Risk Shifting and Excessive Trade Volatility

Assaf Razin[1] and Anuk Serechetapongse[2]

Rough Draft

May 2014

Abstract

The recent global crisis saw a sharp decline in output, but the accompanying decline in international trade volumes was twice as big. But, in the 1990s boom international trade volume increase much more than output levels. Why is international trade so volatile?

The paper develops a parsimonious general-equilibrium model which features a risk-shifting bias in the country resource allocation towards exports, generating excess volatility of the export sector relative to economic activity level. Data on the risk content of exports, and creditor rights indicators, for developed, emerging and developing economies, over the period of 1978-2004, is used to analyze the relationship between the export sector riskiness, creditor rights and financial openness.

Using fixed effects reduced-form regressions; we show that countries with poorer creditor rights, or those which are financially open, are the ones with a higher risk content of exports.

[1] Department of Economics, Cornell University, Ithaca, NY 14853, and Tel Aviv University; email: razin@post.tau.ac.il

[2] International Monetary Fund, Washington, DC 20431; email: aserechetapongse@imf.org

I. Introduction

The recent global crisis saw a sharp decline in output, but the accompanying decline in international trade volumes was twice as big. In the 1990s boom also international trade volume increase much more than output levels. Why is international trade so volatile?

Amiti and Weinstein (2011) and Chor and Manova (2012) highlight the role of financial frictions and the drying up of trade credit as reasons for the trade collapse of 2008/09.

Engel and Wang (2011) point out the fact that the composition of international trade is tilted towards durable goods. Building a two-sector model in which only durable goods are traded, they can replicate the higher volatility of trade relative to general economic activity.

Novy and Taylor (2014) relate the excess volatility of trade to inventory adjustment, in response to uncertainty shocks.

We relate the excess volatility of trade to producers risk shifting behavior, which in a general equilibrium model shifts resources away from importable sectors into exportable sectors. The risk shifting behavior is rooted in the inability of the lenders to observe the borrowers'

investment decision, due to insufficient monitoring of the uses of borrowing funds. Entrepreneurs who have no capital of their own, could appropriate from banks a certain level of informational rent, by investing excessively in the risky sectors of the economy; chief among them are the export sectors.

Allen and Gale (2000) formalize such a credit mechanism whereby investors borrow from banks to invest in the safe and the risky assets. While the safe asset is in variable supply and provides a stable return, the risky asset is in fixed supply and provides a random return. They assume that banks do not know how to invest in the safe and risky assets, so they have no choice but to lend to investors, and they cannot observe the investment decisions of investors after lending. Also, banks and investors cannot condition to terms of the loan on the size of the loan or on asset returns, which caused them to use simple debt contract only. The assumption that banks cannot monitor the investors' usage of borrowing would give rise to the risk shifting behavior among investors. If their portfolio value is insufficient for repayment, they can just declare bankruptcy and avoid further loss. But if their portfolio value turns out to be high, they would just repay the bank the promised return and keep the rest of the proceeds. Thus, investors would substitute towards the risky asset. And since the risky asset is in the fixed supply, the higher demand from investors would bid up the price of the risky asset to be above its fundamental value. Our analytical framework combines the risk-shifting mechanism of Allen and Gale (2000) and the general-equilibrium risk-sharing model of Helpman and Razin (1978) to set forth propositions concerning the effects of the lack of monitoring in the borrowing usage on asset price as well as on production and exports[3].

[3] The model in this chapter relaxes the assumptions in Allen and Gale (2000) that investors are risk neutral and that there is a non-pecuniary cost which restricts the size of investment.

The exposure of the export sectors to risk may cause a country to face increased macroeconomic volatility (OECD (2006), Caballero and Cowan (2007), and Koren and Tenreyro (2007)). To bring theory predictions to data one needs measures of riskiness across sectors. Koren and Tenreyro (2007) measured the intrinsic volatility of different sectors using the variance of the sectoral value added growth. The riskier sectors are the ones with higher intrinsic volatility. From the method of Koren and Tenreyro (2007), Di Giovanni and Levchenko (2011) developed the measure of a country's export riskiness, which is called the risk content of exports, by multiplying the square of each sector's share of exports to the intrinsic sectoral volatility. The risk content of exports can thus be viewed as the variance of export patterns. A country's exports riskiness would rise when its export pattern is tilted towards sectors with high intrinsic volatility.

If the borrowers are poorly monitored, lenders may not be fully repaid. An empirical proxy for the ease debt repayment is developed in La Porta, Lopes-Silanes, Shleifer, and Vishny (1996) (henceforth LLSV (1996)). They developed a de jure measure called the creditor rights index (CRI), which accesses the four aspects of creditors' legal rights against defaulting debtors. Such legal rights would become stronger when there are restrictions on the borrowers' filing for reorganization, when secured creditors can possess their security right after the approval of the reorganization petition, when secured creditors can first gain the proceeds from a bankrupt debtor, and when debtor can no longer administer their properties pending the resolution of the reorganization. Djankov et al (2007) extended the data of LLSV (1996) to cover from 49 countries to 129 countries from 1978 to 2004. This chapter will use the CRI data from Djankov et al (2007) as a proxy for the degree of monitoring. Not only is this measure in line with the

previous chapter's theoretical set-up, but the extended data set would also allow for time series variation[4].

Other studies have explored the implications of creditor rights. For instance, LLSV (1997) examined the impacts of creditors' power on the size and the depth of the bond markets and the stock markets. Djankov et al (2007) investigated how creditors' power affects the extent of credits to the economy. Acharya, Amihud, and Litov (2011) study the relationship between creditors' rights and corporate risk-taking behavior and corporate leverage. Hale, Razin, and Tong (2012) analyze the effects of creditor rights on stock prices in the face of liquidity crises.

An empirical test in this paper analyzed the data of the risk content of exports and creditor rights index from developed and developing economies over the period of 1978-2004. Using fixed effects regressions, the results revealed that countries with poorer creditor rights are the ones with higher risk content of exports. This finding remained robust even after excluding the most volatile production sectors from the analysis. And when separately examining the effects of the four different components of creditor rights index, it is shown that the effects of creditor rights arises from the restrictions on the borrowers' filing for reorganization.

The rest of this paper is organized as follow. Section II describes a theoretical model. Section III shows the results from simulations. Sections IV, V, and VI explain about the dependent variable, the explanatory variable of interest, and the control variables, respectively. Section VII reveals the results from an empirical test, and Section VIII concludes.

[4] Other variables, such as contract enforcement, do not have long data series.

II. Two-period Analytical Framework

Consider the parsimonious based on Helpman and Razin (1978), and Allen and Gale (2000) combined. There are 2 periods, 2 sectors, and 2 factors of production. The production of the first sector, the risky sector, is subject to a productivity shock, whereas the production of the second sector, the safe sector, is not stochastic. The price of the safe good is normalized to 1, so the price of the risky good, denoted by P, captures the relative price of risky good to safe good. There is an international trade in both goods, causing the price of goods to be exogenous. However, there is no international trade in stocks.

II.1 The Risky Export Sector

The production of the first sector, the risky sector, is subject to a random productivity shock. The actual output of the risky sector is

$$\theta Z = \theta F(L_Z, K_Z)$$

where the subscript Z denotes the risky production sector. In the above equation, $Z = F(L_Z, K_Z)$ is a standard homogenous of degree one production function. L_Z and K_Z are the labor and capital input for the risky sector, respectively. The variable θ is a random variable with a continuous positive density $h(\theta)$ on the support $[0, \theta_{MAX}]$ and mean $\bar{\theta}$. The random productivity shock θ is common knowledge, and the actual value of θ will realize in the second period.

Before the productivity shock realizes, the optimal amount of both factors of production must be chosen in the first period. The risky export sector's producers issue stocks, to finance their factor costs. (A real equity from the risky sector will be called a risky equity.) A unit of risky equity in the first period provides a basket of $(\theta(1), \theta(2), \ldots..)$ units of risky good, covering all states of nature.

Since firms choose factor input before the realization of productivity shock, their optimization can be done via maximizing their stock market value (maximizing their stock market value is equivalent to maximizing their profits if there is no productivity shock). Thus, the firms' optimization problem can be written as follow

$$max\ qZ - R_Z K_Z - W_Z L_Z = max\ q\ F(L_Z, K_Z) - R_Z K_Z - W_Z L_Z$$

where q is the selling price of a risky equity, and Z can also be seen as the total amount of issued risky equities. RZ is the rental rate and the W_Z is the wage rate offered by the risky sector.

In the second period after the productivity shock realizes, a holder of one unit of risky equity will be given θ units of risky good as a return, and the monetary value of such return is $P\theta$.

