A New Perspective on Financial Integration*

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Abstract

This paper studies the mechanisms through which financial integration affects the pattern of international capital flows and the domestic economic performances when explicitly accounting for wealth inequality on imperfect capital markets. Balancing the impact of a firm size and a credit rationing effect on the net credit position and aggregate production will help predicting the distribution of gains and losses among and within countries on the basis of a country's aggregate wealth and its distribution. Altogether, the results contribute new explanations for some empirical puzzles. They also bear important implications for policy making, supranational treaty design and financial stability.

Keywords: international financial integration, inequality, imperfect capital markets and allocative efficiency

JEL classification: D24, D31, D61, E44, F36

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1 Introduction

Retrospectively, international financial integration appears to have been the rule rather than the exception over the last centuries. Temporary interruptions mainly arose from the major wars and the Great Depression in the 1930s. While each time, the process was rather spontaneously spurred on anew by the prospect of gains from trade, financial integration has just recently gained a more powerful momentum. Ongoing regional financial integration (i.e. within the EU or ASEAN), GATS negotiations under the auspices of the WTO and the burgeoning emergence of preferential trade agreements (PTAs) including provisions on financial services trade have not only put pressure on the speed of integration, but also on the broadening of the markets involved, in terms of both, geographical scope and the number of financial assets.[1]

Despite this long history and growing interest in policy-making circles, external financial liberalization still constitutes a controversial issue. Based on assumed differences in the marginal product of capital across countries, standard economic theory promises benefits for developing and developed countries alike. While the first use capital inflows to speed up the convergence process, the second enjoy higher returns on capital and risk reduction through enhanced portfolio diversification (see e.g. Stulz, 2005 or Eichengreen and Mussa, 1998). On the other hand, financial openness bears many risks for financial stability and must therefore be accompanied by a range of costly safeguard measures (see e.g. Schmukler, 2003 or Fischer, 1997). All the more is it a matter of dispute that many of the predicted gains in welfare and growth have not always come to pass. As examined by the European Commission (2006), improvements in both, competition and efficiency have been limited despite a fully integrated EU capital market and quasi unrestricted financial services trade since 1996. Also growth (see e.g. the review by Edison et al., 2002) and the associated flows of capital from capital-abundant to capital-scarce countries have picked-up less than expected. Prasad et al. (2003, 2006) obtain that despite very few de jure restrictions to capital movements, effective external financing remains at very low levels in most African countries. With their analysis suggesting a positive correlation between a country's state of financial development and access to foreign financing, they conclude that a low financial development causes a lack of absorptive capacities for capital inflows from abroad.

The purpose of this paper is to identify the origins of lacking absorptive capacities without drawing on differences in the state of financial development or the degree of financial market competition. Attempting to reconcile theory and evidence, it studies the impact of international financial integration coming not only from countries' capital endowments, but also from its distribution among residents in the presence of capital market imperfections. For this purpose, I recur to a simple capital market model featuring a concave production technology and wealth heterogeneity among agents. These seek external financing to optimally capitalize a venture. Yet, with credit relationships be-

[1] Also see e.g. Lothian (2001) and a survey by Chivakul, Cossé and Gerling (2007).

ing subject to a variety of agency and contractual enforcement problems, the lender can only recover a fraction of the project output if the borrower defaults. The lender therefore requires the borrower to put up a collateral. Although it ensures incentive-compatibility, it also makes the insufficiently wealthy agents credit-rationed. They are denied credit and left to open self-financed firms at suboptimal scales. This dampens aggregate capital demand and depresses the domestic equilibrium market rate of return. When two countries now get financially integrated by mutually allowing their residents to borrow and lend across their common borders without any restrictions, domestic market rates of return get equalized. The associated domestic interest rate change gives rise to either reinforcing or competing forces in the form of a firm size and a credit rationing effect. The first is negatively correlated to the rate of return, whereas the second changes sign. That is why the parameter constellation and the direction of the interest rate change matter for assessing the impact on domestic net credit positions and aggregate productions. Their sum finally gives a country's GNP. Its change serves as an overall measure of the beneficence of financial integration.

Against this background, the paper studies, in which constellations it pays off for countries to pursue financial integration. The main finding is that although it must be overall beneficial, participating countries may still be adversely affected. Consequences occur through two channels: international capital flows and, more unexpectedly, changes in the scope of domestic credit rationing. That is why not only a country's aggregate wealth, but also its distribution matters, especially in comparison to its partner country. After having identified the pattern of international capital flows and the allocation of capital, I will show that gains normally only appear in a country, if financial integration sufficiently fosters capital exports or reduces the level of efficiency-distorting credit rationing. That is how this paper also offers an explanation of why widely observed large gaps in productivity and income per capita persist across countries despite an equalization of the marginal return (see e.g. Banjeree and Duflo, 2005). Moreover, this paper's results are consistent with the consensus view in the literature on growth and convergence that most of the income differences across countries can be attributed to differences in total factor productivity (also see Easterly and Levine, 2001 or Hall and Jones, 1999). In this sense, this paper's drivers are the either un- or equalizing force of the wealth-dependent borrowing constraint and the equalizing force of the diminishing returns technology.

Five policy implications deserve emphasis. Financial integration might have ambiguous welfare effects: first, across and second, within participating countries. Third, an optimal theory of financial services trade liberalization arises, underlining that countries' characteristics might require different approaches to financial integration. Fourth, in order to avoid vicious circles of beggar-thy-neighbor policies, all domestic policies affecting the level of credit rationing must be banned or harmonized in supranational treaties on financial integration. Fifth, credit rationing affects financial stability in integrated financial markets.

Altogether, this paper contributes to a growing literature on the beneficence of financial integration. From a calibrated neoclassical model, Gourinchas and Jeanne (2006) receive relative little welfare gains for a typical emerging market country. They conclude that large effects might occur through other channels than capital flows. Others have presented possible explanations for this phenomenon. Economic heterogeneity in the form of differing liquidity across assets is at the root of the dual-liquidity model of emerging-market crisis presented by Caballero and Krishnamurthy (2001). Emphasizing the interaction between domestic and international financial constraints, they show that entrepreneurs in less developed financial markets tend to over-borrow and to under-provision collateral. This decreases foreign lenders' incentives to enter emerging markets and exacerbates the likelihood of financial crisis. Along similar lines, Aoki, Benigno, and Kiyotaki (2006) study how production efficiency depends on the degree of capital account liberalization during the adjustment process after opening up. Whereas von Hagen and Zhang (2006) identify unequal welfare implications to different domestic agents in a small open economy. In order to smooth transition, they suggest a gradual sequencing of policy implementation. Instead, this paper presents credit rationing and its impact on productive efficiency as an additional effect of financial integration. It is therefore most closely related to Matsuyama (2005, 2007). Extending earlier work by Gertler and Rogoff (1990), Barro et al. (1995) and Boyd and Smith (1997), he was one of the first to consequently draw on capital market imperfections as an explanation of why capital may be exported from poorer countries in the South to richer ones in the North. My work however mainly differs in two respects. First, in order to separate the impact of production non-convexities and capital market imperfections, I endogenize the project size. Second, in order to study the macroeconomic impact of wealth inequality, I allow for heterogeneous agents. This way accounting for the macroeconomic impact of wealth inequality allows to fill a gap in the hitherto literature on financial integration. Empirical support also comes from micro level studies with financial integration being found to affect entrepreneurship, firms' capital costs and financing constraints (see e.g. Alfaro and Charlton, 2006; Chari and Herny, 2004; Harrison, Love and McMillian, 2004).

In contrast, I abstract from other channels that may affect the impact of financial integration. Among these is e.g. the beneficial effect of risk sharing on the overall efficiency of investment (see e.g. Obstfeld, 1994; Acemoglu and Zilibotti, 1997 or Athanasoulis and van Wincoop, 2000), capital mobility's ability to mitigate the tragedy of the commons on a common pool of resources (see Tornell and Velasco, 1992), policies enhancing openness and competition (see e.g. Detragiache and Demirgüç-Kunt, 1999 or Kaminsky and Schmukler, 2003), foreign lender's impact on the structure of lending contracts (see e.g. Alessandria and Qian, 2005) or the impact of bank specialization on systemic risk via an integrated interbank market (see e.g. Fecht, Grüner and Hartmann, 2007).[2]

The paper is structured as follows. Based on the model presented in Section 2, Section 3 derives the capital market equilibrium under national autarky. Against this benchmark, Section 4 assesses the impact of financial integration for a broad mix of country types. Section 5 extracts some policy implications, before Section 6 finally concludes. All Proofs are in the Appendix

[2] A more complete picture of the benefits and costs is e.g. provided by Agénor (2003).

2 The Model

Consider an endowment economy with a single good, which is populated with a continuum of risk neutral agents i of mass one.

2.1 Agents, Endowments and Sequence of Events

The economy lasts for three dates. At *date 0*, agents are born as potential entrepreneurs, who are endowed with initial wealth w and an investment project that requires a non-fixed start-up cost $k > 0$. The first is the only source of heterogeneity among agents and assumed to be continuously distributed according to $G(w)$ on $[0, \bar{w}] \subseteq \mathbb{R}_+$. Hence, aggregate wealth is given by $W = \int_0^{\bar{w}} wg(w)\,dw$ and equal to average wealth. Aiming at maximizing their lifetime income I, at *date 1*, agents can resort to the capital market: while some seek to raise further funds for investment, others supply funds. At *date 2*, agents realize the returns of the initiated investment projects and settle financial claims.

2.2 Production

The production technology $F(K, L)$ exhibits constant returns to scale with respect to aggregate capital K and labor L. All agents are prospective entrepreneurs. They can only work in their own firm and have access to the same technology in order to undertake a single project, so that $F(K/L, 1) = f(k)$. It is strictly increasing and concave in the capital-labor ratio $k = K/L$ (i.e. $f' > 0$, $f'' < 0$). It also satisfies the standard INADA conditions (i.e. $f(0) = 0$, $f'(+0) = \infty$, $f(\infty) = \infty$ and $f'(\infty) = 0$). Once sunk, k cannot be recovered.

