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The two-sided effect of financial globalization on output volatility

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Abstract

This paper provides evidence for a significant relation between international financial markets' integration and output volatility. In the framework of a threshold model, it is shown empirically that this relation depends on country's financial risk. Financial risk indicates a country's ability to pay its official, commercial and trade debts. In countries with low financial risk, financial openness decreases output volatility, while, in countries with high financial risk, financial openness increases output volatility. Extensive robustness checks confirm this result.

Keywords: output volatility; financial openness; financial risk

JEL classification: E32, F36, F41

Non-technical summary

With the negative effects of output volatility in mind, politicians have to decide on the extent of their countries' financial integration. However, there is still no consensus among researchers on whether and how financial openness affects output volatility.

I hypothesize that the effect of financial openness on output volatility depends on financial risk. In the context of this paper, financial risk approximates a country's ability to pay its debts and to stabilize its exchange rate. These are the types of risk an investor considers when investing in a country. It is hypothesized that, in the case of low-risk countries, investors buy more equity during recessions because even those firms with good future prospects are relatively cheap. Furthermore, they lend money to prospering projects which domestic banks might not be able to finance. Therefore, international capital inflows are counter-cyclical and reduce output volatility. In the case of high-risk countries, investors fear big losses due to government defaults, exchange rate collapses or panic selling by other investors. Therefore, investors carefully observe changes in growth expectations and the action of other investors. If there are signs of a recession, they withdraw their money as soon as possible. In that case, international capital inflows are pro-cyclical and financial openness increases output volatility.

The hypothesis is tested using a sample of 62 countries in the period 1980-2007. Evidence is found that financial openness increases output volatility in risky countries and decreases output volatility in low-risk countries. Financial openness is thus an important determinant of output volatility if due account is taken of financial risk. In addition to its academic contribution, the paper has policy implications. It offers clear criteria that a country needs to fulfill in order to gain from financial openness in terms of reduced output volatility. The result is robust to changes in the operating definition of the variables, the sample size and the functional form of the model.

Nichttechnische Zusammenfassung

Politiker müssen über den Integrationsgrad ihrer Finanzmärkte entscheiden, ohne die daraus resultierenden Konsequenzen für die Wachstumsvolatilität ihres Landes abschätzen zu können. Denn hinsichtlich einer Antwort auf die Frage, ob der Offenheitsgrad der Finanzmärkte den Konjunkturzyklus verstärkt oder dämpft, gibt es bisher weder auf theoretischer noch empirischer Ebene Konsenz.

In diesem Papier wird die Hypothese aufgestellt, dass das "Finanzrisiko" die Beziehung von Wachstumsvolatilität und Finanzmarktoffenheit beeinflusst. Mit Finanzrisiko ist die Fähigkeit (bzw. Bereitschaft) eines Landes gemeint, Schulden zu begleichen und seinen Wechselkurs stabil zu halten. Die Hypothese fußt auf der Annahme, dass diese Art des Risikos die Entscheidung von ausländischen Investoren hinsichtlich Art und Dauer ihres Engagements beeinflusst: In Ländern mit niedrigem Finanzrisiko kaufen Investoren während einer Rezession verstärkt Aktien, um die selbst für aussichtsreiche Firmen relativ niedrigen Preise auszunutzen. Des Weiteren finanzieren ausländische Investoren profitversprechende Projekte, die andernfalls aufgrund von geringem inländischem Kreditangebot nicht finanziert würden. Demzufolge sind internationale Kapitalströme in diesen Ländern antizyklisch and dämpfen Wachstumsschwankungen. In Ländern mit hohem Finanzrisiko hingegen befürchten Investoren, ihr Geld aufgrund eines Wechselkurseinbruchs oder der Zahlungsunfähigkeit eines Landes zu verlieren. Geringe Anzeichen einer Rezession genügen, um Kapital in großen Mengen aus dem Land fließen zu lassen. In diesen Ländern sind internationale Kapitalflüsse prozyklisch und verstärken Wachstumsschwankungen.

Die Hypothese wird mit Daten für 62 Länder in der Zeit von 1980 bis 2007 getestet. Das Ergebnis der Analyse zeigt, dass Finanzmarktoffenheit Wachstumsschwankungen für risikoreiche Länder erhöht und sie in risikoarmen Ländern abschwächt. Des Weiteren können politische Entscheidungsträger aus der Studie klare Kriterien ableiten, die erfüllt sein müssen, damit eine hohe Finanzmarktintegration ihnen hilft, Wachstumsschwankungen zu dämpfen.

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The Two-Sided Effect of Financial Globalization on Output Volatility[1]

1 Introduction

Output volatility brings about economic and social problems which countries seek to avoid. For example, high output volatility is, by definition, accompanied by deep recessions. The resulting high unemployment has a disproportionate impact on the poorest; see Stiglitz (2000). This might increase social inequality and even foster political unrest. Moreover, economic growth is negatively affected by output volatility, as was demonstrated by Ramey and Ramey (1995) and others.

With output volatility in mind, countries have to decide on the extent of their financial integration. Experience from the past 25 years has led to uncertainty regarding the effect of financial openness on output volatility. On the one hand, the financially deeply integrated United States had, until recently, been experiencing declining output volatility since the 1980s. This period is called the Great Moderation. On the other hand, some developing countries that had opened up their financial markets, i.e. Argentina, experienced deep economic crises in the 1980s or 1990s. Does financial openness lead to a

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decline in output volatility or to economic crises? Countries are left without generally accepted criteria in their decision on the regulation of their financial markets.