II.2 the Non-risky Sector

In contrast, the production of the second sector, the safe sector, is not subject to a productivity shock. Therefore, the profit maximization for firms in the safe sector can be written as follow

$$Max\ X - R_X K_X - W_X L_X = max\ Q\ (L_X,\ KX) - R_X K_X - W_X L_X$$

Where the subscript X denotes the safe production sector. In the above equation, $X = Q(L_X, K_X)$ is a standard homogenous of degree one production function with labor input L_X and capital input K_X. Note that the price of the safe good is normalized to 1. R_X is the rental rate and the W_X is the wage rate offered by the safe sector.

Like firms in the risky sector, firms in the safe sector issue real equities to finance their factor costs. Because there is no productivity shock in the safe sector, the above profit maximization problem can also be viewed as stock market value maximization problem. It can

be interpreted that the selling price of each unit of real equity for the safe sector (henceforth, safe equity) is normalized to 1.

Because the production of a safe sector is not subject to shocks, safe equity yields a constant return in all states of nature. The return on each unit of safe equity equals the marginal product of capital, R_2, which is equal to the depreciation rate plus the risk-free interest rate r. It is assumed further that the depreciation rate is zero, so each unit of safe equity provides a constant return of r units of safe good in the second period.

II.3. Households

There are two types of households, workers and entrepreneurs, both of which will consume only in the second period. Workers, which have no access to the stock market, supply the loans by depositing their labor income in the banks. In contrast, entrepreneurs are the ones who have access to the stock market and demand loan. Thus, they will play an important role in determining the price of real equities as well as resource allocations among production sectors. This is different from the set-up in Allen and Gale (2000) where there are investors and banks but the source of the banks' funds is not mentioned.

II.3.1 Workers

In the first period, workers are endowed with total amount of labor $\overline{L}$, so they will earn labor income from allocating their labor endowment between the risky sector and the safe sector. Because they want to maximize their income for their second-period consumption but have no access to the stock market, they will deposit all their labor income, $W_Z L_Z + W_X L_X$, in a bank in

the first period to get the second-period return $r(W_Z L_Z + W_X L_X)$, where r is the interest rate. As a result, the labor income becomes the supply of loans available for borrowing.

II.3.2 Entrepreneurs

In the first period, entrepreneurs are endowed with total amount of capital $\overline{K}$, which would be allocated between the risky sector and the safe sector. They also own the firms in the two production sectors (by holding all initial real equities) and borrow from banks to invest in the real equities issued by both.

As for the relationship between borrowers and lenders, which in this case are entrepreneurs and banks, the following assumptions in Allen and Gale (2000) are employed to make the interaction between the risk-shifting behavior, asset price, and the real sector as clear as possible.

a. Banks are risk neutral.
b. Banks do not know how to invest in the safe and risky equities by themselves, so they have no alternatives other than lending to entrepreneurs.
c. Banks and entrepreneurs can only use simple debt contract. That is, they cannot condition the terms of borrowing based on the size of borrowing or on asset returns.
d. Entrepreneurs do not need collateral to borrow from banks

The first assumption is present in order for banks not to have preference towards or away from risk. The second assumption prevents banks from investing on their own. Hence, the actions of entrepreneurs can be observed more clearly.

Entrepreneurs can borrow as much as they want at the going lending interest rate, because the terms of loans are not conditioned on the loan size or asset returns. In equilibrium,

the lending interest rate would be equal to the risk-free interest rate, which is the return on the safe equity. If the lending interest rate is lower than the risk-free interest rate, entrepreneurs' demand for loans would be infinite. If the lending interest rate is higher, they will not invest in the safe asset at all. In other words, the demand for loans is perfectly elastic.

Finally, since all the loans are non-collateral loans, banks can only claim the returns on entrepreneurs' portfolio performance but cannot go after their income from other sources, such as their income from endowment[5].

Entrepreneurs' first period budget constraint can therefore be written as follow:

$$x + qz \leq (qZ - R_Z K_Z - W_Z L_Z) + (X - R_X K_X - W_X L_X) + W_Z L_Z + W_X L_X$$

Where, x denotes the quantity of non-risky sector equities purchased by entrepreneurs. Since the unit price of a safe sector real equity is 1, x also represents the total value of the purchased safe sector real equities. Similarly, z is the quantity of risky sector real equities purchased by entrepreneurs, so qz is the total value of the purchased risky sector. On the right hand side, $(qZ - R_Z K_Z - W_Z L_Z)$ and $(X - R_X K_X - W_X L_X)$ are the net values from their ownership of firms in the risky and the safe industries. The amount $W_Z L_Z + W_X L_X$, which is the deposited labor income, becomes the total amount of loans given to entrepreneurs.

In the second period, entrepreneurs would receive the rent on their capital endowment ($R_Z K_Z$ from the risky sector and $R_X K_X$ from the safe sector) and the return on their holdings of risky equities and safe equities. Following that the monetary return per unit of risky equity is $P\theta$ and the monetary return per unit of safe equity is r, the total return on entrepreneurs' portfolio is

$$P\theta z + rx$$

[5] This assumption also prevents entrepreneurs' consumption to be equal to zero in the case that they default.

Because the safe equities provide constant return in all states of nature, the outcome of entrepreneurs' portfolio would depend on the performance of the risky equities. Then entrepreneurs would repay to banks $r(W_Z L_Z + W_X L_X)$,which is the total amount of borrowing multiplied by the risk-free interest rate, before choosing the level of consumption. Nevertheless, the choices of investment and loan repayment made by entrepreneurs as well as the choices of consumption made by both entrepreneurs and workers hinge upon whether entrepreneurs' investment decisions can be monitored. This would also affect the price of the real equities and the actual productions of the real sectors.

III. Asset Prices and Monitoring

III.1 Insufficient Monitoring

This scenario illustrates the event when banks cannot monitor entrepreneurs' usage of borrowings, which would be followed by the risk-shifting behavior among entrepreneurs. If the productivity realization and hence the return on risky equities is high, entrepreneurs can repay the banks a promised return and keep the remaining proceeds from their portfolio. If the productivity realization is low and their portfolio values are insufficient to repay the bank, however, entrepreneurs would repay only the proceeds from their portfolio without bearing any further cost. This would encourage entrepreneurs to demand more risky equities, because they have more to gain on the upside risk and less to lose on the downside risk from investing in risky equities.

The entrepreneurs' optimization problem is to choose their capital allocations and portfolio allocations in the first period and then choose their consumption in the second period. This problem can be solved backward.

In the second period, entrepreneurs receive $R_Z^l K_Z^l + R_X^l K_X^l$ from renting capital to the two production sectors and get a total return of $P\theta z^l + r^l x^l$ from their portfolio. Then they must repay the amount $r^l\left(W_Z^l L_Z^l + W_X^l L_X^l\right)$ to the banks. This causes their total second-period income to be

$$R_Z^l K_Z^l + R_X^l K_X^l + P\theta z^l + r^l x^l - r^l\left(W_Z^l L_Z^l + W_X^l L_X^l\right)$$

Where the superscript *l* indicates the case of no monitoring. If the return on their portfolio is high, the above expression is positive because entrepreneurs would still earn positive profits even after repaying the banks.

If, on the other hand, the return on entrepreneurs' portfolio becomes insufficient for repayment, they would default and only pay the banks the total proceeds of their portfolio, $P\theta z^l + r^l x^l$, so their total second-period income equals

$$R_Z^l K_Z^l + R_X^l K_X^l$$

Formally, entrepreneurs' second period maximization problem in the lack of monitoring scenario can be written as follow:

$max_{c_{Ze}^l(\theta), c_{Xe}^l(\theta) \geq 0} \; u(c_{Ze}^l(\theta), c_{Xe}^l(\theta))$

subject to

$$Pc_{Ze}^l(\theta) + c_{Xe}^l(\theta) \leq \max\{ R_Z^l K_Z^l + R_X^l K_X^l \,,$$
$$R_Z^l K_Z^l + R_X^l K_X^l + P\theta z^l + r^l x^l - r^l(W_Z^l L_Z^l + W_X^l L_X^l) \}$$

Entrepreneurs maximize their utility by choosing their consumption of the risky good ($c_{Ze}^l(\theta)$) and of the safe good ($c_{Xe}^l(\theta)$) subject to their total income, which depends on their choice whether to default.