2.3 Capital Market

Agents can always either remain self-financing entrepreneurs, who simply invest what they own (i.e. $k = w_i$), or costlessly store wealth. A capital market allows agents to smooth their financial needs. On the one hand, there are borrowers, who are entrepreneurs that compete for others' funds in order to leverage their firm's capitalization (i.e. $k > w_i$). On the other hand, there are lenders, who are agents that seek to place funds that they do not want to store or to invest in their own firm (i.e. $k < w_i$).[3]

Given the prevailing market rate of return r, agents decide on how much to invest in the project and on if to resort to the capital market. With a project profit of $y(k) = f(k) - rk$, the optimal investment level, henceforth denoted $k(r)$, amounts to

$$k(r) \text{ such that } f'(k(r)) = r. \tag{1}$$

Owing to f's functional characteristics, $k(r)$ is strictly decreasing and convex in r. Also, $k(r) \to 0^+$ for $r \to \infty$, ensuring that $y(k(r)) \to 0^+$ for $r \to \infty$.

[3] Neglect simultaneous borrowing and lending, since no agent can win from it in equilibrium.

Because of the storage option, agents will never invest more than $k(1)$ or lend for less than $r = 1$.

Lenders take the market rate of return as given when they perfectly compete by their offer of loan contracts. Hence, in equilibrium, only zero-profit contracts will be traded that yield the same return to lenders: from investing $k(r)$, a borrowing entrepreneur generates a revenue $f(k(r))$, out of which he must pay $r[k(r) - w]$ to the lender. However, capital market efficiency is hampered by agency and enforcement problems. That is why a lender anticipates that in case of the borrower's default on his debt, he would only be able to capture a fraction $\gamma \in [0, 1]$ of the virtual project output $f(k)$. γ can also be interpreted as the capital market's state of development. Moreover, limited liability prevents the agents from ending up with negative wealth at date 2. Hence, they cannot lend or invest more than they own or borrow more than they produce.

The economy is closed, so that r arises from equalizing total capital demand $D(r)$ and supply $S(r)$. Capital is scarce, i.e. aggregate wealth is not sufficient to let all agents make the optimal investment in case of zero capital costs:

$$\text{(A1)}\ W < k(1).$$

3 Equilibrium under National Autarky

Based on individual optimal decisions, the capital market equilibrium is first derived for each country under autarky. It then serves as a benchmark against which the outcome of full financial integration will be assessed.

3.1 Credit Rationing and Individual Decisions

Given diminishing returns on capital investment and $r \geq 1$, an agent i with wealth w_i seeks to become a borrower (resp. a lender) if investing the last unit of his initial endowment would yield a higher (resp. lower) rate of return than that offered by the capital market. In view of the participation constraint of the borrower (PC_B) (resp. the lender (PC_L))

$$PC_B\colon\ f'(w_i) > r \quad (\text{resp. } PC_L\colon\ f'(w_i) < 1 \leq r), \tag{2}$$

agents i with $w_i > k(r)$ will supply $w_i - k(r)$ at rate r on the capital market, whereas those with $w_i < k(r)$ will want to raise $k(r) - w_i$. Yet, the latter's willingness to borrow might not be sufficient to do so. Owing to capital market inefficiencies, they can only guarantee the lender the effective rate of return r if the repayment is smaller than the recoverable output. That is why a debt contract is only incentive compatible (IC) if

$$IC\colon\ r[k(r) - w] \leq \gamma f(k(r)). \tag{3}$$

Solving (IC) for the borrower's wealth, gives

$$w \geq \omega(r) := k(r) - \gamma f(k(r))/r. \tag{4}$$

$\omega(r)$ represents the borrower's equity participation that the lender requires to break even. It amounts to the difference between the sunk investment $k(r)$ and the net present value (NPV) of the pledgeable project output. As depicted below in *Figure 1* and as derived in the Proof of *Lemma 1*, $\omega(r)$ roughly resembles a parabola that opens downwards. It has a maximum at $r = \dot{r}$, an inflexion point at $r = \ddot{r}$ and approaches the abscissa for $r \to \infty$.

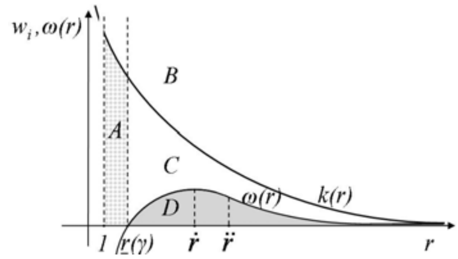

Figure 1: Individual investment decisions given r and w_i

Intuitively, $\omega(r)$'s shape stems from two countervailing forces. First, as the fraction of the project return the borrower has to share with his lender is increasing in r, his incentives to repay the loan fall. This forces the lender to ask for a higher equity participation. Second, the higher r, the smaller the optimal investment $k(r)$ the agent is striving for, so that the smaller the required external financing and thus the necessary stake of the borrower. It can be shown that the first effect prevails as long as $\eta_{y,r} < \gamma/(1-\gamma)$ (and vice versa), where $\eta_{y,r} > 0$ denotes the input price elasticity of output. Consequently, $\omega(r)$ is increasing in r as long as the percentage change in output due to a percentage change in the market rate of return is sufficiently small.[4] Likewise, $\omega(r)$ is found to become strictly convex as soon as $\eta_{y,r} > 2/\left[(1-\gamma)\varepsilon_{k',r}/\gamma - 1\right]$, where $\varepsilon_{k',r} > 0$ is the factor price elasticity of the optimal investment's slope. Beyond that, $\omega(r) \to -\infty$ for $r \to 0$, $\omega(\dot{r}) > 0$ and ω's continuity in r fix a $\underline{r}(\gamma) \in (0, \dot{r})$ for any $\gamma > 0$ such that $\omega(r) < 0$ for $r < \underline{r}(\gamma)$. Given $d\underline{r}(\gamma)/d\gamma > 0$, assume for simplicity that γ is sufficiently high to ensure:[5]

$$\text{(A2)}\ \underline{r}(\gamma) > 1.$$

With regard to r and w_i, agents decide as follows. Provided that $r \geq 1$, agents i with $w_i \geq k(r)$ self-finance the optimal investment $k(r)$ irrespective of r (area B) and lend any remainder. Then, $\omega(r) \leq 0$ for $1 \leq r \leq \underline{r}(\gamma)$, so that all agents i with $w_i < k(r)$ are empowered to open firms at the efficient scale $k(r)$ (area A). Whereas if $r > \underline{r}(\gamma)$, $\omega(r) > 0$ and only agents i with $w_i \geq \omega(r)$ get access to credit (area C). All others are credit-rationed (area

[4] Remark that the better the capital market is developed (i.e. the larger γ), the smaller $\dot{r}$.

[5] Otherwise, there would be credit rationing even if capital costs were zero: $\omega(1) > 0$ and no area A existed in *Figure 1*. If the equilibrium market rate of return was then equal to 1, wealth $U = W - \int_0^{\omega(1)} wg(w)\,dw + [1 - G(\omega(1))]\,k(1)$ would not be used, but get stored.

D), i.e. they are denied to tap other agents' funds and find themselves hindered to realize the optimal capitalization level.[6] Note that these agents would have received sufficient credit under first-best (i.e. in the absence of capital market imperfections when $\gamma = 1$). In view of (2) PC_B, credit-constrained agents still prefer running a self-financed firm of size $k = w_i < k(r)$ to lending or storage. It makes them earn $y_c(r) = f(w) - rw$. All in all:

Lemma 1 *For a given market rate of return $r \geq 1$, the solution to the individual financial contracting problem is as follows:*

(i) For $1 \leq r \leq \underline{r}(\gamma)$, all agents i with $w_i < k(r)$ borrow $k(r) - w_i$ at rate r.

(ii) Whereas for $r > \underline{r}(\gamma)$, those with $\omega(r) \leq w_i < k(r)$ keep on borrowing $k(r) - w_i$ at rate r, but those with $w_i < \omega(r)$ are denied credit and therefore start self-financed firms of size $w_i < k(r)$.

In both cases, $k(r)$ s.t. $f'(k(r)) = r$ and only agents i with $w_i > k(r)$ lend $w_i - k(r)$ at rate r. Moreover, $\omega(r)$ is monotonously decreasing and concave for $\dot{r} \leq r \leq \ddot{r}$, i.e. for $\frac{\gamma}{(1-\gamma)} \leq \eta_{y,r} \leq \frac{2}{\frac{(1-\gamma)}{\gamma}\varepsilon_{k',r} - 1}$.

3.2 Capital Market Equilibrium

On these grounds, the capital market equilibrium can be derived.

Definition 1 *A **capital market equilibrium** consists of a rate of return r^* and individual decisions as described in Lemma 1 such that decisions are optimal given r^* and gross capital demand $D(r^*)$ equals supply $S(r^*)$.*

While $S(r)$ amounts to the entire aggregate wealth W minus the funds devoted to storage, $D(r)$ equals the sum of all agents' investments intended at rate r. Owing to (A1), $r^* > 1$, so that (2) PC_B strictly holds and no wealth gets stored. If γ and W are such that they give rise to an equilibrium rate of return $1 < r^* \leq \underline{r}(\gamma)$, first-best obtains. All agents will get sufficient credit to make the optimal investment $k(r^*) = W$. Then, r^* is such that $r^* = pf'(W)$ and aggregate output amounts to $P^* = f(W)$. Under autarky, P^* also constitutes the gross national product (GNP) Y^*.

