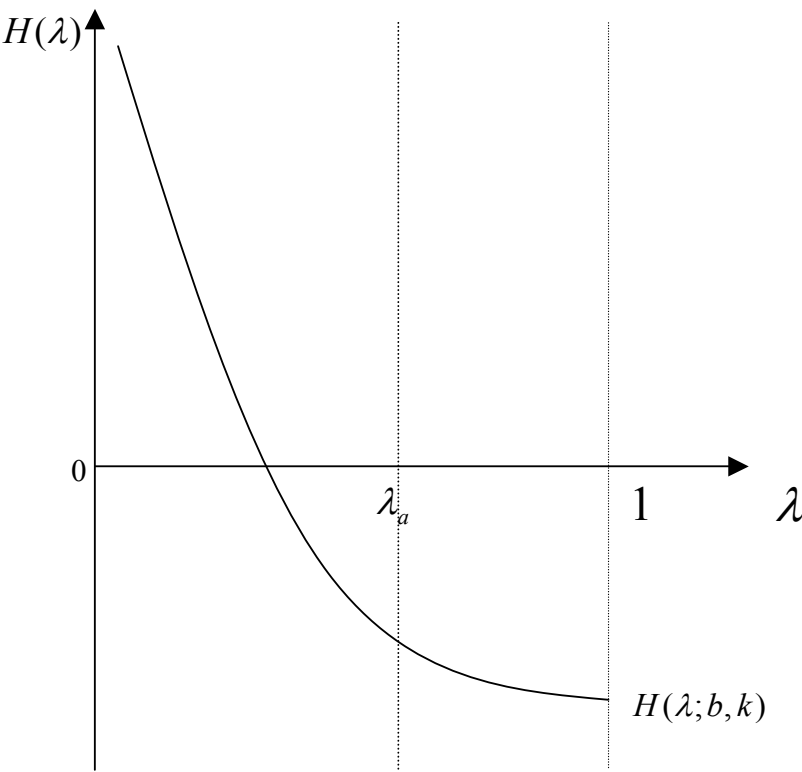
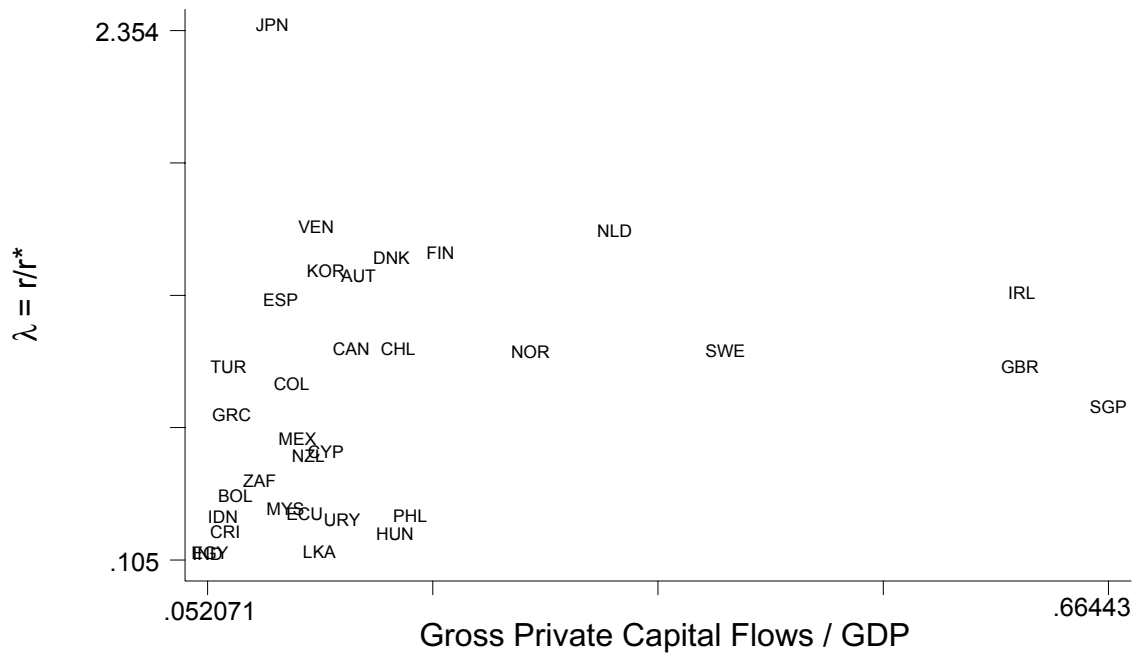
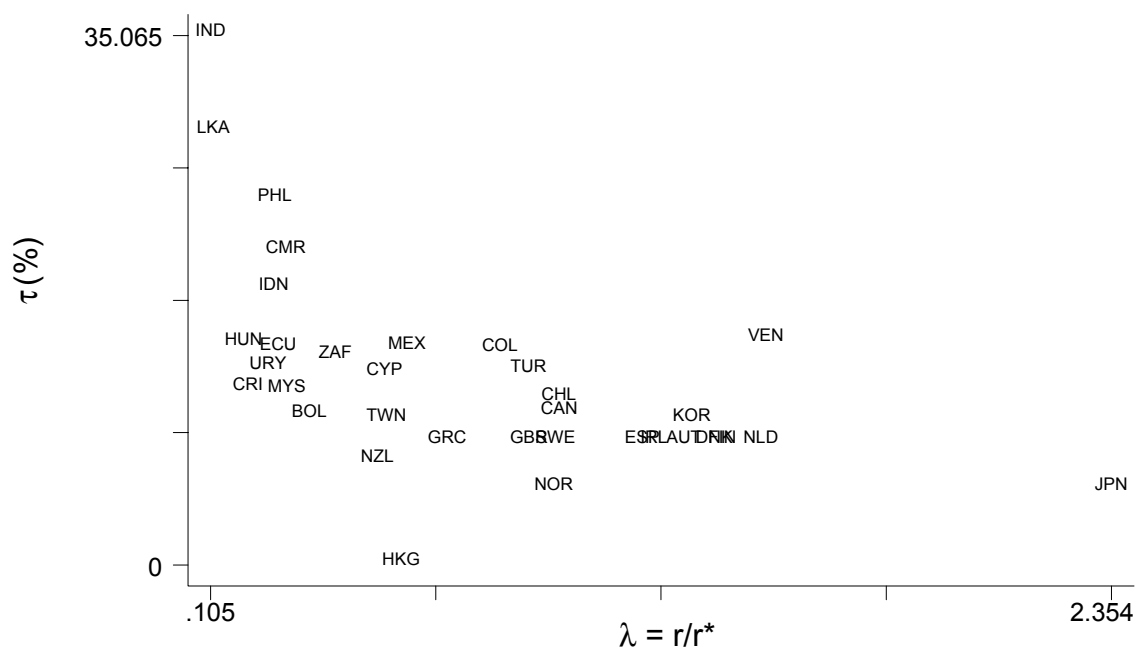