There exists a productivity shock realization θ^* such that entrepreneurs' income when default and not default are equated.

$$R_Z^l K_Z^l + R_X^l K_X^l + P\theta^* z^l + r^l x^l - r^l(W_Z^l L_Z^l + W_X^l L_X^l) = R_Z^l K_Z^l + R_X^l K_X^l$$

Rearranging the above equation yields

$$P\theta^* z^l + r^l x^l - r^l(W_Z^l L_Z^l + W_X^l L_X^l) = 0$$

Hence, θ^* is the threshold value of θ below which entrepreneurs will default on their loans. As a result, entrepreneurs' first-period maximization problem is as follow:

$$max_{K_Z^l, K_X^l, z^l, x^l \geq 0} \int_0^{\theta*} V\left(P, R_Z^l K_Z^l + R_X^l K_X^l\right) h(\theta) d\theta$$

$$+ \int_{\theta*}^{\theta MAX} V\left(P, R_Z^l K_Z^l + R_X^l K_X^l + P\theta z^l + r^l x^l - r^l(W_Z^l L_Z^l + W_X^l L_X^l)\right) h(\theta) d\theta$$

subject to

$$x^l + q^l z^l \leq (q^l Z^l - R_Z{}^l K_Z{}^l - W_Z{}^l L_Z{}^l) + (X^l - R_X{}^l K_X{}^l - W_X{}^l L_X{}^l) + W_Z{}^l L_Z{}^l + W_X{}^l L_X{}^l$$

In the first period, entrepreneurs choose their allocation of capital among the two production sectors as well as their holdings of risky and safe equities to maximize their expected utility subject to their first-period budget constraint determined by the net values of their initial stock holdings and their borrowing from banks.

If entrepreneurs' usage of borrowing is not monitored, they would default when θ is lower than the threshold value θ^*, so the expected return per one unit of loan would be

$$rPr(\theta > \theta^*) + \int_0^{\theta*} \left(\frac{P\theta z^l + r^l x^l}{W_Z^l L_Z^l + W_X^l L_X^l}\right) h(\theta) d\theta < r$$

It is observable that the expected return per one unit of loan will always be less than the contracted risk-free rate. Such difference can be viewed as an informational rent that entrepreneurs reap from workers, who are depositors, because they can hide their investment choices from banks.

As for workers, they will receive from banks the whole return on their deposits, $r^l\left(W_Z^l L_Z^l + W_X^l L_X^l\right)$, in the case of high productivity realization, and the proceeds $P\theta z^l + r^l x^l$ that is less than $r^l\left(W_Z^l L_Z^l + W_X^l L_X^l\right)$ in the case of low productivity realization. Thus, their second-period utility maximization can be written as

$$max_{c_{Zw}^l(\theta), c_{Xw}^l(\theta) \geq 0} \quad u(c_{Zw}^l(\theta), c_{Xw}^l(\theta))$$

subject to

$$Pc_{Zw}^l(\theta) + c_{Xw}^l(\theta) \leq \min\{ P\theta z^l + r^l x^l \ , r^l(W_Z^l L_Z^l + W_X^l L_X^l) \}$$

Workers maximize their utility by choosing their consumption of the risky good ($c_{Zw}^l(\theta)$,) and of the safe good ($c_{Xw}^l(\theta)$) subject to their total return on their deposits, which, again, depends on entrepreneurs' choice whether to default.

And their first-period maximization problem is

$$max_{L_Z^l, L_X^l, \geq 0} \quad \int_0^{\theta*} V(P, P\theta z^l + r^l x^l) h(\theta) d\theta + \int_{\theta*}^{\theta MAX} V\left(P, r^l(W_Z^l L_Z^l + W_X^l L_X^l)\right) h(\theta) d\theta$$

subject to

$$\bar{L} = L_Z^l + L_X^l$$

Where workers choose the allocation of their labor across sectors so as to maximize their expected utility subject to their resource constraint.

III.2 Full Monitoring

The purpose of looking at a full-monitoring scenario is to evaluate the fundamental value of the risky equity, which would serve as the benchmark to compare and tell whether the price of risky equity is overshooting. According to Allen and Gale (2000), the fundamental value is defined as

the value that entrepreneurs would be willing to pay for one unit of risky equity if there is no risk shifting, all else equal[6]. This would occur if banks can fully monitor entrepreneurs' investment decisions. Therefore, entrepreneurs will repay in full regardless of the productivity shock realization.

Entrepreneurs' second-period maximization problem in this scenario is the following:

$$max_{c_{Ze}^f(\theta), c_{Xe}^f(\theta) \geq 0} \quad u(c_{Ze}^f(\theta), c_{Xe}^f(\theta))$$

subject to

$$Pc_{Ze}^f(\theta) + c_{Xe}^f(\theta) \leq \{R_Z^f K_Z^f + R_X^f K_X^f + P\theta z^f + r^f x^f - r^f (W_Z^f L_Z^f + W_X^f L_X^f)\}$$

Hence, their maximization problem in the first period is as follow:

$$max_{K_Z^f, K_X^f, z^f, x^f \geq 0} \int_0^{\theta MAX} V\begin{pmatrix} P, R_Z^f K_Z^f + R_X^f K_X^f + P\theta z^f + r^f x^f \\ - r^f (W_Z^f L_Z^f + W_X^f L_X^f) \end{pmatrix} h(\theta) d\theta$$

subject to

$$x^f + q^f z^f \leq (q^f Z^f - R_Z^f K_Z^f - W_Z^f L_Z^f) + (X^f - R_X^f K_X^f - W_X^f L_X^f) + W_Z^f L_Z^f + W_X^f L_X^f$$

The superscript *f* denotes the full monitoring scenario.

The only difference between these maximization problems and the ones in the lack of monitoring scenario is that now there is no possibility of default.

Since entrepreneurs always repay to banks in full, workers will also get from banks the full return on their deposits, causing workers' second-period maximization problem to be

$$max_{c_{Zw}^f(\theta), c_{Xw}^f(\theta) \geq 0} \quad u(c_{Zw}^f(\theta), c_{Xw}^f(\theta))$$

---

[6] Allen and Gale (2000) also interpret the full monitoring scenario as a case that reveals the price of risky equity entrepreneurs are willing to pay if they use their own funds. Then they conjectured that if such entrepreneurs are introduced in the model, these entrepreneurs would hold less of the risky equity or even short the risky equity, depending on how risk-averse they are and on how severe the risk-shifting problem is. In order for asset price overshooting and the overinvestment in the risky sector to take place, there must be limitations on short sales of the assets.

subject to

$$Pc_{Zw}^{f}(\theta) + c_{Xw}^{f}(\theta) \leq r^{f}(W_Z^f L_Z^f + W_X^f L_X^f)$$

And their first-period maximization problem is

$$max_{L_Z^f, L_X^f \geq 0} \int_0^{\theta MAX} V\left(r^{f}(W_Z^f L_Z^f + W_X^f L_X^f)\right) h(\theta) d\theta$$

subject to

$$\bar{L} = L_Z^f + L_X^f$$

III.4 Equilibrium

In equilibrium, all domestic markets have to clear. The market-clearing conditions for labor and capital can be written as follow

$$\bar{K} = K_Z^j + K_X^j$$

$$\bar{L} = L_Z^j + L_X^j$$

The superscript $j = l, f$ denotes the lack of monitoring scenario or the full monitoring scenario. Because there is no international trade in real equities, the market-clearing condition for risky equities is

$$z^j = Z^j = F(L_Z^j, K_Z^j)$$

where the right-hand side is the demand for risky equities and the left-hand side is the supply of risky equities.

Similarly, the market-clearing condition for safe equities is

$$x^j = X^j = Q(L_X^j, K_X^j)$$

where the right-hand side is the demand for safe equities and the left-hand side is the supply of safe equities[7].

No-arbitrage condition implies that the wage rates and the rental rates offered by the risky sector and the safe sector must equalize. Hence,

$$W_Z^j = W_X^j = W^j, \text{ and } R_Z^j = R_X^j = R^j$$

The rental rate is equal to the sum of the interest rate and the rate of depreciation. It is further assumed that the rate of depreciation is zero, so

$$R^j = r^j$$

In addition, a production sector is in equilibrium if the net stock market value cannot be altered by varying its input levels. Thus, in an equilibrium in which all sectors produce a finite output level,

$$q^j \frac{\partial F(L_Z^j, K_Z^j)}{\partial L_Z^j} = W^j$$

$$q^j \frac{\partial F(L_Z^j, K_Z^j)}{\partial K_Z^j} = r^j$$

$$\frac{\partial Q(L_X^j, K_X^j)}{\partial L_X^j} = W^j$$

$$\frac{\partial Q(L_X^j, K_X^j)}{\partial K_X^j} = r^j$$

[7] This element is different from Allen and Gale (2000). In their partial equilibrium set-up, the supply of the risky equities is fixed at a certain value and the supply of the safe equities is determined by investors' decisions to invest in capital goods.