Otherwise, if $r^* > \underline{r}(\gamma)$, $D(r)$ is dampened by credit rationing, so that r^* also becomes a function of the wealth distribution $G(w)$:

$$r^* = r^*(G(w)) \text{ s.t. } W = \int_0^{\omega(r^*)} wg(w)\,dw + [1 - G(\omega(r^*))]\,k(r^*). \tag{5}$$

That is how capital market imperfections lead to credit rationing. The rich over- and the poor underinvest. Firm sizes and hence the marginal product of capital vary over production units, in turn depressing aggregate output:

$$P^*(G(w)) = \int_0^{\omega(r^*)} f(w)\,g(w)\,dw + [1 - G(\omega(r^*))]\,f(k(r^*)). \tag{6}$$

[6] As $y(k(r))$ net of repayment is maximal for $k(r)$, it follows that if (3) IC does not hold for $k(r)$, it will also not hold for any $k < k(r)$.

Yet, against conventional wisdom, a higher r might not always be associated with a lower P. This owes to the fact that differently to first-best, any interest rate change not only entails a firm size effect due to diminishing returns (i.e. $k'(r) < 0$), but also a credit rationing effect (i.e. $\omega'(r) > 0$ if $r < \dot{r}$ and $\omega'(r) \leq 0$ if not). While for $r < \dot{r}$, the two effects reinforce each other with respect to the level of aggregate investment, they otherwise oppose and so the latter might offset the first. As expected and formally derived in the Proof of *Proposition 1*, the net effect is generally still negative: $dP/dr < 0$ except for

$$dP/dr \geq 0 \quad \text{if} \quad g(\omega(r))\,\omega'(r) \leq -\tfrac{[1-G(\omega(r))]f'(k(r))k'(r)}{[f(\omega(r))-f(k(r))]}. \tag{7}$$

With dP/dr being continuous, $dP/dr < 0$ already for $r < \underline{r}(\gamma)$ and $P \to 0^+$ for $r \to \infty$, so that $dP/dr \to 0^-$ for $r \to \infty$, this exception can only be temporary. Accordingly, efficiency gains from lower credit rationing outweigh smaller firm sizes if, around the turning point at $r = \ddot{r}$, $\omega(r)$ is sufficiently steeply falling and $g(\omega(r))$, i.e. the mass of agents just at the rationing threshold, sufficiently large. In order to keep things simple, assume a typical distribution of wealth:

(A3) $g(w)$ *is a parabola that opens downwards.*

It follows that if (7) is binding, then it is for some $r_{P1}, r_{P2} > \dot{r}$ such that for $r \in [r_{P1}, r_{P2}]$, a single coherent reversal area of $dP/dr \geq 0$ exists.[7] While the exact position of the interval depends on the parameter constellation, we can still derive that $r_2 \geq \ddot{r}$ when $g'(\omega(\ddot{r})) < 0$. The reason is that here, an increasing r is associated with an increasing mass of agents at the rationing threshold via $\omega'(r) < 0$. Similarly, $g'(\omega(\ddot{r})) > 0$ fixes $r_1 \leq \ddot{r}$.[8] Hence:

Proposition 1 *Given γ and (A1) to (A3), there is a unique* ***capital market equilibrium*** *for every aggregate wealth W and distribution $G(w)$, characterized by a market rate of return $r^* > 1$, aggregate output P^* and GNP $Y^* = P^*$ s.t.:*

(i) For $1 \leq r^* \leq \underline{r}(\gamma)$, there is no credit rationing, so that first-best obtains. All agents make the optimal investment $k(r^*)$. r^* and Y^* only depend on W.

(ii) For $r^* > \underline{r}(\gamma)$, a fraction $G(\omega(r^*))$ of the agents is credit-constrained and invests w_i only. All others make the optimal investment $k(r^*)$. r^* and Y^* depend on W and $G(w)$, so that $dP/dr \geq 0$ appears for some $r \in [r_{P1}, r_{P2}]$ (with $r_{P1}, r_{P2} > \dot{r}$ such that $dP/dr = 0$) if $g(\omega(r))\,\omega'(r)$ is sufficiently low. Otherwise, $dP/dr < 0$ prevails $\forall r$.

The analysis of some comparative statics will enhance our understanding of the main forces affecting r^*: the net worth and capital deepening effect. The first captures any influence on entrepreneurs' ability to comply with the credit constraint (4) and so to make the optimal investment. For instance, a higher γ increases the NPV of the borrowers' projects and thus lowers the critical threshold $\omega(r)$. Higher inequality boosts [1-$G(\omega(r))$], i.e. the mass of

[7] In the extreme, the reversal area might boil down to a single point.

[8] While a uniform distribution gives rise to $\dot{r} < r_{P1} \leq \ddot{r} \leq r_{P2}$, more complicated shapes of $g(w)$ could imply several $r_{P1}, r_{P2,}...$ and so more than one coherent reversal response area.

agents with $w \geq \omega(r)$.[9] Both result in an enhanced credit allocation, which in turn improves productive efficiency and so implies a higher r. Per contra, although a higher W makes entrepreneurs benefit of the net worth effect, it additionally releases a capital deepening effect. The latter captures any influence on aggregate capital supply. An increase ensues a surge in investment, which results in lower r due to diminishing returns. Hence, the impact of $\Delta W > 0$ depends on which of the two countervailing effects prevails. The result is also reflected in whether $\Delta D(r) > 0$ required by (5) is achieved through a rise or a fall in r. Differentiating the RHS of (5) and reformulation gives

$$dD/dr \geq 0 \quad \text{if} \quad g(\omega(r))\,\omega'(r) \leq -\tfrac{[1-G(\omega(r))]k'(r)}{\omega(r)-k(r)}. \tag{8}$$

Following the same argumentation as for (7) $dP/dr \geq 0$ yields that there might be some $r_{D1}, r_{D2} > \dot{r}$ such that $dD/dr = 0$. Then, $dD/dr < 0$ for all r but for, if (8) holds, $r \in [r_{D1}, r_{D2}]$, when the rise in demand from alleviated credit rationing temporarily dominates the drop in demand from smaller firm sizes. Only then, a higher W is associated with a higher r^*. On these grounds, an interest rate increase must not necessarily be a sign of improving economic conditions. We will later see how this mechanism can redirect capital flows after integration.

4 Equilibria under Financial Integration

From now on, the world consists of country A and several other countries $j = \{B, C...\}$ of the kind analyzed above. Countries $l = A, j$ share the identical parameters, except for aggregate wealth W_l and its dispersion $G_l(w)$. While capital is perfectly mobile at no cost, agents and thus production are not. Also the sequencing remains as before, but with one exception. At *date 0*, countries can decide to become fully financially integrated by mutually allowing their residents to borrow and lend across their common borders without any restrictions. All agents will do so until the interest rates across countries are equalized, thus giving rise to a common equilibrium market rate of return $\hat{r}^*$ and GNPs $\hat{Y}_l^*$ (instead of r_l^* and Y_l^* obtained under autarky).

Let's assume that a country bases its decision whether to financially open up to another country or not on the implied change of its GNP. As *Lemma 1* does not lose its validity, we can immediately turn to the capital market equilibria that arise from the various financial integration scenarios.

4.1 Exogenous Rate of Return

As a starting point, think of country A as being small relative to the rest of the world into whose global capital market it seeks to integrate its own one. While this leaves the world unaffected, A has to adopt the still prevailing global

[9] Abstract from higher inequality at the lower end only, leaving [1-$G(\omega(r))$] unchanged.

capital market rate of return $\hat{r}^* = r_g^*$. For $\hat{r}^* > \underline{r}(\gamma)$, A realizes a GNP of:

$$\begin{aligned}\hat{Y}_A^* = \; & \hat{r}^* \left[W_A - \int_0^{\omega(\hat{r}^*)} w g_A(w)\, dw - [1 - G_A(\omega(\hat{r}^*))]\, k(\hat{r}^*) \right] \\ & + \left[\int_0^{\omega(\hat{r}^*)} f(w)\, g_A(w)\, dw + [1 - G_A(\omega(\hat{r}^*))]\, f(k(\hat{r}^*)) \right],\end{aligned} \tag{9}$$

where the first term represents the net credit position $\hat{X}_A^* = \hat{r}^* [W_A - D_A(\hat{r}^*)]$ and the second one aggregate output $\hat{P}_A^*$. If, for instance, $r_A^* < \hat{r}^* \leq \dot{r}$, then agents in A see a rise in the market rate of return, scale-down their optimal investments, register tighter credit rationing and start exporting capital to the world. While A loses from less domestic aggregate production $\Delta P_A < 0$, it wins from running a current account surplus $\Delta X_A > 0$.

In order to verify if integration makes A realize a higher GNP, subtract (6) from (9) to obtain $\Delta Y_A = \hat{Y}_A^* - Y_A^* = \Delta X_A + \Delta P_A$ with $\Delta X_A = \hat{X}_A^*$ and

$$\begin{aligned}\Delta P_A = \; & \int_{\omega(r_A^*)}^{\omega(\hat{r}^*)} f(w)\, g(w)\, dw + [1 - G_A(\omega(\hat{r}^*))]\, f(k(\hat{r}^*)) \\ & - [1 - G_A(\omega(r_A^*))]\, f(k(r_A^*))\,.\end{aligned} \tag{10}$$

Thereby, ΔP_A reflects the change in production only, whereas ΔX_A needs to be decomposed into a change in the per-unit remuneration Δr_A and in the quantity of traded capital $\Delta[W_A - D_A(r)]$. But as studied before, a firm size and a credit rationing effect influence ΔP_A and $\Delta D_A(r)$ (eventually even giving rise to reverse responses of $dP_A/dr \geq 0$ and, ensued by $dD_A/dr \geq 0$, $dX_A/dr \leq 0$). That is why the sign of ΔX_A and ΔP_A, let alone the aggregate effect of ΔY_A, is not always immediately clear. Indeed, by the same argumentation as for (7) $d\hat{P}_A^*/dr$, we get $d\hat{X}_A^*/dr = [W_A - D_A(r)] - rD_A'(r) > 0$ except for

$$d\hat{X}_A^*/dr \leq 0 \quad \text{if} \quad g(\omega(r))\, \omega'(r) \leq \frac{-[1 - G(\omega(r))]rk'(r) + [W_A - D_A(r)]}{[\omega(r) - k(r)]r}. \tag{11}$$

Quite alike, if (11) holds, it implies the existence of some $r_{X1}, r_{X2} > \dot{r}$ s.t. $d\hat{X}_A^*/dr = 0$ and $d\hat{X}_A^*/dr \leq 0$ for $r \in [r_{X1}, r_{X2}]$. As follows from the comparison of (11) and (8), the satisfaction of the second automatically implies that of the first for $D_A(r) > W_A$. Starting out from the autarky allocation, the first can therefore never be fulfilled without the second. Thus, (11) holds when lower credit rationing exceptionally dominates lower optimal firm sizes. It fuels domestic capital demand, so that A becomes a capital importer despite $r_A^* < \hat{r}^*$.