Figure 4
Rental Rate Differences and Gross Private Capital Flows: 1996



Source: World Development Indicators and author's calculations

Figure 5
Average Manufacturing Tariffs and Rental Rate Ratios: 1996



Source: UNCTAD and author's estimations. Note: Egypt is excluded

Figure 6: Tariffs and Rental Rate Differences controlling for $(1+\delta)$

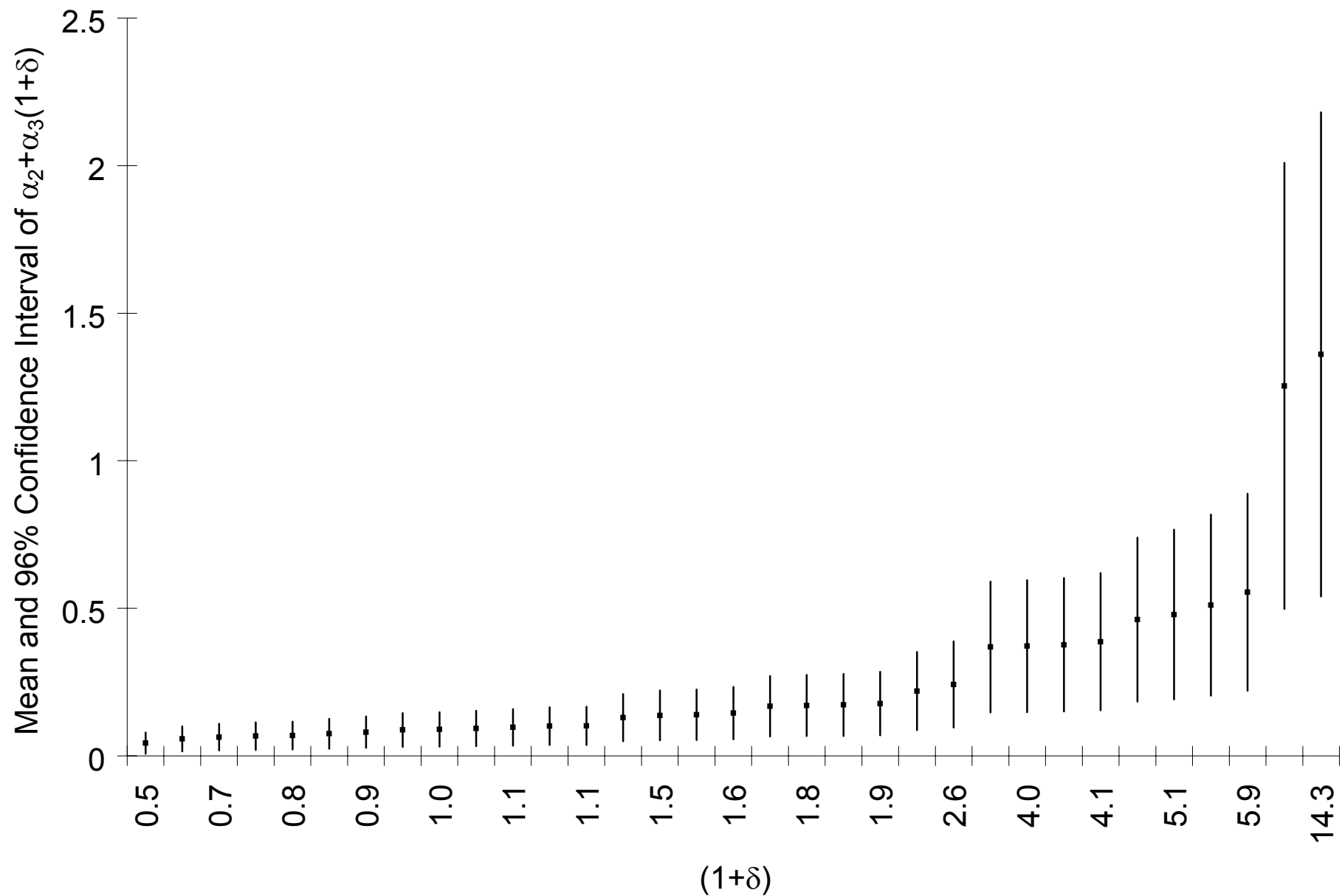


Figure A1: Lerner-Pearce Diagram for Labor-abundant countries

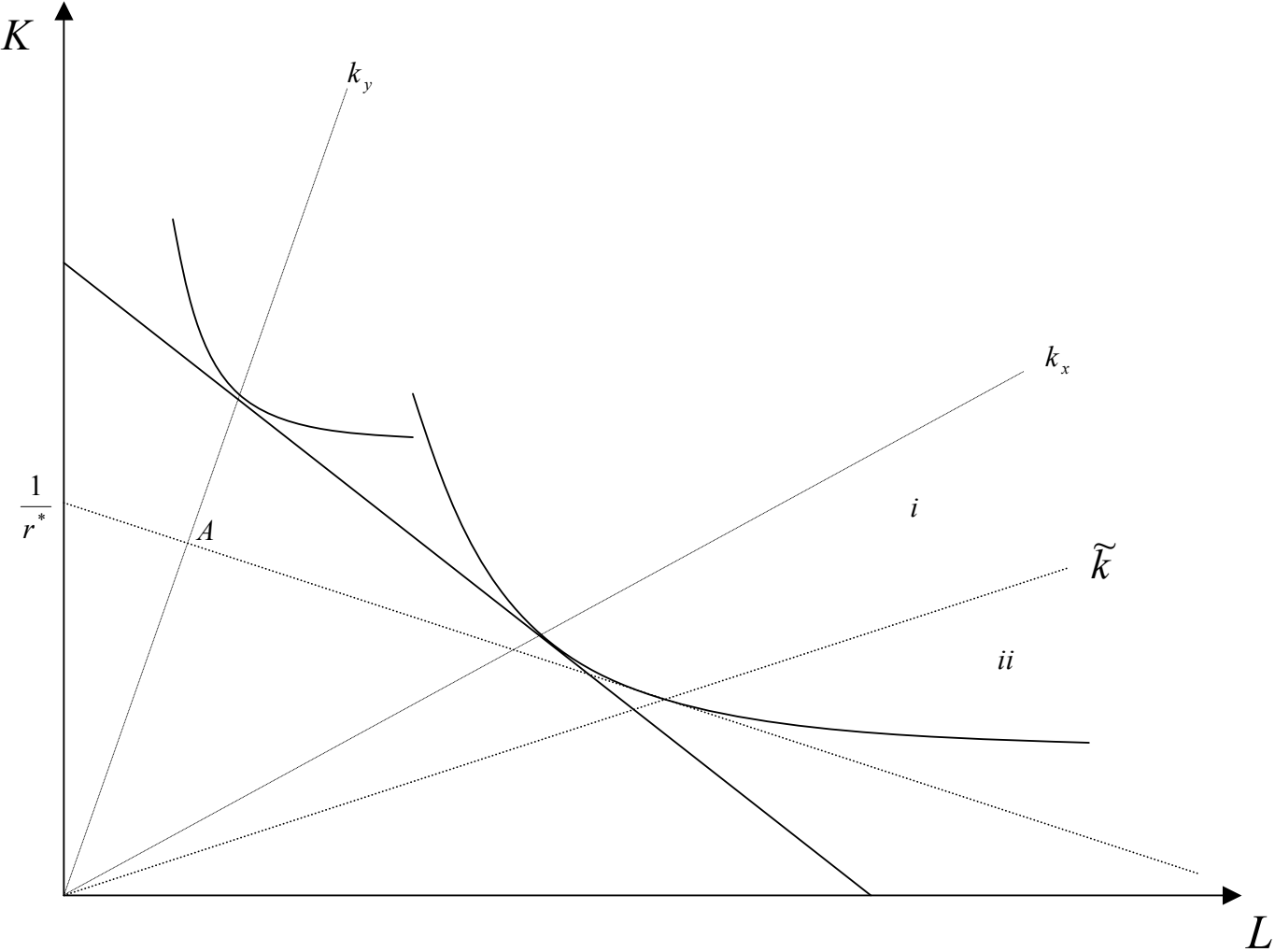


Table 1
Cross-Country Differences in Factor Prices: 1996

#	country	ω	se	w/w*	h*/h	$\lambda = r/r^*$	k/k*	τ (%)
1	AUT	1.14	1.24	1.291	1.136	1.287	1.077	8.08
2	BGR	1.18	2.64	0.047				19.64
3	BOL	0.39	0.07	0.078	1.767	0.352	0.067	9.83
4	CAN	1.00	0.45	0.908	1.070	0.976	1.096	10.01
5	CHL	0.42	0.05	0.296	1.393	0.975	0.344	10.95