The first two equations are the first order conditions of firms in the risky industry, and the latter two are those of firms in the safe industry. Because $F(L_Z^j, K_Z^j)$ is homogenous of degree 1, multiplying $q^j \frac{\partial F(L_Z^j, K_Z^j)}{\partial L_Z^j} = W^j$ by L_Z^j and $q^j \frac{\partial F(L_Z^j, K_Z^j)}{\partial K_Z^j} = r^j$ by K_Z^j and adding them up yields

$$q^j Z^j = q^j F\left(L_Z^j, K_Z^j\right) = W^j L_Z^j + r^j K_Z^j$$

Since $Q(L_X^j, K_X^j)$ is also homogenous of degree 1, repeating the same steps using the first order conditions of the safe sector yields

$$X^j = Q\left(L_X^j, K_X^j\right) = W^j L_X^j + r^j K_X^j$$

This implies that the net values of owning the firms (net value of holding initial stocks) in both industries are zero. Using the above result and the no-arbitrage condition, the entrepreneurs' first-period budget constraint can be re-written as

$$x^j + q^j z^j = w^j \bar{L}$$

Then, when entrepreneurs' usage of borrowings cannot be monitored, the threshold value of productivity shock below which entrepreneurs will default (θ*) can be re-written as

$$P\theta^* z^l + r^l x^l - r^l w^l \bar{L} = P\theta^* z^l + r^l x^l - r^l (x^l + q^l z^l) = 0$$

$$\theta^* = r^l q^l / P$$

This means that the threshold value is positively related to the risk-free interest rate and the price of risky equity and is negatively related to the price of risky good. Thus, the higher price of the risky equity will push up the threshold value, increasing the likelihood the entrepreneurs will default.

Using the re-written first period budget constraint, the market clearing conditions, and the no-arbitrage conditions, the first order conditions of entrepreneurs' first period maximization when they cannot be monitored is

$$\int_{\theta*}^{\theta MAX} V'(P, r^l \overline{K} + P\theta Z^l + r^l X^l - r^l q^l Z^l) h(\theta) d\theta (P\theta - r^l q^l) = 0$$

The above equation will give the price of the risky equity when risk-shifting takes place. Similarly, the first order conditions of entrepreneurs' first period maximization when they can be fully monitored is

$$\int_{0}^{\theta MAX} V'(P, r^f \overline{K} + P\theta Z^f + r^f X - r^f q^f Z^f) h(\theta) d\theta (P\theta - r^f q^f) = 0$$

This equation will determine the fundamental price of the risky equity when there is no risk-shifting.

After the productivity shock realizes, the actual production level of risky good as well as the return on risky equity are determined. Then entrepreneurs and workers would choose their consumption of the safe and the risky goods. A good will be exported if the production level exceeds total consumption, and will be imported otherwise. Nevertheless, since there is no international trade in equities, the value of exports of one good must be equal to the value of imports of another good.

III.5 Simulations

The simulation results are shown in the figures below. Figure 1 reveals that the price of the risky sector's real equity is higher in the lack of monitoring scenario compared with its fundamental value in the full monitoring scenario. This result is in line with that of Allen and Gale (2000). Figure 2 illustrates that the production of the risky sector in the lack of monitoring scenario is higher than that in the full monitoring scenario. Moreover, the higher price of the risky sector's real equity and the higher production of the risky sector are associated with the higher price of the risky good. Finally, Figures 3 and 4 show that the volume and the value of

exports in the risky sector in the lack of monitoring scenario is higher than that in the full monitoring scenario. (Also, exports increase with higher productivity shock.)

The mechanism behind these results can be explained as follow. When borrowers, which in this case are entrepreneurs, cannot be fully monitored and thus can default, they would gear their investments towards the risky production sector by investing more in risky equities, given that they provide higher expected return compared with safe equities. This would bid up the price of risky equities in the low-quality credit market scenario to be higher than in the high-quality credit market scenario. At the same time, as entrepreneurs invest more in risky equities, the risky sector would receive higher level of investment, resulting in the higher production and export levels.

We can now integrate the economy with the global financial markets. Let the world relative stock price, q, be subject to various shocks. The small country assumption implies the domestic stock price becomes equal to the world relative stock price, q, and we can drop the market clearing condition z = Z. That is, the country capital account is not necessarily balanced.

It is straightforward to see that financial integration enhances the riskiness of exports.

An empirical exercise in the next sections will test the hypothesis that exports of the risky sector are higher when the lenders lack the ability to monitor borrowers' investment decisions.

Figure 1: Price of Risky Equity

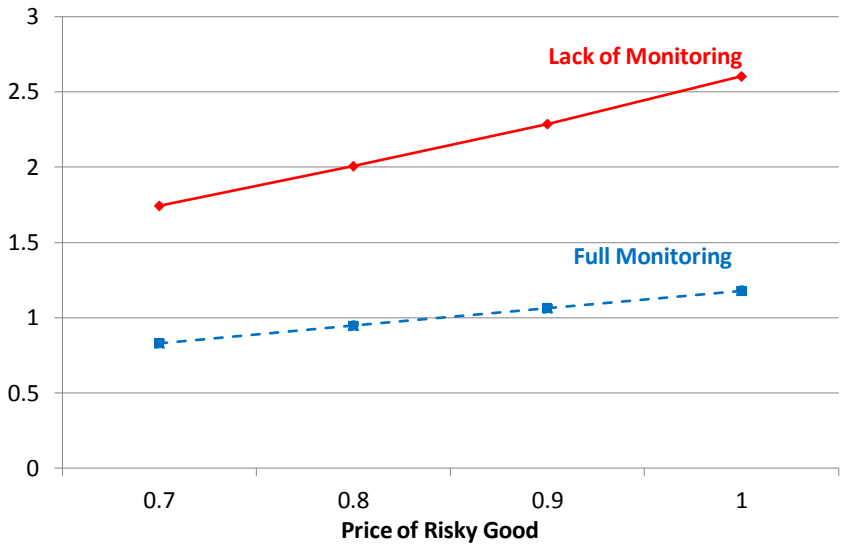
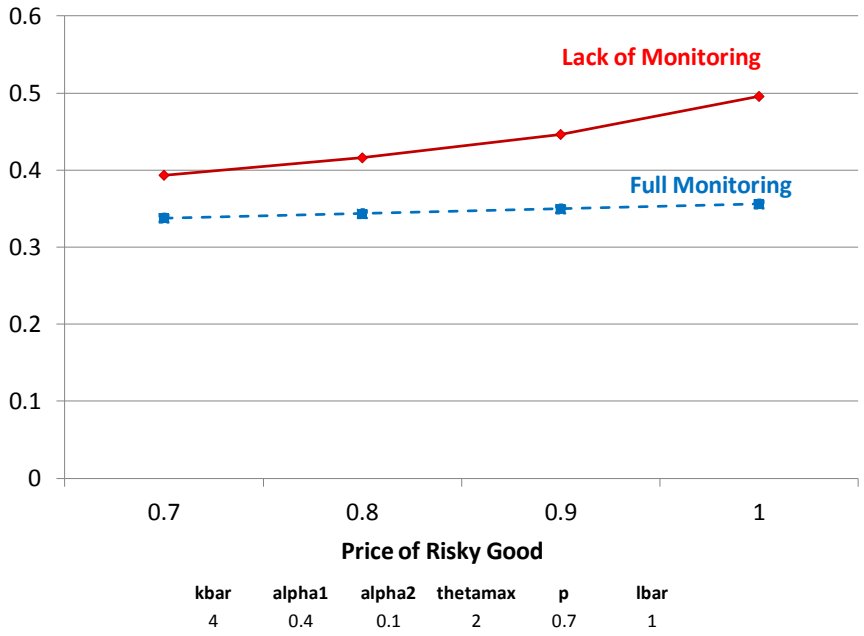
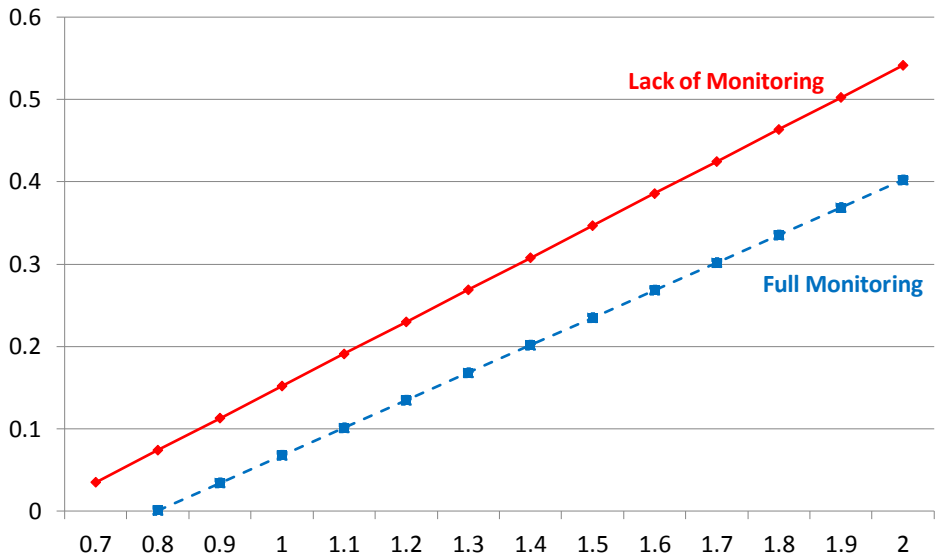


