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* Views expressed are those of the author and do not necessarily reflect official positions of De Nederlandsche Bank.

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Abstract

Regulatory limits on intragroup exposures constrain capital allocation within multinational banking groups. We develop a theoretical model of cross-border banking that captures internal capital markets under supranational supervision and borrowing constraints. Our analysis shows that relaxing intragroup exposure limits can amplify risk-taking by enabling parent banks to draw on affiliate resources and reallocate risk toward the home market, particularly when foreign affiliates are large, well capitalized, and subject to weaker liquidity requirements. We characterize the conditions under which this channel operates and discuss its implications for financial stability. Our findings inform the debate on multinational banking groups by showing how risks can emerge within these organizations and how regulatory tools can mitigate them.

JEL: F23; G21; G28
Keywords: Multinational banks; Intragroup exposures; Risk-taking; Prudential regulation; Liquidity requirements

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1 Introduction

Multinational banking groups (MNBs) benefit from internal capital markets - mechanisms that facilitate the allocation of financial resources across affiliates within the group. These internal markets provide affiliates with an alternative to public capital markets, thereby reducing reliance on costly external financing. They also help smooth liquidity across the organization and optimize funding allocation in response to regulatory constraints or shifting market conditions. By reallocating funds to more profitable or funding-constraint units, internal capital markets enable MNBs to exploit investment opportunities that might otherwise remain unfunded. The structure and functioning of these internal capital markets are shaped by two key features that distinguish banks from non-financial firms.

First, banks operate with significantly higher leverage, relying predominantly on debt-based financing, primarily deposits. Internal capital markets support this high leverage by facilitating the internal flow of funds, which enhances balance sheet flexibility and funding efficiency. However, this also creates risk-shifting incentives, as individual units may take on excessive risk, anticipating that losses can be absorbed or redistributed within the group. In this context, debt serves not only as a funding source but also as a mechanism for transferring risk from shareholders to creditors, thereby influencing risk allocation.

Second, banks are subject to extensive regulation, and MNBs operate across multiple, often heterogeneous, regulatory regimes. While the Basel framework mandates consolidated supervision at the group level, the actual movement of internal funds remains subject to the jurisdiction of national regulators. In the European Union, for example, national authorities retain discretion to deviate from baseline regulatory standards, contributing to regulatory fragmentation. Within this fragmented landscape, internal capital markets serve not only as mechanisms for efficient capital allocation but also as strategic tools for shifting funds across borders and regulatory regimes. This ability to navigate differing local rules can enhance financial flexibility and allow MNBs to respond dynamically to local constraints. However, it also introduces potential risks. The ability to reallocate capital internally may weaken the effectiveness of national prudential oversight, obscure the true risk profile of individual affiliates, and complicate resolution planning for times of distress. Moreover, the strategic use of internal capital markets to navigate regulatory differences may amplify systemic risk if it leads to concentrated exposures or undermines the resilience of affiliates in more strictly regulated jurisdictions.

A point of debate among policymakers and banking executives concerns the regulatory constraints on intragroup funding within European MNBs. On the one hand, national regulators impose restrictions on cross-border capital transfers to safeguard the stability of their domestic banking sectors. These measures aim to limit intragroup exposures and to mitigate the risk that failures of local affiliates could impose losses on domestic creditors or deposit insurance schemes. The Global Financial Crisis (GFC) reinforced this rationale, as liquidity shortages among local affiliates were exacerbated by the failure and nationalization of parent institutions. On the other hand, critics argue that such restrictions impede efficient capital allocation and weaken the functioning of internal capital markets [Enria 2020, 2021, Storbeck and Arnold 2025]. In response, the ECB has introduced policies aimed at easing constraints on intragroup fund movements [The Governing Council of the European Central Bank 2016, ECB Banking Supervision 2022]. Bank managers generally support this position, contending that greater flexibility in internal capital flows enhances allocation efficiency and supports productive investment [ING 2017]. While both perspectives are grounded in legitimate concerns, the tension highlights a broader trade-off between national financial stability and group-level efficiency. Excessive restrictions may fragment internal capital markets and reduce the resilience of MNBs, whereas insufficient oversight could expose domestic systems to spillover risks from cross-border contagion or misaligned incentives within banking groups.

This paper investigates how intragroup exposure limits – regulatory constraints that cap the volume of funding an affiliate of a MNB may extend to another affiliate – shape group-level risk-taking incentives. These limits are defined as a fraction of the affiliate's Tier 1 capital and constitute a prudential tool governing cross-border internal capital markets. While European legislation harmonizes the general framework, national authorities currently retain discretion to impose stricter caps or attach additional conditions to intragroup credit flows. Several jurisdictions, for example Belgium and Italy, enforce a binding 100% ceiling, thereby preventing subsidiaries from transferring more than their Tier 1 capital to the parent or other affiliates. This discretion, however, will lapse in 2028 with the scheduled sunset of the relevant provision in the European capital framework. After that date, national supervisors will no longer be permitted to impose binding quantitative limits on intragroup exposures.

This institutional shift provides a policy-driven change in constraints that is both sharp and exogenous to bank behavior. It naturally raises the central question that motivates the paper: How does the removal of intragroup exposure limits affect bank risk-taking within multinational groups? The analysis focuses precisely on this first-order implication. In our framework, intragroup transfers arise solely as a mechanism that allows the parent entity – assumed to have access to riskier investments – to draw on the balance sheet of an affiliate. The key endogenous choice of the MNB is therefore whether to channel additional resources from the affiliate to the parent, and under what regulatory conditions such reallocation becomes the dominant strategy. The model characterizes the parameter space in which this inefficient transfer occurs and develops comparative statics with respect to the intragroup limit.

Our model does not incorporate potential offsetting benefits of intragroup transfers – such as improved internal liquidity management or enhanced group-level resilience – to generate an explicit welfare trade-off. Although such features would be valuable in a broader normative analysis, the regulatory development that motivates our study does not hinge on the existence of these countervailing forces. The removal of intragroup exposure limits is an exogenous policy change that will materialize mechanically under the current European framework. Within this context, the paper's contribution is to isolate the financial stability implications of relaxing an existing prudential constraint, rather than to re-optimize that constraint from first principles. In our setting, intragroup transfers are privately advantageous yet may be socially inefficient, making the key economic question how MNBs adjust their behavior once a binding limit is lifted. The model therefore concentrates on the mechanism most directly affected by the regulatory shift: the conditions under which expanded intragroup capacity induces the MNBs to undertake inefficient risk-taking. The paper's contribution is to provide a tractable characterization of these conditions and to evaluate how the relaxation of prudential limits alters the allocation of assets within cross-border banking groups.

To assess the potential implications of abolishing intragroup exposure limits, we adopt a two-step approach. First, we present descriptive statistics to establish a set of stylized facts. We document that jurisdictions enforcing stringent intragroup exposure limits exhibit significantly lower levels of cross-border intragroup lending – approximately three times lower. Furthermore, affiliates of MNBs operating in these jurisdictions tend to be significantly smaller than their counterparts in countries without such constraints. We also find that leverage is substantially higher among MNB affiliates in countries lacking hard limits, consistent with increased risk-taking behavior. In addition, MNB affiliates frequently function as internal funding providers, facilitating capital reallocation within the banking group. Finally, among affiliates subject to strict intragroup lending limits, those serving as funding providers exhibit lower returns on assets and reduced profitability, as measured by net profits to equity.

In the second step, we develop a theoretical model of a MNB comprising a parent bank and a foreign affiliate, managed by a profit-maximizing banker. The banker allocates funds between safe and risky assets across both home and foreign markets. We model the affiliate as a subsidiary under supranational supervision, wherein the supervisor ensures support for the affiliate while constraining the parent's ability to exploit limited liability when profitable. The model yields four key results.

First, relaxing intragroup exposure limits increases lending from the affiliate to the parent, thereby enabling greater risk-taking by the parent in the home market. Second, this effect is more pronounced for larger affiliates, which respond more strongly to changes in the exposure limit. Third, higher capitalization of the affiliate does not mitigate the parent's risk-taking under looser constraints; rather, stronger capital positions amplify the transmission of risk through intragroup funding. Fourth, liquidity requirements help restrain risk-taking by offsetting the incentives created by relaxed exposure limits.

The theoretical findings carry several policy implications for the debate on regulatory constraints on intragroup funding. First, the observed increase in parent-bank risk-taking following the relaxation of intragroup exposure limits suggests that such constraints play a critical role in containing broader vulnerabilities within banking groups and point to the need for supervisors to remain alert to heightened risk-taking when such limits are eased. Policymakers should therefore anticipate a potential increase in risk-taking once transitional arrangements for intragroup limits expire, particularly in host countries, which may increase risk-taking of parent banks in home-countries. Second, the amplification of this effect among larger affiliates indicates that size-based regulatory differentiation may be warranted – stricter intragroup exposure rules for large affiliates could help mitigate risk-taking. Third, the finding that higher affiliate capitalization exacerbates rather than dampens risk transmission challenges the conventional reliance on capital buffers as a standalone safeguard. This underscores the need for a more holistic supervisory approach that accounts for intragroup dynamics and cross-border risk channels. Finally, while liquidity requirements can curb risk-taking, their effectiveness should be viewed largely as a theoretical - yet feasible - complementary mechanism rather than a sharply targeted policy lever.

Our paper contributes to three strands of the literature. First, it adds to the growing literature on global and cross-border banking, an area that experienced significant transformation following the GFC. In the years leading up to the GFC, cross-border claims and foreign bank presence expanded rapidly, driven by increased international banking activity, capital flows, and financial integration [Claessens 2017]. The crisis marked a turning point: cross-border banking contracted sharply, with flows declining by approximately 20% [Claessens 2017]. Beyond the reduction in volume, the crisis reshaped the structure of global banking. Amiti *et al.* [2019] document a decline in the sensitivity of cross-border lending to global risk conditions, while Avdjiev *et al.* [2020] highlight a reversal of pre-crisis dynamics. In contrast, the contraction in foreign bank presence was more muted [Claessens 2017, Buch and Goldberg

2020]. Banks from advanced economies retrenched by divesting from distant subsidiaries, whereas banks from emerging and developing economies expanded abroad, resulting in a more regionalized – though not necessarily less fragmented – global banking landscape.