Much research has been conducted on the question of whether financial openness reduces or increases output volatility, but no consensus has been reached yet. On the one hand, researchers expect financial openness to stabilize the economy. This is because financial openness allows investments and savings to be efficiently allocated across geographic areas; see Fischer (1998). Especially in recessions, greater access to (international) capital, and thus borrowing, decreases economic volatility by reducing the sensitivity of consumption and investments to negative income shocks. Since domestic output, in turn, depends on consumption and investment, there are fewer second-round effects on output. In other words, the "traditional multiplier" response is decreased; see Dynan et al. (2006). On the other hand, financial openness might increase output volatility due to movements of "hot money". Kim and Singal (2000) argue that international money is withdrawn if there is a deterioration in expectations about interest rates or economic growth. The real economy is not sufficiently supplied with credits and is hit harder by an economic downturn. Easterly et al. (2000) and Stiglitz (2000) therefore characterize international capital flows as potentially pro-cyclical and as inducing or amplifying output fluctuations.

As theory is inconclusive, empirical research should shed light on the relation between financial openness and output volatility. However, empirical evidence is rather mixed and does not resolve the issue. Some studies find that output volatility is decreased by financial openness, e.g. Bekaert et al. (2006). Other studies find that the economy is destabilized as a consequence of financial openness, e.g. Demirgüç-Kunt and Detragiache (1998). Most studies find no significant or stable relationship at all, e.g. Buch et al. (2005) or Easterly et al. (2000). Owing to the inconclusiveness of past research, Rogoff et al. (2006) hypothesize, without testing, that this relation might depend on a threshold level of one or several variable(s).

This paper develops the idea of a threshold effect and hypothesizes that the effect of financial openness on output volatility can be positive or negative depending on financial risk. Financial risk is measured by an index which combines the information of five financial risk measures: Foreign debt as a percentage of GDP, foreign debt service as a percentage of exports, current account as a percentage of exports, net international liquidity as months of import cover and exchange rate stability. The indicator therefore assesses the ability of a country to pay its official, commercial and trade debts, which is the risk that an investor considers when investing in a country. If a country bears more financial risk than a certain threshold level, financial openness increases output volatility. In those countries, investors withdraw their capital in times of recessions and thereby deepen the recession. By contrast, countries which bear less financial risk than this threshold level attract new capital in times of recessions due to better profit prospects and as a result of the efficient allocation of capital.

This paper finds empirically these two opposing and significant effects of financial openness on output volatility by using Hansen's (1999) panel threshold model. The model determines data-driven thresholds and classifies countries as bearing different levels of financial risk. In line with the hypothesis, financial openness increases output volatility in the high-risk classes, while it decreases output volatility in the low-risk class. This relation between financial openness, financial risk and output volatility is very robust as it is invulnerable to modifications to the operating definition of the variables, the sample size and the functional form of the model. The results of this paper can serve as a guideline to countries that (re)consider their financial integration.

The paper is organized as follows. The next section motivates and describes the threshold model. Section three describes the choice of variables and the data. Section four reports the estimation results of the panel threshold model. Section five demonstrates the robustness of the results. Section six illustrates the effect of financial openness on Argentina and briefly discusses the policy implication of this paper. Finally, section seven concludes.

2 Threshold Model

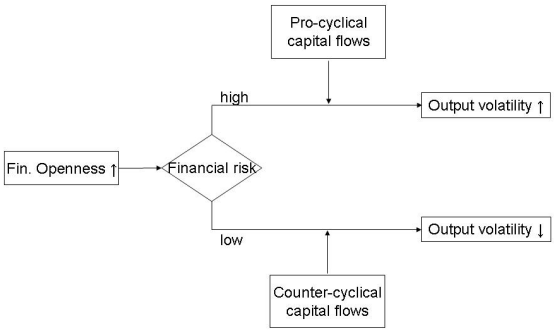
Motivation

The literature is inconclusive on whether financial openness reduces or increases output volatility. In particular, the opposing views have the following implications. Either foreign capital flows are counter-cyclical, in line with the argument of the efficient allocation of capital, and reduce output volatility. Or, foreign capital flows are pro-cyclical, in line with the argument of hot money, and increase output volatility. If one assumes that foreign capital flows may be of both types, the most important question is: For which criterion are foreign capital flows pro-cyclical and for which counter-cyclical. The type of flow then determines whether financial openness increases or decreases output volatility.

This paper takes the perspective of an investor in order to conjecture on a criterion that determines whether foreign capital flows are pro- or counter-cyclical. If an investor is almost sure that her investment is refunded irrespectively of the action of other investors, then there is no reason to withdraw her investment in downturns. On the contrary, the investor will even invest in such a recessive country as she expects high profits. She may buy stocks of relatively cheap firms with good future prospects. Or she may lend money to prospering projects which domestic banks might not be willing to finance in a recession.[2] Under this scenario, foreign capital inflows are counter-cyclical. By contrast, if an investor fears that her investment might be lost (owing, for example, to government default or exchange rate collapse), she will observe not only changes in the country's economy but also the action of other investors very carefully. If there is a sign of a recession, the investor withdraws her money as soon as possible. In that case, foreign capital inflows are pro-cyclical.

[2]Easterly et al. (2000) argue that during recessions, the default rate of credits is higher for domestic financial institutions. Therefore, they are less willing or able to bear risk and they provide fewer credits even to good projects.

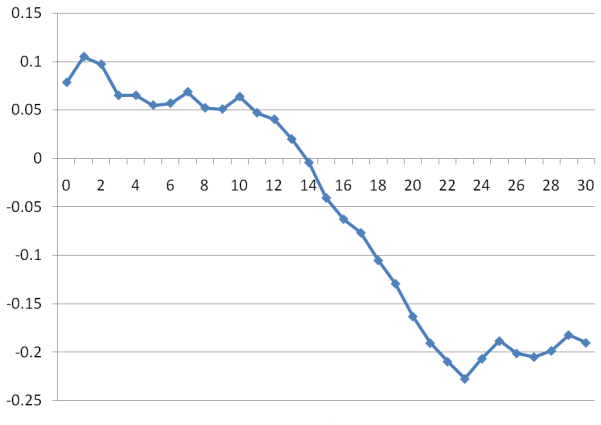
Figure 2.1: Exemplary Effect of Financial Openness on Output Volatility



The criterion whether foreign capital flows are pro-cyclical or counter-cyclical is therefore a certain threshold level of risk to which an investment is exposed. This risk is captured by the financial risk rating of the International Country Risk Guide. The rating measures a country's exchange rate stability and its dependence on foreign money. Figure 2.1 illustrates the hypothesized dependence of output volatility and financial openness on financial risk.

