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7340
2018

November 2018

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CESifo

Impressum:

CESifo Working Papers
ISSN 2364-1428 (electronic version)
Publisher and distributor: Munich Society for the Promotion of Economic Research - CESifo GmbH
The international platform of Ludwigs-Maximilians University's Center for Economic Studies and the ifo Institute
Poschingerstr. 5, 81679 Munich, Germany
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Editors: Clemens Fuest, Oliver Falck, Jasmin Gröschl
www.cesifo-group.org/wp

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CESifo *Working Paper No. 7340*
Category 8: Trade Policy

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Abstract

We build a two-country model with an international duopoly and capital-market integration. We examine how the convergence of the cost of capital, due to its mobility, affects the welfare of each country and their joint welfare. We find that international capital mobility, which equalizes the return to capital between the two countries, reduces their joint welfare. The welfare of the host country improves for sufficiently large market size and high level of capital-market integration, while the welfare of the source country improves only in a very restrictive case with a very small market size and small differences in their initial marginal cost of capital.

JEL-Codes: F120, F150, H210.

Keywords: capital-market integration, imperfect competition, international duopoly.

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Previous versions of this paper were presented at the 13th Conference on Research on Economic Theory and Econometrics (CRETE), the 6th International Ioannina Meeting on Applied Economics and Finance (IMAEF), the University of Cyprus, and the Panteion University; and we are grateful to conference and seminars participants for their comments. We are especially grateful for comments and suggestions from the participants of the Doctoral School of International Institute of Public Finance (IIPF) at University of Oxford as well as comments and suggestions from Fabio Antoniou, Michael Devereux, Manthos Delis, Panos Hatzipanayotou, Costas Hadjiyiannis, Michael Keen, Christos Kotsogiannis, Theodore Mariolis, Pascalis Raimondos - Möller, Nikolaos Tsakiris, and Nikolaos Ziros.

1 Introduction

During the last few decades we have witnessed a large increase in global economic integration, including capital-market integration through international capital mobility. The idea that free capital mobility increases the welfare of both, the host and source, countries has long been one of the most incontrovertible truths in economics. Models with perfect competition, show that free capital mobility between two countries increases the welfare of each country. Many studies argue that reducing restrictions in capital mobility may spur economic development through financial development.[1]

During the 1990s the International Monetary Fund and most of the policy-makers from developed countries supported capital account liberalization for developing economies as a vehicle for economic growth. A large number of countries have followed their advice. The beginning was prominent with a high volume of capital inflows and investments towards these countries associated with high growth rates. However, a few years later a group of countries like Mexico, Russia, Argentina, Thailand and South Korea with recently liberalized capital markets experienced severe financial crises. Moreover, the recent global financial crisis brings skepticism about capital controls, even for developed countries. During the eurozone crisis, for instance, some advanced economies that were entirely open to global capital flows were hit hard. Iceland, Spain, Greece, and Cyprus experienced deep recessions, while the last two countries were forced to impose strict restrictions on capital outflows.[2] Olivier Blachard, chief economist of the International

[1]For example, Stultz (1999), Henry (2000) and Bekaert et al. (2001, 2005) find that financial globalization reduces the cost of equity capital due to lower expected returns to compensate risk and agency cost. Claessens et al. (2001), Stultz (1999), and Stiglitz (2000) show that the increase of capital mobility increases the efficiency of a financial market by pushing inefficient financial institutions out of the market.

[2]There is a large, mainly empirical, literature about capital controls (i.e., restrictions in capital mobility). Alesina et al. (1994) utilizing a sample of OECD countries, find a positive but statistically insignificant impact of capital controls on economic growth. The results of Grilli and Milesi-Ferretti (1995) are similar for a sample of developing countries. Chanda (2005), controlling for ethno-linguistic heterogeneity, finds that capital controls have a positive impact on growth if there is a low degree of

Monetary Fund from 2008 until 2015 at the beginning of 2016 said, "The general presumption was that capital account liberalization was always good and capital controls were nearly always bad. I've seen the thinking change. Partly because it was already wrong then, and because it was particularly wrong in the crisis.[3]

This paper provides another argument as to why unrestricted international capital mobility may not be beneficial for all countries involved. For this purpose, we build a two-country, partial equilibrium model of imperfect competition and examine the welfare implications of an increase of the degree of capital-market integration through the increase in capital mobility between them. We use the international rivalry model of Brander and Krugman (1983) and we assume capital cost heterogeneity for the two rivals. In addressing the welfare impact of international capital-market liberalization, we pose the following questions: Is the reduction of capital mobility constraints, which causes converges in the cost of capital, beneficial for the initially low and high capital cost countries? Does the increase in capital-market integration lead to a higher joint welfare of the two countries? To answer these questions we use a marginal analysis and simulations.

In the marginal analysis, we examine the welfare effects of a small change in initial marginal cost due to international capital mobility for two international rivals. This practice is a common one, especially in a partial equilibrium analysis.[4] In the case with

heterogeneity. However, for a high degree of heterogeneity, capital controls negatively affect growth. Moreover, Chinn and Ito (2005), find that capital liberalization performs well if a threshold level of legal development (e.g., a minimum number of reforms) has been attained. The observed effects of restrictions in capital mobility are controversial and rather country-specific. For a unified approach of the impact of capital controls, see the meta-analysis study of Maguad et al. (2011)

[3]See The Wall Street Journal of the 5th February 2016.

[4]Dasgupta and Stiglitz (1988) introduce a marginal cost change through a process of learning by doing. They then examine the welfare implications of government intervention through a protection policy favoring local firms. Similarly, the change in firms' marginal costs due to R&D has also received a lot of academic interest in the last few decades. D'Aspremont and Jacquemin (1988), Suzumura (1992), and Leahy and Neary (1997), initially assume a marginal cost reduction via R&D; they then examine various welfare implications arising from various scenarios of cooperation or non cooperation in a research joint venture. Spencer and Brander (1983) also introduce marginal-cost-reducing R&D at the first stage and find that government subsidization of research may induce more favorable outcomes in international rivalry.

the marginal analysis, we find some interesting and non-trivial results. We show that reducing restrictions in international capital movements cannot guarantee improvements in each country's welfare separately or in the countries' joint welfare. For the country with initially high capital cost, we find that even though the marginal cost of the local producer is reduced due to capital mobility, it needs a sufficiently large market size and/or a small difference in the initial cost of capital in order to be better off. The low-cost country can be better off with an increase in capital-market integration, but only if the initial cost of capital differences are small. Reducing the cost of capital in the country with high capital costs increases the joint welfare when market is sufficiently large. Increasing the cost of capital in the low-cost country unambiguously decreases joint welfare.

We run a simulation study where we allow the simultaneous convergence in the cost of capital for the two countries. The only scenario in which capital-market integration improves joint welfare is when the common cost of capital under perfect capital-market integration is lower than the average initial cost of capital in the two countries and the market size is not extremely small. Our analysis shows that if the average cost of capital in the two countries remains unchanged after the capital integration process (i.e., same total cost associated with smaller variance of capital cost), then joint welfare is lower compared to the initial situation of no capital mobility (i.e., same total cost associated with larger variance of capital cost).

This study provides some new findings that add to a deeper understanding of the welfare implications of capital-market integration. Prior studies mainly focus on cases of perfect competition when they explore capital mobility. In contrast, we employ a simple model of imperfect competition and show that only under certain conditions capital-market integration leads to a Pareto-improved outcome.

The contributions of our paper are twofold. First, we show that capital-market liberalization does not always lead to Pareto-improved outcomes. Factors such as market size and economic similarities among countries that increase their capital-market integration crucially affect the final outcome. Second, capital-market integration that equalizes capital cost between two countries decreases their joint welfare if the common capital cost under capital mobility equals the initial (without capital mobility) average cost of capital. Thus our analysis extends the work of Salant and Shaffer (1999), who show that when marginal costs are linear, under certain conditions, the asymmetric Cournot is welfare superior to the symmetric. They prove that if the marginal costs of n firms in an industry are rearranged in a way that preserves their sum but strictly increases (decreases) their variance, then, industry profits and social surplus strictly increase (decrease) given that the Nash equilibrium remains interior. Our simulation analysis extends Salant and Shaffer (1999) and shows that the asymmetric Cournot is welfare superior to the symmetric (i) in a framework with an international duopoly (not within an industry of one country) and (ii) the change in the marginal cost is due to international capital mobility (not due to intra country changes in the use of capital by domestic firms).

The paper is organized as follows. Section 2 develops the model. Section 3, using marginal analysis, examines the welfare effects of the convergence in the cost of capital due to increase in capital-market integration. In section 4 we provide detailed simulation analysis using our theoretical model, and section 5 gives the concluding remarks.

2 The model

Consider an asymmetric, two-country, cross-hauling model that is based on Brander and Krugman (1983). Each country, *Home* and *Foreign*, has one firm producing the same homogeneous good. The two firms are assumed to be Cournot competitors. In particular, each firm regards each country as a separate market and therefore chooses the profit-maximizing quantity for each country separately. The variables associated with *Foreign* are denoted by a starred letter. The relative variables for *Home* are denoted by unstarred letters.