The literature provides a comprehensive assessment of the benefits and risks of global banking. On the one hand, cross-border banking can improve financial access [Bruno and Hauswald 2014, Kneer and Raabe 2024], facilitate firm entry [Bermpei *et al.* 2019], and support broader economic development [Giannetti and Ongena 2012, Claessens 2017, Buch and Goldberg 2020]. Foreign banks may also act as stabilizing forces, with parent institutions providing liquidity and support to subsidiaries during periods of host-country distress [De Haas and Van Lelyveld 2010, De Haas *et al.* 2015]. On the other hand, global banking can reduce credit access in low-income countries [Detragiache *et al.* 2008, Claessens and Van Horen 2014] and amplify vulnerabilities by transmitting shocks from home to host countries, thereby increasing exposure to external disturbances [Popov and Udell 2012, De Haas and Van Lelyveld 2014, Cerutti *et al.* 2017, Claessens 2017, Avdjiev and Jager 2022]. While solvency-focused regulation can dampen such spillovers, it may also increase the risk of sudden stops in capital flows [Forbes 2020]. Our study contributes to this literature by exploring the mechanisms through which cross-border banking affects risk-taking.

Second, we contribute to the literature on cross-border banking and regulation, with a particular focus on the relationship between parent banks and their foreign affiliates. Risk-return characteristics are central to MNBs' decisions to enter foreign markets, as shown both theoretically [Dell'Ariccia and Marquez 2010] and empirically [Gibilaro and Mattarocci 2021]. Regulation also shapes these decisions: foreign banks tend to allocate more credit to jurisdictions with relatively lighter regulatory burdens [Houston *et al.* 2012, Emter *et al.* 2019, Dinger and Te Kaat 2020, Gibilaro and Mattarocci 2021, Kowaleksi 2023]. However, the dynamics of cross-border banking within Europe differ: stricter home-country regulation has been found to reduce – rather than encourage – cross-border banking flows [Bremus and Fratzscher 2015]. One explanation is the regulatory bias of national authorities, who often favor domestic banks [Gropp *et al.* 2024] and impose more stringent requirements on foreign subsidiaries [Calzolari and Loranth 2011]. While regulatory forbearance may sometimes be welfare-enhancing by allowing national regulators to internalize domestic distortions [Gersbach *et al.* 2020], a growing literature advocates for supranational supervision [Calzolari *et al.* 2018, Colliard 2020], with empirical evidence suggesting that ECB-led supervision has improved bank safety across member states [Calò *et al.* 2024]. Our paper adds to this literature by showing how European regulatory frictions affect bank risk-taking and by proposing alternative risk-mitigation mechanisms that can facilitate cross-border activity without increasing risk. Our paper also relates to the literature on capital and liquidity regulation. A number of studies show that liquidity requirements are essential for aligning banks' incentives and that capital and liquidity rules should be designed jointly [Vives 2014, Calomiris *et al.* 2015, Walther 2016, Kara and Ozsoy 2020]. Other work, however, find that joint design does not always yield the optimal outcome [Kara and Ozsoy 2020, Kashyap *et al.* 2024, Sundaresan and Xiao 2024]. Our paper contributes to this literature by showing that liquidity requirements can curb risk-taking in a MNB that otherwise has strong risk-shifting incentives. At the same time, we uncover a distinct channel through which capital and liquidity interact in MNBs: because intragroup exposure limits are calibrated as a share of Tier 1 capital, higher capital requirements may inadvertently expand the scope for intragroup lending and thereby increase risk-taking.

Third, our paper contributes to the literature on internal capital markets within MNB groups. These internal markets serve both stabilization and profit-enhancing functions. Financially strong parent banks allocate capital internally to support foreign subsidiaries, stabilizing lending [Busch *et al.* 2022], especially during downturns [De Haas and Van Lelyveld 2010], offsetting deposit shortfalls [Cremers *et al.* 2011], or fulfilling prior commitments [De Haas and Van Lelyveld 2010]. Internal capital flows also play a liquidity management role, with parent banks acting as central liquidity distributors across the group [Cetorelli and Goldberg 2012b]. Our paper departs from this literature by emphasizing a reverse channel: foreign affiliates can also serve as funding sources for parent banks. Evidence suggests that, particularly during periods of stress, capital can flow upstream from affiliates to the parent institution [Schnabl 2012]. For example, during the GFC, U.S. subsidiaries of foreign banks accessed Federal Reserve liquidity facilities and upstreamed these funds to their European parents, thereby enhancing the parent banks' liquidity positions [Buch *et al.* 2016]. We contribute to this literature by identifying a mechanism through which affiliates act as funding providers to parent banks, analyzing the implications for MNBs' risk profiles, and examining the role of regulation in enabling or constraining internal capital market activity.

The remainder of the paper is structured as follows. Section 2 reviews the European regulatory framework governing intragroup exposure limits. Section 3 presents stylized facts and illustrative examples of MNBs operating subsidiaries under these constraints. Section 4 outlines the theoretical model, and Section 5 provides the solution. Section 6 concludes. Proofs are provided in the Appendix.

2 The European intragroup exposure limit

In the European Union (EU), banks are subject to harmonized capital requirements and prudential regulations.[1] These regulations establish a single rulebook through directly applicable European legislation. However, national options and discretions negotiated during the legislative process allow member states to adopt divergent approaches in certain regulatory areas, leading to cross-country differences.

One notable example of such divergence is the regulation of intragroup exposure limits. Within multinational banking groups, entities often incur exposures to other regulated affiliates – for example, by providing funding or extending liquidity. In the case of cross-border intragroup lending, national legislatures and supervisors are permitted to impose specific exposure limits, capping the amount a bank may lend to another group entity as a proportion of its Tier 1 capital. Table 1 presents a detailed summary of the regulatory approaches adopted by individual EU member states. Note that we use the term *exposure* to denote a granted credit, typically in the form of a loan.[2] Throughout the paper, the terms *loan* and

[1] For details see the Council of the European Union [2013a] and Council of the European Union [2013b].

[2] These definitions do not fully align with those in the CRR, which converts certain off-balance sheet

Table 1: Overview of the intragroup exposure limit treatments

	Supervisory judgement	Supervisory judgement + additional conditions	Hard limit
# Member states	8	12	5

Notes: *Supervisory judgment* refers to the baseline treatment under the capital requirements framework, under which the supervisor assesses whether the bank is adequately managing its concentration risk. *Supervisory judgment + additional conditions* indicates that the country departs from the baseline by allowing supervisors to impose further requirements. *Hard limit* denotes whether these additional conditions include a fixed cap on intragroup exposures, typically set at 100% of Tier 1 capital. Classifications are based on the EBA supervisory disclosures.

exposure are used interchangeably, and *exposure* should not be interpreted to include other forms of exposure, such as equity investments.

Under the European framework, three primary regulatory treatments for intragroup exposure limits exist: (1) supervisory judgment, (2) supervisory judgment with additional conditions, and (3) a hard limit.[3] The first treatment relies on supervisory judgment, assessed with reference to a bank's internal risk management policies. Under this approach, intragroup exposures may be exempted from large exposure limits, provided supervisors verify that the bank effectively manages its concentration risk.[4] This verification involves a detailed review of the bank's credit concentration risk management framework to ensure compliance with regulatory standards. As shown in Table 1, several EU member states adhere to this baseline approach.

The second treatment arises when regulators deviate from the baseline by invoking a transitional provision of the Council of the European Union [2013b].[5] This provision, which remains in effect until 2028, allows national authorities to impose stricter conditions. In

items – such as credit lines – into exposure values to ensure that capital is held against them. Moreover, the CRR allows credit risk mitigation techniques to reduce exposure values under specific conditions. We do not incorporate these nuances here, as doing so would introduce complications that are not conducive to analyzing the core issue: the cross-border transfer of funds.

[3]Jurisdictions with *Supervisory judgment* are: Bulgaria, Czech Republic, Ireland, Iceland, The Netherlands, Romania, Slovakia, and Sweden. Jurisdictions with *Supervisory judgment + additional conditions* are: Austria, Denmark, Estonia, Finland, France, Germany, Latvia, Lithuania, Luxembourg, Norway, Portugal, and Spain. Jurisdictions with *Hard limits* are: Belgium, Hungary, Italy, Malta, and Poland.

[4]Article 400(2)(c) of the Council of the European Union [2013b] exempts intragroup exposures from large-exposure limits. See Appendix B for further details.

[5]See Article 493. Further details are provided in Appendix B.

practice, this may include both the verification of risk management adequacy and the imposition of quantitative limits on intragroup exposure. As reported in Table 1, this approach is currently the most widely adopted across member states.

The third treatment involves the imposition of a hard limit – a fixed regulatory cap on intragroup exposures, typically set at 100% of Tier 1 capital. Under this regime, national legislatures prohibit supervisors from authorizing exposures above the specified ceiling. Notable examples include Belgium and Italy, where even subsidiaries of foreign institutions are subject to this restriction.

A key feature of the second and third treatments is their explicitly temporary nature. Both rely on transitional provisions scheduled to expire in 2028. Given that legislative cycles governing amendments to these provisions typically exceed three years, expiration is effectively certain. Once these provisions lapse, intragroup exposure constraints will be materially relaxed in many EU jurisdictions. It is unlikely that national authorities, operating under supranational supervision, will be able to reintroduce comparable restrictions, as the current European regulatory framework provides no clear legal basis for doing so. Consequently, supervisors may instead resort to indirect measures – such as administrative hurdles or prudential disincentives – to limit affiliates' reliance on intragroup funding.

3 MNBs and intragroup funding

3.1 Eurozone banks: stylized facts

As a first step in examining intragroup funding among affiliates of MNBs, we present descriptive statistics for a sample of Eurozone-based subsidiaries. The data are obtained from the Individual Balance Sheet Item (IBSI) statistics collected by the European Central Bank. This dataset offers granular information on balance sheet items, including cross-border intragroup lending by banking subsidiaries. Given our focus on subsidiaries of large banking groups subject to supranational supervision, the analysis is confined to such entities. A no-

Table 2: Descriptive statistics for Eurozone subsidiaries of MNBs

	SJAC	SJAC	HL	HL
	Mean	Median	Mean	Median
$\frac{Sub.deposits}{Par.deposits}$	0.160	0.071	0.104	0.014
$\frac{Sub.Equity}{Sub.Liabilities}$	0.076	0.070	0.093	0.072
$\frac{Intragrouplending*}{Equity}$	5.520	3.005	1.830	0.152

Notes: Columns labeled *SJAC* (Supervisory judgment with additional conditions) refer to subsidiaries in jurisdictions where national legislation permits supervisory discretion and may impose supplementary requirements. Columns labeled *HL* (Hard limit) refer to subsidiaries in countries where a hard limit on intragroup exposures is embedded in the regulatory framework. All calculations are based on IBSI data and are restricted to subsidiaries with total assets exceeding EUR 5 billion and parent banks with equity of at least EUR 1 billion. The Supervisory Judgment regime is omitted, as it covers only three eurozone member states (Ireland, The Netherlands, and Slovakia) with relatively few subsidiaries, which could risk revealing confidential information. *Sub.* denotes subsidiary; *Par.* denotes parent bank. Data refer to year-end 2019. Subsidiaries and parent banks are matched using RIAD codes based on IMFI metadata tables provided by the ECB. *This variable captures only cross-border intragroup lending and is defined at the subsidiary level.

table limitation of the IBSI data is its inability to differentiate whether intragroup lending is directed toward the parent bank or other affiliated entities within the group; it merely identifies whether the lending is cross-border. We use the IBSI data to construct variables that address the paper's research question and discipline the theoretical model and simulations developed in subsequent sections. These variables are categorized by "regulatory regime", as defined in Table 1. The sample is restricted to subsidiaries with total assets exceeding EUR 5 billion, as smaller entities typically tend to offer niche financial services and are less representative of typical banking behavior. Furthermore, we include only parent banks with equity greater than EUR 1 billion to exclude small banking groups. Observations in the top 1% of the leverage distribution are treated as extreme outliers and excluded from the final sample. These observations disproportionately affect sample means, particularly in a small sample and for leverage measures that are bounded below at zero.