6	CMR	0.85	1.47	0.106	2.353	0.293	0.035	20.64
7	COL	0.31	0.03	0.137	1.858	0.828	0.143	14.20
8	CRI	1.17	1.27	0.140	1.656	0.198	0.217	11.59
9	CYP	1.10	1.10	0.465	1.276	0.539	0.668	12.57
10	DNK	1.11	3.61	1.297	1.171	1.363	1.153	8.08
11	ECU	0.51	0.20	0.089	1.586	0.274	0.237	14.22
12	EGY	1.06	16.04	0.060	1.943	0.109	0.075	91.48
13	ESP	0.88	1.58	0.681	1.527	1.183	0.912	8.08
14	FIN	0.84	2.07	0.995	1.174	1.383	1.227	8.08
15	GBR	1.06	0.75	0.769	1.239	0.900	0.807	8.08
16	GRC	0.90	0.77	0.473	1.324	0.696	0.764	8.08
17	HKG	1.11	0.73	0.533	1.214	0.581	1.075	0.00
18	HUN	0.96	2.67	0.140	1.283	0.188		14.60
19	IDN	0.35	0.05	0.047	1.984	0.263	0.135	18.23
20	IND	0.78	0.56	0.042	1.958	0.105	0.053	35.07
21	IRL	1.00	1.59	0.960	1.259	1.212	0.895	8.08
22	JPN	0.55	0.09	1.081	1.205	2.354	1.194	4.98