The underlying assumption of the paper's hypothesis is that the cyclicality of capital flows depends on financial risk. In order to lend some support to this assumption, the correlation between the business cycle component of output (band-pass filtered real per capita GDP) and capital inflows (percentage change in a country's foreign liabilities) is computed for different values of the financial risk rating. The risk rating runs from 0, very high risk, to 50, very low risk. For the computation, the sample described in the next section is used: 62 countries in the period 1980-2007. Figure 2.2 plots the correlation between business cycle and capital inflow against a 20-point rolling window of financial risk. For example, at point zero of the x-axis, the correlation is computed for countries which have a financial risk between 0 and 20. From the figure, one can indeed deduce that the correlation is positive (i.e. capital inflow is pro-cyclical) for financially risky countries and negative (i.e. capital inflow is counter-cyclical) for financially non-risky countries.

Figure 2.2: Correlation Between Business Cycle and Capital Inflow Plotted against a Rolling-Window of Financial Risk



Estimation Method

The panel threshold model developed by Hansen (1999) is used to test the paper's hypothesis. This model divides observations of the variable of interest into classes depending on the value of a certain threshold variable. The coefficient of the variable of interest is therefore a step function depending on the threshold variable. The model is particularly suitable if one expects that the coefficient of the variable of interest changes more or less abruptly at a certain threshold. This is the case in the paper's hypothesis. If output volatility is regressed on financial openness, then the coefficient of financial openness is expected to change its sign once a certain level of financial risk is exceeded. Using this model, data-driven thresholds can be found and their significance can be tested.

The model relies on some assumptions that have to be fulfilled. Firstly, the sample has to being balanced. Secondly, the error terms should be homoscedastic and serially uncorrelated. According to Hansen (1999), however, a violation of this assumption is not a severe problem. In the presence of heteroscedasticity or serial correlation, the threshold estimates are still consistent but the bootstrapped p-values are not reliable. To correct for a potential bias in the slope coefficients of threshold regression (2.1) below,

White-Huber standard errors can be used. Thirdly, the explanatory variables have to be exogenous. However, a modification to this model which is proposed by Kremer et al. (2008) may also handle endogenous variables.

The general threshold model regression with K thresholds is defined as follows:

$$y_{it} = \delta \mathbf{Q_{it}} + \sum_{k=0}^{K-1} \beta_{k+1} x_{it} I(\gamma_k < q_{it} \leq \gamma_{k+1}) + \beta_{K+1} x_{it} I(\gamma_K < q_{it}) + \varepsilon_{it}, \tag{2.1}$$

where $I(\cdot)$ is the indicator function and γ_k is the kth threshold and γ_0=0. Furthermore, y_{it} is the dependent variable, $\mathbf{Q_{it}}$ is the vector of control variables including country specific fixed effects, and x_{it} is the variable of interest which coefficient is suspected to depend on q_{it}, the threshold variable.

The threshold estimation is conducted in two steps as proposed by Hansen (1999). First, the 'best' threshold from a set of equally spaced values of the threshold variable is chosen. To that end, the sum of squared errors for all threshold models using each potential threshold is calculated. The 'best' threshold is then the one that corresponds to the threshold model with the smallest sum of squared errors. In a second step, it is verified whether the threshold effect is significant. Under the null hypothesis of no threshold, the threshold is not identified and the test does not have a known distribution. Therefore, bootstrapping is used in order to simulate a distribution that makes inference on the significance of the threshold possible. If the threshold is significant, it is tested whether there is another threshold. Significance is established at the 10% significance level here. Given the first threshold, the same procedure as before is used in order to find a second threshold. Three or more thresholds can be found analogously.

3 Variable Selection and Data Description

In this section, I elaborate on the measurement of financial openness and financial risk. Furthermore, output volatility and the control variables are introduced. Lastly, the source and coverage of the data are described.

Financial openness variables are either de facto or de jure measures. Most prominently used de jure measures are indicator variables for equity market liberalization used, for example, by Bekaert et al. (2006) and Jayasuriya (2005) or the number of restrictions on the capital account used, for example, by Buch et al. (2005), Chinn and Ito (2006). Rogoff et al. (2006) describe those measures in detail and emphasize that de jure measures cannot capture the actual effect of capital controls or liberalization. They argue that a country which has very liberal capital account laws does not necessarily have to be heavily involved in international financial investments. Furthermore, liberalizations do not necessarily happen at one point in time but materialize gradually. By contrast, de facto variables are continuous variables and do not suffer from these drawbacks.

A commonly used de facto measure of financial openness is gross capital flows divided by GDP used, for example, by Buch et al. (2005), Kose et al. (2003) and Kose et al. (2005). Another measure of financial openness is banks' foreign assets in percent of banks' total assets used by Buch et al. (2005). Furthermore, Beck et al. (1999) construct two measures of foreign bank penetration: firstly, the ratio of the number of foreign banks to the number of domestic banks and secondly, the ratio of the assets of foreign bank to the assets of domestic banks. While the last two measures have a good cross-country coverage, they are available only since 1990.

Following Rogoff et al. (2006), the sum of gross stocks of foreign assets and liabilities as ratio to GDP is used in this analysis.[3] Rogoff et al. (2006) argue

[3]Foreign liabilities= Portfolio equity liabilities + FDI liabilities +debt liabilities + financial derivatives (liabilities). Foreign assets= portfolio equity assets + FDI assets + debt assets + financial derivatives (assets) + total reserves minus gold.

that this variable is less volatile and less prone to measurement errors than flow variables. Furthermore, this de facto measure has a broad coverage.