Table 2 reports descriptive statistics that yield several insights. First, subsidiaries operating under hard intragroup exposure limits engage in substantially less cross-border intragroup lending. The mean ratio of cross-border intragroup lending to equity is 1.83 in hard-limit jurisdictions, compared to 5.52 in regimes governed by supervisory judgment with additional conditions. The divergence between the mean and median – 1.83 and 0.15 under the hard limit versus 5.52 and 3.01 under supervisory judgment – indicates that a small number of subsidiaries with elevated intragroup exposures drive the higher averages. This pattern suggests that intragroup exposure limits are typically binding and that relaxing such limits is associated with higher intragroup exposures.

Second, subsidiaries are typically small relative to their parents in terms of deposit bases. On average, subsidiary deposits amount to at most 16% of parent deposits. Subsidiaries of large banking groups exhibit higher subsidiary-to-parent deposit ratios in jurisdictions without hard intragroup exposures limits. Specifically, the mean ratio increases from 10.4% to 16%, while the median rises more more sharply from 1.4% to 7.1%. This pattern is consistent with subsidiaries operating under supervisory judgment with additional conditions holding relatively larger deposit bases than those subject to hard intragroup exposure limits.

Finally, subsidiaries operating under hard intragroup exposure limits exhibit lower leverage, measured as the ratio of liabilities to equity. The mean leverage ratio increases from 10.75 (i.e., 1/0.093) under hard-limit regimes to 13.15 (i.e., 1/0.076) in jurisdictions governed by supervisory judgment with additional conditions. The divergence between mean and median values – 10.75 and 13.89, respectively, under hard limits, versus 13.15 and 14.28, under supervisory judgment – indicates that a subset of highly leveraged subsidiaries drives the higher average outside hard-limit regimes. The higher leverage observed among subsidiaries outside hard-limit regimes is consistent with the risk-shifting channel (later emphasized in our theoretical model), whereby relaxed intragroup exposure constraints weaken capital discipline and permit leverage choices that increase the exposure of the multinational bank to downside risk.

3.2 Two examples

We next present two illustrative cases of subsidiary banks belonging to MNBs operating in a jurisdiction – Belgium – where hard limits on intragroup exposures are embedded in national regulation. These cases were selected based on two criteria: (1) both subsidiaries have transferred funds to their parent entities, and (2) sufficient public information is available due to their issuance of debt instruments, which has triggered credit rating agency coverage and regulatory disclosure.

The first case examines ING Belgium, a subsidiary of the Netherlands-based ING Group, a designated global systemically important bank (G-SIB). Three characteristics make ING Belgium an informative example. First, it is significantly smaller than its parent group. As of year-end 2022, ING Belgium reported total assets of EUR 165 billion [Moody's 2023], accounting for approximately 17% of ING Group's consolidated balance sheet. Second, the subsidiary exhibited relatively poor profitability in that specific period, generating a return on average equity of 3.38% in 2022, substantially below the consolidated return on equity of ING Group of 7. 8%.[6] Third, ING Belgium has consistently operated with excess funding capacity, driven by a strong retail and corporate deposit base – this surplus has historically been reallocated within ING Group, through interbank lending and the purchase of assets originated by other affiliates [Moody's 2023].

The second case focuses on BNP Paribas Fortis, the Belgian subsidiary of France-based BNP Paribas. BNP Paribas Fortis shares several characteristics with ING Belgium. First, it is modest in size relative to the consolidated group, with EUR 350 billion in assets – equivalent to 13% of BNP Paribas's EUR 2.6 trillion balance sheet [Fitch 2024]. Second, it exhibits moderate profitability: a return on equity of 8% in 2022, compared to 9.9% for the consolidated group.[7] Third, BNP Paribas Fortis plays an active role in group-wide liquidity

[6] This consolidated figure includes ING Belgium's performance. Adjusting for its contribution, and assuming equity is proportional to total assets across the group, the return on equity for the non-Belgian portion of the group is estimated at 8.7%. The adjustment uses ING Belgium's 17% share of the group's total balance sheet to isolate the return on equity for the non-Belgian operations. The calculation is: (7.8%*100-3.38%*17)/(100-17)=8.7.

[7] As with the previous case, the consolidated figure includes the subsidiary's performance. Adjusting for

management by reallocating excess funding to other entities within the group [Fitch 2024].

Both examples underscore the role of intragroup funding as a mechanism for reallocating resources from lower-return to higher-return markets within cross-border banking groups. They reveal a common structural pattern: (i) the subsidiary is relatively small within the consolidated group, (ii) it operates with below-group-average profitability, (iii) it maintains a funding surplus, and (iv) it engages in intragroup transactions to reallocate excess liquidity. These empirical features, together with the stylized facts presented earlier, inform the theoretical model developed in the following section.

4 The model

This section presents a tractable model capturing key features of MNBs affiliates – size, profitability, funding, and intragroup lending – under differing regulatory regimes. The framework helps us explore how relaxing cross-border intragroup constraints affects risk-taking behavior, risk allocation, and financial stability.

Units

Consider a multinational bank that operates two units: a parent, indexed by $i = P$, and an affiliate, indexed by $i = F$. The parent bank is located in the home country, where the MNB is incorporated, while the affiliate is located in a foreign country. The MNB operates in a prudential framework and is managed by an owner-manager (hereafter, the banker) with limited liability, who maximizes its expected payoff. There are three dates $(0, 1, 2)$, no discounting, and everyone is risk neutral.

Funding

The MNB has two sources of funding: its own internal funds, representing the bank's equity, and external funds from depositors. At date 0 each unit i is endowed with C^i units of capital. We assume that the parent is larger than the foreign affiliate: $C^P = \omega C^F$, with $\omega > 1$. We

its contribution, and again assuming proportional equity allocation, the estimated return on equity for the non-Belgian portion of the group is 10.18%: (9.9*100-8*13)/(100-13)=10.18). This figure is closer to the upper bound of typical bank cost of equity estimates [Altavilla *et al.* 2021].

treat C^F and ω as exogenous parameters in our model.

External financing is obtained from depositors. Each bank unit's deposits are received at date 0 and mature at date 2. We normalize the notional value of parent unit's deposits to one: $D^P = 1$. The fact that the parent is significantly larger than the affiliate is reflected by the foreign unit's smaller deposits size available at date 0: $D^F = \beta D^P = \beta$, with $\beta < 1$. We treat β as an exogenous parameter in our model. We denote inverse leverage of the foreign unit by $\gamma = C^F/D^F$, with $\gamma < 1$. Accordingly, we can write the units' capital in terms of leverage and size of deposits: $C^F = \gamma\beta$ and $C^P = \omega\gamma\beta$. Deposits carry an interest rate r^i_D. We assume that the market for deposits is more competitive in the home than in the foreign country: $r^P_D > r^F_D$, and that r^F_D is to be taken as zero.[8] The assumption of divergent deposit rates is well grounded empirically. Rates vary across EU countries, and these cross-country patterns are shaped by, for example, local competitive structures [Grodzicki *et al.* 2023, Kho 2025].[9]

After attracting funding and prior to investment, the banker may reallocate resources internally, with the endogenous scale of internal funds denoted by I. Access to an internal capital market between the parent and foreign affiliate can influence the local investment decision. The key friction is the bank's inability to commit to creditors regarding the scale of internal transfers and the resulting portfolio allocation at date 1 – more on this below.

Assets

[8]This assumption may be rationalized by deposit insurance with a risk-insensitive premium.

[9]Higher deposit rates can reflect the degree of banking-sector concentration or, alternatively, broader heterogeneity in financial-market structure, with higher rates indicating stronger competition for depositor funds from non-bank financial intermediaries. We compute the spread between home and host countries' interest rates on new overnight deposits in the euro area to be approximately 27 basis points. The spread is constructed as follows. We collect interest rates on overnight deposits for households and non-financial corporations for euro area member states subject to a hard limit (i.e., Belgium, Italy, and Malta). For each of these countries, we identify two largest foreign-owned banks and match them to their euro area home countries (i.e., France, Austria, the Netherlands, and Spain). We then collect comparable deposit rates for the corresponding home countries. Rates are averaged separately across host and home countries, and the home–host spread is computed. The spread is close to zero during the period of unconventional monetary policy but rises sharply in 2024, reaching nearly 60 basis points, before declining and stabilizing at around 27 basis points by the summer of 2025. This pattern indicates economically meaningful divergence between home and host deposit rates, motivating the model's allowance for cross-country heterogeneity.

Table 3: Joint state of the world for the units of the banking group

		Parent Good	Bad
Affiliate	Good	pq	$(1-p)q$
	Bad	$p(1-q)$	$(1-p)(1-q)$

Notes: The table reports the joint probabilities of risky asset outcomes for the parent and affiliate. p denotes the probability of a good state for the parent risky asset and q for the affiliate. The probabilities of bad states are $1-p$ and $1-q$, respectively.

Each bank unit i may invest locally at $t = 1$ in two types of assets. A *safe*, risk-free liquid asset (such as treasury securities), for each unit invested at date 1 generates a low return (normalized to 0) at date 2. We denote the endogenous scale of the safe asset investment by S^i, with $i \in \{P, F\}$. A *risky* asset (such as loans) for each unit invested at date 1 produces at date 2: $R^i = 1 + r^i > 1$ in the good state, but 0 in the bad state. The parent's good state occurs with probability $p \in (0, 1)$. The foreign affiliate's good state occurs with probability $q \in (0, 1)$. The bad state occurs with probability $1 - p$ and $1 - q$, respectively. Returns on the risky assets in the two countries are uncorrelated. Table 3 summarizes the joint state of the world distribution.