The domestic (*Foreign*) firm produces output x (x^*) for *Home* (*Foreign*) consumption and output y (y^*) for *Foreign* (*Home*) consumption. Thus, $(x + y)$ represents the total *Home* production, while $(x^* + y^*)$ represents the total of *Foreign*'s production. Countries are identical in size and have the same quasi-linear preferences that lead to the following linear inverse demands:

$$p(q) = A - q; \quad (1)$$

$$p(q^*) = A - q^*, \quad (2)$$

where $A > 0$ is the demand intercept that represents the market size, while $q = x + x^*$ and $q^* = y + y^*$ denote the total quantity in *Home* and *Foreign*, respectively. Note that with this set up x and x^*, as well as y and y^*, are perfect substitutes.[5] Moreover, we consider capital as the only factor of production, and we assume full capital employment associated with constant returns to scale technology in both countries. We assume, for simplicity, that one unit of capital produces one unit of output. Thus,

$$c(R) = R[x + y]; \quad (3)$$

$$c(R^*) = R^*[x^* + y^*], \quad (4)$$

where $c(R)$ ($c(R^*)$) and $R(R^*)$ are respectively the total production cost and the unit cost of capital in *Home* (*Foreign*). Without loss of generality, we assume that *Home* has small capital endowments and *Foreign* has relatively large capital endowments. As a result of these unequal capital endowments in the two countries, the cost of capital is higher in *Home* compared to *Foreign* (i.e., $R > R^*$).

[5] In general, the inverse demand we obtain from the quasi-linear utility functions are of the form: $p(q) = A - bq$, where $b > 0$.

The appropriate measure of welfare, W, that comes from the quasi-linear preferences is the sum of profits Π and consumer surplus CS, minus the net capital payments NCP:

$$W = \Pi + CS - \phi NCP; \quad (5)$$

$$W^* = \Pi^* + CS^* + \phi NCP, \quad (6)$$

where the consumer surplus, given the linear inverse demand functions (1) and (2), is given as:

$$CS = \int_0^q p(u)du - p(q)q = \frac{q^2}{2}; \quad (7)$$

$$CS^* = \int_0^{q^*} p(u^*)du^* - p(q^*)q^* = \frac{{q^*}^2}{2}. \quad (8)$$

When we allow capital mobility between the two countries, *Home* becomes the capital importer country and thus Net Capital Payments are positive (i.e., $NCP > 0$), while *Foreign* is the capital exporter country and thus receives net capital income. The net capital payments associated with the international capital movements, NCP, are the difference between total country production before capital mobility (i.e., α) and after capital mobility times the price of one unit of capital.[6] More precisely, and taking into consideration the F.O.C. (see eq. (A1)), we get:

$$\begin{aligned} NCP = R^T[(\hat{x}^T + \hat{y}^T)_{cm} - \alpha] &= R^T\left[\frac{2}{3}(A - 2R^T + R^*) - \alpha\right] \\ &= R^T\left[\frac{2}{3}(A - 2R^T + R^*) - \frac{2}{3}(A - 2R^0 + R^*)\right] \\ &= R^T\left[\frac{4}{3}(R^0 - R^T)\right], \end{aligned} \quad (9)$$

where R^T denotes the domestic cost of capital after the capital mobility, $(\hat{x}^T + \hat{y}^T)$ represents the total domestic production after the capital mobility, $\alpha = (\hat{x}^0 + \hat{y}^0) = \frac{2}{3}(A - 2R^0 + R^*)$ denotes the total domestic production before the capital mobility, and

[6] In the background we assume a simple production function, which is a one-by-one relationship between capital and output (i.e., $q(k) = k$, where k denotes capital).

R^0 represents the domestic cost of capital before the capital mobility. In what follows, we use the somehow simpler form of NCP: $NCP = R[(\hat{x} + \hat{y})_{cm} - \alpha]$, keeping in mind that the cost of capital R represents the cost of capital after the capital mobility, R^T.

Finally, in eqs. (5) and (6), the parameter $\phi \in \{0, 1\}$ denotes whether international capital mobility exists (i.e., $\phi = 1$) or does not (i.e., $\phi = 0$).[7] Clearly, our analysis considers only the former. In particular, in what follows we assume international capital mobility and we consider the welfare effects of capital-market integration.

Profits for each firm are equal to the revenue from sales in *Home* and *Foreign* minus the cost. That is,

$$\Pi = px + p^*y - R[x + y]; \tag{10}$$

$$\Pi^* = px^* + p^*y^* - R^*[x^* + y^*]. \tag{11}$$

The domestic and the *Foreign* firm maximize their profits as given by eqs. (10) and (11) by choosing the optimal level of output for each market (see appendix A1).

3 Welfare effects of capital-market integration

3.1 Own effects

Our objective is to examine the effect on each country's welfare and on two countries' joint welfare when capital-market integration increases under an imperfectly competitive product market. To this end, we run a one-shot game. At stage 0, the two countries decide to increase international capital mobility by lowering capital flows restrictions between them, and at stage 1 the two firms choose non cooperatively their profit-maximizing

[7] In the absence of international capital mobility, the cost of capital may decrease due to other reasons such as an improvement in technology. In this case $\phi = 0$.

quantities. Markets are segmented so that firms can treat each country as a separate market. We assume an interior equilibrium. That is, each firm produces a strictly positive output $((x + y) > 0; (x^* + y^*) > 0)$. This requires that the marginal costs R, R^* must satisfy the following condition: $R^* < R < A$. Substituting these outputs into eqs. (5) and (6) we obtain the equilibrium welfare levels for the two countries. We begin by examining first the case for *Home*. Substituting equations (10), (7) and (9) into equation (5) gives:

$$\begin{aligned} W &= \Pi + CS - \phi NCP \\ &= (A - x - x^*)x + (A - y - y^*)y - R(x + y) + \frac{(x + x^*)^2}{2} - \phi R(x + y - a), \end{aligned} \tag{12}$$

Note that α denotes the total production in *Home* before the international capital mobility, and $x + y$ denotes the total production after the international capital mobility.[8] Differentiating eq. (12) with respect to R, we obtain the following:

$$\begin{aligned} \frac{\partial W}{\partial R} &= (A - x - 2R)\frac{\partial x}{\partial R} + (A - 2y - y^* - 2R)\frac{\partial y}{\partial R} - y\frac{\partial y^*}{\partial R} + x^*\frac{\partial x^*}{\partial R} - 2(x + y) - \alpha \\ &= \underbrace{-\frac{8}{9}(A - 2R + R^*)}_{(-)} \underbrace{-\frac{1}{9}(2A - R - R^*)}_{(-)} - \phi[\underbrace{\frac{2}{3}(A - 2R + R^*) - \alpha}_{(+)} \underbrace{-\frac{4}{3}R}_{(-)}], \end{aligned} \tag{13}$$

We obtain the results in the second line by using the expressions for the equilibrium outputs: $\hat{x} = \frac{1}{3}(A - 2R + R^*), \hat{y} = \frac{1}{3}(A - 2R + R^*), \hat{x^*} = \frac{1}{3}(A + R - 2R^*), \hat{y^*} = \frac{1}{3}(A + R - 2R^*)$ (see also appendices A1 and A2). Eq. (13) shows how a change in the domestic cost of capital, R, affects each term of *Home*'s welfare. More precisely, given the restrictions for an interior solution as given in eq. (A2), a decrease in the cost of capital, R, increases both, the profits for the domestic firms (first term) and the consumer surplus (second term), but its effect on net capital payments is ambiguous. Doing some manipulations, eq. (13) can be written as[9]:

[8] Because *Home* by assumption is the capital-importer country: $x + y > \alpha$.

[9] The effect of a change in R on NCP is given as follows: $NCP_R = \frac{2}{3}(A - 4R + R^* - 3\alpha) \gtreqless 0$. Its sign is ambiguous and depends on the market size, A, and the difference in the cost of capital, $(R - R^*)$, (see appendix A2 for analytic calculations). Using NCP_R we can show that the second partial derivative

$$W_R|_{\phi=1} = -\frac{1}{9}(16A - 41R + 13R^* - 9\alpha) \gtreqless 0. \tag{14}$$

As eq. (14) shows, the welfare effect of a reduction in the cost of capital for the high cost country is ambiguous. The likelihood that the reduction in R improves *Home*'s welfare increases if A is very large and the difference R-R* is small. Thus, a marginal cost reduction due to capital mobility might not be beneficial for the high capital cost country.

Setting eq. (14) equal to zero and solving for the market size, we derive the required market size A_I for *Home* to be indifferent between the scenario of an international capital mobility and the one of no mobility as

$$W_R|_{\phi=1} = 0 \Rightarrow A_I = \frac{41R - 13R^* + 9\alpha}{16} \Rightarrow A_I = \frac{13(R - R^*) + 28R + 9\alpha}{16}. \tag{15}$$

Eq. (14) shows that for a sufficiently large market size, say $A > A_I$, a reduction of R due to capital mobility, increases *Home*'s welfare, $W_R|_{\phi=1} < 0$. Intuitively, as we can see from eq. (14), in the case of a large-enough market size, $A > A_I$, *Home*'s benefits from the reduction of R due to higher profits, $\Pi_R = -\frac{8}{9}(A - 2R + R^*) < 0$, and consumer surplus, $CS_R = -\frac{1}{9}(2A - R - R^*) < 0$, exceed NCP. Obviously, the inverse holds for a sufficiently small market size, $A < A_I$. The following proposition summarizes the previous results.