Financial risk is measured by the financial risk rating, which is an element of the International Country Risk Guide published by the Political Risk Services group.[4] The financial risk rating measures a country's capacity to pay for its official, commercial, and trade debt obligations. A higher risk rating indicates low financial risk. The rating consists of 0 to 50 risk points aggregated over five financial risk components: Foreign debt as a percentage of GDP (0-10 risk points), foreign debt service as a percentage of exports of goods and services (0-10 risk points), current account as a percentage of exports of goods and services (0-15 risk points), net international liquidity as months of import cover (0-5 risk points) and exchange rate stability (0-10 risk points). This weighting is the one published by the PRS group and, therefore, the one investors are most likely to work with. For that reason, this weighting is also employed in this paper.

The financial risk rating is used by academics and investors alike. According to Hoti and McAleer (2004), the interest in financial risk ratings is due to the increased international debt of developing countries since the 1970s and the incidences of debt rescheduling in the early 1980s. The rating influences investment decisions because they affect investors' expectations of the risk-return features of their investments (Hoti and McAleer 2004). Examples of academic studies employing the financial risk rating are Hoti and McAleer (2004), Hassan et al. (2003), IMF (2008), Girard and Omran (2007), Bekaert et al. (2006) and Jayasuriya (2005).

Next, the measures of output volatility and of the control variables are presented. Output volatility is commonly measured as the standard deviation of GDP growth over a five-year window. In order to enhance the presentation of the estimation results, this definition of output volatility is multiplied by a factor of 100. Variables which are most commonly used to explain out-

[4]According to Hoti and McAleer (2004), the International Country Risk Guide is the only risk rating agency to provide detailed and consistent monthly data over an extended period for a large number of countries.

put volatility are monetary policy quality, fiscal policy quality, supply shocks and trade openness, e.g. Karras and Song (1996) and Buch et al. (2005). In this analysis, inflation, government expenditure growth, standard deviation of terms of trade growth and the sum of exports and imports divided by GDP are used to capture those concepts. In addition, financial risk is used as control variable. This assures that the effect of financial openness in different risk classes is not driven by financial risk solely but also by financial openness as a function of financial risk.

In the empirical analysis, annual data for 26 developed countries and 36 developing countries are used. Countries are chosen on the grounds of data availability and are listed in Table 7.1 in the Appendix. The sample period 1980-2007 is chosen, firstly, because financial globalization arguably gained pace from 1980 onwards and, secondly, because observations in the balanced panel are maximized for this sample period. Output volatility and control variables are available for the time period 1980-2007.[5] The financial risk rating covers the period 1984-2006. Financial openness is available for the period 1980-2004.[6] The variables are calculated over a five-year period (seven years for the last time period) using either averages or standard deviations according to their definition. The five-year window is typically chosen because a full business cycle lasts about this long. For the analysis, non-overlapping windows instead of rolling windows are used in order to avoid problems stemming from serial correlation. The periods run from 1980-1984, 1985-1989, . . . , 2000-2007, if data availability permits. Consequently, the time series dimension contains five observations. In the Appendix, definitions of the variables as well as the sources of the data are provided in Table 7.3. Moreover, descriptive statistics are presented in Table 7.2 and country-averages of output volatility, financial openness and financial risk are plotted over time in Figure 7.1 in the Appendix.

[5]Data for 2007 are based on projections from the IMF's World Economic Outlook database. Fiscal policy quality covers only the period 1981-2007 for the Netherlands, Portugal, Spain, New Zealand, South Africa, Bolivia, Brazil, the Dominican Republic, Israel, Cameroon, Kenya, Malawi, Senegal, Tanzania and Togo.

[6]Except for Malawi and Haiti, where financial openness covers 1980-2003.

4 Empirical Analysis

In this section, the effect of financial openness on output volatility is estimated. First, a linear regression is estimated revealing that there is no linear relation between financial openness and output volatility. Then, the threshold model is estimated to verify the working hypothesis of a two-sided effect of financial openness on output volatility.

As a benchmark for the threshold estimation, a linear regression is estimated:

$$\sigma_{Yit} = \delta \mathbf{Q_{it}} + \beta FinOpen_{it} + \varepsilon_{it} \tag{4.1}$$

The dependent variable is output volatility. $\mathbf{Q}$ is the vector of control variables including time and country fixed effects and $FinOpen$ is financial openness. The statistics of this regression can be found in Table 4.1. The usual OLS standard errors are not systematically different from the White-Huber standard errors. Nevertheless, the analysis of the coefficients in this and the following regressions relies on White-Huber standard errors which render the p-values robust to heteroscedasticity and serial correlation at no cost.[7]

The regression indicates that there is no significant linear relation between financial openness and output volatility. Turning to the control variables, more terms of trade volatility and higher inflation lead to more output volatility but not significantly. High government expenditure significantly increases output volatility. This indicates that large government spending might be a sign of macroeconomic imbalances or profligacy and thereby destabilize the economy. More trade openness leads to more output volatility. This confirms the argument of Giovanni and Levchenko (2006) stating that firstly, traded sectors are more volatile than other sectors and that secondly, trade leads to specialization. Giovanni and Levchenko (2006) acknowledge that traded sectors have a smaller correlation with the domestic economy but this implicit negative relation with output volatility is offset by the former pos-

[7] In contrast to time-series regressions, the White-Huber standard errors are robust to serial correlation in panel regressions of the form "small T, large N", see Wooldridge (2002).

Table 4.1: Benchmark: The Linear Model

$$\sigma_{Yit} = \delta \mathbf{Q_{it}} + \beta FinOpen_{it} + \varepsilon_{it}$$

regressor	coefficient	White std.err.	OLS std.err.
π	0.387	0.249 (0.121)	0.208 (0.064)
Δ_{Gov}	0.311 **	0.144 (0.032)	0.100 (0.002)
σ_{ToT}	0.037	0.043 (0.386)	0.018 (0.042)
$TraOpen$	3.789 **	1.815 (0.038)	1.234 (0.002)
$FinRisk$	-0.125**	0.031 (0.000)	0.035 (0.000)
$FinOpen$	0.064	0.125 (0.609)	0.150 (0.669)
$R^2[\bar{R}^2]$			0.25 [0.22]

Notes: The dependent variable is output volatility. $\mathbf{Q}$ =control variables as well as time and country fixed effects. π = monetary policy. Δ_{Gov} = fiscal policy. σ_{ToT} = supply shock volatility. $TraOpen$ = trade openness. $FinRisk$ = financial risk. $FinOpen$ = financial openness. Definitions of the variables can be found in Table 7.3. 62 countries and five time periods are used (i.e. 310 observations). 5-year non-overlapping windows are used. *** (**, *) denote significance at the 1% (5%, 10%) level using White-Huber standard errors, p-values relying on normal approximation are given in parenthesis.

itive effects. Lastly, a high financial risk rating implying low financial risk, decreases output volatility.