Let L^i denote the endogenous scale of investment in the risky asset by unit i. We assume that asset choices are not verifiable, preventing the bank from committing at date 0 to either the scale or type of investment. The parent's risky asset is riskier than the affiliate's, $p < q$, but offers a higher return per unit, $r^P > r^F$. In the spirit of asset substitution literature [Jensen and Meckling 1976], we assume that the parent's risky asset has a lower net present value (NPV) than that of the affiliate:

$$p(1 + r^P) < q(1 + r^F), \tag{1}$$

yet it offers a higher expected return to the banker, thereby creating incentives for risk-shifting:

$$pr^P > qr^F. \tag{2}$$

The endogeneity of internal funds flow (I) and risky assets scales (L^i), combined with debt pricing at date 0 that does not reflect subsequent risk choices, drives the bank's risk-taking incentives.

Our analysis focuses on the bank incentives to opportunistically allocate the affiliate's cheaper funding toward riskier domestic investments – a case where intragroup exposure flows unidirectionally from the foreign unit to the parent. This focus is motivated by the regulatory treatment of intragroup exposures, which are typically capped at 100% of a unit's Tier 1 capital. These limits are less binding for large parent banks, given their greater capital buffers, but are often constraining for smaller foreign affiliates.[10]

Finally, the banker may divert available funds immediately after date 0, extracting private benefits proportional to the size of bank liabilities. The MNB operates normally when the banker's expected profit from investing in safe and risky assets exceeds the payoff from diverting all funds:

$$\Pi \geq \theta(\omega\gamma\beta + \gamma\beta + 1 + \beta), \tag{3}$$

where $\omega\gamma\beta + \gamma\beta + 1 + \beta$ is the total amount of funds and $\theta \in (0, 1)$ is the conversion factor of available funds into private benefits. If funds are diverted, the banker also withholds his own funds, which would otherwise be sized by creditors in the event of bank's default. These private benefits obtained during diversion are non-pledgeable to outside creditors, and diversion results in full creditor losses.[11] Anticipating diversion, creditors may refuse to lend, giving rise to a borrowing constraint. Expression (3) formalizes this constraint for the MNB, akin to Holmstrom and Tirole [1998] formulation, where a firm's borrowing capacity depends on the owner-manager's net worth. We interpret the parameter θ as a measure of creditor

[10] Regulatory limits on intragroup exposures may trap liquidity in non-domestic subsidiaries, thereby impeding internal fund reallocation [Enria 2021].

[11] As in Burkart and Ellingsen [2004] and Martin and Parigi [2013], cash diversion can be interpreted as a costly fraudulent action that the banker undertakes if it is more profitable than fulfilling the promised repayment to depositors. Alternatively, private benefits can capture the proceeds of looting [Calomiris and Kahn 2013] or shirking [Laffont and Martimort 2002].

protection: lower values of θ imply stronger protections, reflecting institutional environments with limited diversion opportunities and more relaxed credit conditions – characteristics typically associated with advanced economies.

Regulation

The MNB is subject to regulatory constraints. First, liquidity regulation requires the bank to invest at least a fraction $\alpha \in (0, 1)$ of its deposits in safe, liquid assets. This rule, akin to the Liquidity Coverage Ratio (LCR), aims to ensure that both units can withstand liquidity stress by maintaining local liquidity buffers (and, for the foreign unit, without reliance on the parent). The parent must satisfy a group-level requirement that considers all MNB's deposits: $S^P \geq \alpha(1 + \beta)$, while the foreign unit is subject to an individual requirement that applies only to its deposits: $S^F \geq \alpha\beta$. In equilibrium, both constraints bind, implying $S^P = \alpha(1 + \beta)$ and $S^F = \alpha\beta$.[12]

Second, the foreign unit faces a cap on internal funds transfers. This rule aims to reduce risks at local level. Intragroup exposure is limited to fraction of the affiliate's capital: $I \leq \epsilon\gamma\beta$, where $\epsilon > 0$ captures the regulatory tightness. A higher ϵ reflects looser constraints, consistent with the anticipated relaxation of intragroup exposure limits scheduled for 2028.

Institutional architecture

We consider a supranational regulatory framework in which a single authority oversees both the parent bank and its foreign affiliate. The affiliate exhibits characteristics of both a subsidiary and a branch. It is separately capitalized, regulated, and located in a different jurisdiction – features typical of a subsidiary. At the same time, it lacks full limited liability at the affiliate level because, in certain states of the world, the parent remains liable for the affiliate's obligations – a defining characteristic of a branch.

This hybrid design is essential for the mechanism we study. A purely subsidiary structure would insulate the parent from losses at the foreign unit, eliminating cross-liability and thereby the supervisory incentives that arise from joint exposure. Conversely, a pure branch

[12] Safe assets holdings are set at the regulatory minimum, since any additional allocation to safe assets reduces expected profits. Appendix A.1 formalizes this result.

structure would fully consolidate the affiliate into the parent, removing the jurisdictional frictions and regulatory segmentation that motivate supranational oversight in the first place. The hybrid arrangement – legally separate but not fully shielded – captures the institutional reality under supranational regimes such as the ECB's Single Supervisory Mechanism. It reflects situations in which local law requires separate capitalization and host-country regulation, but supranational rules or group-level guarantees prevent the parent from allowing the affiliate to default autonomously. This legal configuration creates shared liability without full consolidation.

Under this architecture, the supranational supervisor prohibits the parent bank from letting the affiliate fail and requires the parent to support an impaired foreign unit provided the parent remains solvent. As a result, the parent and affiliate effectively share liability for each other's losses except in the event of simultaneous default. Such cross-liability, combined with jurisdictional separation, generates the distinctive incentive structure for the supranational supervisor – and hence for the banking group – highlighted in Loranth *et al.* [2022]. Within supranational supervision, the supervisor places priority on maintaining the repayment of liabilities across the group rather than on the standalone profit maximization of each entity.

For our model this means that at date 2, if the home economy is in a good state while the foreign economy experiences distress, the parent – if solvent – is required to use residual assets, after repaying home-country depositors, to cover the foreign affiliate's outstanding liabilities. Conversely, when the home economy is in distress, but the foreign economy is performing well, the foreign affiliate must transfer resources to support an insolvent parent. Failure of the MNB occurs when the consolidated assets of the banking group are insufficient to cover its total liabilities. This may arise when both the home and foreign economies are simultaneously in a bad state, or when the home country is in a bad state and the foreign affiliate's profits are insufficient to meet the parent's domestic liabilities, rendering full repayment to home-country depositors infeasible.

Timeline

The following timeline summarizes the sequence of events.

- $t = 0$: Each bank unit $i \in \{P, F\}$ has capital C^i and deposits D^i.
- $t = 1$: The banker selects the scale of internal funds I and home and foreign investments by each unit $i \in \{P, F\}$ in safe S^i and risky L^i assets. The banker can divert all available funds into private benefits.
- $t = 2$: Payoffs are realized and distributed. The payoffs of each unit are used first to repay its depositors, and next to support the other unit (if necessary). Remaining funds (if any) are distributed to the banker.

5 Model solution

This section solves the model with exogenous interest rates set by date 0 depositors. The assumption of risk-inelastic deposit rates corresponds to the case when date 0 depositors are fully protected by deposit insurance priced with a risk-insensitive premium ($r_D^F = 0$). Positive deposit rates in the home deposit market ($r_D^P > 0$) reflect a competitive equilibrium among deposit-taking institutions. We solve the model backwards: we first characterize payoffs conditional on the bank's asset allocation and internal capital flows, and then determine the profit-maximizing level of intragroup exposure. The analysis concludes with comparative statics illustrating how the banker's incentive to engage in risk-shifting varies with regulatory constraints, as well as with the size and capital structure of the foreign affiliate.

5.1 Bank payoffs

The balance sheet identity for each bank unit ensures the equality of assets and liabilities. For the parent bank, assets must equal the sum of capital, deposits, and intragroup funding, implying that $L^P + S^P = \omega\gamma\beta + 1 + I$, while for the foreign unit the sum of assets and the intragroup loan must equal the combined value of capital and deposits, $L^F + S^F + I = \gamma\beta + \beta$.

No intragroup transfer When the bank does not make any reallocation of funds across units,

its expected profit is:

$$\Pi_{I=0} = pq(1+r^F)(\gamma\beta+\beta-\alpha\beta)+p[(1+r^P)\omega\gamma\beta+(r^P-r_D^P)-r^P\alpha(1+\beta)+\beta(\alpha-1)], \quad (4)$$

where the right-hand side of (4) represents a combination of the expected return in the good-good state – where the return on the risky asset is positive in both bank units – and the expected return in the good-bad state – in which the parent bank realizes a nonzero return on the risky asset while the foreign unit experiences a return of zero.[13] In all other states of the world, the banking group's total assets fall short of total liabilities, yielding a return of zero.[14]

Intragroup transfer Now consider the bank's profits when it makes intragroup transfers from the foreign unit to the parent unit. Similar to (4), the bank's expected profit is:

$$\Pi_{I>0} = pq(1+r^F)(\gamma\beta+\beta-\alpha\beta-I)+p[(1+r^P)(\omega\gamma\beta+I)+(r^P-r_D^P)-r^P\alpha(1+\beta)+\beta(\alpha-1)], \quad (5)$$

where the right-hand side of (5) reflects a combination of the expected returns in the good-good state and good-bad state.[15] In all remaining states of the world, the total assets of the banking group fall short of total liabilities, resulting in a payoff of zero.

5.2 Intragroup exposure

The bank faces a strategic choice between forgoing intragroup transfers from the foreign to the parent unit – thereby securing profit $\Pi_{I=0}$ (4) – and engaging in such transfers to realize profit $\Pi_{I>0}$ (5). We analyze the banker's decision in two steps. First, we assess the banker's

[13]The expected return in the good-good state is $pq[(1+r^P)L^P+S^P-(1+r_D^P)D^P+(1+r^F)L^F+S^F-D^F]$, that, using the balance sheet identities for $I=0$, takes the form $pq[(1+r^P)(\omega\gamma\beta+1-\alpha(1+\beta))+\alpha(1+\beta)-(1+r_D^P)*1+(1+r^F)(\gamma\beta+\beta-\alpha\beta)+\alpha\beta-\beta]$. Similarly, the expected return in the good-bad state is $p(1-q)[(1+r^P)L^P+S^P-(1+r_D^P)D^P+S^F-D^F]$, that takes the form $p(1-q)[(1+r^P)(\omega\gamma\beta+1-\alpha(1+\beta))+\alpha(1+\beta)-(1+r_D^P)*1+\alpha\beta-\beta]$.