Proposition 1. *Consider a two-country model with an international duopoly. International capital mobility, which decreases the cost of capital for the high-cost country, improves its welfare if the market size is sufficiently large.*

Foreign has a large capital endowment and thus its local firm buys capital at a lower cost (i.e., $R^* < R$). During the process of capital-market integration, capital moves from

with respect to the *Home*'s cost of capital, R, is negative: $NCP_{RR} < 0$. Thus, as the capital-market integration proceeds towards the equalization of capital costs in the two countries, the high-cost country, *Home*, pays less for each further level of integration.

the low return to the high-return country. Thus, *Foreign* becomes the capital exporter and its welfare is given by:

$$W^* = \Pi^* + CS^* + \phi NCP$$
$$= (A - x - x^*)x^* + (A - y - y^*)y^* - R^*(x^* + y^*) + \frac{(y + y^*)^2}{2} - [-R(x + y - \alpha)], \tag{16}$$

where the second line is derived using eqs. (11) and (8). Differentiating eq. (16) with respect to R^*, gives:

$$\begin{aligned} W^*_{R^*} = \frac{\partial W^*}{\partial R^*} &= (A - 2x^* - x - R^*)\frac{\partial x^*}{\partial R^*} + (A - y^* - R^*)\frac{\partial y^*}{\partial R^*} \\ &- x^*\frac{\partial x}{\partial R^*} + y\frac{\partial y}{\partial R^*} - (x^* + y^*) + R(\frac{\partial x}{\partial R^*} + \frac{\partial y}{\partial R^*}) \\ &= \underbrace{-\frac{8}{9}(A + R - 2R^*)}_{(-)} \underbrace{-\frac{1}{9}(2A - R - R^*)}_{(-)} \underbrace{+\phi\frac{2}{3}R}_{(+)}, \end{aligned} \tag{17}$$

The second line is derived using the expressions for the equilibrium outputs: $\hat{x} = \frac{1}{3}(A - 2R + R^*), \hat{y} = \frac{1}{3}(A - 2R + R^*), \hat{x^*} = \frac{1}{3}(A + R - 2R^*), \hat{y^*} = \frac{1}{3}(A + R - 2R^*)$ (see also appendix A1). Eq. (17) denotes the effect of an increase in the cost of capital, R^*, on each component of *Foreign*'s welfare. More precisely, given the restrictions in eq. (A2), an increase in the cost of capital, R^*, unambiguously decreases the profits for the *Foreign* firm (first term), decreases the consumer surplus (second term), and has a positive impact from the NCP (third term). Doing some manipulations, eq. (17) can be written as:[10]

$$W^*_{R^*}|_{\phi=1} = -\frac{1}{9}(10A + R - 17R^*) \gtreqless 0. \tag{18}$$

Eq. (18) shows that an increase in the cost of capital in *Foreign* has an ambiguous

[10] The sign of the partial derivative of the net capital payments with respect to *Foreign*'s cost of capital, R^*, is negative (i.e., revenue for *Foreign*) and thus it has a positive impact on the welfare of *Foreign* (capital exporter). Intuitively, when R^* increases, the profit-maximizing output of the *Foreign* firm decreases, thus *Home*'s firm output increases, which increases the use of capital and thus capital payments increase: $NCP^*_{R^*} = -\frac{2}{3}R < 0$. Also, as we can see the partial derivative of $NCP^*_{R^*}$ with respect to the *Home* cost of capital, R, yields: $NCP_{R^*R} = -\frac{2}{3} < 0$ and because R is lower due to capital mobility, the effect of an R^* increase on net capital payments that *Foreign* receives is lower.

effect on its welfare. The likelihood that the increase in R^* increases *Foreign*'s welfare increases if A is small and the difference between R and R^* is small even though $R^* < R$. Next, setting eq. (18) equal to zero and solving for the market size, we obtain the market size A_I^*, which makes *Foreign* indifferent between free capital mobility and no capital mobility.

$$W^*_{R^*}|_{\phi=1} = 0 \Rightarrow 10A + R - 17R^* = 0 \Rightarrow A_I^* = \frac{-R + 17R^*}{10}. \tag{19}$$

The market size A_I^* given by equation (19) must be higher than $A^{min} = 2R - R^* < A_I^*$, where A^{min} = the minimum market size we receive from the F.O.C. for an interior solution. In contrast with *Home*, for *Foreign* this condition is binding and requires two countries with similar costs of capital. That is:

$$A^{min} < A_I^* \Rightarrow 2R - R^* < \frac{-R + 17R^*}{10} \Rightarrow \frac{R}{R^*} < \frac{27}{21} \Rightarrow R < \frac{27}{21}R^*. \tag{20}$$

The above analysis shows that an increase in R^* due to capital mobility increases *Foreign*'s welfare (i.e., $W^*_{R^*}|_{\phi=1} > 0$) if i) the two countries have similar capital costs (i.e., $R^* < R < \frac{27}{21}R^*$) in order for $A^{min} < A_I^*$ and ii) $A \in (A^{min}, A_I^*)$, which implies relatively small market size. For example, if $R = 10$ and $R^* = 9$, then $A \in (A^{min} = 11$ and ${A^*}_I = 14.3)$. Thus if A is between 11 and 14.3, then an increase in R^* increases *Foreign*'s welfare. Intuitively, in this case, the losses from the increase of R^* in *Foreign*'s profits $(\Pi^*_{R^*} = -\frac{8}{9}(A + R - 2R^*) < 0)$ and consumer surplus: $(CS^*_{R^*} = -\frac{1}{9}(2A - R - R^*) < 0)$ do not exceed the revenue gains from NCP. If, however, the two countries have large differences in capital cost or $A > A_I^*$, then an increase in R^* reduces *Foreign*'s welfare. For example, if $R = 10$ and $R^* = 7$, then no market size exists for which an increase in R^* increases *Foreign*'s welfare and satisfies the condition for an interior solution.[11] Proposition 2 summarizes this discussion.

[11]See appendix A4 for more numerical examples.

Proposition 2. *Consider a two-country model with an international duopoly. International capital mobility, which increases the cost of capital in the low-cost country, usually leads to deterioration of its welfare. Its welfare, however improves if the differences in capital cost and market size are sufficiently small.*

3.2 Joint welfare

Next, we examine what happens to joint welfare when the cost of capital changes for the two countries. We define joint welfare as the sum of the two countries' welfare, as follows:

$$JW = W + W^*. \tag{21}$$

We begin by examining the effect of an increase in *Home*'s cost of capital on the two countries' joint welfare, which is given as follows:

$$\begin{aligned} JW_R = &\underbrace{-\frac{8}{9}(A - 2R + R^*)}_{(-)} \underbrace{-\frac{1}{9}(2A - R - R^*)}_{(-)} \\ &\underbrace{+\frac{4}{9}(A + R - 2R^*)}_{(+)} \underbrace{-\frac{1}{9}(2A - R - R^*)}_{(-)} \\ &= -\frac{2}{9}\left(4A - 11R + 7R^*\right) = -\frac{2}{9}(4A - 7(R - R^*) - 4R) \gtreqless 0. \end{aligned} \tag{22}$$

NCP clearly influences the results for each country's welfare separately, and plays no role in joint welfare, because they cancel each other. A reduction in R due to capital mobility exerts a positive impact on *Home*'s local monopolist profits (first term), a positive impact on *Home*'s consumer surplus (second term), a negative impact on *Foreign*'s local monopolist profits (third term), and a positive impact on *Foreign*'s consumer surplus (forth term).[12] Surprisingly, the total effect from a reduction of R is ambiguous. The

[12]These last two terms show the spillover effects from a decrease in *Home*'s cost of capital on *Foreign*'s welfare. That is, a decrease in *Home*'s cost of capital causes an increase in the optimal *Home* output and leads to lower *Foreign* production and profits. Moreover, a decrease in *Home*'s cost of capital, R, *ceteris*

source of this ambiguity is our assumption of an imperfectly competitive product market. Note that under a perfectly competitive product market, the first and the third terms (i.e., the effect on the profits of the two local monopolists) of eq. (22) are absent and thus the total effect of the reduction in R on welfare is positive. If, however, the market size A is sufficiently large and/or the difference between the initial costs of capital is small, then the decrease in R increases joint welfare.[13]

Next, we examine how an increase in *Foreign*'s cost of capital, R^*, affects joint welfare. Differentiating eq. (21) with respect to R^*, gives the effect on joint welfare as:

$$JW_{R^*} = W^*_{R^*} + W_{R^*} \quad = -\frac{2}{9}\left(4A + 7R - 11R^*\right) < 0, \tag{23}$$

Equation (23) shows that a marginal increase in R^* has a negative impact on joint welfare (see appendix A4 for analytical calculations). In the next proposition, we summarize how changes in the cost of capital affect the joint welfare as follows:

Proposition 3. *Consider a two-country model with an international duopoly. i) The reduction of the high cost of capital in Home improves the joint welfare if the market size is sufficiently large. ii) The increase of the low capital cost in Foreign, R^*, unambiguously reduces the joint welfare.*

So far our marginal analysis shows that within an international duopoly model, the introduction of international capital mobility is far from a win-win situation for the two countries and for their joint welfare. We show that the welfare of *Home*, the country with high capital cost, improves for sufficiently large market size and/or small differences in the cost of capital. The welfare of *Foreign*, the low-cost country, increases with an increase in R^* only under very restrictive assumptions and is very likely to decrease. Finally, we

paribus leads to a higher *Home* total production $x + y$, lower price, and thus higher *Foreign* consumer surplus (i.e., $(y + y^*)^2/2$) (see appendix A4 for analytical calculations).

[13]From eq. (22) it is clear that in the special case, where $R = R^*$ and given the initial condition for interior solution (i.e., $A > 2R - R^*$), we find that $JW_{R^*} < 0$.

show when R is reduced, in order to get a Pareto-improved outcome for joint welfare, a large-enough market size, A is needed. Our results crucially depend on the model's assumption of imperfect competition, on the total market size, and on the initial cost of capital in the two countries.