A general problem in the discussion on the effect of financial openness (or policy quality) on output volatility is the question of reversed causality and endogeneity. Economically, both problems are hard to argue against. This paper only tackles the question of whether the empirical results are biased due to statistical endogeneity. In order to test whether any regressor is endogenous, the regression-based Hausman test is applied to regression (4.1). Each variable is tested for exogeneity separately. Instrumental variables are particularly difficult to find for this large sample due to data availability. Not only must the instruments be correlated to the potentially endogenous variable, they must also provide more information on the potentially en-

dogenous variable than all other exogenous variables in the regression. This "rank condition" is fulfilled if the instrument is significant in a reduced form regression.[8] The second condition that needs to be fulfilled is that of the instruments' exogeneity.

Two approaches are implemented to test endogeneity. Firstly, first differencing instead of within transformation is used in order to eliminate fixed effects. In that way, the second lag of the variable can be used as an instrument. The rank condition is fulfilled for inflation, government expenditure growth, financial risk and financial openness. As can be deduced from the p-values in the first panel of Table 4.2, the regression-based Hausman test indicates that the variables are exogenous, applying a 10% significance level. Secondly, trade openness and terms of trade variation are instrumented by variables not used in the original regression: constraints on the executive and current account balance divided by GDP, respectively.[9] Using those instruments, the rank condition and the Hausman test indicate that trade openness and terms of trade variation are exogenous as well; see second panel of Table 4.2. Therefore, all variables used in this analysis are statistically exogenous.

In the next step, Hansen's threshold model is applied. It will be determined whether the effect of financial openness on output volatility depends on the financial risk that a country bears. The statistics of the first panel in Ta-

[8] In the reduced form regression, the instrument as well as all exogenous variables are regressed on the potentially endogenous variable. If the instrument is significant, then it can be used in the endogeneity test.

[9] Instruments are chosen on the grounds of passing the rank condition. "Constraints on the executive" is an index running from 1 to 7 measuring the extent of institutionalized constraints on the decision-making powers of chief executives, such as the legislatures. The variable was initially compiled and described by Gurr et al. (1989). Current account balance divided by GDP is retrieved from the IMF's World Economic Outlook database. Exogeneity of the instruments is tested in the following way. The variable to be instrumented is substituted by its instrument in regression (4.1). Using first differencing instead of the within transformation and the variables second lag as an instrument, as before, yields the test regression. From the statistics in the third panel of Table 4.2, it can be deduced that both variables, constraints on the executive and current account balance, pass the rank condition and the Hausman test.

Table 4.2: Endogeneity Tests

Variable	Instruments	rank condition	Hausman
π	2. lag	0.000	0.395
Δ_{Gov}	2. lag	0.032	0.801
$TraOpen$	2. lag	0.203	0.238
σ_{ToT}	2. lag	0.788	0.489
$FinRisk$	2. lag	0.000	0.727
$FinOpen$	2. lag	0.011	0.185
$TraOpen$	$xconst$	0.001	0.847
σ_{ToT}	CA	0.003	0.315
xconst	2. lag	0.000	0.218
CA	2. lag	0.012	0.902

Notes: In the first and third panel, first differencing is used to eliminate fixed effects while in the second panel, the within transformation is used. π = monetary policy. Δ_{Gov} = fiscal policy. σ_{ToT} = supply shocks. $TraOpen$ = trade openness. $FinRisk$ = financial risk. $FinOpen$ = financial openness. $xconst$ = constraints put on the executive. CA = current account balance / GDP. In the last two columns, robust p-values are presented. A valid instrument must fulfill the rank condition, i.e. the p-value of the rank condition must be smaller than 0.10. A variable is exogenous if the p-value of the (regression-based) Hausman test is greater than 0.10.

ble 4.3 indicate that the significance of a double threshold is not rejected if the alternative is a triple threshold. Furthermore, the p-values of 0.058 in the second panel and of 0.065 in the third panel of Table 4.3 imply that the hypotheses of a single and no threshold are rejected at the 10% level, respectively. Therefore, the double threshold model is the appropriate model to work with.[10] As the upper part of Table 4.4 indicates, the two thresholds are estimated to be at a financial risk rating of 23 and 29. Therefore, countries are divided into three classes according to their level of financial risk. Countries with a level of financial risk of 23 or below are classified as having 'high-risk' and are in class one. Countries with a level of financial risk above 23 and less than or equal to 29 have 'high-intermediate risk' and are in class two. Countries with a level of financial risk above 29 are classified as having 'low-risk' and are in class three.

Having determined the number of thresholds as well as their point estimates, the appropriate threshold regression (4.2) is estimated:

$$\begin{aligned} \sigma_{Yit} = \delta \mathbf{Q_{it}} + \beta_1 FinOpen_{it} I(FinRisk_{it} \leq 23) + \beta_2 FinOpen_{it} \\ I(23 < FinRisk_{it} \leq 29) + \beta_3 FinOpen_{it} I(FinRisk_{it} > 29) + \varepsilon_{it} \end{aligned} \tag{4.2}$$

As shown in the lower panel of Table 4.4, financial openness is significant in all three financial risk classes and has the expected signs. In countries with very high financial risk, financial openness increases output volatility. In high-intermediate risk countries, financial openness also increases output volatility but by less than in risky countries. By contrast, more financial openness decreases output volatility in a low-risk country. Section six will illustrate the magnitude of the estimated effect of financial openness on output volatility in each risk class using the example of Argentina. Before that, the robustness of the estimation result is tested in the next section.