[14]We explain in Appendix A.2 the payoff structure for each state of the world.

[15]These expected returns corresponds to those described in footnote 13, evaluated under the condition $I>0$.

incentives to undertake risk domestically by deploying funds sourced from the foreign unit. Second, we examine the banker's ability to take sufficient risk to render intragroup transfers worthwhile, thereby preventing the full diversion of resources in the first place.

The banker has incentives to transfer funds from the foreign to the parent unit when $\Pi_{I>0} > \Pi_{I=0}$, which is equivalent to (use (4) and (5)):

$$\frac{1+r^P}{1+r^F} > q, \tag{6}$$

where

$$I \leq I_{max} \equiv \epsilon\,\gamma\beta, \tag{7}$$

by regulation. Expression (6) implies that transferring funds from the foreign unit to undertake risky investments in the home country can only dominate the alternative of investing those funds abroad when the return on domestic risk-taking is sufficiently high.

Next to this profitability condition, the bank must also transfer a large enough volume of funds internally to reach a scale at which risk-taking at the parent unit dominates the incentive to divert resources. The banker chooses to make transfer I and take risk domestically over diverting all available resources when $\Pi_{I>0} > \theta(\omega\gamma\beta + \gamma\beta + 1 + \beta)$, which is equivalent to (use (3) and (5)):

$$I > I_{min} = \frac{\theta X - pqY - pZ}{p(1+r^P) - pq(1+r^F)}, \tag{8}$$

where $X = \omega\gamma\beta + \gamma\beta + 1 + \beta$, $Y = (1+r^F)(\gamma\beta + \beta - \alpha\beta)$, and $Z = (1+r^P)\omega\gamma\beta + (r^P - r^P_D) - r^P\alpha(1+\beta) + \beta(\alpha - 1)$.[16]

Lemma 1. *The bank chooses to transfer I funds internally from the foreign to the parent unit and take risk at home when $I_{min} < I_{max}$, corresponding to:*

$$\theta < \theta^* = \frac{\epsilon\gamma\beta[p(1+r^P) - pq(1+r^F)] + pqY + pZ}{X}. \tag{9}$$

[16]One can verify that $I_{min} > 0$ for $\theta > \theta_{min} = \frac{pqY+pZ}{X}$. To see this, note that (6) implies that the denominator in (8) is positive, while the numerator is positive from (6) and the assumption that $\alpha < 1$.

There exist parameter values such that the intersection between conditions $\frac{1+r^P}{1+r^F} > q$ *and* $\theta < \theta^*$ *is non-empty. When the bank chooses to transfer funds internally for taking risk at home, it does so at its maximum scale* I_{max}*. For* $\theta \geq \theta^*$*, the bank makes no transfers internally.*

Proof. See Appendix.

The intuition for Lemma 1 is that intragroup transfers and increased domestic risk-taking become attractive only at a sufficiently large scale (i.e., when the size of the transfer is large enough to generate expected profits that exceed the private benefits of diversion) and in the presence of asymmetric investment opportunities and funding constraints across jurisdictions. Accordingly, a MNB is more likely to pursue such a strategy when its borrowing constraints are relatively loose – that is, when θ is low ($\theta < \theta^*$). A lower θ may reflect a stronger institutional environment under a supranational authority, characterized by enhanced creditor protection and more effective contract enforcement, both of which serve to relax external financing constraints. In such an institutional setting, the MNB is less constrained in raising funds abroad, and may use internal capital transfers to overcome tighter domestic borrowing conditions – often the result of heightened competition in the home market. Shifting funds from foreign affiliates, where investment returns may be lower, effectively substitutes for external financing at the parent level. This enables the parent bank to make domestic investments that carry higher upside potential than foreign investments, albeit at greater risk. Expression (9) characterizes the MNB's risk-taking strategy as a function of θ and other model parameters. It allows us to evaluate how changes in those parameters – specifically ϵ, β, γ, and α – affect risk-taking by examining their impact on the threshold θ^*. A higher θ^* broadens the parameters space over which the MNB opts to reallocate funds and take risk at home, which we interpret as stronger risk-taking incentives.

5.3 Determinants of parent bank risk-taking

For the effect of exposure limit ϵ on bank risk-taking, we can demonstrate the following:

Proposition 1 *(Intragroup exposure limit and risk-taking). Higher exposure limit of the intragroup transfers* ϵ *expands the range of parameter values for which the bank chooses the risky investment at home:* $\partial\theta^*/\partial\epsilon > 0$*, and increases the scale of the intragroup transfers:* $\partial\ I_{max}/\partial\epsilon > 0$.

Proof. See Appendix.

Proposition 1 is our key result. It shows that, in our framework, MNBs unconstrained by restrictive intragroup exposure limits have stronger risk-taking incentives. The reason is that a higher ϵ enables an MNB to make larger intragroup transfers (higher I_{max}), thereby increasing the attractiveness of domestic investments. Put differently, when intragroup transfers are relatively unconstrained, MNBs can strategically reallocate capital from affiliates with lower risk-adjusted returns to the home country, where they may have more profitable -— albeit riskier -— investment opportunities. This dynamic helps explain why, historically, MNBs headquartered in advanced economies have tended to be more aggressive in reallocating liquidity across borders in response to shifting market conditions or to exploit regulatory arbitrage opportunities. Empirical evidence from bank-level data shows that MNBs often channel funds from subsidiaries in lower-return jurisdictions toward parent banks or affiliates operating in markets experiencing funding pressures [Cetorelli and Goldberg 2012a] or to fund additional loan growth [Correa *et al.* 2015]. These flows are particularly pronounced during periods of global financial stress, when internal capital markets become critical mechanisms for liquidity smoothing. As a result, unconstrained MNBs can act as centralized capital allocators, exploiting return asymmetries across jurisdictions and regulatory differentials, often amplifying cross-border financial spillovers in the process [Cetorelli and Goldberg 2012a, Schnabl 2012, Correa *et al.* 2015].

We now examine the effect of the size of the foreign affiliate β on bank risk-taking. We can demonstrate the following:

Proposition 2 *(Foreign unit size and risk-taking). Larger foreign affiliates reinforce the effects of loosening exposure limits on risk taking:* $\partial^2\theta^*/\partial\epsilon\partial\beta > 0$ *and* $\partial^2\ I_{max}/\partial\epsilon\partial\beta > 0$.

Proof. See Appendix.

Proposition 2 highlights the role of affiliate size, measured by the deposit base (β), in amplifying the effects of a looser intragroup exposure limit (ϵ). Specifically, when intragroup exposure limits are relaxed, the increase in intragroup lending is more pronounced for larger foreign affiliates. This suggests that MNBs with larger affiliates respond more aggressively to regulatory flexibility, reallocating a greater share of their available funds within the MNB structure. One could argue that larger affiliates benefit from a broader and more stable funding base, which enhances their parent bank's ability to channel liquidity across the group. A deeper deposit base allows these affiliates to maintain lower marginal funding costs and sustain higher leverage, positioning them to expand intragroup lending when regulatory conditions permit. This dynamic aligns with observed patterns in the organizational design of MNBs. Correa *et al.* [2015] find that large affiliates—particularly those located in financially open or lightly regulated jurisdictions—often function as internal liquidity providers within the banking group. These affiliates are more likely to be structured as branches or less ring-fenced subsidiaries, giving them greater operational flexibility to support the parent or other affiliates during periods of funding stress. In jurisdictions with less restrictive intragroup exposure limits, such affiliates can effectively operate as funding hubs, pooling retail deposits and transferring them toward group entities facing higher marginal returns or tighter external financing constraints.

This mechanism helps explain the strategic location choices and size distribution of affiliates within global banking networks. MNBs may deliberately concentrate larger affiliates in countries without hard intragroup limits to maximize their capacity to shift capital internally and respond opportunistically to global market signals. These structural choices enhance the MNB's ability to engage in high-return, high-risk activities in home markets while minimizing funding frictions. Thus, the interaction between affiliate size and intragroup exposure limits provides a key channel through which MNBs optimize funds allocation across borders, reinforcing the central role of organizational architecture in shaping the transmission of financial shocks and regulatory spillovers.

Consider now the effect of foreign unit's capital structure. We can demonstrate the following:

Proposition 3 *(Foreign unit leverage and risk-taking). Better capitalization of foreign affiliates reinforces the effects of exposure limits:* $\partial^2\theta^*/\partial\epsilon\partial\gamma > 0$ *and* $\partial^2\ I_{max}/\partial\epsilon\partial\gamma > 0$.

Proof. See Appendix.

Proposition 3 highlights the role of leverage ($1/\gamma = D/C$) in shaping intragroup lending decisions. The key result is that foreign affiliates with higher capital relative to deposits respond more strongly to the relaxation of intragroup exposure limits. This suggests that large, well-capitalized affiliates increase intragroup lending more aggressively when regulatory constraints are loosened – a counterintuitive result, given that capital is typically associated with dampening risk-taking incentives. The economic intuition behind this result lies in the dual role of capital in banking. On the one hand, higher capital buffers reduce default risk and cushion creditor losses. On the other hand, higher capital increases the affiliate's skin in the game, discouraging excessive risk-taking under normal conditions. However, in our framework, when intragroup exposure limits are relaxed, well-capitalized affiliates have greater capacity to deploy funds internally without immediate regulatory restrictions. A higher capital base not only provides a cushion against potential losses but, more importantly, increases financial flexibility, allowing the parent bank to reallocate liquidity across the group. This, in turn, enables the parent bank to pursue riskier opportunities elsewhere within the MNB structure while remaining compliant with capital adequacy requirements at the affiliate level. The fact that global banks implement internal liquidity management to grow lending in one country with funds obtained in another has been well-established empirically [Cetorelli and Goldberg 2012a, Schnabl 2012, Correa *et al.* 2015]. Moreover, well-capitalized affiliates may have easier access to external funding, including wholesale markets, due to their stronger financial position. This allows them to expand their balance sheets and extend greater intragroup credit when allowed by regulation. The result is that, paradoxically, increasing capital requirements – intended to enhance financial stability – could incentivize greater risk-taking through intragroup transfers rather than curbing it. This dynamic underscores the unintended consequences of capital regulation, suggesting that capital buffers alone may not be sufficient to mitigate risk.