3.3 Country size heterogeneity

For simplicity, up to now, we assume no market-size heterogeneity for the two countries. In this section we relax this assumption. We set *Foreign*'s market size equal to B. Consequently, we redefine *Foreign*'s inverse demand to capture the new *Foreign* market size as:

$$p(q^*) = B - q^*, \tag{24}$$

where $B > 0$ is the demand intercept that represents *Foreign*'s market size. Utilizing eqs. (1) - (11) but replacing the initial *Foreign* inverse demand (i.e., eq. (2) with eq. (24)), we run exactly the same analysis to the one of the subsections 3.1 - 3.2.

The obtained results under market-size heterogeneity are consistent with our baseline results presented above. More precisely, the higher the total market size and the lower the difference between the initial cost of capital in the two countries, the easier it is for joint welfare to increase when *Home*'s cost of capital falls. Note that we obtain this result independently of the relationship between *Home*'s and *Foreign*'s market size (i.e., $A \gtreqless B$). Because these results do not add more information than those obtained without market-size heterogeneity, and due to the complexity of the equations, we do not report them in the main text.[14] Nevertheless, we provide a comprehensive table of simulations using the equations with market-size heterogeneity in section 4, which follows.

[14]All the equations with market size heterogeneity are available upon request.

4 The welfare effects of the simulation analysis

Section 3 covers the analysis of the marginal effects of a capital-cost convergence between two countries on their welfare levels and joint welfare. In this section, we run a simulation and examine how the convergence of the cost of capital due to capital-market integration between the two countries affects (i) the welfare of the country with initially high capital cost, (ii) the welfare of the country with initially low capital cost, and (iii) the joint welfare. Specifically, we run a simulation using the model developed in section 3, captured by eqs. (1)-(11).[15] The welfare levels of each country for the various levels of capital-market integration depend on the model parameters $\{R, R^*, A\}$. We set the initial, without capital mobility, cost of capital for *Home* $R = 10$ and for *Foreign* $R^* = 4$. We examine four different market sizes: a very small market ($A = 20$), a small market ($A = 30$), a moderate market ($A = 60$), and a large market ($A = 80$).[16] Note that according to the model's restrictions and our choices for R and R^*, a market size $A > 16$ is required for an interior solution.

In tables 1-3 we show *Home*'s welfare, *Foreign*'s welfare and the joint welfare for various levels of integration (no capital mobility, as well as small, medium, high, and perfect integration). The higher the level of capital-market integration, the lower *Home*'s cost of capital is (see Column 1 of each table), and the higher *Foreign*'s cost of capital (see column 2). The last three columns show the welfare levels for *Home*, *Foreign* and the joint.

Table 1 presents the case where the change in *Home*'s cost of capital equals the absolute value of *Foreign*'s cost of capital (i.e., $|-dR| = |dR^*|$). Under this scenario, the

[15] The simulations incorporate the relevant model's restrictions as they described by eq. (A2).

[16] We also examine the restrictive scenario of an extremely small market size ($A = 16.5$) under three different scenarios: (i) $|-dR| > |dR^*|$ (see table B1 and figure 2), (ii) $|-dR| = |dR^*|$ (see table B2) and (iii) $|-dR| < |dR^*|$ (see table B3). We find that *Foreign* for a small degree of capital-market integration is better off only under the first scenario. As we explain in section 3, net capital payments drive this outcome.

average cost of capital doesn't change during the whole integration process (i.e., it is always identical to the initial one at Level 0, and is equal to 7). We report three findings that are common across all the panels of table 1. First, *Home*'s welfare is improved for a sufficiently large market size A, and/or a high level of capital integration. Second, *Foreign*'s welfare decreases for each market size and each level of integration. Third, an increase in the capital-market integration always reduces the two countries' joint welfare. Across all the panels of table 1 we can see that as the marginal costs of the two international rivals come closer, joint welfare decreases. Thus, we can conclude that within our model, the international-capital mobility, which equalizes the cost of capital in the two countries, causes their joint welfare to decrease, compared to the case of no capital mobility. That is, from the perspective of joint welfare, the Cournot with asymmetric marginal cost of capital is a welfare superior to the one with symmetric capital cost. This important result shows that the result in Salant and Shaffer (1999), who show the welfare superiority of the asymmetric case, for a specific industry of a country, carries over to our case with an international duopoly, international capital mobility, and net capital payments.

Proposition 4. *Assume two countries, one with high capital cost and one with low capital cost. Capital-market integration equalizes the cost of capital between the two countries. If the cost of capital under capital mobility, R^{cm}, is identical to the initial average cost of capital without capital mobility, $(R + R^*)/2$, then this capital-integration process results in:*

- *an increase in Home's welfare for a sufficiently large market size and/or high level of integration,*
- *a decrease in Foreign's welfare,*
- *a decrease in joint welfare (i.e., the asymmetric international duopoly is welfare superior to the symmetric one).*

Table 1: The welfare effects of capital-market integration when: $A = B; |-dR| = |dR^*|$

Panel A: Very small market size: $A = 20$; $\alpha = 2.67$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10	4	41.11	145.11	186.22
Level 1: Narrow capital integration	9	5	30.44	135.78	166.22
Level 2: Deep capital integration	8	6	27.78	126.44	154.22
Level 3: Perfect capital integration	**7**	**7**	**33.11**	**117.11**	**150.22**

Panel B: Small market size: $A = 30$; $\alpha = 9.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10	4	161.11	345.11	506.22
Level 1: Narrow capital integration	9	5	163.78	322.44	486.22
Level 2: Deep capital integration	8	6	174.44	299.78	474.22
Level 3: Perfect capital integration	**7**	**7**	**193.11**	**277.11**	**470.22**

Panel C: Moderate market size: $A = 40$; $\alpha = 16$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10	4	370.00	634.00	1004.00
Level 1: Narrow capital integration	9	5	386.00	598.00	984.00
Level 2: Deep capital integration	8	6	410.00	562.00	972.00
Level 3: Perfect capital integration	**7**	**7**	**442.00**	**526.00**	**968.00**

Panel D: Large market size: $A = 60$; $\alpha = 29.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10	4	1054.44	1478.44	2532.89
Level 1: Narrow capital integration	9	5	1097.11	1415.78	2512.89
Level 2: Deep capital integration	8	6	1147.78	1353.11	2500.89
Level 3: Perfect capital integration	**7**	**7**	**1206.44**	**1290.44**	**2496.89**

Panel E: Very large market size: $A = 80$; $\alpha = 42.67$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10	4	2094.44	2678.44	4772.89
Level 1: Narrow capital integration	9	5	2163.78	2589.11	4752.89
Level 2: Deep capital integration	8	6	2241.11	2499.78	4740.89
Level 3: Perfect capital integration	**7**	**7**	**2326.44**	**2410.44**	**4736.89**

Keeping the assumption that a change in *Home*'s cost of capital equals the absolute value of *Foreign*'s cost of capital (i.e., $|-dR| = |dR^*|$), we evaluate the robustness of proposition 4 in the case of market-size heterogeneity. We simulate the model in eqs. (1) - (11), where the initial *Foreign* inverse demand defined in eq. (2) is replaced by (24). In the appendix B, table B4 reports the results when $A \leq B$ and table B5 when $A \geq B$. Both scenarios yield qualitatively similar results to the ones in table 1: (i) *Home*'s welfare increases for a large-enough market size $(A + B)$ and/or high level of capital integration, (ii) *Foreign*'s welfare decreases, and (iii) the joint welfare decreases as the capital integration proceeds.

We obtain the results in table 1 under the assumption that $|-dR| = |dR^*|$. This condition yields an equilibrium, where the cost of capital under a perfectly integrated capital market equals the average cost of capital in the two countries without capital mobility (i.e., at Level 0). Table 2 and figure 1 present the results under the assumption $|-dR| > |dR^*|$. In this case, the integration process ends up with a lower average cost than the one with no integration (i.e., 6 at Level 4 compared to 7 at Level 0).

Panel A in table 2 presents the welfare levels for each level of capital-market integration between two relatively small countries ($A = 20$) and shows that *Home* must reach the highest level of integration (i.e., perfect capital integration) in order to enjoy a higher welfare level (47.11 at Level 4 compared to 41.11 at Level 0). *Foreign* is worst off, but the same holds for joint welfare. In panel B we run the same exercise for a larger market size, ($A = 30$). In this case *Home* achieves a higher welfare level even from the first level of integration (165.63 at Level 1 compared to 161.11 at Level 0), while *Foreign* is again worse off. Joint welfare improves only under a perfectly integrated capital market (512 at Level 4 compared to 506.22 at Level 0). This means that we end up with a Pareto-improved outcome because *Home*'s gains are high enough to fully compensate *Foreign* for its losses. Moving to panel C which uses a moderate market size ($A = 40$), *Home* once again is better off even from the first level of integration, but *Foreign* is worse off. Contrary to panel B, joint welfare requires only moderate integration level (Level 2) in order to improve. Panel D presents the results when this process occurs between two large countries ($A = 60$). In this case, *Home* is better off even from the initial level of integration, and *Foreign* is worse off as previously. The joint welfare is higher even from the initial level of the process (Level 1). Last, panel E yields similar results with panel D.[17] The conclusions from table 2 are illustrated in figure 1 and are summarized in Proposition 5.

For coherence and completeness purposes, we also run the same exercise, but for an extremely small market size (in terms of our F.O.C.), i.e., $A = 16.5$. Only under this restricted scenario that includes (i) $|-dR| > |dR^*|$, (ii) market size very close to A^{min}, and (iii) very narrow integration level, *Foreign* may achieve a welfare improvement from an increase in its cost of capital due to capital mobility. The results for this scenario are presented in table B1 and in figure 2 in the appendix B. According to it, when the economies move from "No-mobility" to "Narrow capital integration," *Foreign*'s welfare rises from 96.11 to 96.63.