Netting out $d\hat{P}_A^*/dr$ and $d\hat{X}_A^*/dr$ finally gives $d\hat{Y}_A^*/dr > 0 \; \forall r$ but for

$$d\hat{Y}_A^*/dr \leq 0 \quad \text{if} \quad g_A(\omega(r))\, \omega'(r) \geq -\frac{[W_A - D_A(r)]}{[[f(\omega(r)) - r\omega(r)] - y(r)]}, \tag{12}$$

which holds when $|\Delta X_A| \leq |\Delta P_A|$ with $d\hat{X}_A^*/dr > 0$ and $d\hat{P}_A^*/dr < 0$ and/or when, in the light of the hitherto analysis, a reverse response area of not only $d\hat{X}_A^*/dr \leq 0$, but also $d\hat{P}_A^*/dr \geq 0$ temporarily materializes for some $r > \dot{r}$.

Definition 2 *Call $dY/dr \leq 0$ for $r \in [r_{Y1}, r_{Y2}] = [r_{P1}, r_{P2}] \cap [r_{X1}, r_{X2}]$ with $r_{Y1}, r_{Y2} > \dot{r}$ s.t. $dY/dr = 0$ the GNP reversal response case (Y-RRC) and $dY/dr > 0$ for $\forall r \in \{\mathbb{R}^+ | r \in [r_{Y1}, r_{Y2}]\}$ the standard response case (Y-SRC).*

This being said, the outcome of financial liberalization subtly depends on the parameter constellation and the direction of the interest rate change. *Table 1* summarizes some general results that emerge if both market rates of return fall onto the same side of $\dot{r}$ (either r_A^*, $\hat{r}^* \leq \dot{r}$ or r_A^*, $\hat{r}^* > \dot{r}$) into the same response case (either Y-SRC or Y-RRC). Otherwise, no further refined prediction can be made but that any outcome can materialize. Altogether, some well-known results from standard economic theory get refuted: higher (resp. lower) interest rates make net lending (resp. net borrowing) countries not always better off.

		$\Delta r_A^* > 0$: $r_A^* < \hat{r}^*$	$\Delta r_A^* < 0$: $r_A^* > \hat{r}^*$
r_A^*, $\hat{r}^* \leq \dot{r}$:	$r_A^*, \hat{r}^* \leq \underline{r}(\gamma)$	$\Delta Y_A > 0$	$\Delta Y_A > 0$
	otherwise	$\Delta Y_A \gtreqless 0$ if $\lvert\Delta P_A\rvert \lesseqgtr \lvert\Delta X_A\rvert$	$\Delta Y_A > 0$
r_A^*, $\hat{r}^* > \dot{r}$:	Y-SRC	$\Delta Y_A > 0$	$\Delta Y_A < 0$
	Y-RRC	$\Delta Y_A \leq 0$	$\Delta Y_A \geq 0$

Note that in all other r_A^*-$\hat{r}^*$-constellations (but for $\Delta r_A = 0$ when $\Delta Y_A = 0$), any result can obtain: $\Delta Y_A = \Delta P_A + \Delta X_A \lesseqgtr 0$.

Table 1: Beneficence of financial integration for country A

Unlike with first-best credit for $r_A^*, \hat{r}^* \leq \underline{r}\,(\gamma)$, higher interest rates $r_A^* < \hat{r}^*$ leave net lending countries not necessarily better off with credit rationing. $\Delta Y_A \gtreqless 0$ when $|\Delta P_A| \lesseqgtr |\Delta X_A|$ for $r_A^* < \hat{r}^* \leq \dot{r}$ (when $\Delta P_A < 0$ and $\Delta X_A > 0$). Only the parameter constellation decides on if the improved credit position suffices to cover the loss in domestic production incurred from tightened credit rationing and shrunken firm sizes. If so, A wins (even if no resident in A was previously credit constrained) and otherwise loses from financial integration. All the more is it remarkable that for $\dot{r} < r_A^* < \hat{r}^*$, diminishing credit rationing makes the generally expected result of $\Delta Y_A > 0$ reappear for sure in the Y-SRC. Whereas in the Y-RRC (when $\Delta P_A > 0$ and $\Delta X_A < 0$), $\Delta Y_A \leq 0$ obtains. The reason is that even though firm sizes decline, A's credit rationing around $\ddot{r}$ sufficiently decreases to increase its aggregate investment. This way, A turns into a net borrower despite a surge in the interest rate. That is how a general result reemerges: as a net borrower, A loses from higher interest rates. The improved efficiency from lower credit rationing does not outweigh the losses from smaller firm sizes and from the negative net credit position.

Also the contrary, i.e. that lower interest rates $r_A^* > \hat{r}^*$ make net borrowing countries better off, might not generally be true. Although it is true with first-best for $r_A^*, \hat{r}^* \leq \underline{r}\,(\gamma)$ and for $\dot{r} \geq r_A^* > \hat{r}^*$ (when $\Delta P_A > 0$ and $\Delta X_A < 0$). $\Delta Y_A > 0$ owes to the fact that an interest rate drop induces more net borrowing firms with non-negative profits at a higher efficient scale, which on top all generate higher profits than their credit-rationed counterparts. For $r_A^* > \hat{r}^* > \dot{r}$, instead, worsened credit rationing hampers efficiency so badly, that the output increase from higher optimal firm sizes cannot withal cover the negative net credit position. Hence, $\Delta Y_A < 0$ in the Y-SRC. Whereas in the Y-RRC (when $\Delta P_A < 0$ and $\Delta X_A > 0$ temporarily materialize), $\Delta Y_A \geq 0$. Despite a drop in the per-unit capital remuneration and thus larger optimal firm sizes,

A's domestic gross capital demand falls, because of higher credit rationing. Yet, against conventional wisdom, becoming a net lender then even allows A to win from lower interest rates. Altogether:

Proposition 2 *Given γ and (A1) to (A3), after opening up as a small country to the world, A with r_A^* and Y_A^* takes on the global rate $r_g^* = \hat{r}^*$ and realizes $\hat{Y}_A^*$.*

(I) If $r_A^*, \hat{r}^* \leq \underline{r}(\gamma)$, there neither was, nor will be credit rationing. First-best arises. As compared to r_A^*, A wins from a higher and a lower $\hat{r}^*$ ($Y_A^* < \hat{Y}_A^*$).

(II) If $\hat{r}^* > \underline{r}(\gamma)$, there will be credit rationing. (II.i) For $r_A^*, \hat{r}^* \in (\underline{r}(\gamma), \dot{r}]$, A may win or lose from $r_A^* < \hat{r}^*$ ($Y_A^* \lesseqgtr \hat{Y}_A^*$). Yet, A wins from $r_A^* > \hat{r}^*$ ($Y_A^* < \hat{Y}_A^*$). (II.ii) In contrast, for $r_A^*, \hat{r}^* > \dot{r}$, A normally wins from $r_A^* < \hat{r}^*$ ($Y_A^* < \hat{Y}_A^*$), but loses from $r_A^* > \hat{r}^*$ ($Y_A^* > \hat{Y}_A^*$). However, the opposite obtains for $r_A^*, \hat{r}^* \in [r_{Y1}, r_{Y2}]$ if Y-RRC exists with $r_{Y1}, r_{Y2} > \dot{r}$ such that $dY/dr = 0$. Y-RRC in turn materializes if $\omega'(r)\, g_A(\omega(r))$ is sufficiently low.

(III) In any other r_A^*-$\hat{r}^*$-line-up (and in case II.i), the parameter constellation decides on the magnitude of ΔP_A and ΔX_A and thus on $Y_A^* \lesseqgtr \hat{Y}_A^*$.

4.2 Endogenous Market Rate of Return

Alternatively, country A thinks of pursuing financial integration with a country j at eye height, i.e. with a partner that is not big enough to act as the world. This way, the market rate of return $\hat{r}^*$ becomes endogenous to integration and follows from equating global capital supply $S(\hat{r}^*)$ and demand $D(\hat{r}^*)$:

$$\hat{r}^* \text{ s.t.} \quad W_A + W_j = \begin{array}{l} \int_0^{\omega(\hat{r}^*)} w g_A(w)\, dw + [1 - G_A(\omega(\hat{r}^*))]\, k(\hat{r}^*) \\ + \int_0^{\omega(\hat{r}^*)} w g_j(w)\, dw + [1 - G_j(\omega(\hat{r}^*))]\, k(\hat{r}^*)\,. \end{array} \tag{13}$$

Integration entails inter-country capital flows, whose direction and magnitude are entirely driven by the differences in marginal productivity under autarky. Given e.g. $r_A^* > r_j^*$, A net borrows from j until the marginal productivity is equated across the two countries. This does, however, not always imply the elimination of differences in average marginal rates of productivity

$$\rho_l = \int_0^{\omega(\hat{r}^*)} f'(w)\, g_l(w)\, dw + [1 - G_l(\omega(\hat{r}^*))]\, f'(k(\hat{r}^*)) \text{ with } l = A, j. \tag{14}$$

If $S(\hat{r}^*) = W_A + W_j$ is sufficiently high to ensure $\hat{r}^* \leq \underline{r}(\gamma)$, there is no credit rationing and the *RHS* in (13) reduces to $2k(\hat{r}^*)$. All agents make the same optimal investment $k(\hat{r}^*)$, so that also $\hat{\rho}_A^* = \hat{\rho}_j^*$. As depicted in *Figure 2* below, starting from $\rho_A^* > \rho_j^*$ (e.g. ensued by $\omega(r_A^*) > \omega(r_j^*)$ and $k(r_A^*) < k(r_j^*)$) in the autarky point T_0 on the resource constraint $W_A + W_j$, capital will flow from j to A until $\hat{r}^* = f'(k(\hat{r}^*)) = \hat{\rho}_l^*$ in point T_1.