A natural qualification to this interpretation concerns the regulatory mechanism through which capital affects intragroup activity. In our setting, tighter capital regulation weakens the bindingness of exposure limits because these limits are defined as a fraction of capital. As a result, higher capital mechanically relaxes the constraint on intragroup lending, thereby amplifying internal transfers. This channel is therefore not a generic statement about capital per se, but about the interaction between capital requirements and exposure rules as currently designed. Under alternative regulatory architectures – such as nominal caps on intragroup exposures, limits tied to risk-weighted assets rather than capital, or simply tied to deposits – the same amplification mechanism may be attenuated or absent altogether. We view this not as a weakness but as an important insight: the destabilizing effect of higher capital arises from the joint design of capital and exposure regulation. A more nuanced takeaway is thus that capital buffers can backfire when combined with exposure limits that scale with capital, highlighting the need to consider the full regulatory package rather than individual instruments in isolation.

Finally, we examine the effect of liquidity regulation on bank risk-taking. We can demonstrate the following:

Proposition 4 *(Liquidity requirements and risk-taking). Stricter liquidity requirements reduce the range of parameter values for which the bank chooses the risky investment at home and mitigates the effects of exposure limits:* $\partial\theta^*/\partial\alpha < 0$ *and* $\partial^2\theta^*/\partial\epsilon\partial\alpha = 0$.

Proof. See Appendix.

Proposition 4 shows that stricter liquidity requirements can counteract the heightened risk-taking incentives that arise when intragroup exposure limits are relaxed. The intuition behind this result is that liquidity regulations constrain the asset composition of both MNB's units, requiring them to hold a larger share of liquid, low-yield assets. These constraints reduce affiliates' ability to reallocate resources abroad into riskier, higher-yield investments

– behavior that relaxed exposure limits would otherwise amplify, particularly when affiliates act as "core funding markets" for the parent [Cetorelli and Goldberg 2012b]. Our results therefore highlight that concerns about loosening restrictions on intragroup funding flows can be mitigated by tightening alternative regulatory requirements. More broadly, the role we identify for liquidity requirements helps rationalize recent evidence that stricter regulation may reduce cross-border risk-taking and capital flows [Forbes 2020].

This result aligns with a growing literature that views liquidity regulation as a key instrument for mitigating banks' risk-taking incentives. Prior work shows that liquidity requirements shape banks' ex-ante incentives by constraining balance-sheet choices rather than merely providing ex-post insurance [Vives 2014, Calomiris *et al.* 2015, Walther 2016, Kara and Ozsoy 2020]. As Vives [2014] emphasizes, liquidity regulation operates by inducing an incentive structure that moves banks closer to socially optimal behavior – albeit not necessarily achieving the fully optimal allocation [Kara and Ozsoy 2020, Kashyap *et al.* 2024, Sundaresan and Xiao 2024]. Our result extends this insight to a cross-border setting in an MNB, in which risk-taking is facilitated by intragroup exposures between the parent and its affiliate.

From a theoretical standpoint, the mechanism operates through a reduction in the marginal benefit of risk-shifting behavior. When affiliates are required to maintain a larger buffer of liquid assets – such as government securities or central bank reserves – the parent bank's capacity to channel funds toward riskier investments is curtailed. This limitation stems from the direct reduction in available capital for risky investments. As a result, the expected payoff from engaging in risk-shifting strategies diminishes, leading to a more conservative overall risk profile for the MNB.

From a policy point of view, a caveat to this interpretation is that our focus on liquidity requirements reflects a deliberately narrow regulatory experiment rather than an exhaustive policy evaluation. The result that tighter liquidity regulation can offset the effects of relaxed intragroup exposure limits should therefore not be read as a uniquely optimal or dominant policy prescription. Instead, it illustrates the broader principle that risk-taking induced by looser intragroup constraints can be mitigated by complementary regulations that bind on balance-sheet composition. Other, potentially simpler or more targeted tools – such as redesigned exposure limits that do not scale with Tier 1 capital, explicit concentration caps on intragroup claims, or ring-fencing measures that restrict the mobility of affiliate liquidity -— could achieve similar stabilizing effects within our framework or modest extensions of it. These considerations become particularly salient in light of the planned sunset of the current hard intragroup exposure limit in 2028. Our analysis should thus be viewed as highlighting one feasible offsetting instrument rather than advocating liquidity requirements as the sole or preferred response, underscoring the importance of evaluating alternative regulatory designs in future work.

In the subsequent section, we present a simulation-based analysis aimed at quantifying the appropriate values of the liquidity requirements necessary to effectively neutralize the adverse effects of relaxed intragroup exposure limits. By varying the level of liquidity constraints, we show how tighter requirements can offset the increased risk incentives induced by greater intragroup flexibility, thereby offering a more comprehensive framework for regulating multinational banks' risk-taking behavior.

5.4 Intragroup exposure limits and liquidity requirements: a numerical example

The comparative statics in the previous section verified that as MNBs gain greater flexibility to reallocate funds internally – via a relaxation of intragroup exposure limits (i.e., an increase in ϵ) – their incentives to take risk increase accordingly. To mitigate this rise in risk appetite, higher levels of liquidity (i.e., an increase in α) are required to restore balance in group's risk profile. This section attempts to illustrate the economic significance of these results through a simple numerical exercise.

We consider the following baseline parameter values: $r^P = 0.27$, $r^F = 0.14$, $p = 0.8$, $q = 0.9$,

$\gamma = 0.093$, and $r_D^P = 0.01$.[17] Affiliate size relative to the parent, denoted by β, is allowed to vary across three different values – 0.15, 0.30, and 0.50 – corresponding to small, medium, and large affiliates, respectively. To ensure an identical capital structure between the parent and the affiliate, we set $\omega = 1/\beta$.[18] The intragroup exposure limit is set at $\epsilon = 1$, representing a 100% cap, while the liquidity requirement is set at $\alpha = 0.18$, consistent with the average liquid assets-to-total asset ratio observed among Eurozone banks. Given these parameters, the threshold values of the conversion factor θ – above which intragroup transfers and risk-shifting do not occur – are derived from equation (9). Specifically, we find $\theta^* = 0.22$ for $\beta = 0.15$, $\theta^* = 0.2$ for $\beta = 0.3$, and $\theta^* = 0.18$ for $\beta = 0.5$. We take these parameter values as representing the current regulatory regime characterized by a hard limit treatment of intragroup exposures and provide insight into the interaction between affiliate size, liquidity constraints, and intragroup exposure limits.

Table 4: Liquidity response to relaxed intragroup constraints

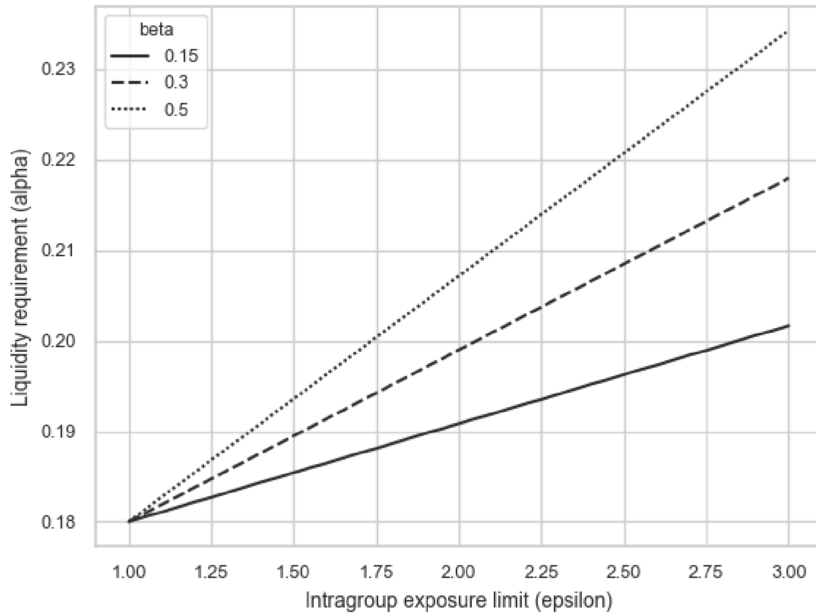
	β=0.15	β=0.3	β=0.5
ϵ=1.5	3.0%	5.3%	7.5%
ϵ=2	6.0%	10.6%	15.1%
ϵ=2.5	9.0%	15.8%	22.6%
ϵ=3	12.0%	21.1%	30.2%

Notes: This table reports the relative increases in the liquidity requirements (α) needed to offset a relaxation in the intragroup exposure limit (ϵ), compared to the baseline case where $\epsilon = 1$. Results are shown for three values of affiliate size (β). The table is intended to be read vertically: for each value of β, it displays the corresponding relative increase in α required to neutralize the risk-shifting incentives induced by higher ϵ.

[17] These values are intended to capture a risk–return trade-off across jurisdictions while remaining parsimonious. Home investments feature higher returns (0.27) but lower success probability (0.8), reflecting higher margins combined with greater idiosyncratic risk, whereas foreign investments are safer (success probability 0.9) but less profitable (return 0.14). Leverage is set to 11 to mirror balance-sheet leverage of large internationally active banks, and the deposit rate of 1 percent reflects a low risk-free environment consistent with recent monetary conditions. Together, these values generate meaningful incentives for intragroup reallocation without targeting specific moments.

[18] The numerical exercise is constructed so that the affiliate mirrors the parent's capital and liability structure. This rules out any influence of balance-sheet composition on the results. Consequently, when the deposit base is scaled through β, the capital structure adjusts mechanically, allowing us to isolate the effect of an increase in deposits from any change in capital structure.

Figure 1: Intragroup exposure limits and liquidity requirements



Notes: This figure plots the liquidity ratio (α) required to maintain the same level of risk as in the baseline scenario, where $\epsilon = 1$ and $\alpha = 0.18$, across varying values of the intragroup exposure limit (ϵ). Each line corresponds to a different affiliate size (β). The dotted line represents $\beta = 0.5$ (large affiliate), the dashed line represents $\beta = 0.3$ (medium affiliate), and the solid line represents $\beta = 0.15$ (small affiliate). For detailed parameter values and calibration assumptions, see the main text.

We examine how the required level of liquidity regulation (α) must adjust when intragroup exposures limits are relaxed (i.e, when ϵ increases), holding the threshold conversion factor θ^* constant. Specifically, we adjust α to offset increases in ϵ, such that the incentive for intragroup risk-shifting remains unchanged. The results of this numerical exercise are presented in Figure 1. The dotted line corresponds to $\beta = 0.5$ (large affiliate), the dashed line to $\beta = 0.3$ (medium affiliate), and the solid line to $\beta = 0.15$ (small affiliate).