Proposition 5. *Assume two countries, Home with high capital cost and Foreign with low capital cost. Capital-market integration equalizes the cost of capital between the two countries. If the cost of capital under capital mobility, R^{cm}, is lower than the average of the initial cost of capital without capital mobility, $(R+R^*)/2$, then this capital integration process results in:*

- *an increase in Home's welfare for a sufficiently large market size and/or high level of integration,*
- *a decrease in Foreign's welfare, except for the restrictive case of an extremely small market along with a very limited level of integration,*
- *an increase in joint welfare only under a large-enough market size and/or a high level of capital integration.*

[17] Running the same exercise under market-size heterogeneity (i.e., $A \neq B$), we end up with exactly the same qualitative results. We do not report these results, however they are available upon request.

Table 2: The welfare effects of capital-market integration when: $A = B; |-dR| > |dR^*|$

Panel A: Very small market size: $A = 20$; $\alpha = 2.67$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	41.11	145.11	186.22
Level 1: Narrow capital integration	9.00	4.50	33.40	142.90	176.31
Level 2: Moderate capital integration	8.00	5.00	31.83	139.17	171.00
Level 3: Deep capital integration	7.00	5.50	36.40	133.90	170.31
Level 4: Perfect capital integration	**6.00**	**6.00**	**47.11**	**127.11**	**174.22**

Panel B: Small market size: $A = 30$; $\alpha = 9.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	161.11	345.11	506.22
Level 1: Narrow capital integration	9.00	4.50	165.63	335.13	500.75
Level 2: Deep capital integration	8.00	5.00	176.28	323.61	499.89
Level 3: Deep capital integration	7.00	5.50	193.07	310.57	503.64
Level 4: Perfect capital integration	**6.00**	**6.00**	**216.00**	**296.00**	**512.00**

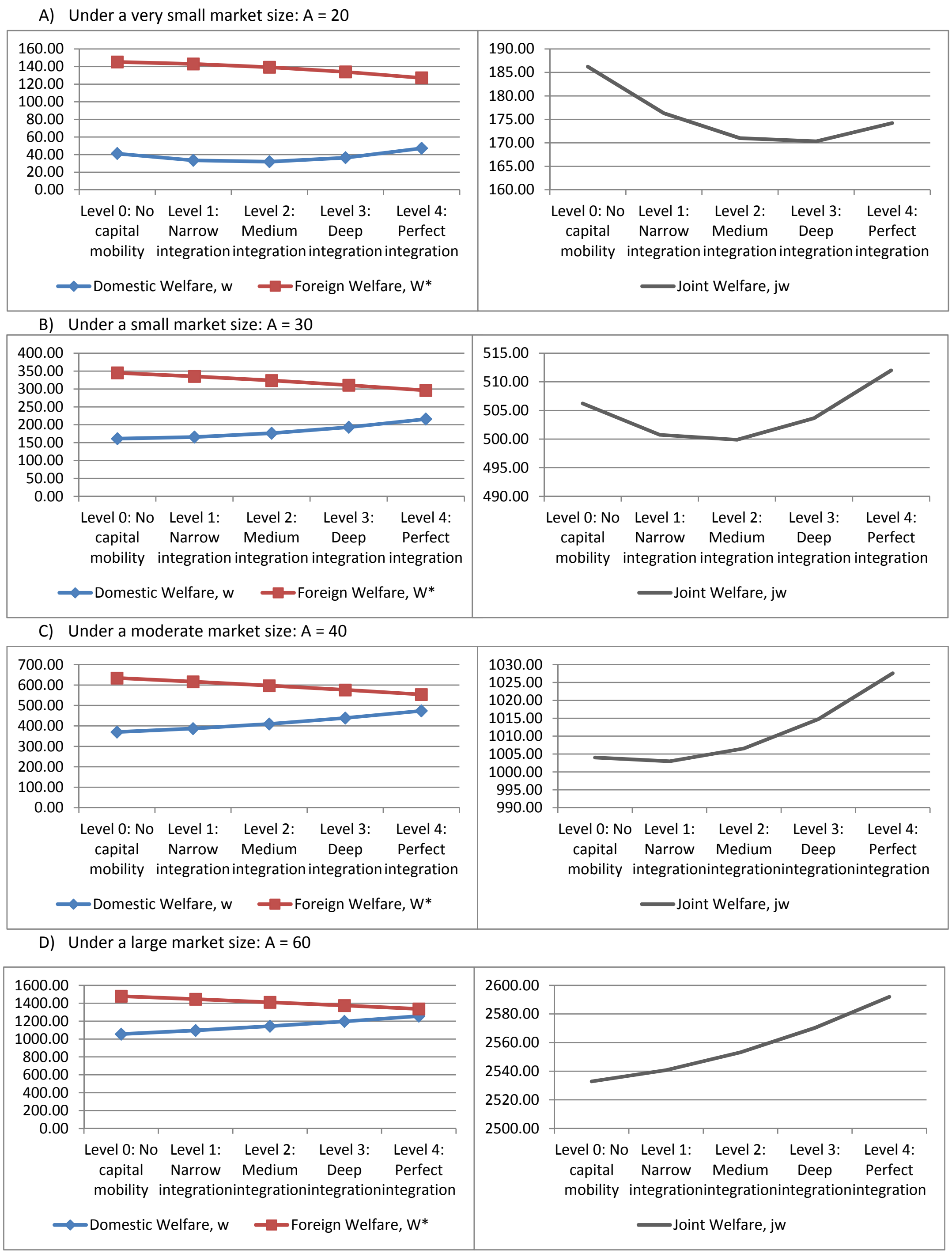
Panel C: Moderate market size: $A = 40$; $\alpha = 16$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	370.00	634.00	1004.00
Level 1: Narrow capital integration	9.00	4.50	386.74	616.24	1002.97
Level 2: Moderate capital integration	8.00	5.00	409.61	596.94	1006.56
Level 3: Deep capital integration	7.00	5.50	438.63	576.13	1014.75
Level 4: Perfect capital integration	**6.00**	**6.00**	**473.78**	**553.78**	**1027.56**

Panel D: Large market size: $A = 60$; $\alpha = 29.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	1054.44	1478.44	2532.89
Level 1: Narrow capital integration	9.00	4.50	1095.63	1445.13	2540.75
Level 2: Moderate capital integration	8.00	5.00	1142.94	1410.28	2553.22
Level 3: Deep capital integration	7.00	5.50	1196.40	1373.90	2570.31
Level 4: Perfect capital integration	**6.00**	**6.00**	**1256.00**	**1336.00**	**2592.00**

Panel E: Very large market size: $A = 80$; $\alpha = 42.67$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	2094.44	2678.44	4772.89
Level 1: Narrow capital integration	9.00	4.50	2160.07	2629.57	4789.64
Level 2: Moderate capital integration	8.00	5.00	2231.83	2579.17	4811.00
Level 3: Deep capital integration	7.00	5.50	2309.74	2527.24	4836.97
Level 4: Perfect capital integration	**6.00**	**6.00**	**2393.78**	**2473.78**	**4867.56**

Particularly, figure 1 presents the integration process under four different market sizes. The total outcome is consistent with propositions 1-4. The plot on the LHS for each pair shows the

Figure 1: The welfare effects of capital-market integration when $A = B$; $|-dR| > |dR^{*}|$



welfare level for each country during the capital-integration process and as expected, it maps the welfare convergence for the two countries. The RHS plot in each pair shows how joint welfare responds to this capital-market integration process. Clearly the market size, A, as well as the differences in the marginal cost of capital, $(R - R^*)$, affect joint welfare in the manner explained earlier.

In table 3 we examine a case in which the capital-market integration process decreases *Home*'s cost of capital by less than it increases *Foreign*'s cost of capital (i.e., $|-dR| < |dR^*|$). In this case, the equilibrium cost of capital under a perfect capital-market integration is higher than the average of the initial cost of capital in the two countries (e.g., the average cost of capital equals 8 at Level 4 compared to 7 at Level 0). Similar to all the previous scenarios, *Home*'s welfare improves in a sufficiently large market size and/or high level of integration, but *Foreign* is worse off. Finally, under the current scenario, a capital-market integration process reduces the joint welfare independently of market size, A (see panels A-E of table 3).[18]

Proposition 6. *Assume two countries, Home with high capital cost and Foreign with low capital cost. Capital-market integration equalizes the cost of capital between the two countries. If the cost of capital under capital mobility, R^{cm}, is higher than the average of the initial cost of capital without capital mobility, $(R + R^*)/2$, then this capital integration process results in:*

- *an increase in Home's welfare for a sufficiently large market size and/or high level of integration,*
- *a decrease in Foreign's welfare,*
- *a decrease in joint welfare.*

[18]Once again, running the same exercise under market-size heterogeneity (i.e., $A \neq B$), we end up with exactly the same qualitative results. We do not report these results; however they are available upon request.