In contrast, if $S(\hat{r}^*)$ is so low that $\hat{r}^* > \underline{r}(\gamma)$, there is credit rationing. A fraction [1-$G_A(\omega(\hat{r}^*))$] of agents in country A and [1-$G_j(\omega(\hat{r}^*))$] in j makes the same optimal investment $k(\hat{r}^*)$. As all other agents can only run self-financed sub-optimal firms, not only $\hat{\rho}_l^* > \hat{r}^*$ persists, but also $\hat{\rho}_A^* \neq \hat{\rho}_j^*$ if

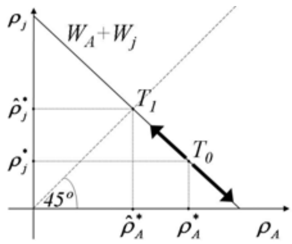

Figure 2: Pattern of capital flows between country A and j

$G_A(\omega(\hat{r}^*)) \neq G_j(\omega(\hat{r}^*))$.[10] In that sense, the higher $\hat{\rho}_l^* - \hat{r}^*$, the larger the deviation of allocative efficiency from its first-best level. After all:

Proposition 3 *If, given γ and (A1) to (A3), financial integration of countries A and j entails an aggregate wealth $W_A + W_j$ that is:*

(I) so high that $\hat{r}^* \leq \underline{r}(\gamma)$, no credit rationing arises. All agents in both countries make the same optimal investment $k(\hat{r}^*) = [W_A + W_j]/2$.

(II) so low that $\hat{r}^* > \underline{r}(\gamma)$, credit rationing emerges. A fraction $[1\text{-}G_A(\omega(\hat{r}^*))]$ of agents in A and $[1\text{-}G_j(\omega(\hat{r}^*))]$ of agents in j makes the same optimal investment $k(\hat{r}^*)$, whereas all others simply invest their initial endowments.

The fact that, unlike in the first-best case (I), $\hat{r}^*$, $\hat{Y}_A^*$ and $\hat{Y}_j^*$ not only depend on aggregate wealth, but also on its distribution across countries, endangers the beneficence of financial integration for A and j in case (II).

As a matter of fact, financial integration must be production-enhancing on aggregate.[11] However unlike for $\hat{r}^* \leq \underline{r}(\gamma)$, predictions about the beneficence of financial integration for an individual country and the pattern of ρ_l (highlighted by the arrows in *Figure 2*) require to know the relation and position of all market rates of return for $\hat{r}^* > \underline{r}(\gamma)$. These, however, cannot be determined without taking into account the countries' characteristics with respect to their aggregate wealth W_l and its distribution $G_l(w)$. Recall that in comparison to a partner country, a country will be considered as richer if its aggregate wealth is higher and more unequal if a larger fraction of its residents has access to credit.

In what follows, we therefore study the five most pertinent cases: A teaming up with a (1) homogenous, (2) less unequal, (3) richer, (4) richer, less unequal as well as (5) richer, more unequal country. The last four W_l-G_l-combinations are

[10] This is consistent with the evidence reviewed in Bajeree and Duflo (2005). Also note how crucial the immobility of agents and thus of production is for the outcome. FDI and free trade of the output would eliminate any differences in ρ_l across countries. See e.g. Antràs and Caballero (2007) on the complementarity of trade and capital mobility.

[11] Integration goes in hand with the equalization of domestic market rates of return, so that there remains a single optimal investment level across countries (instead of two in autarky). This reduces the variation of firm scales and therewith the variation of the marginal product of capital. With a concave production function, the output then increases across countries.

sketched in *Figure 3*.[12] In each case, equation (5) and *Proposition 1* are used to determine the relation of autarkic market rates of return r_l^*. Afterwards, equation (13) as well as *Propositions 1* and *3* allow to find out where the market rate of return after integration materializes. Finally, the sign of Δr_l^* together with the location of r_l^* and $\hat{r}^*$ (above all vis-à-vis $\dot{r}$ and Y-SRC/Y-RRC) will enable us to read the beneficence of financial integration from *Proposition 2*.

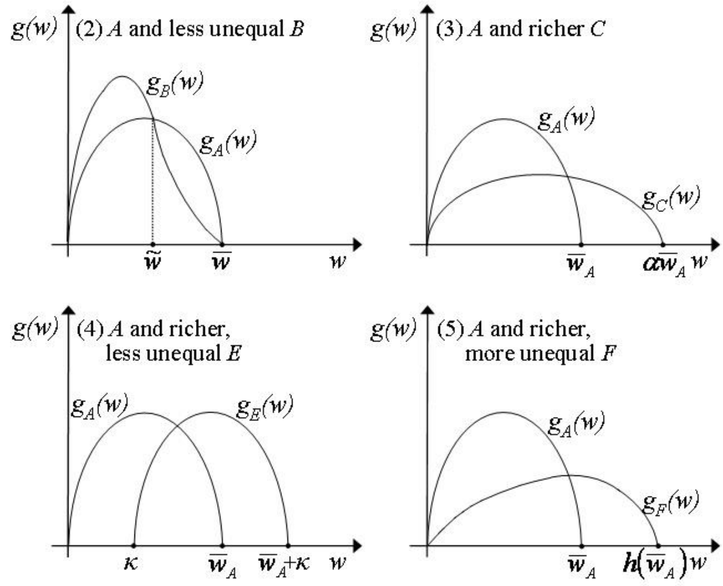

Figure 3: Graphical sketch of stylized W_l-$G_l\,(w)$-combinations studied

4.2.1 Teaming up with a homogenous country

Initially, emanate from the polar case of country A pursuing financial integration with an identical country $\tilde{A}$: $W_A = W_{\tilde{A}}$ and $G_A\,(w) = G_{\tilde{A}}\,(w)$. It is obvious that $r_A^* = r_{\tilde{A}}^*$ under autarky and that, with integration proportionally increasing gross capital supply and demand, $\hat{r}^* = r_A^* = r_{\tilde{A}}^*$ after integration.

Corollary 1 *Financially integrating homogenous countries A and $\tilde{A}$ with $W_A = W_{\tilde{A}}$ and $G_A\,(w) = G_{\tilde{A}}\,(w)$ is neutral with respect to GNP ($\Delta Y_A^* = \Delta Y_{\tilde{A}}^* = 0$). The domestic autarkic equilibria characterized in Proposition 1 persist.*

[12] Moreover, switching indices allows A to derive the consequences of teaming up with just the opposite type of country than laid out in (2) to (5).

4.2.2 Teaming up with a less unequal country

A also faces the option of forming an integrated capital market with a less unequal country B. Although the two dispose of equal aggregate wealth $W_A = W_B$, a relatively larger part of it is in the hands of the poor in B. Given (A3), $g_A(w) < g_B(w)$ for $w < \tilde{w}$ (and vice versa) with $\tilde{w} \in (0, \bar{w})$ such that $g_A(\tilde{w}) = g_B(\tilde{w})$. Thus, not only B's Lorenz curve, but also B's cumulative wealth distribution $G_B(w)$ first-order stochastically dominate those of A.

The study of comparative statics in Section 3.2 showed that $\Delta[1\text{-}G(w)]$ entails a net worth effect only. Due to $G_A(w) < G_B(w) \forall w \in (0, \bar{w})$, gross capital demand is always higher in A than in B. With equal gross capital supply, this puts comparatively more pressure on the equilibrium market rate of return in A, so that $r_A^* > r_B^*$ and $k(r_A^*) < k(r_B^*)$ under autarky. An opening up then incites A to borrow abroad. Capital flows from B to the more unequal country A, which establishes $r_A^* > \hat{r}^* > r_B^*$. Yet, despite a common single optimal firm size $k(\hat{r}^*)$ and rationing threshold $\omega(\hat{r}^*)$, $\rho_A < \rho_B$ continues to hold because of $G_A(\omega(\hat{r}^*)) < G_B(\omega(\hat{r}^*))$. Given $\hat{r}^*$, A has more absorptive capacities for productive capital than B, which would not be the case in a first-best world. Concerning the implied change in GNP, *Proposition 2* applies for $\Delta r_A^* < 0$ and $\Delta r_B^* > 0$. For instance, if $r_A^* \leq \dot{r}$, A wins, whereas this is only true for its more equal counterpart B if $|\Delta P_B| < |\Delta X_B|$.

Corollary 2 *The beneficence of financially integrating country A and a less unequal B with $W_A = W_B$ and $G_A(w) < G_B(w) \forall w \in (0, \bar{w})$ can be read from Proposition 2 on the basis of $r_A^* > \hat{r}^* > r_B^*$.*

4.2.3 Teaming up with a richer country

Things get more complicated when country A considers to confederate with a richer country C. All things being equal, suppose that every agent in C owns α times as much wealth as his respective counterpart in A, i.e. $w_i^C = \alpha w_i^A$ with $\alpha > 1$. That is why the graph of $g_C(w)$ appears as a horizontal dilation of $g_A(w)$ to the right. Although this leaves C with a higher aggregate wealth than A (i.e. $W_C = \alpha W_A$), the countries' relative wealth dispersion is identical. Owing to $G_A(w/W_A) = G_C(w/W_C)$, A and C share the same Lorenz curve.