[10] It might be argued that a 10% significance level is not sufficient to establish the significance of the double threshold. In view of the significance of financial openness in the second step, displayed in Table 4.4, the choice of the double threshold model seems, however, appropriate.

Table 4.3: Test Statistics Determining the Number of Thresholds

$\sigma_{Yit} = \delta \mathbf{Q_{it}} + \sum_{k=0}^{K-1} \beta_{k+1} FO_{it} I(\gamma_k < FR_{it} \leq \gamma_{k+1}) + \beta_{K+1} FO_{it} I(\gamma_K < FR_{it}) + \varepsilon_{it}$	
Test against triple threshold: (H_0: K=2, H_1: K=3)	
F_3	6.17
p-value	0.259
critical values (10%, 5%, 1%):	(9.23, 11.42, 17.44)
Test against double threshold: (H_0: K=1, H_1: K=2)	
F_2	17.77
p-value	0.058
critical values (10%, 5%, 1%):	(12.24, 19.01, 33.74)
Test against single threshold: (H_0: K=0, H_1: K=1)	
F_1	25.48
p-value	0.065
critical values (10%, 5%, 1%):	(17.52, 29.77, 55.15)

Notes: The dependent variable is output volatility. $\mathbf{Q}$ =control variables as well as time and country fixed effects. FO = financial openness. FR = the threshold variable financial risk rating. The definition of all variables can be found in Table 7.3. $\gamma_k = k^{th}$ threshold level (where $\gamma_0 = 0$) and K = number of thresholds. The test statistic of a likelihood ratio, testing whether there are $k-1$ versus k threshold(s), is denoted by F_k and indicates that the number of thresholds is 2. 1000 bootstrap replications were used to obtain the critical values and p-values. Each risk class is required to contain at least 10% of all observations.

Table 4.4: Estimation Results of Double Threshold Regression

$\sigma_{Yit} = \delta \mathbf{Q_{it}} + \beta_1 FO_{it} I(FR \leq \hat{\gamma}_1) + \beta_2 FO_{it} I(\hat{\gamma}_1 < FR_{it} \leq \hat{\gamma}_2) + \beta_3 FO_{it} I(FR > \hat{\gamma}_2) + \varepsilon_{it}$

Threshold estimates		
$\hat{\gamma}_1$	23	[20, 24]
$\hat{\gamma}_2$	29	[27, 39]
Regression estimates		
π	0.144	(0.474)
Δ_{Gov}	0.362***	(0.007)
σ_{ToT}	0.037	(0.409)
$TraOpen$	3.989***	(0.007)
$FinRisk$	-0.064**	(0.035)
$FinOpen\ I(FinRisk \leq 23)$	1.826***	(0.001)
$FinOpen\ I(23 < FinRisk \leq 29)$	0.513***	(0.003)
$FinOpen\ I(29 < FinRisk)$	-0.248*	(0.086)
$R^2[\bar{R}^2]$:		0.34 [0.32]

Notes: The dependent variable is output volatility. **Q** =control variables as well as time and country fixed effects. π = monetary policy. Δ_{Gov} = fiscal policy. σ_{ToT} = supply shocks. $TraOpen$ = trade openness. $FinRisk$ = financial risk. $FinOpen$ = financial openness. Definitions of the variables can be found in Table 7.3. 62 countries and five 5-year non-overlapping time periods are used (i.e. 310 observations). *** (**, *) denote significance at the 1 (5, 10) percent level. Robust p-values are given in parenthesis and bootstrapped confidence intervals are given in brackets.

5 Assessing the Robustness of the Results

In order to check the robustness of the estimation results, three variations are analyzed. Firstly, the robustness of the results with respect to the variables' operational definitions is tested. Secondly, alternative model specifications are implemented. And thirdly, the sample is extended and shortened. The robustness checks confirm that countries with low financial risk profit from financial globalization in terms of reduced output volatility while financially risky countries are negatively affected by financial openness.

Variation to the Definitions of the Variables

In this subsection, I use alternative definitions of financial openness, output volatility and the control variables in order to assess the robustness of the paper's result.

It might be argued that foreign companies' location decision concerning foreign direct investments (FDI), which are included in the measure of financial openness, is affected by countries' output volatility. Since it was demonstrated that financial openness is exogenous, this issue does not seem to affect the estimation results. And indeed, the exclusion of FDI has virtually no effect on the number and level of thresholds or the significance and sign of financial openness. A table with the estimation results is available upon request.

Next, the standard deviation of the cyclical component of GDP is used as an alternative measure of output volatility. In order to retrieve the cyclical component, GDP is filtered using the band-pass filter advocated by Baxter and King (1999).[11] When repeating the analysis of Section 4 using the cycli-

[11] I follow Baxter and King (1999) who propose using those fluctuations that last at least two years and at most eight years to capture the business cycle. In order to enhance the presentation of the estimations, output volatility is defined here as the standard deviation of the cyclical component of per capita GDP multiplied by 100.

cal component of GDP, the main results do not change. Selected statistics of this regression can be found in Table 7.4 in the Appendix.

Lastly, the robustness of the results with respect to the choice of control variables is established. To that end, alternative measures of the control variables are used to estimate threshold model (4.2). This robustness check is a variant of Leamer's (1983) and Levine and Renelt's (1992) extreme bounds analysis. The extreme bounds analysis yields upper and lower bounds for the three coefficients of financial openness from all possible combinations of control variables. As alternative measures of policy quality the variance of inflation and government expenditure growth are used. Furthermore, terms of trade growth was used instead of its standard deviation. As an alternative to the financial risk rating, short-term interest rates were used. Threshold regression (4.2) is then run sixteen times. Each regression includes all five control variables, but a different combination of their measures. Out of these regressions, Table 5.1 lists the highest and lowest coefficients together with the p-value of financial openness in each of the three risk classes. The sign of the coefficients of financial openness has changed in none of the sixteen regressions, and the coefficients are significant in all regressions. Therefore, the results of this paper are robust to alternative measurements of the control variables.