Figure 2: Production of Risky Good

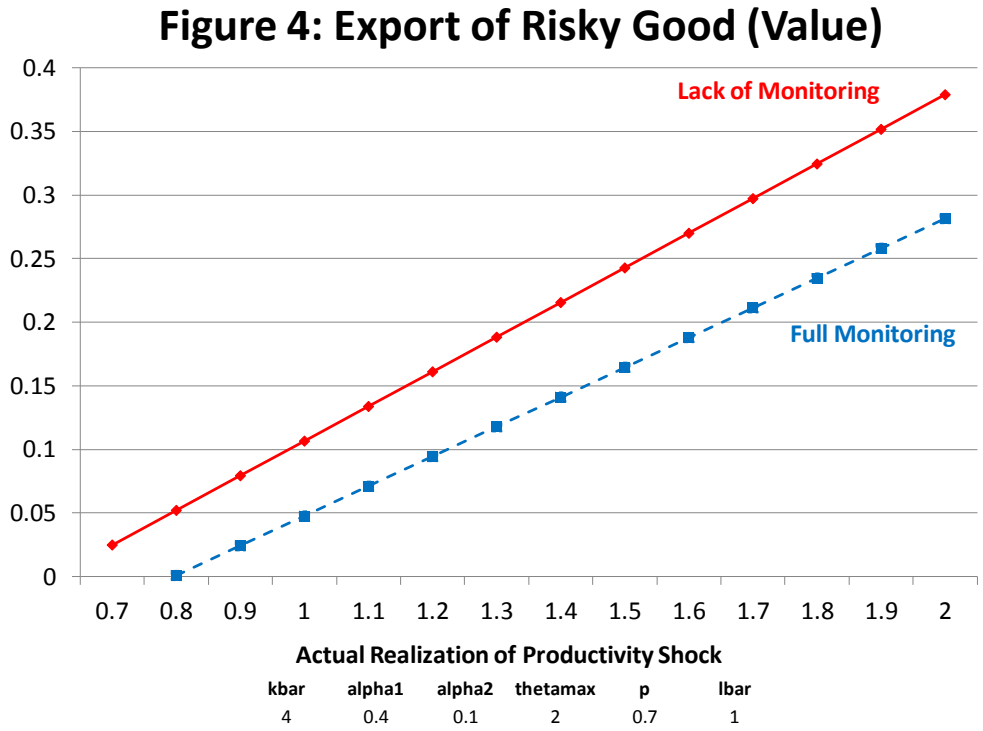


kbar	alpha1	alpha2	thetamax	p	lbar
4	0.4	0.1	2	0.7	1

Figure 3: Export of Risky Good (Volume)



kbar	alpha1	alpha2	thetamax	p	lbar



IV. Measuring the Riskiness of Exports

A dependent variable for an empirical exercise is Di Giovanni and Levchenko (2011)'s risk content of exports, which aims to capture export volatility. The rationale behind the construction of this index is that a country's export volatility can be broken down into two parts, the intrinsic volatility of each sector and a country's share of exports in each sector.

This chapter follows the steps in Di Giovanni and Levchenko (2011) to obtain the data of the sectoral value added growth. The value added data of the 28 manufacturing sectors come from the UNIDO Industrial Statistics Database, which reports the data using the 3-digit ISIC

Revision 3 classification. In addition, the value added in agriculture (short for Agriculture, Hunting, Forestry and Fishing) and mining (short for Mining and Quarrying) sectors come from the United Nations National Accounts Official Country Data. Hence there are a total of 30 production sectors. The value added data were originally reported in current U.S. dollars, and they are converted into constant international dollars using the Penn World Tables.

The data of the countries' sectoral exports to the rest of the world come from the UN Comtrade Database, which reports the data according to the 4-digit SITC Revision 2 classification. Hence, the sectoral exports data are converted into the 3-digit ISIC Revision 3 classification using the tables provided in M. Affendy, Yee, and Satoru (2010).

First, the sectoral intrinsic volatility is calculated using the method similar to Koren and Tenreyro (2007). Define y_{ict} as the value added growth, which reflects innovations to the value added, in country *c*, sector *i*, and time *t*. To control for the cross-country long-run differences in the value added growth, the series y_{ict} is subtracted by the mean growth rate for each country and sector over the entire time period. The demeaned value added growth is denoted as $\widetilde{y_{ict}}$, and it can be seen as the sector-specific shock for each country and each year.

$$\widetilde{y_{ict}} = y_{ict} - \frac{1}{T}\sum_{t=1}^{T} y_{ict}$$

Then a global shock for sector i and time t, denoted as Y_{it}, is calculated by averaging the series $\widetilde{y_{ict}}$ across countries for each sector and each year.

$$Y_{it} = \frac{1}{C}\sum_{c=1}^{C} \widetilde{y_{ict}}$$

After obtaining the global sector-specific shock Y_{it}, the sample variance of this series is computed. Such variance is used as a measure of the sectoral intrinsic volatility.

$$\sigma_i^2 = \frac{1}{T-1}\sum_{t=1}^{T}(Y_{it} - \overline{Y_i})^2$$

The sample covariance between Y_{it} and Y_{jt}, which captures how shocks of different sectors covary, is also computed for each pair of different sectors *i* and *j*.

$$\sigma_{ij} = \frac{1}{T-1}\sum_{t=1}^{T}(Y_{it} - \overline{Y_i})(Y_{jt} - \overline{Y_j})$$

Repeating this procedure for all the 30 production sectors gives the 30x30 variance-covariance matrix, which will be denoted as $\sum$. By construction, $\sum$ is country and time invariant.

Table 4 summarized the summary statistics of the growth in value added for each industry. The square of the reported standard deviation is equal to the diagonal of $\sum$. Miscellaneous petroleum and coal products industry is the one with the highest variance, followed by other manufactured products. The industries with the lowest variance are mining and agriculture[8].

Afterwards, for different countries and years, each of the thirty industry's share of export to total exports, a_{ict}^X, is constructed and regrouped to form a 30x1 vector denoted as a_{ct}^X. Finally, the risk content of export index is calculated as follow:

$$Riskcontent_{c,t} = a_{ct}^X \sum a_{ct}^X$$

This is a composite index for each country and each year. The higher magnitude of the risk content of exports indicates that a country has higher exports in sectors with higher volatility in production. In addition, since the sectoral intrinsic volatility is country and time invariant, the cross-country differences of this index comes solely from the difference in export patterns.

[8] This finding still holds after excluding outliers in the miscellaneous petroleum and coal products sector.

V. Measuring Ability to Monitor

The explanatory variable of interest is an empirical proxy that captures the degree of enforcing debt repayment, which would reflect the degree of monitoring the borrowing usage. The creditor rights index (CRI) will be used as such proxy, because it measures whether creditors can more easily force repayment, grab collateral, or gain control of the debtors' assets.

The CRI was first proposed by LLSV (1996) and later extended by Djankov et al (2007). It was constructed during January of every year. First, the bankruptcy and bankruptcy-related laws were reviewed to identify major reforms and assess the impacts of such reforms on the CRI. Then the local bankruptcy lawyers were surveyed to confirm or amend the timing of reforms and their impacts.

The index takes the values from 0 to 4. One additional point is added if a country's law and regulations contains each of these four aspects of creditors' power in bankruptcy.

a. Restrictions on reorganization filing

In some countries, debtors can unilaterally seek protection from creditors by filing for reorganization without creditor consent. If this is the case, creditors can, at best, get their money or collateral with a delay. Thus, restrictions on reorganization filing, such as the creditor consent or minimum dividends, would make it more difficult for debtors to escape creditors' demands.

b. The lack of automatic stay or asset freeze

Automatic stay prevents creditors from repossessing the loan collateral, thereby protecting debtors. If there is no automatic stay, creditors can pull collateral even before the completion of reorganization.

c. Priority for secured creditors to gain before other entities the proceeds from asset disposition

In countries where creditors were repaid after other entities, they could be left with no assets to back up their claims. An example would be Mexico, where secured creditors were repaid after various social constituencies. Providing such priority would strengthen creditor rights.

d. Prohibition of management to administer the properties pending the resolution of reorganization

In some countries, such as Malaysia, management (debtor) is replaced by a party appointed by the court or creditors. This threat of dismissal may improve creditors' power.