As seen before, ΔW triggers a net worth and a capital deepening effect. Hence, the impact of ΔW crucially depends on the sign of dD/dr and we need to distinguish four interest rate scenarios. The first is the standard scenario of r_A^* and r_C^* materializing where $dD/dr < 0$. We know from the analysis of comparative statistics, that this yields the usually expected autarky result of $r_A^* > r_C^*$. But even though integration sets free capital flows from C to the poorer A, which lead to $r_A^* > \hat{r}^* > r_C^*$, $\rho_A > \rho_C$ persists. The reason is that a relatively larger fraction of agents in A still remains too poor to comply with the wealth requirement: $G_A(\omega(\hat{r}^*)) > G_C(\omega(\hat{r}^*))$. This lets A register less capital inflows than expected on the grounds of the differences in the optimal investments' marginal rates of productivity and the equality of the state of financial development (i.e. $\gamma_A = \gamma_C$). With $\Delta r_A^* < 0$ and $\Delta r_C^* > 0$, *Proposition 2* allows to draw the respective conclusions concerning ΔY_A and ΔY_C.

Just the contrary obtains in the reversal scenario of r_A^* and r_C^* occurring where $dD/dr \geq 0$. It gives $r_A^* < r_C^*$ in autarky. Remember that this owes to the fact that here, $\omega(r_A^*) > \omega(r_C^*)$ exceptionally outweighs $k(r_A^*) > k(r_C^*)$ in terms of gross capital demand. Against conventional wisdom, integration then makes the relatively richer country C become a net borrower of the poorer A, so that $r_A^* < \hat{r}^* < r_C^*$. The redirected capital flows further widen the gap between ρ_A and ρ_C (with the first further increasing). As in the light of *Definition 2* and the Proof of *Proposition 2*, the reversal scenario of $dD/dr \geq 0$ falls into the *Y-RRC*, *Proposition 2* offers a clear prediction for $\Delta r_A^* > 0$ and $\Delta r_C^* < 0$: A always loses and its richer partner C always wins from financial integration.

Unfortunately, in the two mixed scenarios, when $r_A^* > r_C^*$ with either only r_A^* or r_C^* being located where $dD/dr \geq 0$, no general prediction is possible. The parameter constellation alone will determine if $\hat{r}^*$ emerges where $dD/dr \geq 0$ or $dD/dr < 0$. However, this anchor is needed for deriving the direction of capital flows as well as ΔY_A and ΔY_C. Still, we can conclude, that principally and in contrast to standard economic theory, any outcome is possible here.

Corollary 3 *The beneficence of financially integrating country A and a richer C with $W_C = \alpha W_A$ $(\alpha > 1)$ and $G_A(w/W_A) = G_C(w/W_C)$ can be read from Proposition 2 on the basis of $r_A^* > \hat{r}^* > r_C^*$ $\forall r$. There is only one exception: if $dD/dr \geq 0$ exists and $r_A^*, r_C^* \in [r_{D1}, r_{D2}]$, then $r_A^* < \hat{r}^* < r_C^*$.*

4.2.4 Teaming up with a richer, less unequal country

Furthermore, A could choose a richer, less unequal partner E. For this purpose, suppose that every agent in E owns $\kappa > 0$ units of wealth more than his counterpart in country A. The graph of $g_E(w)$ follows from a simple horizontal shift of $g_A(w)$ to the right by κ, $W_E = W_A + \kappa$. Yet, $G_A(w/W_A) < G_E(w/W_E)$ obtains, letting the Lorenz curve of E stochastically dominate that of A. The reason is that adding κ has a relatively larger impact on the wealth of the poor than on that of the rich and so reduces inequality in E.

As this setting appears as a combination of the two cases studied before, the analysis is straightforward. Starting out again with the standard scenario of r_A^* and r_E^* arising where $dD/dr < 0$, yields $r_A^* > r_E^*$. In fact, compared to r_E^*, supply and demand side forces reinforce each other and drive up r_A^*. A has an absolutely lower gross capital supply, since its aggregate wealth is lower. Besides that, it registers a relatively higher gross capital demand, since a higher fraction of its residents has access to credit. After opening up, E therefore exports capital to the poorer, more unequal A and $r_A^* > \hat{r}^* > r_E^*$. Nevertheless, capital flows remain lower than under first-best and $\rho_A > \rho_E$. This stems from the result that because of their lower personal wealth, relatively more agents remain credit constrained in A (i.e. $G_A(\omega(\hat{r}^*)) > G_E(\omega(\hat{r}^*))$). Given $\Delta r_A^* < 0$ and $\Delta r_E^* > 0$, *Proposition 2* predicts the sign of ΔY_A and ΔY_E.

On the other hand, in the reversal scenario of r_A^* and r_E^* materializing where

$dD/dr \geq 0$, $r_A^* > r_E^*$ reemerges in autarky. In fact, the credit rationing effect ($\omega'(r) < 0$) temporarily dominates the firm size effect (i.e. $k'(r) < 0$). This makes gross capital demand even higher than in the respective standard scenario case before. Given the still lower gross capital supply, this additionally puts relatively more pressure on r_A^*, so that $r_A^* > r_E^*$ again. Yet, when the two countries now open their borders to capital flows, they see $r_A^* > \hat{r}^* > r_E^*$ and E starts net borrowing from the poorer, less unequal A. ρ_A and ρ_E further depart. With, as laid out above, the reversal area of $dD/dr \geq 0$ falling into the *Y-RRC*, *Proposition 2* shows that in view of $\Delta r_A^* < 0$ and $\Delta r_E^* > 0$, A's *GNP* clearly rises, whereas E's falls.

As for the two mixed scenarios, the findings of Section 4.2.3 apply.

Corollary 4 *The beneficence of financially integrating country A and a richer, less unequal E with* $W_E = W_A + \kappa$ $(\kappa > 0)$ *and* $G_A(w/W_A) < G_E(w/W_E)$ *can be read from Proposition 2 on the basis of* $r_A^* > \hat{r}^* > r_E^* \forall r$.

4.2.5 Teaming up with a richer, more unequal country

At last, country A may choose to get together with a richer, more unequal country F. This situation occurs e.g. when every agent's wealth in F is a positive, increasing and convex mapping of its counterpart's wealth in A: $w_i^F = h(w_i^A)$ with $h'(w_i^A) > 0$ and $h''(w_i^A) > 0$. The graph of $g_F(w)$ looks like a dilation (in the presence of a fixed term also going in hand with a parallel shift) of $g_A(w)$ to the right. Hence, F exhibits a higher aggregate wealth and a more unequal wealth dispersion than A: $W_A < W_F$ and $G_A(w/W_A) > G_F(w/W_F)$.

Again, the countries differ along both dimensions. Yet, this time, they differently affect (5) r^*. That is why already in the standard scenario of r_A^* and r_F^* emerging where $dD/dr < 0$, no general result obtains: $r_A^* \gtreqless r_F^*$ in autarky. Even though A indeed has a lower absolute gross capital supply, it also has a relatively lower gross capital demand than F. For any r, a larger fraction of its residents is credit constrained. It can therefore not generally be predicted, if this on net translates into a higher or lower equilibrium market rate of return in A than in F. Thus, capital flows can principally go either way and depend on the specific parameter constellation. Also, $\Delta r_A^* \gtreqless 0$ and $\Delta r_F^* \lesseqgtr 0$.

Similarly, no clear picture arises in the reversal scenario of r_A^* and r_F^* materializing where $dD/dr \geq 0$: again, $r_A^* \gtreqless r_F^*$ in autarky. Yet, contrary to the standard scenario before, the supply and demand side forces on the equilibrium market rate of return might realign again. Whilst A's gross capital supply still remains lower, its gross capital demand picks up. Recall that the latter originates from the credit rationing effect ($\omega'(r) < 0$) temporarily dominating the firm size effect (i.e. $k'(r) < 0$). Consequently, there are parameter constellations, in which this jump in A's gross capital demand even leads to A having a relatively higher gross capital demand than E. With the supply and demand side forces reinforcing each other, we would get $r_A^* > r_F^*$ with the consequences described in the reversal scenario in Section 4.2.4. However, if this happens depends on the magnitude of the effects, precluding any general forecasts. Thus,

$\Delta r_A^* \gtreqless 0$ and $\Delta r_F^* \lesseqgtr 0$.

Once more, as for the two mixed scenarios, the argumentation laid out in Section 4.2.3 reapplies correspondingly.

Corollary 5 *The beneficence of financially integrating country A and a richer, more unequal F with $W_A < W_F$ and $G_A(w/W_A) > G_F(w/W_F)$ cannot be read from Proposition 2 without taking into account the exact parameter constellation. Only that can decide on not only $r_A^* \gtreqless r_F^*$, but also $\Delta r_A^* \gtreqless 0$ and $\Delta r_F^* \lesseqgtr 0$.*

5 Policy Implications

The results imply manifold recommendations for all those, who attempt to progress with financial integration in the hope of tapping its benefits.

5.1 Winners and Losers

We have seen that there is no W-$G(w)$-combination that would principally disqualify a country for financial integration - neither as an active proponent, nor as a potential team mate. Financial integration rather appears as a menu of choices, whose beneficence across partner countries depends on the country's own characteristics and its counterpart's. Beyond that, there is no team constellation that does not seem appealing in at least one interest rate scenario. The variation stems from the sign and relative magnitude of the credit rationing and the firm size effect in either the Y-SRC or the Y-RRC. These also govern the pattern of capital flows. And it is obvious that when capital flows remain below their first-best levels, the same will be true for the benefits from financial integration. However, apart from the first-best case for $r_A^*, r_B^* \leq \underline{r}(\gamma)$, there are only two further interest rate scenarios that have the potential to be beneficial for both countries at once: first, for $r_A^*, r_B^* < \dot{r}$ (if $\Delta P + \Delta X \geq 0$ also for the country for which $\Delta r^* > 0$) and eventually second, in some parameter constellations in all r_A^*-$\hat{r}^*$-constellations that cannot be generally studied (and that are therefore only mentioned in the footer of *Table 1*). This being said, international financial integration should only be observable in these three cases. Otherwise, other motivations must have played a role.