Variation to the Model Specification

In this subsection, the threshold model specifications are modified in various ways to determine the model which best fits the data. A first modification concerns the functional form. Output volatility cannot be negative and, therefore, it might enhance the fit of the model to take the logarithm of output volatility. Estimation results of the thus modified version of regression (4.2) reveal that all three risk classes remain significant and keep their signs. Since the adjusted R-squared is smaller than for the original regression and for the sake of comparison with previous research, output volatility and not

Table 5.1: Robustness to Measurement of Control Variables

	coefficient	p-value
Financial openness in high-risk class		
high:	2.57***	(0.00)
base:	1.83***	(0.00)
low:	1.74***	(0.01)
Financial openness in intermediate risk class		
high:	0.84***	(0.00)
base:	0.51***	(0.00)
low:	0.45***	(0.01)
Financial openness in low-risk class		
high:	-0.24*	(0.10)
base:	-0.25*	(0.09)
low:	-0.32**	(0.02)

Notes: Regression(4.2) is run sixteen times. In each regression, different measures of the control variables and their permutations are used. The estimated coefficient and p-value for "base" refer to the threshold model of section 4. The rows labeled "high" and "low" give the highest and lowest estimate of the sixteen regressions.

its logarithm is used in this paper. A table with the estimation results is available upon request.

The last model modification changes the interaction between financial openness and financial risk. First, I allow for the third, insignificant threshold at $FinRisk = 40$ and estimate the triple threshold model:

$$\sigma_{Y\,it} = \delta \mathbf{Q_{it}} + \beta_1 FinOpen_{it} I(FinRisk_{it} \leq 23) + \beta_2 FinOpen_{it} I(23 < FinRisk_{it} \leq 29) \tag{5.1}$$
$$+ \beta_3 FinOpen_{it} I(29 < FinRisk_{it} \leq 40) + \beta_4 FinOpen_{it} I(FinRisk_{it} > 40) + \varepsilon_{it}$$

The estimation results can be seen in Table 5.2. All four classes are significant and the signs are consistent with the results of the double threshold model. The coefficient of financial openness is positive for the two more risky classes and negative for the two less risky classes. The adjusted R-squared is higher than in the double threshold model. Furthermore, Wald tests indicate that the coefficients of financial openness in the different classes are significantly different from each other. The coefficients decrease monotonously from more risky to less risky classes. This leads to the notion that the relation between financial risk and the coefficient of financial openness might be a linear rather than a step function.

Therefore, I include an interaction term of financial openness and financial risk in the linear regression (4.1). The relevant estimation results can be found in Table 7.5 in the Appendix. Financial openness and the interaction term are highly significant. The coefficient of financial openness is positive, while the coefficient of the interaction term is negative, confirming that the effect of financial openness decreases and turns negative when financial risk decreases (and the financial risk rating increases). The effect of financial openness on output volatility becomes negative when $FinRisk = 36.5$.

Compared to the double threshold model, the triple threshold model has a higher adjusted R-squared, while the linear regression with the interaction term has a lower adjusted R-squared. In terms of this model selection criterion, the triple threshold model is the superior model. Therefore, estimation results and tables of the triple threshold model are presented as a supplement in what follows.

Table 5.2: Estimation Results: Triple Threshold Regression

$$\sigma_{Yit} = \delta \mathbf{Q_{it}} + \beta_1 FO_{it} I(FR \leq \gamma_1) + \ldots + \beta_4 FO_{it} I(FR > \gamma_3) + \varepsilon_{it}$$

Threshold estimates		
$\hat{\gamma}_1$	23	[20, 24]
$\hat{\gamma}_2$	29	[27, 39]
$\hat{\gamma}_3$	40	[34, 45]
Regression estimates		
π	0.130	(0.513)
Δ_{Gov}	0.344***	(0.009)
σ_{ToT}	0.037	(0.396)
$TraOpen$	4.815***	(0.003)
$FinRisk$	-0.054*	(0.079)
$FinOpen\ I(FinRisk \leq \hat{\gamma}_1)$	1.879***	(0.000)
$FinOpen\ I(\hat{\gamma}_1 < FinRisk \leq \hat{\gamma}_2)$	0.537***	(0.002)
$FinOpen\ I(\hat{\gamma}_2 < FinRisk \leq \hat{\gamma}_3)$	-0.230*	(0.075)
$FinOpen\ I(\hat{\gamma}_3 < FinRisk)$	-0.520***	(0.010)
$R^2[\bar{R}^2]$: 0.36 [0.33]		

Notes: The dependent variable is output volatility. **Q** =control variables as well as time and country fixed effects. π = monetary policy. Δ_{Gov} = fiscal policy. σ_{ToT} = supply shocks. $TraOpen$ = trade openness. $FinRisk$ = financial risk. $FinOpen$ = financial openness. Definitions of the variables can be found in Table 7.3. 62 countries and five 5-year non-overlapping time periods are used (i.e. 310 observations). *** (**, *) denote significance at the 1% (5%, 10%) level. Robust t-statistics are given in parentheses and confidence intervals are given in brackets.

Variations to the Sample

As the last robustness check, the sample is varied. The use of Hansen's panel threshold model restricts the panel to be balanced. However, the panel has to be balanced only in order to determine the number and the value of the thresholds. By taking the thresholds of the balanced panel as given, one may estimate the double threshold regression (4.2) and the triple threshold regression (5.1) in order to obtain coefficients of financial openness in the different risk classes for an unbalanced panel. The extended panel consists of 86 instead of 62 countries with four to five time observations, leading to a total of 406 observations.[12]

Table 5.3 presents the estimation results of the double threshold regression (4.2) and the triple threshold regression (5.1) when using the unbalanced panel. The signs of financial openness in all risk classes are unchanged. Further, financial openness is highly significant for the two most risky classes. However, financial openness turns insignificant in the low-risk class of the double threshold model and the low-intermediate risk class of the triple threshold model. Remarkably, the very low-risk class of the triple threshold model is significantly negative, emphasizing that the relation between financial openness and output volatility is significant for very low-risk countries in the extended panel, too. The main results obtained for the balanced panel are therefore also applicable to this even greater sample.