Table 3: The welfare effects of capital-market integration when: $A = B; |-dR| < |dR^*|$

Panel A: Very small market size: $A = 20$; $\alpha = 2.67$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	41.11	145.11	186.22
Level 1: Narrow capital integration	9.50	5.00	31.46	133.29	164.75
Level 2: Moderate capital integration	9.00	6.00	24.94	122.94	147.89
Level 3: Deep capital integration	8.50	7.00	21.57	114.07	135.64
Level 4: Perfect capital integration	**8.00**	**8.00**	**21.33**	**106.67**	**128.00**

Panel B: Small market size: $A = 30$; $\alpha = 9.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	161.11	345.11	506.22
Level 1: Narrow capital integration	9.50	5.00	159.24	321.07	480.31
Level 2: Moderate capital integration	9.00	6.00	160.50	298.50	459.00
Level 3: Deep capital integration	8.50	7.00	164.90	277.40	442.31
Level 4: Perfect capital integration	**8.00**	**8.00**	**172.44**	**257.78**	**430.22**

Panel C: Moderate market size: $A = 40$; $\alpha = 16$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	370.00	634.00	1004.00
Level 1: Narrow capital integration	9.50	5.00	375.90	597.74	973.64
Level 2: Moderate capital integration	9.00	6.00	384.94	562.94	947.89
Level 3: Deep capital integration	8.50	7.00	397.13	529.63	926.75
Level 4: Perfect capital integration	**8.00**	**8.00**	**412.44**	**497.78**	**910.22**

Panel D: Large market size: $A = 60$; $\alpha = 29.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	1054.44	1478.4	2532.89
Level 1: Narrow capital integration	9.50	5.00	1075.90	1417.74	2493.64
Level 2: Moderate capital integration	9.00	6.00	1100.50	1358.50	2459.00
Level 3: Deep capital integration	8.50	7.00	1128.24	1300.74	2428.97
Level 4: Perfect capital integration	**8.00**	**8.00**	**1159.11**	**1244.44**	**2403.56**

Panel E: Very large market size: $A = 80$; $\alpha = 42.67$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	2094.44	2678.44	4772.89
Level 1: Narrow capital integration	9.50	5.00	2131.46	2593.29	4724.75
Level 2: Moderate capital integration	9.00	6.00	2171.61	2509.61	4681.22
Level 3: Deep capital integration	8.50	7.00	2214.90	2427.40	4642.31
Level 4: Perfect capital integration	**8.00**	**8.00**	**2261.33**	**2346.67**	**4608.00**

5 Concluding remarks

We build a simple two-country model with international duopoly, where the cost of capital is not equal between the two countries. Within this framework we allow free capital mobility, which results in the convergence of the cost of capital in the two countries, and we examine the effects of this convergence on the welfare of each country and on their joint welfare.

The marginal analysis, where we allow for a small change in the cost of capital for each country, shows that international capital movements cannot guarantee the improvement in each country's welfare and in their joint welfare. Specifically, we show, among other things, that i) reducing the cost of capital due to free mobility between two countries increases the welfare of the high-cost country (*Home*) if the market size is sufficiently large; ii) increasing capital cost, decreases the welfare of the low-cost country (*Foreign*), except under a very restrictive scenario with an extremely small total market size associated with a very small difference in the cost of capital; iii) convergence in the cost of capital increases the joint welfare of the two countries if the reduction in the high-cost country's cost of capital (*Home*) is associated with a sufficiently large market size; and iv) the increase in the low-cost country's capital cost (*Foreign*) unambiguously decreases the joint welfare. Our results crucially depend on our assumption of an international duopoly, on the total market size, and on the initial differences in the capital cost between the two countries.

The simulation study shows that the only scenario in which the perfect capital-market integration increases the two countries' joint welfare is when a) the common cost of capital due to free capital mobility is lower than the average of the initial cost of capital in the two countries; and b) the market size is sufficiently large. We find that irrespective of the market size in the two countries, when the common cost of capital after the free capital mobility equals the average initial cost of capital in the two countries, their joint welfare unambiguously decreases with free capital mobility. That is, free capital mobility that equalizes the marginal cost of capital in the two countries leads to a welfare inferior outcome compared to the case of no capital mobility and unequal marginal cost of capital. Thus, the well known result of Salant and Shaffer (1999) who showed, within an industry of one country, that the symmetric Cournot is a welfare inferior to the asymmetric one, curries over to our framework with an international duopoly, international capital mobility and net capital payments.

In the presence of an international duopoly, the unrestricted capital-market integration that converges cost among countries is not necessarily socially desirable in the sense that it does not always lead to a Pareto-improved outcome. These results add to the general debate concerning the use of capital restrictions between countries in order to avoid a series of negative consequences for their welfare. In this sense, our study adds another argument against unrestricted international capital flows.

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Appendix A The welfare effects of capital-market integration

Appendix A.1 First-order conditions

Solving the profit maximization problem for the firms (see eqs. (10) and (11)), we can obtain the equilibrium outputs as follows:

$$\left\{ \begin{aligned} \hat{x} &= \frac{1}{3}(A - 2R + R^*), \hat{y} = \frac{1}{3}(A - 2R + R^*), \\ \hat{x}^* &= \frac{1}{3}(A + R - 2R^*), \hat{y}^* = \frac{1}{3}(A + R - 2R^*). \end{aligned} \right\} \tag{A1}$$

Using the conditions (A1), we derive the conditions required for an interior solution as follows:

$$(A - 2R + R^*) > 0; (A + R - 2R^*) > 0. \tag{A2}$$

According to eq. (A2), it is required that $A > 2R - R^*$ and $A > 2R^* - R$. However, since $R > R^*$, what is actually required is that $A > 2R - R^*$.

Appendix A.2 The effect on ***Home***'s welfare

Differentiating *Home* welfare (i.e., eq. (5)) with respect to its own marginal cost yields:

$$\frac{\partial W}{\partial R} = \frac{\partial \Pi}{\partial R} + \frac{\partial CS}{\partial R} - \phi \frac{\partial NCP}{\partial R}$$

Substitute the equilibrium outputs from eq. (A1) and calculating each partial derivative on the RHS, we obtain:

$$
\begin{aligned}
\frac{\partial \Pi}{\partial R} &= (A - x - x^*)\frac{\partial x}{\partial R} - x\left(\frac{\partial x}{\partial R} + \frac{\partial x^*}{\partial R}\right) + (A - y - y^*)\frac{\partial y}{\partial R} - y\left(\frac{\partial y}{\partial R} + \frac{\partial y^*}{\partial R}\right) \\
&\quad - R\left(\frac{\partial x}{\partial R} + \frac{\partial y}{\partial R}\right) - (x + y) \Rightarrow \\
\frac{\partial \Pi}{\partial R} &= (A - 2x - x^* - R)\frac{\partial x}{\partial R} - (A - 2y - y^* - R)\frac{\partial y}{\partial R} - x\frac{\partial x^*}{\partial R} - y\frac{\partial y^*}{\partial R} - (x + y) \Rightarrow \\
\frac{\partial \Pi}{\partial R} &= -\frac{8}{9}(A - 2R + R^*) < 0
\end{aligned}
\tag{A3}
$$

$$
\begin{aligned}
\frac{\partial CS}{\partial R} &= (x + x^*)\left(\frac{\partial x}{\partial R} + \frac{\partial x^*}{\partial R}\right) \Rightarrow \\
\frac{\partial CS}{\partial R} &= -\frac{1}{9}(2A - R - R^*) < 0
\end{aligned}
\tag{A4}
$$

$$
\begin{aligned}
\frac{\partial NCP}{\partial R} &= (x + y - \alpha) + R\left(\frac{\partial x}{\partial R} + \frac{\partial x^*}{\partial R}\right) \Rightarrow \\
\frac{\partial NCP}{\partial R} &= \frac{2}{3}(A - 4R + R^*) - \alpha \gtreqless 0
\end{aligned}
\tag{A5}
$$

Finally, we add eqs. (A3)-(A5) to obtain the total effect of a decrease in *Home*'s cost of capital on its welfare as shown in eq. (14).

Appendix A.3 The effect on *Foreign*'s welfare

Differentiating *Foreign* welfare (i.e., eq. (6)) with respect to its own marginal cost, we obtain:

$$
\frac{\partial W^*}{\partial R^*} = \frac{\partial \Pi^*}{\partial R^*} + \frac{\partial CS^*}{\partial R^*} + \phi\frac{\partial NCP}{\partial R^*}
$$

Substituting the equilibrium outputs from eq. (A1) and calculating each partial derivative on the RHS, we obtain:

$$
\begin{aligned}
\frac{\partial \Pi^*}{\partial R^*} &= (A - x - x^*)\frac{\partial x^*}{\partial R^*} - x^*\left(\frac{\partial x}{\partial R^*} + \frac{\partial x^*}{\partial R^*}\right) + (A - y - y^*)\frac{\partial y^*}{\partial R^*} - y^*\left(\frac{\partial y}{\partial R^*} + \frac{\partial y^*}{\partial R^*}\right) \\
&\quad - R^*\left(\frac{\partial x^*}{\partial R^*} + \frac{\partial y^*}{\partial R^*}\right) - (x^* + y^*) \Rightarrow \\
\frac{\partial \Pi^*}{\partial R^*} &= (A - x - 2x^* - R^*)\frac{\partial x^*}{\partial R^*} - (A - y - 2y^* - R^*)\frac{\partial y^*}{\partial R^*} - x^*\frac{\partial x}{\partial R^*} - y^*\frac{\partial y}{\partial R^*} - (x^* + y^*) \Rightarrow \\
\frac{\partial \Pi^*}{\partial R^*} &= -\frac{8}{9}(A + R - 2R^*) < 0
\end{aligned}
\tag{A6}
$$

$$\frac{\partial CS^*}{\partial R^*} = (y + y^*)\left(\frac{\partial y}{\partial R^*} + \frac{\partial y^*}{\partial R^*}\right) \Rightarrow$$
$$\frac{\partial CS^*}{\partial R^*} = -\frac{1}{9}(2A - R - R^*) < 0 \tag{A7}$$

$$\frac{\partial NCP}{\partial R^*} = R\left(\frac{\partial x}{\partial R^*} + \frac{\partial y}{\partial R^*}\right) \Rightarrow$$
$$\frac{\partial NCP}{\partial R^*} = \frac{2}{3}R < 0 \tag{A8}$$

Finally, we add eqs. (A6) and (A8) to obtain the total effect of an increase in *Foreign*'s cost of capital on its welfare as we show in eq. (18).