Indeed, unrational decisions of countries can most obviously be explained on the basis of the result that financial opening bears opposite distributional implications for domestic agents. This owes to credit rationing operating like an entry barrier. It constrains gross capital demand and depresses the equilibrium market rate of return. This is good for borrowers and bad for lenders. For instance, in the standard case for $r \in (\underline{r}(\gamma), \dot{r}]$, an interest rate drop makes the middle class gain (because credit rationing decreases, in turn enabling them to reach the optimal capitalization level), while the rich lose (because of the decreased remuneration of capital) and the poor are equally off (because they anyway do not take part in either side of the capital market). That is how residents are divided into supporters and opponents of financial integration.

Political economy considerations can then be put forward to explain the two sides of the coin. First, why countries still pursue financial integration, even if they know the country as a whole will lose from it. And second, why they do not do so, even if they know the country as a whole would win from it. In the end, it might all depend on what group holds the political power in its hands, so that it is able to convince the government to follow its best interests and not the country's as a whole.[13]

5.2 Optimal Financial Services Trade Liberalization

Altogether, the results lend novel theoretical support to the observation of why some countries prefer a stepwise à la carte approach to financial integration in the framework of preferential trade agreements (PTAs) rather than within the multilateral trading system of the WTO (GATS).

First, in view of the results in Sections 4.1 as well as 4.2 and given its own characteristics, a country might be better off by hand-picking the most suitable partner than by opening up to the whole world. In that sense, this paper offers a first attempt of a theory of optimal financial services liberalization (FSTL). Even though there are only few interest rate scenarios that simultaneously increase GNP in both countries, political economy considerations can explain why in all other scenarios, losing countries might still agree to pursue financial integration with a winning country. Moreover, a winning country could promise to compensate the losing country in order to win its consent to a mutual opening. Second, especially if seen in a more dynamic perspective, a country's needs evolve on its path of development with capital accumulation and with the evolution of domestic inequality. In fact, the identity of winners and losers determines the development of inequality across and within countries. Now losing countries might anticipate that they will win in later periods and therefore find it optimal to open up now on the basis of the sum of discounted profits. Likewise, teaming up later with the then most appropriate partner through a PTA also appears as an appealing flexible policy tool for counteracting unpleasant influences from previous integrations, current partners' integrations with third parties or adverse domestic interest rate shocks. However remark that once the country has opened up and accumulated a non-zero current account position, the satisfaction of (8) $dD/dr \geq 0$ must no longer necessarily imply that of (11) $dX/dr \leq 0$.[14] Thus, this paper's predictions have to be slightly adapted when

[13] Alternative argumentations could be derived from dynamizing the model or extending it in the directions pointed out in the Conclusion.

[14] If it does, mind the following: think e.g. of the Y-RRC in Section 4.2.3, where $r_A^* > \hat{r}_0^* > r_C^*$ made A the net borrower of the poorer C. An interest rate drop to $\hat{r}_1^*$ with $r_A^* > \hat{r}_0^* > \hat{r}_1^*$ (ensued by e.g. A additionally teaming up with a slightly richer C' than C) would induce A to reduce its capital imports, but not necessarily to directly turn into a capital exporter (as under autarky). Contrariwise, if it does not, (11) might hold without (8) for net borrowers with $D > W$. That is why in the Y-RRC, the country may not immediately see a total reversal of its flows, just a diminishment of its NCP (because lower capital imports would not be sufficient to cover a higher per-unit remuneration of capital). Whereas for net lenders with $D < W$, (11) even implies (8), whilst the second can again also hold without the first.

applied to already open countries that look out for further partners. Third, a PTA allows countries to pursue an asymmetric à la carte approach (e.g. opening up the borrowing, but restricting the lending side and vice versa). It leaves the countries prepared to prevent a detrimental reversal of capital flows in case the *Y-RRC* occurs (e.g. after an interest rate shock or spill-overs from the other country teaming up with a third party).

5.3 Strategic Use of Domestic Policies

Furthermore, the results offer important insights for supranational treaty design. These originate from the fact that at *date 0*, after the contract parties have resolved upon financial integration, each member country still has the full range of domestic economic policies at its disposal. These can be used to improve the country's economic conditions with view to the credit constraint (4) $\omega(r)$. In fact, each country can increase the share of its population being eligible for a credit through e.g. political wealth redistribution, inflation or a capital market reform that increases the state of financial development γ.

The mechanisms are already evident in the simplest case of two homogenous countries with $r_A, r_{\tilde{A}} \in (\underline{r}(\gamma), \dot{r}]$ in Section 4.2.1.[15] The received result that e.g. inflation does not affect the real economy holds under autarky based on *Proposition 1*, because inflation proportionally increases demand and supply and so leaves the equilibrium market rate of return unaffected. Whereas after integration, *Corollary 1* implies that the same is only true for an equal rate of inflation $\pi_A = \pi_{\tilde{A}}$. For e.g. $\pi_A > \pi_{\tilde{A}}$, instead, residents in A become relative wealthier than their counterparts in $\tilde{A}$. This enables more agents in A to put up the required collateral and increases gross capital demand. The equilibrium market rate of return has to adjust upwards and induces a rise in the rationing threshold. Still, more agents in A can overcome the rationing threshold than in $\tilde{A}$, so that the first crowd out the latter and use them as lenders. Consequently, A's GNP rises and $\tilde{A}$'s falls. As the benefit A attains from manipulating the domestic scope of credit rationing comes at the expense of $\tilde{A}$, the latter is forced to retaliate with similar measures.

In order to avoid such vicious circles of beggar-thy-neighbor policies,[16] treaties on financial integration should include a harmonization or ban of all domestic policies affecting the domestic level of credit rationing.[17]

5.4 Resilience to Macroeconomic Shocks

Without drawing on risk diversification per se, this paper dismantles credit rationing as a shock-absorber or -amplifier. While credit rationing fosters financial stability in integrated financial markets in the standard case, it triggers

[15] It is straightforward how to adapt the analysis to all other settings in Section 4.2.

[16] The term goes back to Canzoneri and Henderson (1988).

[17] It is obvious that no vicious circle can arise if A opened up to the world, because irrespective of the domestic policy implemented, A cannot change the global market rate of return. Thus, no one would be affected and thus incited to retaliate.

contagion in the Y-RRC.

For this to see, think again in terms of the simplest context of two homogenous countries and the equilibrium characterized in *Corollary 1* for $r_A, r_{\tilde{A}} \in (\underline{r}(\gamma), \dot{r}]$. After integration, a negative macroeconomic shock occurs in A in the form of e.g. a sudden decline in the business climate. It makes all projects' probability of success drop from 1 to $p < 1$. This entails a decrease of the optimal firm size in A to $k_A^\circ(\hat{r}^*)$ s.t. $pf'(k_A^\circ(\hat{r}^*)) = \hat{r}^*$. Hence, credit rationing worsens at all levels of r with $\omega_A^\circ(\hat{r}^*) := k_A^\circ(\hat{r}^*) - \gamma pf(k_A^\circ(\hat{r}^*))/\hat{r}^*$. *Lemma 1* prevails in A but with $\omega_A^\circ(\hat{r}^*) > \omega_A(\hat{r}^*)$. As the business climate remains unaffected in the other country $\tilde{A}$, firm sizes and the scope of credit rationing stay at their previous levels, so that $k_A^\circ(\hat{r}^*) < k_{\tilde{A}}(\hat{r}^*)$ and $\omega_A^\circ(\hat{r}^*) > \omega_{\tilde{A}}(\hat{r}^*)$. It follows that gross capital demand in A decreases, whereas it remains stable in $\tilde{A}$. The common interest rate has to fall and A starts exporting capital to $\tilde{A}$. While A's GNP drops because of the firm size and the efficiency effect, it still drops less than under autarky because of A's capital account surplus. Likewise, $\tilde{A}$'s GNP increases. Remark that for $r_A, r_{\tilde{A}} > \dot{r}$, A still loses less in the Y-SRC than under autarky and $\tilde{A}$ wins.

Hence, integrated capital markets might indeed provide a shock absorbing capacity via the impact of credit rationing in the two countries. Any macroeconomic shock ensuing a drop in net capital demand in one country will be attenuated by the other country's intact capital demand. That is why the rate of return and the GNP under integration are still higher in the country that experiences the shock than they would have been under national autarky. The argumentation reverses in the Y-RRC.

6 Conclusion

This paper complements existing theories of financial integration with the impact of wealth inequality in the presence of capital market imperfections. It draws on production inefficiencies due to credit rationing as a new cost, whose magnitude depends on a country's aggregate wealth endowment and wealth distribution relative to the country it opens up to.

On these grounds, a novel explanation arises for unconventional patterns of international capital flows as well as for why financial integration might turn out welfare-enhancing in some countries and welfare-deteriorating in others. These insights also allow to dismantle winners and losers within a country, so paving the way for political economy considerations. Finally, the paper points out the implications of credit rationing for policy making, esp. for supranational treaty design, optimal financial services trade liberalization and financial stability.

However, the paper only makes a start and so offers various roads for future research. First of all, attention should be given to balancing out the effects of credit rationing induced by wealth inequality against the typical costs and benefits of financial integration outlined in the introduction. The paper also suggests various extensions. Countervailing effects to the impact of wealth dispersion could e.g. be based on differing states of financial development γ_i,[18] increased domestic capital market competition ensued by the entry of foreign lenders or economies of scale in banking. Following Iacoviello and Minetti (2006), domestic lenders could also be assumed to be better at recovering value from a borrower's default than foreign lenders, so requiring less collateral. Above that, different technologies f_i can be expected to trigger a specialization effect, and hidden heterogenous project qualities (asymmetric information) to give rise to an additional quality effect in the pool of loans.[19] Going one step further would also require to study dynamic effects on capital accumulation and future equilibrium market rates of return[20] as well as to derive an optimal dynamic path of successive integrations.