23	KOR	0.48	0.03	0.547	1.153	1.307	0.907	9.57
24	LKA	0.38	0.05	0.025	1.692	0.112	0.082	28.59
25	MAC	18.71	7.52	0.187				
26	MAR	1.12	0.78	0.132			0.148	22.60
27	MEX	0.44	0.09	0.167	1.567	0.595	0.442	14.31
28	MYS	0.72	0.16	0.154	1.377	0.295	0.497	11.47
29	NLD	1.13	0.98	1.342	1.245	1.479	1.086	8.08
30	NOR	1.19	2.79	1.115	1.025	0.962	1.610	4.98
31	NZL	1.16	3.92	0.572	1.061	0.522	0.858	6.84
32	PHL	0.53	0.09	0.099	1.422	0.266	0.122	24.13
33	POL	1.21	0.31	0.124				9.28
34	SGP	1.19	1.08	0.640	1.353	0.728	1.531	
35	SWE	1.07	0.45	0.974	1.067	0.967	0.947	8.08
36	TUR	0.47	0.11	0.225	1.879	0.899	0.258	12.80
37	TWN	1.14	1.69	0.470	1.326	0.545	0.517	9.56
38	URY	1.34	0.48	0.223	1.488	0.248	0.277	12.95
39	USA			1.000	1.000		1.000	6.16
40	VEN	0.22	0.02	0.186	1.737	1.492	0.363	14.83
41	ZAF	0.97	2.23	0.307	1.322	0.417	0.261	13.69