As ϵ increases, so does α, and the increase in α is economically significant in case of MNBs with larger affiliates. For MNBs with small affiliates (i.e., $\beta = 0.15$), an increase in ϵ from 1 to 2 increases the liquidity requirement necessary to prevent risk shifting from $\alpha = 0.18$ to $\alpha = 0.19$ representing a 6% increase. However, for MNBs with larger affiliates (i.e., $\beta = 0.5$), the necessary liquidity requirements increases by as much as 30% when ϵ triples from 1 to

3, as shown in Table 4. Such growth in liquidity requirements may prove extremely costly and likely implausible in practice.

The numerical exercise confirms that, under a range of plausible assumptions, liquidity requirements alone may be sufficient to deter MNBs from engaging in risk-shifting through intragroup transfers. For MNBs with relatively small foreign affiliates, the adverse effects of relaxing intragroup exposure limits can be offset by substantial – yet not prohibitively high – increases in liquidity requirements. In contrast, for MNBs with large affiliates, the level of liquidity requirements necessary to curb excessive risk-taking may become implausibly high, raising concerns about the feasibility and efficiency of relying solely on liquidity regulation.

6 Conclusions

This paper studies risk-taking behaviour in cross-border banking groups in light of a forthcoming regulatory shift in Europe, scheduled for implementation in 2028, which will significantly relax intragroup lending constraints across jurisdictions. This change is expected to affect the internal capital dynamics between parent banks and their foreign affiliates, with potentially far-reaching implications for risk management and financial stability.

We develop a theoretical model of an MNB comprising of a large parent bank and a smaller foreign affiliate. The owner-manager allocates resources between safe and risky projects across both home and host countries. The model incorporates supranational supervision, which prevents the parent from invoking limited liability in the event of affiliate distress. In the presence of borrowing constraints, intragroup lending enables the MNB to reallocate funds from the affiliate to the parent, thereby enhancing expected returns but also increasing risk-taking incentives. We characterize the conditions under which this inefficient transfer occurs and show that relaxing intragroup exposure limits could amplify this channel, particularly when the affiliate is large and deposit-rich. Notably, higher affiliate capitalization does not mitigate risk-taking; instead, it expands the internal funding capacity and increases risk exposure. By contrast, liquidity requirements – by promoting safe-assets accumulation and enhancing the affiliate's value in adverse states – help restrain risk-taking.

These findings yield several policy implications. First, relaxing intragroup exposure limits could increase parent-bank risk-taking, underscoring the role of such constraints in containing broader vulnerabilities within banking groups and pointing to the need for supervisors to remain alert to heightened risk-taking when such limits are eased. Second, the amplification of risk among large affiliates suggests that size-based regulatory differentiation – such as stricter limits for large affiliates – may be warranted. Third, the result that higher affiliate capitalization intensifies risk transmission challenges the effectiveness of capital buffers as standalone safeguards, pointing to the need for a more integrated supervisory approach. This effect is not generic to capital but stems from the joint design in which exposure limits scale with capital. Under alternative architectures – absolute caps on intragroup claims or limits tied to risk-weighted assets – the amplification we document would be attenuated.

Finally, while liquidity requirements can curb risk-taking, their effectiveness here should be viewed largely as a theoretical - yet feasible - complementary mechanism rather than a sharply targeted policy lever. Strengthening liquidity standards for affiliates engaged in intragroup lending can, in principle, offset incentives created by relaxed exposure limits and reinforce financial stability across jurisdictions. Consistent with our regulatory experiment, we view liquidity requirements as one plausible offsetting instrument rather than a uniquely optimal prescription. When affiliates are small or modestly capitalized, moderate liquidity requirements can substitute for relaxed exposure caps: by shifting balance sheets toward safe assets, they dampen the parent risk-taking at relatively low intermediation cost, yielding net welfare gains. By contrast, for large, deposit-rich, well-capitalized affiliates, liquidity alone would require implausibly high buffers, inducing excessive safe-asset hoarding and foregone credit supply. In such cases, targeted exposure caps or size-based calibration of intragroup limits could dominate on welfare grounds, curbing tail risk without imposing outsized balance-sheet distortions.

Future research should extend the model to incorporate interbank market dynamics, allowing for a richer analysis of the welfare trade-offs between increased risk and the potential efficiency gains from capital mobility – such as harmonized lending rates and enhanced competition in deposit markets.

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Appendix

A Proofs

A.1 Expected returns are always decreasing in α

The expected return in the good-good state is given by:

$pq[(1 + r^P)L^P + S^P - (1 + r^P_D)D^P + (1 + r^F)L^F + S^F - D^F]$,

which can be written as:

$pq[(1+r^P)(\omega\gamma\beta+1-\alpha(1+\beta))+\alpha(1+\beta)-(1+r^P_D)*1+(1+r^F)(\gamma\beta+\beta-\alpha\beta)+\alpha\beta-\beta]$.

Similarly, the expected return in the good-bad state is given by:

$p(1 - q)[(1 + r^P)L^P + S^P - (1 + r^P_D)D^P + S^F - D^F]$,

which can be written as:

$p(1 - q)[(1 + r^P)(\omega\gamma\beta + 1 - \alpha(1 + \beta)) + \alpha(1 + \beta) - (1 + r^P_D) * 1 + \alpha\beta - \beta]$.

Thus, the bank expected profit is given by: $\Pi = pq(1+r^F)(\gamma\beta+\beta-\alpha\beta)+p[(1+r^P)\omega\gamma\beta+ (r^P - r^P_D) - r^P\alpha(1 + \beta) + \beta(\alpha - 1)]$.

By differentiating the equation above with respect to α, we obtain:

$$\frac{\partial \Pi}{\partial \alpha} = -pq(1 + r^F)\beta - pr^P(1 + \beta) + p\beta < 0. \tag{10}$$

QED

A.2 Payoff structure

Failure of the MNB occurs whenever the consolidated assets of the banking group are insufficient to cover its total liabilities. This situation arises either when both the home and foreign economies are simultaneously in a bad state, or when the home economy is in a bad state and the foreign affiliate's profits are insufficient to meet the parent's domestic liabilities, making full repayment to home-country depositors infeasible. We establish conditions under which the MNB's expected returns are strictly positive in the good-good state, which occurs with probability pq, and in the good-bad state, which occurs with probability $p(1-q)$, and zero in all remaining states of the world – namely, the bad-good and bad-bad states – when consolidated assets fall short of liabilities.

Good-good state (p, q)

A necessary condition for positive expected returns in this state is that realized returns from successful (risky) investments by both the parent and the affiliate suffice to repay home and foreign depositors, irrespective of the level of intragroup transfers I. Since returns increase in I due to the higher return per unit invested at the parent ($r^P > r^F$), the condition must hold at the minimum transfer level, $I = 0$.

Positive returns in the good-good therefore require:

$$(1 + r^P)L^P + S^P - (1 + r_D^P)D^P + (1 + r^F)L^F + S^F - D^F > 0.$$

Rearranging terms and using the balance sheet identities evaluated at $I = 0$, this condition can be written as:

$$(1 + r^P)C^P + (1 + r^F)C^F + r^P(D^P - S^P) + r^F(D^F - S^F) > r_D^P D^P.$$

This inequality implies:

$$r_D^P < r_{Dmax1}^P \equiv \gamma\beta[(1 + r^P)\omega + (1 + r^F)] + (1 - \alpha)(r^P + \beta r^F) - \alpha\beta r^P,$$

where $r_{Dmax1}^P > 0$. Thus, provided that the cost of home deposits is sufficiently low, the MNB is able to repay both home and foreign depositors when risky investments succeed in both locations.

Bad-bad state ($1 - p$, $1 - q$)

A necessary condition for negative expected returns in this state is that the realized returns from safe investments by both the parent and the affiliate are insufficient to cover repayment to depositors, regardless of intragroup transfers I. Returns are maximized when all funds are allocated to safe assets (i.e., $L^P = L^F = 0$). Since the return per unit invested in safe assets is identical at the parent and the affiliate, the MNB's total returns are independent of I, and the condition can again be evaluated at $I = 0$.

Negative returns in the bad-bad state require:

$$S^P - (1 + r_D^P)D^P + S^F - D^F < 0.$$

Using the balance sheet identities at $I = 0$, this condition becomes:

$$C^P + C^F - r_D^P D^P < 0,$$

which implies:

$$r_D^P > r_{Dmin1}^P \equiv \gamma\beta(1 + \omega),$$

where $r_{Dmin1}^P > 0$. Hence, when the cost of home deposits is sufficiently high, the MNB fails even if all funds are invested in safe assets. We can show that $r_{Dmin1}^P < r_{Dmax1}^P$ for $r^P > r^F$.

Good-bad state (p, $1 - q$)

A necessary condition for positive expected returns in this state is that returns from the parent's successful (risky) investments and the affiliate's safe investments suffice to repay both sets of depositors, independently of intragroup transfers I. As in the good-good state, returns are increasing in I because $r^P > r^F$, so the condition must hold at $I = 0$. In addition, since foreign risky investments fail, returns increase in the affiliate's safe investment; therefore, the condition should hold at the minimum regulatory level $S^F = \alpha\beta$.

Positive returns in the good-bad state require:

$$(1 + r^P)L^P + S^P - (1 + r_D^P)D^P + S^F - D^F > 0.$$

Rearranging the terms and using the balance sheet identities at $I = 0$, this condition becomes:

$$(1 + r^P)C^P + r^P(D^P - S^P) + S^F - D^F > r_D^P D^P,$$

which implies:

$$r_D^P < r_{Dmax2}^P \equiv \gamma\beta\omega(1 + r^P) + (1 - \alpha)(r^P - \beta) - \alpha\beta r^P,$$

where $r_{Dmax2}^P > 0$. Moreover, $r_{Dmax2}^P < r_{Dmax1}^P$. Thus, for sufficiently low home deposits costs, the MNB can repay both home and foreign depositors when only the parent's risky investment succeeds and the affiliate holds the the minimum required level of safe assets.

Bad-good state ($1 - p$, q)

A necessary condition for negative expected returns in this state is that returns from the affiliate's successful (risky) investments and the parent's safe investments are insufficient to repay depositors, regardless of intragroup transfers I. Returns are maximized at $I = 0$. Since returns increase in the parent's safe investment when its risky assets fail, the condition must hold when all parent funds are invested in safe assets (i.e., $L^P = 0$) and the affiliate maintains the minimum required safe investment $S^F = \alpha\beta$.