7 Appendix

7.1 Proofs for Section 3

Proof of Lemma 1: The *Lemma* directly follows from (A2), the derivation of $k(r)$, $\omega(r)$ and $\underline{r}(\gamma)$. It remains to assess the functional form of (4) $\omega(r)$, which is continuos and differentiable in r. Using (1) $f'(k(r)) = r$ gives:

$$\omega'(r) = [1-\gamma]\, k'(r) + \gamma f(k(r))/r^2. \tag{15}$$

As the first term is monotonously increasing in r, whereas the second is monotonously decreasing in r, there is a single $r = \dot{r}$, such that $\omega'(\dot{r}) = 0$. Then, $\omega'(r) > 0$ for $r < \dot{r}$ and $\omega'(r) < 0$ for $r > \dot{r}$. This stems from the fact that $r \to 0$, $k'(r) \to 0^-$ and $f(k(r))/r^2 \to \infty$. Whereas for $r \to \infty$, $k'(r) \to -\infty$ and $f(k(r))/r^2 \to 0^+$. Using (1), simple algebra yields that (15) $\omega'(r) \geq 0$ as long as

$$\eta_{y,r} := -rf'(k(r))\, k'(r)/f(k(r)) \leq \gamma/[1-\gamma],$$

where $\eta_{y,r} > 0$ is the input price elasticity of output. Likewise,

$$\omega''(r) = [1-\gamma]\, k''(r) + [\gamma/r]\left[k'(r) - 2f(k(r))/r^2\right]. \tag{16}$$

Against the background of $\omega(r)$'s monotony and with the first term being positive, whilst the second one being negative for all r, there must be a single $r = \ddot{r}$, such that $\omega'(\ddot{r}) = 0$. Then, $\omega''(r) < 0$ for $r < \ddot{r}$ and $\omega''(r) > 0$ for $r > \ddot{r}$, since $\omega(r) \to -\infty$

[18] With otherwise identical countries, the scope of credit rationing in the country with the higher γ would decrease ($d\omega/d\gamma < 0$), so that it would attract capital flows from the other country. Additionally, γ could be modelled to be driven e.g by the scope of diversification opportunities (as e.g. in Acemoglu and Zilibotti, 1997 or Martin and Rey, 2004), the presence of foreign banks with superior efficiency (as e.g. in Levine, 1996 or Rajan and Zingales, 2003) or taxed-financed financial infrastructure investments (as e.g. in Ando and Yanagawa, 2002).

[19] Dynamically put, progress could also be endogenized by making the technology switch dependent on surpassing financing hurdles (as in Horii, Yamamoto and Ohdoi, 2005).

[20] While Piketty (1997) or Gerling (2007) provide a dynamization with variable firm sizes, Matsuyama (2004) studies the impact of financial integration on the set of steady states.

for $r \to 0$, but $\omega(r) \to 0$ for $r \to \infty$. By comparison of the terms in $\omega'(r)$ and $\omega''(r)$, it must be that $\dot{r} < \ddot{r}$. Similarly, one can show that (16) $\omega''(r) \leq 0$ for

$$\eta_{y,r} \leq 2/\left[(1-\gamma)\,\varepsilon_{k',r}/\gamma - 1\right].$$

where $\varepsilon_{k',r} > 0$ is the factor price elasticity of the optimal investment's slope. Then, it follows from the fact that $\omega(r)$ is decreasing and concave for $\gamma/[1-\gamma] \leq \eta_{y,r} \leq 2/\left[(1-\gamma)\,\varepsilon_{k',r}/\gamma - 1\right]$ that $\varepsilon_{k',r} \leq 2 + \frac{\gamma}{(1-\gamma)}$.

Proof of Proposition 1: The Proof immediately follows from (A1) to (A3), *Definition 1*, *Lemma 1* and the construction of the demand correspondence. On top:

$$dP^*/dr = \left[f(\omega(r))\text{-}f(k(r))\right]\omega'(r)\,g(\omega(r)) + \left[1\text{-}G(\omega(r))\right]f'(k(r))\,k'(r) \quad (17)$$

There are two effects at play: a credit rationing and a firm size effect effect. While the second is captured by the second term and always negative, the first is captured by the first term, which is negative for $r < \dot{r}$ and positive thereafter - owing to a change in sign of $\omega'(r)$. As P is decreasing in r if $1 \leq r \leq \underline{r}(\gamma)$, when credit rationing is absent (so that only the firm size effect is effective), $dP/dr < 0$ for $r < \dot{r}$. Yet, this standard response might not persist throughout $r > \dot{r}$, since the firm size and credit rationing effect then go into opposite directions w.r.t. aggregate investment. Instead, as derived in (7), the opposite response arises if, around the point of inflexion at $r = \ddot{r}$, a sufficiently small $g(\omega(r))\,\omega'(r)$ entails an investment-enhancing credit rationing effect that outweighs the investment-depressing firm size effect.

7.2 Proofs for Section 4

Proof of Proposition 2: As shown above, this follows from (A1) to (A3), *Lemma 1*, *Proposition 1* and the impact of Δr on (10) ΔP_A and $\Delta X_A = \hat{X}_A^*$, whereby:

$$d\hat{X}_A^*/dr = \left[W_A\text{-}D_A(r)\right] + r\left[k(r)\text{-}\omega(r)\right]\omega'(r)\,g(\omega(r))\text{-}r\left[1\text{-}G(\omega(r))\right]k'(r) \quad (18)$$

Starting out from autarky, the first term is positive if we are in the interest rate region where $D_A'(r) < 0$ (and negative if condition (8) holds). The second term is positive if $r < \dot{r}$ (and negative if not) and the third negative $\forall r$. For $r \leq \underline{r}(\gamma)$, the second as well as third term vanish and $D_A'(r) < 0$, so that $d\hat{X}_A^*/dr > 0$. Otherwise, the interest rate range and the magnitude of the terms matter. By the same analysis as for dP/dr and for the existence of a reversal response in Section 3.2, $d\hat{X}_A^*/dr > 0\;\forall r$ except for if condition (11) holds. Given (A3), a market rate of return span $[r_{X1}, r_{X2}]$ then materializes for which $d\hat{X}_A^*/dr \leq 0$. Beyond that, it follows from the comparison of (11) and (8), that the RHS of the first is larger than that of the second for $D_A(\hat{r}^*) > W_A$. As both RHS are negative, the satisfaction of the first is therefore automatically implied by that of the second as long as $D_A(r) > W_A$. The contrary, instead, would require $D_A(r) < W_A$. Yet, this can never be true, since coming from an autarkic equilibrium as characterized in *Proposition 1* makes the satisfaction of (8) equivalent to $D_A(\hat{r}^*) > W_A$. Thus, (11) $d\hat{X}_A^*/dr \leq 0$ cannot be fulfilled without (8) $dD_A/dr \geq 0$ holding.

Now, relabel (17) dP^*/dr from the Proof of *Proposition 1* to get $d\hat{P}_A^*/dr$. Summing it up with (18) $d\hat{X}_A^*/dr$ gives the derivative of (9) $\hat{Y}_A^*$ w.r.t. r. After using the optimum result (1) $f'(k(r)) = r$, $d\hat{Y}_A^*/dr = [W_A - D_A] - rD' + P'$ reduces to

$$d\hat{Y}_A^*/dr = [W_A - D_A(r)] + [[f(\omega(r)) - r\omega(r)] - y(r)]\,\omega'(r)\,g_A(\omega(r)). \quad (19)$$

Again, the first term is positive (except for if condition (8) holds) and approaches W_A for $r \to \infty$. In the second term, $[f(\omega(r)) - r\omega(r)] - y(r) < 0$ (since the profit is maximal for $k(r)$ and smaller for any other $k \neq k(r)$), so that the sign of $\omega'(r)$ depicted in *Lemma 1* becomes crucial once more.

Thus, for $r \leq \dot{r}$, the signs of the two terms in (19) oppose. It is immediately clear that for $r \leq \underline{r}(\gamma)$, when there is no credit rationing, $d\hat{Y}_A^*/dr > 0$. Whereas for $\underline{r}(\gamma) < r_A^* < \hat{r}^* \leq \dot{r}$, $d\hat{Y}_A^*/dr \gtreqless 0$, depending on $|\Delta P_A| \lesseqgtr |\Delta X_A|$ with $\Delta P_A < 0$ and $\Delta X_A > 0$. In contrast, $d\hat{Y}_A^*/d\hat{r}^* > 0$ for $r > \dot{r}$ when both terms in (19) share the positive sign. This is given in the Y-SRC characterized in *Definition 2*, when any losses from smaller firm sizes become less burdensome relative to the gains in the net credit position and the relaxed credit rationing. Whereas in the Y-RRC, the fulfillment of (8) makes A a capital importer, so that the first term in (19) becomes negative. Then, (12) assures that any dominance of the credit rationing over the firm size effect, which makes ΔP_A and ΔX_A temporarily change sign, translates into $\Delta P_A \geq 0$ remaining dominated by $\Delta X_A \leq 0$. Thus, $d\hat{Y}_A^*/d\hat{r}^* \leq 0$ in the Y-RRC.

At last, because of $[W_A - D_A(r)]$, there are scenarios, in which the direction of the interest rate change becomes decisive. If A sees an interest rate decline (i.e. $\dot{r} \geq r_A^* > \hat{r}^*$), we get $\Delta Y_A > 0$, because (12) cannot hold. This owes to the fact that $\Delta r_A < 0$ induces more net borrowing firms with non-negative profits at a higher optimal scale, each generating higher profits than their credit-rationed counterparts ($y'(r) < 0$). That is how in the aggregate, the first term in (19) gets dominated by the second. As soon as $r_A^* > \hat{r}^* > \dot{r}$, instead, also the first term in (19) turns negative owing to tightened rationing. Hence, $\Delta Y_A < 0$ in the Y-SRC. Contrariwise, (12) implies that in the Y-RRC, $\Delta Y_A \geq 0$, because the effects just reverse. As (8) holds, A turns into a capital exporter, making the first term positive. Then, (12) ensures again that the first term dominates the second, so that the positive effect prevails.

Proof of Proposition 3: The Proof follows from (A1) to (A3), *Definition 1*, *Lemma 1*, *Propositions 1* and *2* as well as the construction of the aggregated supply and demand correspondence.

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