Source: Caselli (2004), UNIDO, UNCTAD and author's calculations

Notes:

se: standard error of ω .

w/w*: Ratio of average manufacturing yearly wages per worker (Caselli, 2004)

h*/h: Ratio of US to each country's human capital from Caselli (2004)

$\lambda = r/r^*$: rental ratio ratio after accounting for human capital differences computed as $(w/w^*)(h^*/h)/w$

k/k*: Ratio of 1990 capital per worker (Caselli, 2004)

τ : Average Manufacturing Tariffs from Nicita and Olarreaga (2001) (UNCTAD)

Table 2
Sector-specific and average Technology Differences ($1+\delta_i$)

3-digit ISIC Industry																																										
#	Country	311	313	314	321	322	323	324	325	331	332	341	342	351	352	353	354	355	356	361	362	369	371	372	381	382	383	384	385	390	(1+δ)	T1	T2									
1	AUT	0.90	0.90	0.80	0.73	0.73	0.73	0.72	0.74	0.74	0.78	0.76	0.76	0.75	0.77	0.77	0.75	0.75	0.73	0.75	0.74	0.74	0.74	0.75	0.74	0.74	0.76	0.75	0.75	0.74	0.76	0.76	1.67	1.61								
2	BGR																																									
3	BOL	3.54	3.48	2.13	4.10	3.88	4.16	4.03	4.40	4.63	3.90	4.16	3.47	3.55	3.47	3.90	4.24	4.00	4.32	3.93	4.15	4.18	4.12	4.37	4.21	3.85	4.17	4.06	4.21	3.95												
4	CAN	1.17	1.17	0.75	1.07	1.11	1.06	1.13	1.05	1.13	1.07	1.06	1.05	1.06	1.08	1.10	1.09	1.08	1.07	1.03	1.07	1.06	1.05	1.08	1.06	1.06	1.08	1.04	1.06	1.07	1.82	1.79										
5	CHL	1.27	1.26	0.77	1.45	1.38	1.48	1.43	1.56	1.63	1.40	1.49	1.25	1.28	1.25	1.40	1.51	1.43	1.53	1.40	1.48	1.49	1.47	1.55	1.53	1.39	1.49	1.45	1.50	1.41												
6	CMR	4.10	4.30	2.81	3.98	4.17	4.13	4.26	4.52	4.67	4.00	4.10	3.69	3.95	3.80	4.05	4.37	4.16	4.40	4.21	4.31	4.01	4.00	4.25	4.00	4.08	4.05	4.09	4.50	4.11												
7	COL	1.68	1.58	0.94	2.02	1.93	1.95	2.02	2.09	2.35	1.80	1.94	1.52	1.58	1.49	1.75	2.02	1.98	2.12	1.85	1.95	1.91	1.85	2.12	1.99	1.80	2.00	1.87	2.05	1.86	6.25	5.26										
8	CRI	5.27	5.57	3.92	5.05	5.23	5.19	5.13	5.23	5.45	5.20	5.28	4.94	5.21	5.29	5.14	5.01	5.00	5.12	4.94	5.23	4.86	4.94	4.89	4.79	5.00	5.03	4.88	5.19	5.07												
9	CYP	2.18	2.04	1.51	1.89	2.39	1.90	1.76	1.92	2.04	1.93	1.94	1.87	1.97	1.85	1.81	1.87	1.90	1.88	1.85	1.89	1.84	1.87	1.85	1.85	1.93	1.95	1.88	1.94	1.91												
10	DNK	0.85	0.85	0.75	0.69	0.70	0.69	0.68	0.71	0.70	0.74	0.73	0.72	0.73	0.73	0.71	0.72	0.70	0.71	0.70	0.71	0.71	0.71	0.70	0.71	0.72	0.71	0.70	0.71	0.72												