Negative return in the bad-good state require:

$$S^P - (1 + r_D^P)D^P + (1 + r^F)L^F + S^F - D^F < 0.$$

Using the balance sheet identities at $I = 0$, this condition can be written as:

$$C^P + (1 + r^F)C^F + r^F(D^F - S^F) < r_D^P D^P,$$

which implies:

$$r_D^P > r_{Dmin2}^P \equiv \gamma\beta\omega + (1 + r^F)\gamma\beta + r^F(\beta - \alpha\beta),$$

with $r_{Dmin2}^P > 0$. Furthermore, $r_{Dmin2}^P > r_{Dmin1}^P$. Thus, for sufficiently high home deposits costs, the MNB cannot repay home and foreign depositors even when all parent funds are invested in safe assets and affiliate investments are successful.

Putting the four cases together, when $r_{Dmin2}^P < r_{Dmax2}^P$, there exists a non-empty range of home deposits rates $r_D^P \in (r_{Dmin2}^P, r_{Dmax2}^P)$ such that the MNB's expected returns are strictly positive in good-good and good-bad states and zero in the bad-good and bad-bad states. In this region, home deposits costs are sufficiently low to permit repayment when the parent's risky investment succeeds, yet sufficiently high to ensure default when risk materializes and consolidated returns are insufficient to cover deposits.

A.3 Proof of Lemma 1

First, we show that the MNB's strategy for transfer of funds from the foreign unit to the parent reduces to a condition on θ, namely $\theta < \theta^*$. Second, we show that there exist parameter values such that the intersection of conditions $\theta < \theta^*$ and $\frac{1+r^P}{1+r^F} > q$ is non-empty.

Recall from (6) and (7) that the banker transfers funds from the foreign unit to undertake risky investments in the home country only when the return on domestic risk-taking is sufficiently high relative to foreign risk-taking: $\frac{1+r^P}{1+r^F} > q$. Conditional on this, differentiating (5) yields $\frac{\partial \Pi_{I>0}}{\partial I} = p[(1+r^P) - q(1+r^F)] > 0$, so the bank's profit from transferring funds and taking risk at home increases in I. Hence, when the bank chooses to transfer funds internally, it does so at a maximal scale I_{max}. Moreover, from (8), the banker prefers transferring funds and taking domestic risk over diverting all resources whenever it can be done at a sufficiently large scale $I > I_{min}$. Substituting from (7) and (8) and rearranging terms gives that $I_{min} < I_{max}$ for:

$\theta < \theta^* = \frac{\epsilon\gamma\beta[p(1+r^P) - pq(1+r^F)] + pqY + pZ}{X}$,

where $X = \omega\gamma\beta + \gamma\beta + 1 + \beta$, $Y = (1 + r^F)(\gamma\beta + \beta - \alpha\beta)$, and $Z = (1 + r^P)\omega\gamma\beta + (r^P - r^P_D) - r^P\alpha(1 + \beta) + \beta(\alpha - 1)$.

Next, we show that there exist parameter values such that the intersection of $\theta < \theta^*$ (corresponding to $I_{min} < I_{max}$) and $\frac{1+r^P}{1+r^F} > q$ is non-empty. Namely, we derive conditions under which risk-taking equilibrium exists. For this, it is convenient to rewrite the condition $I_{min} < I_{max}$ as a restriction on r^P rather than θ as we have in (9). Recall that

$$I_{\max} = \epsilon\gamma\beta, \qquad I_{\min} = \frac{\theta X - pqY - pZ}{p(1 + r^P) - pq(1 + r^F)},$$

with X, Y, Z as above.

Assume $\frac{1+r^P}{1+r^F} > q$. Then the denominator of I_{min} is positive:

$$p(1 + r^P) - pq(1 + r^F) > 0,$$

so rearranging the terms in (9) gives that $I_{min} < I_{max}$ is equivalent to

$$\theta X < pqY + pZ + \epsilon\gamma\beta\big[p(1 + r^P) - pq(1 + r^F)\big].$$

Substituting for Y and Z and collecting terms proportional to r^P gives:

$$\theta X < pA\, r^P + C,$$

where $A = \omega\gamma\beta + 1 - \alpha(1 + \beta) + \varepsilon\gamma\beta$, and C, which collects all remaining terms, depends on $q(1 + r^F)$ and constants, and is given by

$$C = pq(1 + r^F)\big[(\gamma\beta + \beta - \alpha\beta) - \varepsilon\gamma\beta\big] + p\omega\gamma\beta - pr^P_D + p\beta(\alpha - 1).$$

Thus,

$$I_{\min} < I_{\max} \quad \Longleftrightarrow \quad r^P > \underline{r}^P \equiv \frac{\theta X - C}{pA}.$$

Finally, our maintained assumption $\frac{1+r^P}{1+r^F} > q$ implies:

$$r^P > q(1 + r^F) - 1,$$

which exceeds $\underline{r}^P$ because C is increasing in $q(1 + r^F)$ while pAr^p grows linearly in r^P, and therefore guarantees $r^P > \underline{r}^P$. It follows that $I_{\min} < I_{\max}$. *QED*

A.4 Proof of Proposition 1

By differentiation (use (9)):

$$\frac{\partial \theta^*}{\partial \epsilon} = \frac{\gamma\beta p[1 + r^P - q(1 + r^F)]}{X}. \tag{11}$$

Recall that from (6): $1 + r^P > q(1 + r^F)$, making the numerator of (11) positive. The denominator $X = \omega\gamma\beta + \gamma\beta + 1 + \beta$ is always positive. Therefore, $\partial\theta^*/\partial\epsilon > 0$.

By differentiation (use (7)): $\partial\ I_{max}/\partial\epsilon = \gamma\beta > 0$. *QED*

A.5 Proof of Proposition 2

Substituting $X = \omega\gamma\beta + \gamma\beta + 1 + \beta$ into the denominator of (11), obtains by differentiation:

$$\frac{\partial^2 \theta^*}{\partial \epsilon \partial \beta} = \frac{\gamma p[1 + r^P - q(1 + r^F)]}{(\gamma\omega\beta + \gamma\beta + 1 + \beta)^2}. \tag{12}$$

Recall that from (6): $1 + r^P > q(1 + r^F)$, making the numerator of (12) positive. The denominator is a square, and thus it is always positive. Therefore, $\partial^2\theta^*/\partial\epsilon\partial\beta > 0$.

By differentiation (use (7)): $\partial^2\ I_{max}/\partial\epsilon\partial\beta = \gamma > 0$. *QED*

A.6 Proof of Proposition 3

Substituting $X = \omega\gamma\beta + \gamma\beta + 1 + \beta$ into the denominator of (11), obtains by differentiation:

$$\frac{\partial^2 \theta^*}{\partial \epsilon \partial \gamma} = \frac{\beta(1 + \beta) p[1 + r^P - q(1 + r^F)]}{(\gamma\omega\beta + \gamma\beta + 1 + \beta)^2}. \tag{13}$$

Recall that from (6): $1 + r^P > q(1 + r^F)$, making the numerator of (13) positive. The denominator is a square, and thus it is always positive. Therefore, $\partial^2\theta^*/\partial\epsilon\partial\gamma > 0$.

By differentiation (use (7)): $\partial^2\ I_{max}/\partial\epsilon\partial\gamma = \beta > 0$. *QED*

A.7 Proof of Proposition 4

Differentiating (9) with respect to α yields:

$$\frac{\partial \theta^*}{\partial \alpha} = \frac{1}{X}[p\beta - pq\beta(1 + r^F) - pr^P(1 + \beta)]. \tag{14}$$

The denominator $X = \omega\gamma\beta + \gamma\beta + 1 + \beta$ is always positive, while the numerator is negative given (1). *QED*

B Intragroup exposure limits in the CRR

The implementation of the intragroup exposure limits in European regulation reflects a combination of provisions. The baseline treatment of large exposures is set out in Article 395 of the Council of the European Union [2013b]:

> *An institution shall not incur an exposure to a client or group of connected clients the value of which exceeds 25 % of its Tier 1 capital.*

This provision, which defines a large exposure as an exposure to a client or group of connected clients, would in principle cap any intragroup exposure at 25% of Tier 1 capital. However, intragroup exposures are exempted from this stringent treatment under Article 400(2)(c):

> *Competent authorities may fully or partially exempt the following exposures: [...] (c) exposures incurred by an institution, including through participations or other kinds of holdings, to its parent undertaking, to other subsidiaries of that parent undertaking, or to its own subsidiaries and qualifying holdings, in so far as those undertakings are covered by the supervision on a consolidated basis to which the institution itself is subject [...]*

The conditions for this exemption are further specified in Article 400(3):

> *Competent authorities may only make use of the exemption provided for in paragraph 2 where the following conditions are met: (a) the specific nature of the*

exposure, the counterparty or the relationship between the institution and the counterparty eliminate or reduce the risk of the exposure; and (b) any remaining concentration risk can be addressed by other equally effective means such as the arrangements, processes and mechanisms provided for in Article 81 of Directive 2013/36/EU.

Article 403(c) essentially provides that the competent authority *may* grant this exemption – i.e., its application is discretionary – based on the characteristics of the exposure. Intragroup exposures naturally fall within this assessment, and the exemption is conditioned on whether concentration risk is adequately managed in accordance with Article 81. Article 81 of the CRD sets out high-level standards for the management of concentration risk. In practice, competent authorities typically issue policies that specify the criteria and methodologies used to assess applications for intragroup exemptions from the large-exposure rules.

Taken together, the CRR establishes a baseline regime in which intragroup exposures may be exempted from large-exposure rules provided that the bank demonstrates sound concentration-risk management. However, the framework also includes transitional provisions governing the shift toward this baseline treatment. These are set out in Article 493(3)(c):

By way of derogation from Article 400(2) and (3), Member States may, for a transitional period until the entry into force of any legal act following the review in accordance with Article 507, but not after 31 December 2028, fully or partially exempt the following exposures from the application of Article 395(1): [...] (c) exposures, including participations or other kinds of holdings, incurred by an institution to its parent undertaking, to other subsidiaries of that parent undertaking or to its own subsidiaries and qualifying holdings, in so far as those undertakings are covered by the supervision on a consolidated basis to which the institution itself is subject, in accordance with this Regulation, Directive 2002/87/EC or with equivalent standards in force in a third country; exposures that do not meet those criteria, whether or not exempted from Article 395(1) of this Regulation, shall be *treated as exposures to a third party.*

This provision allows the legislator – i.e., the EU Member State – to override Article 395 and the associated exemptions under Article 400 through national law. It therefore constitutes a Member State option. In practice, such national legislation typically takes one of two forms: the imposition of a hard limit or the introduction of additional conditions that the competent authority must verify.

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