The higher the index, the stronger the protection of creditors.

Since 1978, there have been a total of 162 reforms across 99 countries, but only 32 reforms in 25 countries affect the CRI. The years and countries in which those reforms took place and their impacts on the CRI are summarized in Table 5.

Table 6 shows the CRI and its components of various countries in 2003. There is a mix of advanced economies and emerging markets and developing countries that obtain each of the different scores from 0 to 4. Very similar pattern also appear on other years because of the infrequent time series variation. LLSV (1996) as well as Djankov et al. (2007) documented that the CRI scores varies systematically across legal origins. Economies that are of English common law legal origin, such as the United Kingdom and Hong Kong, tend to have the highest CRI. As for countries that are of German civil law legal origin (such as Germany, Japan, South Korea, and Switzerland) and of Nordic legal origin, their CRI tend to be intermediate. Finally, CRI is the lowest among French civil law countries.

VI. Empirical Test

VI.1 Control Variables

The control variables include the share of a country's share of inward foreign direct investment (FDI) to the world's total FDI, the per capita GDP in constant dollar, a measure of trade openness, and a measure of financial openness. A country's share of inward FDI to the world's total FDI captures the global allocation of investment through foreign direct investment, which could affect a country's overall production capacity. Similar to Di Giovanni and Levchenko, the per capita GDP and its square divided by 100 are included to control for the non-linear effect of country's size. The trade openness measure, which is the natural log of total exports plus total imports to GDP, captures a country's degree of trade integration, which could potentially affect its production specialization pattern. While Di Giovanni and Levchenko used a de facto measure of financial openness (total external assets plus total external liabilities divided by GDP), this paper used Chinn-Ito's de jure financial openness index instead since the share of inward FDI is already included in a regression. The Chinn-Ito financial openness index is calculated based on indicators for different aspects of financial openness published in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The index is the first standardized principal component of these four variables:

a. Variable indicating the presence of multiple exchange rate
b. Variable indicating restrictions on current account transactions
c. 5-year average of variable indicating restrictions on capital account transactions
d. Variable indicating the requirement of the surrender of export proceeds

The index has a mean of zero, and the higher value of the index indicates the higher degree of financial openness.

VI.2. Empirical Findings

A reduced form regression to test the effect of the credit market quality on the riskiness of exports is as follow:

$$Riskcontent_{c,t} = \alpha + \beta CRI_{c,t} + \delta X'_{c,t} + \eta_c + \gamma_t + \varepsilon_{c,t}$$

where $Riskcontent_{c,t}$ is the risk content of exports index, $CRI_{c,t}$ is the creditor rights index, and $X'_{c,t}$ are the control variables mentioned above. According to the predictions from the model, the lower quality of a country's credit market would lead to the higher riskiness in exports, so the coefficient in front of $CRI_{c,t}$ should be negative. The country-specific effects and time-specific effects are denoted by η_c and γ_t, respectively. The sample period is from 1978 to 2004.

Table 7 reveals the results of the above fixed effects regression. The first column includes the GDP per capita, the re-scaled square of GDP per capita, and the de jure financial openness measure as controls. The second column also includes, in addition to the three controls, the share of inward FDI. The third column includes the trade openness measure instead of the share of inward FDI, and the fourth column includes all the control variables. All of these four columns point out a significant negative relationship between the creditor rights index and the risk content of exports, suggesting that countries with lower degree of creditor rights have riskier exports.

Another noteworthy point is that the trade openness measure does not appear to be significant in determining a country's riskiness in exports. This is consistent with the finding of Di Giovanni and Levchenko. However, in contrast to Di Giovanni and Levchenko, the de jure

financial openness measure has a significant positive effect on a country's risk content in exports, meaning that higher financial openness is associated with higher exports in risky sectors.

A robustness test is conducted to examine if the regression results are driven by the high volatility of petroleum-related industries. Table 8 revisited the previous regressions. However, the dependent variable is different. This time, miscellaneous petroleum and coal products industry and petroleum refineries industry are removed from the calculation of the risk content of exports. The results of this test are in line with the main regressions.

In addition, Table 9 investigated which components of the creditor rights index are responsible for varying the riskiness of exports. The regressions use the same set of control variables as the main regressions, but the CRI is replaced by all of its components[9]. It is shown that the restrictions on reorganization filing matters a great deal. However, the lack of automatic stay on assets, the priority of secured creditors, and the removal of management after bankruptcy are not particularly important. This evidence suggests that debtors' ability to escape creditors' demands supports riskier exports. In other words, if debtors can seek protection from creditors by filing for reorganization without restrictions, such as the need for creditor consent, creditors may, at best, be repaid with a delay. Thus, it is easier for debtors to get away without repaying their loans. This could encourage more risk-shifting behavior and gear their investments towards the risky sectors, thereby increasing the production and exports in the risky sectors.

[9] The sample period for this analysis is from 1978 to 2003, because there is a considerable amount of missing data on the CRI components in 2004.

VIII. Conclusion

The important element of the model in this paper is the risk-shifting behavior of borrowers, which was caused by the lack of monitoring in the borrowing usage. The effects of such behavior in the financial sector is transmitted to the real sector via the surge in the demand to invest in the risky sector that pushes up the price of the risky equity and therefore increase the investment into the risky sector.

The focus of the paper is on the results from the inability of the lenders to observe the borrowers' investment decision in the lack of monitoring scenario. In doing so, the full monitoring scenario is used as a benchmark to observe whether asset price overshoots and whether overinvestment in the risky sector occurs. However, it is an extreme case and hardly exists in reality, because the main reason banks are lending is that they still rely on entrepreneurs' private information about investment. If banks have sufficient information to invest in the safe and the risky assets, they would have invested by themselves and not lend to entrepreneurs. Hence, entrepreneurs could appropriate from banks a certain level of informational rent. On the other hand, if entrepreneurs have sufficient funding, they would not have to borrow from banks in the first place.

Another question which could be raised is that, besides the lack of monitoring, limited liability is another feature of the model that would also contribute to the risk-shifting behavior. This is because the limited liability assumption prevents the banks from seizing anything else other than entrepreneurs' portfolio return, thereby protecting entrepreneurs from further loss when their investment turns sour. This leads to another question: what would happen if entrepreneurs have to put collaterals in order to borrow from banks? In other words, what would happen if the limited liability assumption were relaxed? Depending on their degree of risk

aversion and on the size of the collateral, such entrepreneurs would hold less of the risky equities, lowering the degree of asset price overshooting and thus the extent of overinvestment in the risky sector. Nevertheless, the main results following the risk-shifting behavior when entrepreneurs are not monitored would still prevail.

In sum, this paper series provides a possible cause behind the overshooting in asset price and traces some implications of a disruption in the financial sector to the real sector. A two-period, two-sectors, small open economy model predicts that the lack of monitoring of borrowing usage would lead to risk-shifting behavior in the financial market and thus over-investment in a risky sector that is more subject to production volatility. This simultaneously causes the risky sector's stock price as well as its production and exports to be higher compared to the scenario when borrowing usage is well-monitored. The result of an empirical exercise is also in line with a model's hypothesis that countries with poorer quality credit markets are the ones with higher exports in sectors with greater volatility in production.

As Caballero and Cowan (2007) pinpointed, countries that specialize in risky production sectors after trade liberalization are more likely to face higher macroeconomic volatility. Therefore, the results of this paper could hint a linkage between financial sector policy stance and macroeconomic conditions, suggesting that countries with weak monitoring system in financial sector may experience more volatile output. Nevertheless, such linkage needed to be more closely investigated in further studies.