11	ECU	4.64	4.66	2.96	5.11	4.97	5.06	5.14	5.28	5.78	4.86	5.39	4.25	4.44	4.27	4.76	5.13	5.06	5.29	4.82	5.03	4.87	4.79	5.27	5.04	4.79	5.11	4.89	5.26	4.89												
12	EGY	11.21	151.37	10.00	12.00	13.33	11.90	13.68	11.65	14.71	11.27	11.52	9.65	10.89	10.35	10.06	10.81	12.09	12.65	11.73	11.48	10.15	10.12	11.07	9.89	11.25	10.91	9.92	11.88	16.34												
13	ESP	1.03	1.02	0.88	0.88	0.88	0.88	0.86	0.90	0.91	0.91	0.91	0.87	0.88	0.87	0.87	0.90	0.88	0.90	0.88	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.88	0.89	0.90	2.38	2.33										
14	FIN	0.89	0.88	0.75	0.77	0.76	0.76	0.75	0.78	0.79	0.79	0.79	0.75	0.76	0.75	0.75	0.79	0.76	0.79	0.76	0.77	0.77	0.77	0.78	0.78	0.77	0.78	0.76	0.77	0.78	1.54	1.49										
15	GBR	1.30	1.30	1.14	1.07	1.08	1.07	1.05	1.09	1.09	1.14	1.12	1.10	1.12	1.11	1.09	1.11	1.08	1.10	1.09	1.09	1.09	1.10	1.09	1.09	1.11	1.10	1.08	1.09	1.11	1.72	1.67										
16	GRC	1.75	1.73	1.49	1.49	1.48	1.48	1.45	1.51	1.52	1.54	1.54	1.47	1.49	1.47	1.47	1.53	1.48	1.52	1.48	1.50	1.50	1.50	1.51	1.51	1.50	1.51	1.48	1.50	1.51	2.22	2.17										
17	HKG	1.57	1.63	1.11	1.49	1.46	1.57	1.49	1.61	1.60	1.65	1.64	1.61	1.65	1.67	1.65	1.61	1.54	1.56	1.57	1.61	1.60	1.62	1.58	1.62	1.62	1.59	1.59	1.59	1.57	2.50	2.44										
18	HUN	7.11	8.84	6.17	5.45	5.32	5.61	5.34	5.69	5.76	5.66	5.74	5.49	5.65	5.45	5.54	5.71	6.13	5.68	5.55	5.60	5.49	5.46	5.69	5.80	5.76	5.95	5.66	5.71	5.82	10.00	7.69										
19	IDN	5.11	5.61	3.23	6.36	6.48	6.00	6.40	6.55	7.92	5.49	5.78	4.58	4.81	4.46	5.23	6.28	6.51	7.14	5.64	6.23	5.74	5.58	6.61	5.92	5.50	6.65	5.65	6.70	5.86												
20	IND	12.06	21.50	8.78	13.20	12.95	11.86	13.27	13.39	14.61	12.40	12.38	12.25	12.79	12.62	12.82	14.15	12.75	13.73	13.57	13.99	12.94	12.75	13.20	12.60	12.98	13.22	12.78	13.54	13.18												
21	IRL	0.98	0.97	0.85	0.82	0.82	0.81	0.80	0.83	0.83	0.86	0.85	0.83	0.84	0.83	0.82	0.84	0.82	0.84	0.82	0.83	0.83	0.83	0.83	0.83	0.83	0.83	0.82	0.83	0.84	1.82	1.79										
22	JPN	0.51	0.52	0.31	0.52	0.53	0.57	0.63	0.55	0.55	0.50	0.52	0.47	0.47	0.46	0.50	0.52	0.52	0.52	0.49	0.52	0.53	0.52	0.53	0.52	0.48	0.51	0.50	0.52	0.51	1.43	1.41										
23	KOR	1.00	1.04	0.72	1.00	0.96	1.01	0.99	1.07	1.12	0.98	1.00	0.89	0.91	0.88	0.98	1.05	0.99	1.06	0.98	1.03	1.03	1.00	1.07	1.06	0.98	1.03	1.01	1.04	1.00												
24	LKA	13.21	12.60	20.21	14.93	15.09	14.76	15.60	14.79	18.13	13.63	13.91	11.07	11.77	11.50	12.71	15.20	14.10	16.04	13.50	14.93	13.42	13.24	15.26	13.97	13.14	15.00	13.63	15.00	14.30	11.11	14.29										
