



Systemic risk, international regulation, and the limits of coordination[☆]



Gazi Ishak Kara

Office of Financial Stability Policy and Research, Board of Governors of the Federal Reserve System, 20th Street and Constitution Avenue N.W., Washington, DC 20551, United States

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ABSTRACT

This paper examines the incentives of national regulators to coordinate capital adequacy requirements in the presence of systemic risk in global financial markets. In a two-country model, correlated asset fire sales by banks generate systemic risk across national financial markets. Absent coordination, national regulators choose inefficiently low levels of macro-prudential regulation. Thus, symmetric countries always benefit from relinquishing their authority to a central regulator that establishes uniform regulations across countries. I also consider the separate case of asymmetric countries: while there is a limit to coordination when countries are sufficiently asymmetric in a single dimension, existence of asymmetries in multiple dimensions might actually relax this limit or even eliminate it.

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1. Introduction

The underlying shocks that precipitated the financial crisis of 2007–09 quickly spread across global financial markets and were amplified on an unprecedented scale. The strikingly global nature of the crisis has revived interest in the international coordination of financial regulation. Regulatory reforms and the strengthening of coordination between national financial regulators are prominent items on the international reform agenda. For example, the G-20 countries established the Financial Stability Board (FSB) during the crisis to create guidelines for regulatory coordination and the supervision of systemic risk in the international financial system.¹ The euro-zone countries, meanwhile,

responded by creating the European Banking Union, which consists of two main initiatives: the Single Supervisory Mechanism and the Single Resolution Mechanism.

This paper develops a game-theoretic model to analyze the feasibility of coordination among national financial regulators when there is systemic risk in global financial markets. The paper makes three contributions. First, it studies the coordination problem under a novel externality channel. Acharya (2003, 2009) and Dell'Ariccia and Marquez (2006) examine the benefits of international coordination of financial regulation under externalities that operate through integrated loan or deposit markets during tranquil times. In contrast, I consider a mechanism similar to Krugman's (2008) *international finance multiplier*, in which shocks to highly leveraged institutions facing collateral constraints force them to shrink their balance sheets by fire selling their assets, creating a multiplier effect. Several studies have argued that this pecuniary externality was a crucial element in the international propagation and amplification of shocks during the Asian crisis, following the Russian default of 1999, and during the recent global financial crisis (Calvo, 1999; Krugman, 2008; Devereux and Yetman, 2010).

In the model of this paper, during times of distress, intermediaries from different countries have to sell assets in a global market to a single set of buyers: global investors, who are less productive than banks and have downward sloping demand for assets. As a result, the asset price falls, forcing banks to sell even more assets. I seek answers to the following questions: how do national financial regulators behave under this systemic externality if they act non-cooperatively? Would an individual regulator tighten or relax regulation when regulation is tightened in another country? Under which conditions would national

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E-mail address: Gazi.I.Kara@frb.gov.

¹ The FSB was established after the 2009 G-20 London summit in April 2009; it is the successor to the Financial Stability Forum, which was founded in 1999 by the G-7 finance ministers and central bank governors.

regulators relinquish their authority to a central international regulator who would impose the same regulatory standards across countries? How do asymmetries across countries affect both the nature of regulatory standards and the feasibility of coordination when national regulators act non-cooperatively?

Second, this paper introduces a novel positive externality: In the model, lax regulations in one country may positively affect others. This externality arises when we incorporate the profits of global investors into national welfare functions.² In the previous literature, relaxing regulatory standards in one country imposes only a negative externality on other countries. In contrast, in the full version of the model here, higher leverage in one country implies a deeper financial crisis for both countries (negative externality) but also leads to a larger transfer of assets from banks in this country to the global investors in the other country (positive externality). The positive externality channel could presumably lead to inefficiently high regulation in the non-cooperative equilibrium. Nevertheless, I show that, in my framework, the negative externality always dominates.

Third, to the best of my knowledge, this paper is the first to study whether coordination in the sense of imposing common regulatory standards is feasible when countries differ in more than one dimension. I show that while there is a limit to coordination when we focus on asymmetries in a single dimension, asymmetries in multiple dimensions might in certain cases relax this limit or even eliminate it. Furthermore, my model allows the consideration of asymmetries that arise from structural differences between countries, such as differences in productive technologies or financial structure, whereas the previous literature only analyzed the coordination among regulators with different preferences. In that regard, this paper allows us to use observable country characteristics to explain differences in bank capital regulations.