VI. APPENDIX A.

Table 1: Variables and Data Sources

Variable	Data Source

Value added by sectors	UNIDO Industrial Statistics Database, UN National Accounts Official Country Data
Exports by sector	UN Comtrade Database
Creditor rights index	Djankov et al. (2007)
Share of inward FDI	Lane and Milesi-Ferretti (2006)
GDP per capita in constant dollar	IFS
Trade openness	IFS
Chinn-Ito financial openness index	Chinn and Ito (2008)

Table 2: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Risk content of exports index	1423	0.1837	0.7893	0.00002	12.95
Creditor rights index	1415	1.9025	1.1581	0	4
Share of inward FDI	1143	0.0236	0.0410	0	0.284
GDP per capita in constant dollar	1148	10207.46	9654.44	191.10	39004.86
Trade openness	1117	4.0334	0.5218	2.446	5.930
Chinn-Ito financial openness index	1122	0.5064	1.5806	-1.831	2.500

Table 3: Pair-Wise Correlations

Variable	1	2	3	4	5	6
1. Risk content of exports index	1					
2. Creditor rights index	0.0301	1				
3. Share of inward FDI	-0.0941	0.097	1			
4. GDP per capita in constant dollar	-0.1113	0.2849	0.3639	1		
5. Trade openness	0.0479	0.1724	-0.0552	0.1159	1	
6. Chinn-Ito financial openness index	-0.0482	0.3124	0.3226	0.6357	0.1672	1

Table 4: Sector Summary Statistics

Sector Name	Growth of Value Added	
	Mean	Std. Dev.
Agriculture	0.0023	0.1455
Beverages	0.0395	0.5111

Fabricated metal products	0.0416	0.4450
Food products	0.0440	0.4069
Footwear, except rubber or plastic	-0.0129	0.8806
Furniture, except metal	0.3375	5.4811
Glass and products	0.0647	0.4608
Industrial chemicals	0.1565	0.9894
Iron and steel	0.2105	1.1886
Leather products	-0.0106	0.6530
Machinery, electric	0.0151	2.6286
Machinery, except electrical	0.0431	0.8157
Mining and quarrying	-0.0022	0.1217
Misc. petroleum and coal products	38.6708	499.9505
Non-ferrous metals	0.3031	3.6214
Other non-metallic mineral products	0.0464	0.4376
Other chemicals	-0.0014	0.3313
Other manufactured products	1.5578	28.6340
Paper and products	0.0562	0.3707
Petroleum refineries	-0.0068	1.4631
Plastic products	0.0628	0.2887
Pottery, china, earthenware	0.1240	2.5297
Professional and scientific equipment	0.4467	4.0947
Printing and publishing	0.0456	0.3301
Rubber products	0.0656	0.5740
Textiles	-0.0169	0.2509
Tobacco	0.1087	2.2677
Transport equipment	0.0760	0.6354
Wearing apparel, except footwear	0.1526	2.9813
Wood products, except furniture	0.0629	0.3687

Table 5: Creditor Rights Reforms

Country	Year of Reform	Change in CRI	Reorganization Restrictions	No Automatic Stay	Priority to Secured Creditors	Management do not Stay
Austria	1982	-1				-1
Denmark	1984	1				1
United Kingdom	1985	1				1

Ireland	1990	-1	-1			
Canada	1992	-1				-1
Finland	1993	-2	-1			-1
India	1993	-1		-1		
Russian Federation	1994	1				1
Romania	1994	1		1		
Israel	1995	-1	-1			
Sweden	1995	-1				-1
Lithuania	1995	1	1			
Armenia	1996	-1		-1		
Azerbaijan	1997	1				1
Kazakhstan	1997	1				1
Mongolia	1997	1				1
Niger	1998	-2	-1		-1	
Indonesia	1998	-1		-1		
Russian Federation	1998	-1				-1
Kazakhstan	1998	1	1			
Lithuania	1998	1			1	
Thailand	1999	-1		-1		
Ukraine	1999	-1		-1		
Japan	2000	-1		-1		
Malawi	2000	-1	-1			
Bulgaria	2000	1	1			
Kazakhstan	2001	-1			-1	
Uruguay	2001	1		1		
Japan	2003	1		1		
Russian Federation	2002	1				1
Romania	2003	1		1		
Spain	2004	1			1	

Source: Djankov et al (2007)

Table 6: Creditor Rights Index and Its Components in 2003

country	CRI	CRI Components			
		Reorganization Restrictions	No Automatic Stay	Priority to Secured Creditors	Management do not Stay
Benin	0	0	0	0	0
Burkina Faso	0	0	0	0	0
Cameroon	0	0	0	0	0

Central African Republic	0	0	0	0	0
Chad	0	0	0	0	0
Colombia	0	0	0	0	0
Congo, Rep.	0	0	0	0	0
Cote d'Ivoire	0	0	0	0	0
Ecuador	0	0	0	0	0
France	0	0	0	0	0
Guinea	0	0	0	0	0
Lao PDR	0	0	0	0	0
Mali	0	0	0	0	0
Mexico	0	0	0	0	0
Niger	0	0	0	0	0
Oman	0	0	0	0	0
Peru	0	0	0	0	0
Senegal	0	0	0	0	0
Togo	0	0	0	0	0
Tunisia	0	0	0	0	0
Yemen, Rep.	0	0	0	0	0
Algeria	1	0	0	0	1
Argentina	1	0	0	1	0
Brazil	1	0	1	0	0
Burundi	1	0	0	0	1
Canada	1	0	0	1	0
Congo, Dem. Rep.	1	0	0	0	1
Costa Rica	1	0	0	1	0
Finland	1	0	0	1	0

Table 6: Creditor Rights Index and Its Components in 2003 (Continued)

country	CRI	CRI Components			
		Reorganization Restrictions	No Automatic Stay	Priority to Secured Creditors	Management do not Stay
Ghana	1	0	0	0	1
Greece	1	1	0	0	0
Guatemala	1	0	0	1	0
Hungary	1	1	0	0	0

Ireland	1	0	0	1	0
Jordan	1	0	0	0	1
Lesotho	1	0	0	1	0
Mauritania	1	0	1	0	0
Morocco	1	0	0	0	1
Pakistan	1	0	0	1	0
Papua New Guinea	1	0	0	1	0
Paraguay	1	0	0	1	0
Philippines	1	0	0	1	0
Poland	1	0	0	0	1
Portugal	1	0	0	1	0
Puerto Rico	1	0	0	1	0
Rwanda	1	1	0	0	0
Sweden	1	0	0	1	0
Switzerland	1	0	0	1	0
United States	1	0	0	1	0
Vietnam	1	0	0	1	0
Zambia	1	0	0	0	1
Armenia	2	0	0	1	1
Bangladesh	2	0	0	1	1
Belarus	2	1	0	0	1
Belgium	2	0	0	1	1
Bolivia	2	1	0	1	0
Bulgaria	2	0	0	1	1
Cambodia	2	1	0	1	0

Table 6: Creditor Rights Index and Its Components in 2003 (Continued)

country	**CRI**	**CRI Components**			
		Reorganization Restrictions	No Automatic Stay	Priority to Secured Creditors	Management do not Stay
Chile	2	0	1	1	0
China	2	1	0	1	0
Dominican Republic	2	0	1	1	0

Egypt, Arab Rep.	2	1	0	0	1
Georgia	2	0	0	1	1
Haiti	2	0	1	1	0
Honduras	2	1	0	0	1
India	2	1	0	1	0
Indonesia	2	0	0	1	1
Iran	2	0	0	1	1
Italy	2	1	0	0	1
Jamaica	2	0	1	1	0
Japan	2	0	0	1	1
Kazakhstan	2	1	0	0	1
Lithuania	2	1	0	1	0
Madagascar	2	0	0	1	1
Malawi	2	0	1	0	1
Moldova	2	0	1	1	0
Mongolia	2	0	0	1	1
Mozambique	2	0	1	1	0
Namibia	2	0	0	1	1
Nepal	2	1	1	0	0
Norway	2	1	0	1	0
Romania	2	0	1	1	0
Russian Federation	2	1	0	0	1
Slovak Republic	2	0	1	1	0
Spain	2	0	1	0	1
Sri Lanka	2	1	0	0	1
Taiwan, China	2	0	0	1	1

Table 6: Creditor Rights Index and Its Components in 2003 (Continued)

country	**CRI**	**CRI Components**			
		Reorganization Restrictions	No Automatic Stay	Priority to Secured Creditors	Management do not Stay
Tanzania	2	0	1	0	1
Thailand	2	0	0	1	1
Turkey	2	1	1	0	0
Uganda	2	0	1	0	1

Ukraine	2	0	0	1	1
United Arab Emirates	2	1	1	0	0
Uzbekistan	2	1	0	1	0
Albania	3	0	1	1	1
Angola	3	1	1	1	0
Australia	3	0	1	1	1
Austria	3	0	1	1	0
Azerbaijan	3	0	1	1	1
Bosnia and Herzegovina	3	0	1	1	1
Botswana	3	0	1	1	1
Croatia	3	0	1	1	1
Czech Republic	3	0	1	1	1
Denmark	3	0	1	1	1
Uzbekistan	2	1	0	1	0
Albania	3	0	1	1	1
Angola	3	1	1	1	0
Australia	3	0	1	1	1
Austria	3	0	1	1	0
Azerbaijan	3	0	1	1	1
Bosnia and Herzegovina	3	0	1	1	1
Botswana	3	0	1	1	1
Croatia	3	0	1	1	1
Czech Republic	3	0	1	1	1
Denmark	3	0	1	1	1
El Salvador	3	1	1	1	0