25	MAC																																									
26	MAR																																									
27	MEX	2.14	2.17	1.37	2.44	2.41	2.44	2.50	2.66	2.75	2.24	2.40	2.02	2.14	2.03	2.27	2.53	2.44	2.61	2.37	2.49	2.40	2.36	2.61	2.44	2.30	2.48	2.37	2.52	2.35												
28	MYS	3.59	4.27	2.25	4.07	4.07	3.96	4.42	4.40	4.82	4.08	4.15	3.52	3.67	3.55	3.76	4.54	4.32	4.27	4.16	4.23	3.97	3.85	4.21	3.88	3.92	4.22	3.70	4.07	4.00												
29	NLD	0.78	0.78	0.69	0.64	0.64	0.64	0.62	0.65	0.65	0.68	0.67	0.66	0.68	0.67	0.65	0.66	0.64	0.65	0.65	0.65	0.65	0.64	0.65	0.66	0.65	0.65	0.65	0.65	0.66	1.39	1.37										
30	NOR	0.96	0.97	0.67	0.98	1.01	1.00	0.96	0.96	0.98	0.99	1.00	1.01	1.03	1.00	1.02	1.00	1.03	1.02	0.98	0.96	0.96	0.96	0.98	1.00	1.01	0.98	0.98	0.98	0.98												
31	NZL	1.81	1.90	1.29	1.71	2.03	1.83	1.91	1.86	1.96	1.96	1.90	1.80	1.88	1.88	1.90	1.89	1.87	1.84	1.78	1.87	1.82	1.82	1.85	1.89	1.91	1.87	1.79	1.85	1.85	2.63	2.63										
32	PHL	5.17	5.65	3.60	5.59	5.50	5.91	6.44	6.04	6.33	5.23	5.53	4.45	4.81	4.35	5.17	5.70	5.66	6.19	5.25	5.78	5.24	5.22	5.88	5.25	5.11	5.29	5.22	5.76	5.40												
33	POL																																									
34	SGP	1.24	1.29	0.88	1.16	1.14	1.22	1.15	1.25	1.24	1.29	1.28	1.27	1.30	1.32	1.30	1.25	1.20	1.21	1.22	1.26	1.24	1.26	1.23	1.26	1.27	1.24	1.24	1.24	1.23	2.08	2.04										
35	SWE	1.21	1.20	1.06	0.99	1.00	0.99	0.97	1.01	1.01	1.05	1.04	1.02	1.04	1.03	1.01	1.03	1.00	1.02	1.01	1.01	1.01	1.02	1.01	1.01	1.02	1.01	1.00	1.01	1.03	1.75	1.72										
36	TUR	1.48	1.62	1.32	1.50	1.47	1.59	1.71	1.56	1.69	1.45	1.50	1.30	1.31	1.26	1.40	1.50	1.50	1.67	1.44	1.48	1.51	1.47	1.61	1.52	1.42	1.52	1.47	1.55	1.49												
37	TWN	2.03	2.38	1.78	1.70	1.74	1.73	1.65	1.74	1.82	1.84	1.80	1.77	1.83	1.84	1.81	1.85	1.71	1.83	1.80	1.83	1.80	1.75	1.81	1.79	1.83	1.88	1.75	1.77	1.82												
38	URY	3.97	4.39	3.06	3.83	3.74	3.91	3.88	3.86	4.06	4.12	3.99	3.93	4.13	3.91	3.89	4.06	3.95	3.95	3.91	3.94	3.90	3.85	3.94	3.67	4.01	3.79	3.90	4.07	3.92	9.09	4.55										
39	USA	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00												
40	VEN	0.97	0.94	0.56	1.24	1.17	1.19	1.24	1.28	1.47	1.06	1.24	0.88	0.91	0.85	1.03	1.22	1.19	1.31	1.10	1.17	1.16	1.11	1.30	1.21	1.06	1.21	1.12	1.24	1.12												
41	ZAF	2.60	2.73	2.11	3.02	3.80	2.65	2.80	2.64	2.88	2.56	2.62	2.37	2.48	2.37	2.53	2.68	2.61	2.62	2.45	2.44	2.42	2.41	2.49	2.42	2.49	2.55	2.34	2.46	2.59												

