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International financial integration and risk sharing among countries: A production-based approach

H. Youn Kim

Department of Economics, Western Kentucky University, Bowling Green, KY 42101, USA

ARTICLE INFO

Article history:

Received 19 October 2012

Revised 5 December 2013

Available online 12 December 2013

Keywords:

Production risks

Financial market integration

Risk sharing

Intertemporal equilibrium condition

International consumption-output correlation puzzle

ABSTRACT

Kim, H. Youn—International financial integration and risk sharing among countries: A production-based approach

This paper develops a production-based model for analyzing a role of asset trade in pooling risks among countries and provides new evidence for the international consumption-output puzzle and risk sharing among countries. Efficient risk sharing rules among countries are the same as the conditions for full financial integration. Input prices and interest rates as well as technology shocks are found to be the driving variables for cross-country output movements. The international correlation puzzle reflects an inability to account for production risk sharing among countries in previous studies. The degree of international risk sharing is substantial relative to earlier estimates, which is largely realized from pooling production risks rather than consumption risks among countries. *J. Japanese Int. Economies* **31** (2014) 16–35. Department of Economics, Western Kentucky University, Bowling Green, KY 42101, USA.

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1. Introduction

Many studies in international macroeconomics have found that measured cross-country correlations of consumption growth are surprisingly low – far from perfect as predicted by the model – and, more importantly, tend to be even lower than the corresponding output correlations (Backus et al., 1992; Baxter and Crucini, 1993; Obstfeld, 1994a,b; Tesar, 1995). This is contrary to the implication that integrated world financial markets should help individuals to smooth consumption in response to idiosyncratic fluctuations in income. This phenomenon has become known as the

E-mail address: youn.kim@wku.edu

“international or cross-country consumption-output correlation anomaly or puzzle” (Backus et al., 1992). These studies typically rest on a consumption (or endowment)-based framework in which consumers maximize expected utility of consumption over time under the condition of uncertainty. Many attempts have been made to resolve the puzzle, but results are, by and large, not satisfactory (see Tesar, 1995; Lewis, 1996, 1999; Baxter, 2011).

In an effort to shed some light on the well-known but unsettled cross-country correlation riddle, this paper develops an altogether different approach suitable for explaining financial market integration and risk sharing among countries or regions from the vantage point of the *production* side, rather than the *consumption* side, of the economy. The thesis of the proposed model is that production shocks are the driving force for output co-movements across countries and that international risk sharing, which is captured through asset trade in world financial markets, is possibly realized from diversifying *production* risks rather than *consumption* risks among countries. In many respects, the production-based model, though it has not received due regard, is more relevant than traditional consumption-based models to characterize international financial market integration and risk sharing among countries. Production variables such as output or investment are more characteristic of economic fluctuations than consumption, and stock returns are found to be significantly related to production activity (see Cochrane, 1991, 1996; Kim, 2013). While international financial markets may not be an adequate mechanism for consumers to share the risk of consumption, they do provide opportunities for firms to diversify the risk of international production. Multinational firms tend to shift production to take advantage of lower costs of production and hence to mitigate risk occurring in one country by shifting resources from other countries. The proposed production-based approach provides us an alternative measure for evaluating welfare gains from international risk sharing in contrast to the traditional consumption-based measure with a utility function (Tesar, 1995).

We analyze a multi-country, multi-factor production model with a focus on a hypothesized role for asset trade in pooling risks among countries. We view each country as a producer of goods and services, instead of as a consumer as in traditional consumption-based models, in a small open economy under conditions of production uncertainty or risk.¹ The model is characterized as a state-contingent intertemporal production problem using the cost function that is a function of output, input prices, and a technology shock. The producer's intertemporal marginal rate of substitution of output supply is described by the ratio of marginal costs of output in two successive periods, and the production Euler equation, which shows that asset returns are determined by the producer's production decisions across time and states of nature, is derived. If countries are fully integrated financially, the growth rates of marginal cost of output must be the same for their producers across states of nature, which is equal to the (negative of) world interest rate. The international production risk sharing problem is modeled as the problem facing a social (world) planner who minimizes the sum of expected costs of an individual country over time for an efficient intertemporal allocation of output under production risk. The first-order conditions yield a set of rules for efficient output sharing among producers in different countries under uncertainty. In particular, efficiency in production requires that producers in different countries equalize their marginal cost of output at every state and time. This condition implies that the growth rate of marginal cost is constant across countries and does not depend on idiosyncratic shocks but rather on common shocks affecting all countries. If all shocks are common shocks, opportunities for risk sharing among countries are limited. Moreover, if international financial markets are complete or fully integrated, there is perfect risk sharing among countries. For a Cobb-Douglas cost function, efficient risk sharing implies that when countries experience common technology shocks (in addition to common input prices and interest rates), output growth rates should be perfectly correlated across them.

¹ There are many recent production-based studies to examine asset returns (see Cochrane, 1991, 1996; Baxter and Jermann, 1997; Bottazzi et al., 1996; Kim, 2003, 2013; Gomes et al., 2009) and capital mobility across countries (see Gordon and Lans Bovenberg, 1996). This underscores the importance of a production-based approach. These studies are, however, based on a simple production function framework which is not grounded in the intertemporal cost minimization problem (Kim, 2003, 2013, is an exception) and do not analyze international risk sharing.

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