I propose a three-period, two-good model featuring two countries with independent regulators. Each country has a continuum of banks. Banks borrow consumption goods from local deposit markets and invest them in a long-term productive asset. All agents are risk-neutral. All uncertainty in the model is resolved at the beginning of the interim period, at which point one of the two states of the world is realized: a good state or a bad state. In the good state, there are no shocks and banks' investments produce a safe net positive return in the last period. However, in the bad state, banks' investments are distressed, and they have to be restructured in order to remain productive. Collateral and commitment problems prevent banks from borrowing when liquidity shocks hit. Instead, banks sell some of their long-term assets to less productive global investors in exchange for liquid resources. The price of the productive asset is determined in a spot market in which banks from the two countries and global investors trade.

In the first period, regulators act simultaneously and choose the regulatory standard for their domestic banks. Regulation in this model, which takes the form of a minimum capital ratio requirement, is macro-prudential because it is necessitated by systemic externalities. Due to pecuniary externalities and risk neutrality, the minimum regulatory capital ratio always binds in equilibrium. Therefore, if the regulatory standard is relaxed in one country, banks in this country invest more in the risky asset during the initial period. If the liquidity shocks hit in the interim period, these banks are forced to sell more assets, causing the asset price to fall further. A lower asset price will increase the cost of distress for the banks in the other country as well.

The strategic interaction between the two regulators is essentially a perfect information Cournot game under pecuniary externalities. I show that regulation levels in the two countries are strategic substitutes: if one regulator tightens the standards in its jurisdiction, the other regulator optimally loosens its standards. This result follows from the public goods property of macro-prudential regulations in an international context.

Moreover, I show that regulatory standards in the non-cooperative equilibrium are inefficiently lax compared to regulatory standards a central regulator would choose. National regulators internalize the positive effect of tighter capital requirements on asset prices in the interim period; however, they have an incentive to free-ride on regulations in the other country. Therefore, if the two countries are symmetric and if there is a commitment mechanism, both countries can improve their welfare by relinquishing regulatory authority to a central regulator. Without a commitment mechanism provided by the central authority, national regulators will still have an incentive to deviate from the cooperative solution because it is not an equilibrium.

I also consider the feasibility of coordination when there are asymmetries between countries. First, I consider two types of asymmetries in isolation: differences in productive technologies and unequal populations of global investors. I assume that, for political reasons, the central regulator has to choose the same regulation levels in both countries. Given the structural differences in one single dimension, voluntary cooperation emerges only between sufficiently similar countries, even if there is a commitment mechanism. In particular, the regulator in the high-return country or in the country with a larger population of global investors chooses lower regulatory standards in equilibrium and is less willing to compromise on stricter regulatory standards.

Next, I analyze the combined effect of these two asymmetries on regulatory coordination and show that it is contingent on the nature and direction of the asymmetries. For example, two countries that are highly asymmetric in terms of productive technologies and would not coordinate in the absence of other asymmetries could actually choose to coordinate if they are also sufficiently asymmetric in terms of the population of global investors. This coordination happens because when asymmetries affect regulatory choices in opposite directions they will offset each other. Furthermore, I show that not all dimensions of asymmetries are equally important in determining whether countries would coordinate or not.

The paper proceeds as follows. Section 2 contains a brief summary of related literature. Section 3 provides the basics of the model and presents the main results of the paper with symmetric countries. Section 4 considers countries asymmetric in terms of productive technology. Section 5 extends the basic model to include global investors in the national welfare functions and analyzes the effect of financial integration on regulatory standards. Section 6 analyzes combined effect of multiple asymmetries on regulatory coordination. Section 7 investigates the robustness of the results to some changes in the model environment. Section 8 provides a brief policy discussion. Section 9 concludes, and Appendix A contains the proofs.

2. Literature review

This paper belongs to the international financial regulation theory that has developed in recent decades. Dell'Ariccia and Marquez (2006) investigate the incentives of national regulators to form a regulatory union in a two-country banking model, where a single bank from each country competes for loans in both markets in a Bertrand differentiated-products setup. Acharya (2003) shows that convergence in international capital adequacy standards cannot be effective unless it is accompanied by convergence in other aspects of banking regulation, such as closure policies. In the model considered by Acharya (2009), banks in different regions may choose their investments to be highly correlated compared to globally optimal correlation levels. Acharya calls this fact "systemic risk shifting."

These studies focus on the benefits of international coordination in financial regulation under externalities that operate through integrated loan or deposit markets. In contrast, this paper focuses on pecuniary externalities between national financial markets that operate through asset markets and asset prices during times of distress. Unlike Acharya (2009), in this paper, systemic risk in international financial markets

² I thank an anonymous referee for this suggestion.

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