Source: Author's estimations and Trefler (1995)

$(1+\delta)$: Unweighted average of $(1+\delta_{1i})$

T1: Neutral technological differences model (Trefler, 1995)

T2: Unrestricted model (Trefler, 1995)

Table 3
Tariffs and Capital Market Integration: 1996

Dependent Variable	(1+ τ)	(1+ τ)	(1+ τ)	(1+ τ)	(1+ τ)	(1+ τ)
Constant	1.169 <i>0.017</i>	1.189 <i>0.025</i>	0.890 <i>0.051</i>	0.910 <i>0.064</i>	0.970 <i>0.033</i>	0.961 <i>0.040</i>
λ	-0.065 <i>0.019</i>	-0.093 <i>0.038</i>			-0.005 <i>0.015</i>	0.009 <i>0.034</i>
(1+ δ)					0.015 <i>0.003</i>	0.016 <i>0.004</i>
$\lambda * (1+\delta)$			0.197 <i>0.042</i>	0.186 <i>0.052</i>	0.096 <i>0.029</i>	0.094 <i>0.040</i>
Adjusted R ²	0.242	0.169	0.383	0.333	0.788	0.751
Sample	35	25	34	25	34	25
Restrictions	None	$\delta > 0$	None	$\delta > 0$	None	$\delta > 0$

Notes:

Standard errors in italics

All estimations exclude Egypt, but none of them is affected by its exclusion

Table 4
Cross-country Differences in Tariffs
Productivity and Factor Abundance Effects

λ and δ correct for Human Capital Differences

Dependent Variable	(1+ τ)	(1+ τ)	(1+ τ)	(1+ τ)	(1+ τ)	(1+ τ)	(1+ τ)*	(1+ τ)*
Constant	1.195 <i>0.014</i>	1.204 <i>0.018</i>	0.968 <i>0.079</i>	0.970 <i>0.100</i>	0.968 <i>0.079</i>	1.060 <i>0.102</i>	0.965 <i>0.078</i>	1.129 <i>0.098</i>
k/k*	-0.119 <i>0.019</i>	-0.154 <i>0.033</i>	-0.026 <i>0.035</i>	-0.048 <i>0.050</i>	0.036 <i>0.144</i>	-0.232 <i>0.248</i>	0.105 <i>0.078</i>	-0.027 <i>0.228</i>
$(1+\delta) \cdot \lambda$			0.175 <i>0.060</i>	0.186 <i>0.075</i>	0.203 <i>0.061</i>	0.159 <i>0.075</i>	0.206 <i>0.060</i>	0.115 <i>0.075</i>
$(1+\delta) \cdot \lambda^2$			-0.042 <i>0.018</i>	-0.059 <i>0.026</i>	-0.080 <i>0.027</i>	-0.144 <i>0.040</i>	-0.073 <i>0.024</i>	-0.119 <i>0.039</i>
k/k* $\cdot (1+\delta) \cdot \lambda$					-0.132 <i>0.150</i>	-0.032 <i>0.240</i>	-0.204 <i>0.079</i>	-0.290 <i>0.196</i>
k/k* $\cdot (1+\delta) \cdot \lambda^2$					0.074 <i>0.029</i>	0.289 <i>0.099</i>	0.072 <i>0.028</i>	0.299 <i>0.104</i>
Adjusted R ²	0.533	0.473	0.605	0.570	0.662	0.675	0.670	0.642
Sample	34	24	33	24	33	24	33	24
Restrictions	None	$\delta > 0$	None	$\delta > 0$	None	$\delta > 0$	None	$\delta > 0$

Standard errors in italics

All estimations exclude Egypt, but none of them is affected by its exclusion

* Coefficient and standard errors of k/k* $(1+\delta) \lambda^2$ are computed using Delta Method

Table 5
Factor Endowments and Productivity

Dependent Variable	k/k*	k/k*
Constant	1.935 <i>0.222</i>	1.670 <i>0.231</i>
$(1+\delta) \cdot \lambda$	-1.409 <i>0.182</i>	-1.184 <i>0.196</i>
$(1+\delta) \cdot \lambda^2$	0.381 <i>0.064</i>	0.308 <i>0.089</i>
Adjusted R ²	0.728	0.617
Sample	33	24
Restrictions	None	$\delta > 0$

Standard Errors in Italics