Appendix A.4 Effects on *Foreign*'s welfare: A numerical example

We present below how an increase of *Foreign*'s cost of capital, R^*, affects its welfare, using the restrictions of the F.O.C. for an interior solution (i.e., $A - 2R + R^* > 0$) as well as eqs. (18) - (20) for two different scenarios: (i) $A \in (A^{min}, A_I^*)$ (i.e., a relatively small market size), and (ii) $A > A_I^*$ (i.e., a relatively large market size).

Example 1:

Cost of capital for *Home* and *Foreign*: $(R = 5,\ R^* = 4) \Rightarrow \frac{R}{R^*} = (5/4) < \frac{27}{21}$

So, using eq. (20): $A^{min} < A_I^*$

Using the F.O.C.: $A^{min} = 2R - R^* > 0 \Rightarrow A^{min} = 2(5) - 4 \Rightarrow A^{min} = 6$

Using eq. (18): $W^*_{R^*} > 0 \Rightarrow A < \frac{-R+17R^*}{10} \Rightarrow A < \frac{-5+17(4)}{10} \Rightarrow A < 6.3$ and thus $A_I^* = 6.3$

So, for: $A \in (A^{min}, A_I^*) \Rightarrow A \in (6, 6.3)$, $W^*_{R^*} > 0$

Using eq. (18):

Scenario 1: $A = 6.1 \Rightarrow W^*_{R^*} = -\frac{1}{9}\left(10(6.1) + 5 - 17(4)\right) = -\frac{1}{9}\left(-2\right) \Rightarrow W^*_{R^*} = \frac{2}{9} > 0$

Scenario 2: $A = 6.4 \Rightarrow W^*_{R^*} = -\frac{1}{9}\left(10(6.4) + 5 - 17(4)\right) = -\frac{1}{9}\left(1\right) \Rightarrow W^*_{R^*} = -\frac{1}{9} < 0$

Example 2:

Cost of capital for *Home* and *Foreign*: $(R = 6,\ R^* = 4) \Rightarrow \frac{R}{R^*} = (6/4) > \frac{27}{21}$

So, using eq. (20): $A^{min} > A_I^*$

Using the F.O.C.: $A^{min} = 2R - R^* > 0 \Rightarrow A^{min} = 2(6) - 4 \Rightarrow A^{min} = 8$

Using eq. (18): $W^*_{R^*} > 0 \Rightarrow A < \frac{-R+17R^*}{10} \Rightarrow A < \frac{-6+17(4)}{10} \Rightarrow A < 6.2$ and thus $A^*_I = 6.2$

So, for $(R = 6,\ R^* = 4)$**:** $A^{min} > A^*_I$, and thus there is no scenario where $W^*_{R^*} > 0$.

<u>**Example 3:**</u>

Cost of capital for *Home* and *Foreign*: $(R = 150,\ R^* = 130) \Rightarrow \frac{R}{R^*} = \frac{150}{130} < \frac{27}{21}$

So, using eq. (20): $A^{min} < A^*_I$

Using the F.O.C.: $A^{min} = 2R - R^* > 0 \Rightarrow A^{min} = 2(150) - 130 \Rightarrow A^{min} = 170$

Using eq. (18): $W^*_{R^*} > 0 \Rightarrow A < \frac{-R+17R^*}{10} \Rightarrow A < \frac{-150+17(130)}{10} \Rightarrow A < 206$ and thus $A^*_I = 206$

So, for: $A \in (A^{min}, A^*_I) \Rightarrow A \in (170, 206)$, $W^*_{R^*} > 0$

Using eq. (18):

Scenario 1: $A = 200 \Rightarrow W^*_{R^*} = -\frac{1}{9}\left(10(200) + 150 - 17(130)\right) = -\frac{1}{9}\left(-60\right) \Rightarrow W^*_{R^*} = \frac{60}{9} > 0$

Scenario 2: $A = 207 \Rightarrow W^*_{R^*} = -\frac{1}{9}\left(10(207) + 150 - 17(130)\right) = -\frac{1}{9}\left(10\right) \Rightarrow W^*_{R^*} = -\frac{10}{9} < 0$

<u>**Example 4:**</u>

Cost of capital for *Home* and *Foreign*: $(R = 160,\ R^* = 120) \Rightarrow \frac{R}{R^*} = \frac{160}{120} > \frac{27}{21}$

So, using eq. (20): $A^{min} > A^*_I$

Using the F.O.C.: $A^{min} = 2R - R^* > 0 \Rightarrow A^{min} = 2(160) - 120 \Rightarrow A^{min} = 200$

Using eq. (18): $W^*_{R^*} > 0 \Rightarrow A < \frac{-R+17R^*}{10} \Rightarrow A < \frac{-160+17(120)}{10} \Rightarrow A < 188$ and thus $A^*_I = 188$

So, for $(R = 160,\ R^* = 120)$**:** $A^{min} > A^*_I$, and thus there is no scenario where $W^*_{R^*} > 0$.

Appendix A.5 The effects on joint welfare

Differentiating joint welfare (i.e., eq. (21)) with respect to *Home*'s cost of capital, R, gives:

$$\frac{\partial JW}{\partial R} = \frac{\partial W}{\partial R} + \frac{\partial W^*}{\partial R}$$

The first term on the RHS is given by eq. (14). Using equations (6), (8) and (11), and the equilibrium output from (A1), the effect of a change in *Home*'s cost of capital on *Foreign*'s welfare is given as follows:

$$
\begin{aligned}
\frac{\partial \Pi^*}{\partial R} &= (A-x-x^*)\frac{\partial x^*}{\partial R} - x^*\left(\frac{\partial x}{\partial R}+\frac{\partial x^*}{\partial R}\right) + (A-y-y^*)\frac{\partial y^*}{\partial R} - y^*\left(\frac{\partial y}{\partial R}+\frac{\partial y^*}{\partial R}\right) \\
&\quad - R^*\left(\frac{\partial x^*}{\partial R}+\frac{\partial y^*}{\partial R}\right) \Rightarrow \\
\frac{\partial \Pi^*}{\partial R} &= (A-x-2x^*-R)\frac{\partial x^*}{\partial R} - (A-y-2y^*-R^*)\frac{\partial y^*}{\partial R} - x^*\frac{\partial x}{\partial R} - y^*\frac{\partial y}{\partial R} \Rightarrow \\
\frac{\partial \Pi^*}{\partial R} &= \frac{4}{9}(A+R-2R^*) > 0
\end{aligned}
\tag{A9}
$$

$$
\begin{aligned}
\frac{\partial CS^*}{\partial R} &= (y+y^*)\left(\frac{\partial y}{\partial R}+\frac{\partial y^*}{\partial R}\right) \Rightarrow \\
\frac{\partial CS^*}{\partial R} &= -\frac{1}{9}(2A-R-R^*) < 0
\end{aligned}
\tag{A10}
$$

$$
\begin{aligned}
\frac{\partial NCP^*}{\partial R} = -\frac{\partial NCP}{\partial R} &= -(x+y-\alpha) - R\left(\frac{\partial x}{\partial R}+\frac{\partial y}{\partial R}\right) \Rightarrow \\
\frac{\partial NCP^*}{\partial R} &= -\frac{2}{3}(A-4R+R^*) + \alpha \gtrless 0
\end{aligned}
\tag{A11}
$$

Finally, we add eqs. (14) and (A9)-(A11) to determine how an increase in *Home*'s cost of capital affects *Foreign*'s welfare as shown in eq. (22). Similarly, the effect of a change in *Foreign*'s cost of capital on the JW is:

$$
\frac{\partial JW}{\partial R^*} = \frac{\partial W^*}{\partial R^*} + \frac{\partial W}{\partial R^*}
$$

The first term on the RHS is given by eq. (18). Using the equilibrium output from (A1) and equations (6), (8), and (11), the effect of a change in *Foreign*'s cost of capital on *Home*'s welfare, is given by:

$$
\begin{aligned}
\frac{\partial \Pi}{\partial R^*} &= (A-x-x^*)\frac{\partial x}{\partial R^*} - x\left(\frac{\partial x}{\partial R^*}+\frac{\partial x^*}{\partial R^*}\right) + (A-y-y^*)\frac{\partial y}{\partial R^*} - y\left(\frac{\partial y}{\partial R^*}+\frac{\partial y^*}{\partial R^*}\right) \\
&\quad - R\left(\frac{\partial x}{\partial R^*}+\frac{\partial y}{\partial R^*}\right) \Rightarrow \\
\frac{\partial \Pi}{\partial R^*} &= (A-2x-x^*-R)\frac{\partial x}{\partial R^*} - (A-2y-y^*-R^*)\frac{\partial y}{\partial R^*} - x\frac{\partial x^*}{\partial R^*} - y\frac{\partial y^*}{\partial R^*} \Rightarrow \\
\frac{\partial \Pi}{\partial R^*} &= \frac{4}{9}(A-2R+R^*) > 0
\end{aligned}
\tag{A12}
$$

$$\frac{\partial CS}{\partial R^*} = (x + x^*)\left(\frac{\partial x}{\partial R^*} + \frac{\partial x^*}{\partial R^*}\right) \Rightarrow$$
$$\frac{\partial CS}{\partial R^*} = -\frac{1}{9}(2A - R - R^*) < 0 \tag{A13}$$

$$\frac{\partial NCP}{\partial R^*} = R\left(\frac{\partial x}{\partial R^*} + \frac{\partial y}{\partial R^*}\right) \Rightarrow$$
$$\frac{\partial NCP}{\partial R^*} = \frac{2}{3}R > 0 \tag{A14}$$

Finally, we add eqs. (18) and (A12)-(A14) to obtain the total effect of an increase in *Foreign*'s cost of capital on *Home*'s welfare as shown by eq. (23).