Table 6: Creditor Rights Index and Its Components in 2003 (Continued)

country	CRI	CRI Components			
		Reorganization Restrictions	No Automatic Stay	Priority to Secured Creditors	Management do not Stay
Ethiopia	3	1	0	1	1
Germany	3	0	1	1	1
Israel	3	0	1	1	1
Korea, Rep.	3	0	1	1	1

Kuwait	3	1	1	1	0
Kyrgyz Republic	3	0	1	1	1
Latvia	3	1	0	1	1
Macedonia	3	0	1	1	1
Malaysia	3	1	1	1	0
Netherlands	3	0	1	1	1
Saudi Arabia	3	1	1	1	0
Singapore	3	0	1	1	1
Slovenia	3	0	1	1	1
South Africa	3	1	0	1	1
Syrian Arab Republic	3	1	1	0	1
Uruguay	3	1	1	1	0
Venezuela, RB	3	0	1	1	1
Hong Kong	4	1	1	1	1
Kenya	4	1	1	1	1
Lebanon	4	1	1	1	1
New Zealand	4	1	1	1	1
Nicaragua	4	1	1	1	1
Nigeria	4	1	1	1	1
Panama	4	1	1	1	1
United Kingdom	4	1	1	1	1
Zimbabwe	4	1	1	1	1

Table 7: Regressions of Creditors' Protection on the Riskiness of Exports

Dependent Variable: Risk Content of Exports Index

Explanatory Variables	(1)	(2)	(3)	(4)
Creditor rights index	-0.12*	-0.12*	-0.13**	-0.13**
	(0.06)	*(0.06)*	*(0.07)*	*(0.07)*
Constant dollar GDP per capita	-0.31	-0.31	-0.46	-0.47

	(0.30)	*(0.30)*	*(0.33)*	*(0.33)*
(GDP per capita)^2/100	3.63	3.60	6.27	6.30
	(5.85)	*(5.86)*	*(6.36)*	*(6.37)*
Financial openness index	0.10***	0.10***	0.11***	0.11***
	(0.03)	*(0.03)*	*(0.03)*	*(0.03)*
Share of inward FDI		-0.31		-0.50
		(1.12)		*(1.16)*
Trade openness			0.002	-0.003
			(0.15)	*(0.15)*
No. of Observations	1120	1119	1090	1089
No. of Countries	61	61	60	60
R-squared	0.0102	0.0109	0.0124	0.0132

Table 8: Regressions of Creditors' Protection on the Riskiness of Exports-Excluding Petroleum-Related Industries

Dependent Variable: Risk Content of Exports Index (without petroleum-related industries)

Explanatory Variables	(1)	(2)	(3)	(4)
Creditor rights index	-0.07*	-0.07*	-0.08*	-0.08*
	(0.04)	*(0.04)*	*(0.04)*	*(0.04)*
Constant dollar GDP per capita	-0.14	-0.15	-0.22	-0.23

	(0.19)	*(0.19)*	*(0.21)*	*(0.21)*
(GDP per capita)^2/100	0.96	0.94	1.63	1.66
	(3.77)	*(3.78)*	*(4.10)*	*(4.11)*
Financial openness index	0.09***	0.09***	0.10***	0.10***
	(0.02)	*(0.02)*	*(0.02)*	*(0.02)*
Share of inward FDI		-0.30		-0.45
		(0.72)		*(0.75)*
Trade openness			-0.14	-0.14
			(0.10)	*(0.10)*
No. of Observations	1120	1119	1090	1089
No. of Countries	61	61	60	60
R-squared	0.0009	0.0014	0.0002	0.0004

Table 9: Regressions of Creditors' Protection Components on the Riskiness of Exports

Dependent Variable: Risk Content of Exports Index

Explanatory Variables	1	2	3	4
Creditor rights index components				
Reorganization Restrictions	-0.20*	-0.23*	-0.25*	-0.26*
	(0.11)	*(0.14)*	*(0.14)*	*(0.14)*
No Automatic Stay	-0.17	-0.17	-0.18	-0.18
	(0.10)	*(0.12)*	*(0.13)*	*(0.13)*
Priority to Secured Creditors	0.05	0.03	0.02	0.01
	(0.33)	*(0.40)*	*(0.40)*	*(0.40)*
Management do not Stay	0.01	-0.002	-0.02	-0.01

	(0.09)	*(0.11)*	*(0.11)*	*(0.11)*
Constant dollar GDP per capita	-0.30	-0.41	-0.56*	-0.58*
	(0.24)	*(0.28)*	*(0.32)*	*(0.32)*
(GDP per capita)^2/100	4.00	6.47	8.42	8.62
	(4.59)	*(5.53)*	*(6.00)*	*(6.01)*
Financial openness index	0.09***	0.09***	0.10***	0.10***
	(0.02)	*(0.02)*	*(0.02)*	*(0.03)*
Share of inward FDI		-0.61		-0.81
		(1.00)		*(1.02)*
Trade openness			-0.09	-0.09
			(0.14)	*(0.14)*
No. of Observations	1053	1053	1029	1028
No. of Countries	60	60	59	59
R-squared	0.0047	0.0065	0.007	0.0082

VII. References

Acharya, V. V., Y. Amihud, et al. (2011). "Creditor rights and corporate risk-taking." Journal of Financial Economics 102(1): 150-166.

Allen, F. and D. Gale (2000). "Bubbles and Crises." The Economic Journal 110(460): 236-255.

Arip, M. A., L. S. Yee, et al. (2010). "Commodity-Industry Classification Proxy: A Correspondence Table between SITC Revision 2 and ISIC Revision 3." Journal of International Economic Studies 03/2010(24): 185 - 202.

Caballero, R. and K. C. L. (2007). Financial Integration Without the Volatility Mimeo. MIT. .

Chinn, M. D. and H. Ito (2008). "A New Measure of Financial Openness." Journal of Comparative Policy Analysis: Research and Practice 10(3): 309-322.

Di Giovanni, J. and A. A. Levchenko (2011). "The Risk Content of Exports: A Portfolio View of International Trade." NBER International Seminar on Macroeconomics 8(1): 97-151.

Djankov, S., C. McLiesh, et al. (2007). "Private credit in 129 countries." Journal of Financial Economics 84(2): 299-329.

Grossman, G. M. and A. Razin (1985). "The Pattern of Trade in a Ricardian Model with Country-Specific Uncertainty." International Economic Review 26(1): 193-202.

Hale, G., A. Razin, et al. (2012). "The Impact of Creditor Protection on Stock Prices in the Presence of Liquidity Crises: Theory and Cross-country Evidence," Economica, Forthcoming.

Helpman, E. (1988). "Trade Patterns under Uncertainty with Country Specific Shocks." Econometrica 56(3): 645-659.

Helpman, E. and A. Razin (1978). A Theory of International Trade under Uncertainty, New York: Academic Press.

Koren, M. (2003). "Financial Globalization, Portfolio Diversification, and the Pattern of International Trade." IMF Working Paper 03/233.

Koren, M. and S. Tenreyro (2007). "Volatility and Development." The Quarterly Journal of Economics 122(1): 243-287.

La Porta, R., F. Lopez-De-Silanes, et al. (1996). "Law and Finance." Journal of Political Economy 106: 1113-1155.

La Porta, R., F. Lopez-De-Silanes, et al. (1997). "Legal Determinants of External Finance." The Journal of Finance 52(3): 1131-1150.

Lane, P. R. and G. M. Milesi-Ferretti (2007). "The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970–2004." Journal of International Economics 73(2): 223-250.

OECD (2006). The Rise of China and India: What's in it for Africa?, OECD Publishing.

Razin, A. (2011). Comment. J. d. Giovanni and A. A. Levchenko, NBER.

Turnovsky, S. J. (1974). "Technological and Price Uncertainty in a Ricardian Model of International Trade." The Review of Economic Studies 41(2): 201-217.

United Nations Industrial Development Organization (2011). Industrial Statistics Database. CD-ROM.

United Nations Statistics Division (2012). National Accounts Official Country Data. Electronic Resource.

United Nations Statistics Division (2012). United Nations Commodity Trade Statistics Database. Electronic Resource.