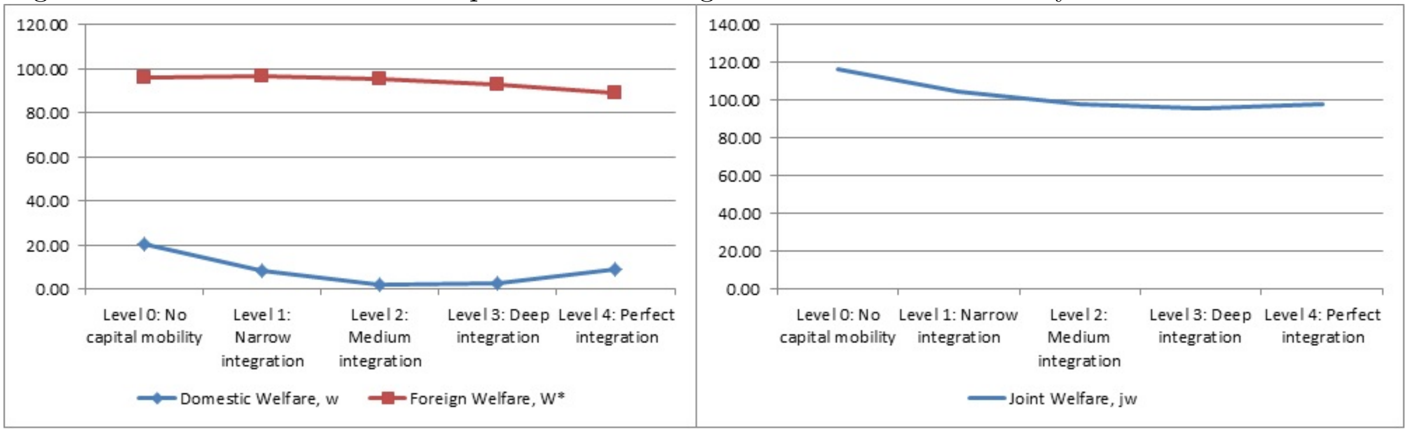
Appendix B Simulation Analysis for *Foreign*

In this appendix, we examine the conditions under which capital-market integration improves the welfare level of the initially low-capital-cost country. According to the results of our simulations (see proposition 5) for (i) a sufficiently small market size A, associated with (ii) a narrow capital-market integration and only for the case where (iii) the average marginal cost falls due to capital-market integration, the whole process could benefit the low-cost (*Foreign*) country. To get this result, we utilize an extremely small market size ($A = 16.5$), which is slightly higher than the minimum required by our model for an interior solution (i.e., ($A = 16$)). The outcome of this exercise is shown in table B1 and graphically in figure 3 below.

Table B1: The welfare effects of capital-market integration when: $A = B; |-dR| > |dR^*|$

Extremely small market size: $A = 16.5$**;** $\alpha = 0.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	20.11	96.11	116.22
Level 1: Narrow capital integration	9.00	4.50	8.13	96.63	104.75
Level 2: Moderate capital integration	8.00	5.00	2.28	95.61	97.89
Level 3: Deep capital integration	7.00	5.50	2.57	93.07	95.64
Level 4: Perfect capital integration	**6.00**	**6.00**	**9.00**	**89.00**	**98.00**

Figure 2: The welfare effects of capital-market integration under an extremely small market size



The above three conditions must be satisfied in order *Foreign* to improve its welfare through capital-market integration. To enhance the clarity of our argument, we also provide exactly the same scenario with the previous case but for the cases where (i) $|-dR| = |dR^*|$ (i.e., unchanged average marginal cost after the capital-market integration) and (ii) $|-dR| < |dR^*|$ (i.e., higher average marginal cost after the capital-market integration). To this end, once again we utilize an extremely small market size ($A = 16.5$), which is slightly higher than the minimum required by our model for an interior solution (i.e., $A = 16$). The outcome of this exercise is shown in tables B2 and B3.

Table B2: The welfare effects of capital-market integration when: $A = B; |-dR| = |dR^*|$

Extremely small market size: $A = 16.5$; $\alpha = 0.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	20.11	96.11	116.22
Level 1: Narrow capital integration	9.00	5.00	4.78	91.44	96.22
Level 2: Deep capital integration	8.00	6.00	-2.56	86.78	84.22
Level 3: **Perfect capital integration**	**7.00**	**7.00**	**-1.89**	**82.11**	**80.22**

Table B3: The welfare effects of capital-market integration when: $A = B; |-dR| < |dR^*|$

Extremely small market size: $A = 16.5$; $\alpha = 0.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	20.11	96.11	116.22
Level 1: Narrow capital integration	9.00	5.00	7.74	88.57	96.31
Level 2: Deep capital integration	8.00	6.00	-1.50	82.50	81.00
Level 3: **Perfect capital integration**	**7.00**	**7.00**	**-7.60**	**77.90**	**70.31**

Table B4: The welfare effects of capital-market integration when: $A \leq B; |-dR| = |dR^*|$

Panel A: Very small market size: $A = 20$, $B = 20$; $\alpha = 2.67$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	41.11	145.11	186.22
Level 1: Narrow capital integration	9.00	5.00	30.44	135.78	166.22
Level 2: Deep capital integration	8.00	6.00	27.78	126.44	154.22
Level 3: Perfect capital integration	**7.00**	**7.00**	**33.11**	**117.11**	**150.22**

Panel B: Small market size: $A = 20$, $B = 30$; $\alpha = 9.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	103.33	491.78	595.11
Level 1: Narrow capital integration	9.00	5.00	106.00	469.11	575.11
Level 2: Deep capital integration	8.00	6.00	116.67	446.44	563.11
Level 3: Perfect capital integration	**7.00**	**7.00**	**135.33**	**423.78**	**559.11**

Panel C: Moderate market size: $A = 20$, $B = 40$; $\alpha = 16$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	254.44	1105.11	1359.56
Level 1: Narrow capital integration	9.00	5.00	270.44	1069.11	1339.56
Level 2: Deep capital integration	8.00	6.00	294.44	1033.11	1327.56
Level 3: Perfect capital integration	**7.00**	**7.00**	**326.44**	**997.11**	**1323.56**

Panel D: Large market size: $A = 20$, $B = 60$; $\alpha = 29.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	823.33	3131.78	3955.11
Level 1: Narrow capital integration	9.00	5.00	866.00	3069.11	3935.11
Level 2: Deep capital integration	8.00	6.00	916.67	3006.44	3923.11
Level 3: Perfect capital integration	**7.00**	**7.00**	**975.33**	**2943.78**	**3919.11**

Panel E: Very large market size: $A = 20$, $B = 80$; $\alpha = 42.67$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	1747.78	6225.11	7972.89
Level 1: Narrow capital integration	9.00	5.00	1817.11	6135.78	7952.89
Level 2: Deep capital integration	8.00	6.00	1894.44	6046.44	7940.89
Level 3: Perfect capital integration	**7.00**	**7.00**	**1979.78**	**5957.11**	**7936.89**

Table B5: The welfare effects of capital-market integration when: $A \geq B; |-dR| = |dR^*|$

Panel A: Very small market size: $A = 20$, $B = 20$; $\alpha = 2.67$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	41.11	145.11	186.22
Level 1: Narrow capital integration	9.00	5.00	30.44	135.78	166.22
Level 2: Deep capital integration	8.00	6.00	27.78	126.44	154.22
Level 3: Perfect capital integration	**7.00**	**7.00**	**33.11**	**117.11**	**150.22**

Panel B: Small market size: $A = 40$, $B = 20$; $\alpha = 9.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	307.78	287.33	595.11
Level 1: Narrow capital integration	9.00	5.00	310.44	264.67	575.11
Level 2: Deep capital integration	8.00	6.00	321.11	242.00	563.11
Level 3: Perfect capital integration	**7.00**	**7.00**	**339.78**	**219.33**	**559.11**

Panel C: Moderate market size: $A = 60$, $B = 20$; $\alpha = 16$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	841.11	518.44	1359.56
Level 1: Narrow capital integration	9.00	5.00	857.11	482.44	1339.56
Level 2: Deep capital integration	8.00	6.00	881.11	446.44	1327.56
Level 3: Perfect capital integration	**7.00**	**7.00**	**913.11**	**410.44**	**1323.56**

Panel D: Large market size: $A = 100$, $B = 20$; $\alpha = 29.33$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	2707.78	1247.33	3955.11
Level 1: Narrow capital integration	9.00	5.00	2750.44	1184.67	3935.11
Level 2: Deep capital integration	8.00	6.00	2801.11	1122.00	3923.11
Level 3: Perfect capital integration	**7.00**	**7.00**	**2859.78**	**1059.33**	**3919.11**

Panel E: Very large market size: $A = 140$, $B = 20$; $\alpha = 42.67$					
Level of capital market integration	*Home*'s cost of capital, R	*Foreign*'s cost of capital, R^*	*Home* Welfare, W	*Foreign* Welfare, W^*	Joint Welfare, JW
Level 0: No capital mobility	10.00	4.00	5641.11	2331.78	7972.89
Level 1: Narrow capital integration	9.00	5.00	5710.44	2242.44	7952.89
Level 2: Deep capital integration	8.00	6.00	5787.78	2153.11	7940.89
Level 3: Perfect capital integration	**7.00**	**7.00**	**5873.11**	**2063.78**	**7936.89**