Besides the extension of the sample, its reduction is considered as well. The countries are divided into three income groups according to their World Bank classification: low income, middle income and high income. The double and triple threshold regressions, (4.2) and (5.1), are then estimated leaving out one of those groups at a time. Financial openness continues to have the same signs in all three/four risk classes, except for the insignificant second risk

[12]The sample is extended with the following countries, covering the time period 1985-2007: Angola, Botswana, Burkina Faso, Chile, China, Colombia, El Salvador, Ethiopia, Guinea, Hungary, Ivory Coast, Republic of Korea, Madagascar, Malaysia, Mali, Mozambique, Niger, Nigeria, Oman, Poland, Switzerland, Trinidad and Tobago, Uganda, Zimbabwe.

Table 5.3: Estimation Results: The Unbalanced Panel

regressor	double threshold		triple threshold	
$FinOpen2.1/FinOpen3.1$	1.531^{***}	(0.004)	1.590^{***}	(0.003)
$FinOpen2.2/FinOpen3.2$	0.451^{***}	(0.002)	0.475^{***}	(0.001)
$FinOpen2.3/FinOpen3.3$	-0.113	(0.332)	-0.083	(0.474)
$FinOpen3.4$			-0.282^{*}	(0.087)
$R^2[\bar{R}^2]$	0.27 [0.24]		0.26 [0.24]	

Notes: $FinOpen\ k.l$ equals financial openness if the observation is in risk class l of a model with k thresholds, and equals zero otherwise. An observation is e.g. in risk class 1 if $FinRisk \leq \hat{\gamma}_1$. 86 countries and four to five 5-year non-overlapping time periods are used, leading to 406 observations. Time and country fixed effects are included. *** (**, *) denote significance at the 1% (5%, 10%) level. Robust p-values are given in parenthesis. The thresholds of regression (4.2) [and (5.1)] are used: 23, 29[, 40].

class if high income countries are excluded; see Table 7.6 in the Appendix. However, the third risk class turns insignificant when leaving out low and middle income countries. More importantly, the first and the fourth risk class in the triple threshold model are always significant. Therefore, the general result of this paper is confirmed even under sample variations.

The robustness checks in this section demonstrated that the general result of this paper is valid even under modifications to variables, model and sample: financial openness significantly decreases output volatility in high-risk countries and significantly reduces output volatility in low-risk countries.

6 Interpretation and Implication of the Estimation Results

In this section, I would like to give a meaning to the coefficients of financial openness and interpret the results of this paper in terms of policy implications.

As can be seen in Table 4.4, an increase in financial openness by one unit (i.e. an increase of the sum of a country's foreign assets and liabilities by the amount of its GDP) leads to an increase in output volatility of 1.826 (0.513) units if a country has high (high-intermediate) financial risk. Low-risk countries experience a reduction in output volatility of 0.248 units under the same scenario.

But how great is the effect of financial openness on output volatility in percentage terms in reality? By how much does financial openness in an exemplary country change from one period to the next? In order to illustrate the estimated effect of financial openness on output volatility, Argentina is described, since it is a country with an eventful past which has been in all three risk classes in the past 27 years. In Argentina, financial openness increased from 0.5 to 2.1 units between the early 1980s and the early 2000s.

In the 1980s, Argentina suffered from economic stagnation and hyperinflation as a result of protectionist and populist economic policies (Hoti and McAleer 2004). In this period, output volatility was, on average, 5.6 and financial risk was high. Combining this information with the estimation results of the last section, financial openness was responsible for about 19% of output volatility in the 1980s.[13]

In the 1990s, Argentina successfully developed its economy and brought back confidence in the domestic currency. Argentina got through the Mexican and Asian financial crisis relatively well, partly because the falling dollar increased its competitiveness in European markets; see Krueger (2002). In this period, output volatility was 4.9 on average and financial risk was low.

[13]This is computed as follows: financial openness in the period 1980-1984 was 0.451. Multiplying financial openness by the coefficient of financial openness in risk class 1, gives 0.824. The actual output volatility at that time was 4.603. If financial openness had been zero, output volatility should have been less, namely 4.603-0.824=3.780. Therefore, if financial openness had been zero, output volatility would have been 17.9% smaller. Putting it differently, financial openness was responsible for 17.9% of output volatility. In the period 1985-1989, financial openness was responsible for 20.9% of output volatility. Hence, in the period 1980-1989, financial openness was responsible for around 19% of output volatility.

Table 6.1: Percentage of Countries in Each Risk Class by Year

	1980	1985	1990	1995	2000
very high-risk	29%	29%	6%	2%	0%
high-intermediate risk	26%	31%	23%	8%	8%
low-risk	45%	40%	71%	90%	92%
low-intermediate risk	*18%*	*9%*	*31%*	*59%*	*73%*
very low-risk	*27%*	*31%*	*40%*	*31%*	*19%*

Note: The table displays the percentage of countries in the sample which have been in a certain risk class during a certain time period. The low-risk class is split up into low-intermediate risk and very low-risk in accordance with the third and fourth risk class of the triple threshold model. The table indicates a shift towards less financial risk.

Financial openness in combination with the low level of financial risk reduced output volatility by 4% in comparison with a hypothetical situation with closed financial markets. In 1999-2002, Argentina experienced an economic crisis: the currency peg had to be abandoned, bank deposits had to be frozen to prevent further bank runs, and external debt payments had to be suspended. During this period, output volatility was 7.3 and financial risk was high-intermediate. According to the estimation results, financial openness in combination with intermediate risk was responsible for 14% of output volatility.

The case of Argentina illustrates how great the estimated effect of financial openness on output volatility can be. The estimation results of the earlier analysis attribute up to 21% of output volatility in Argentina to financial openness. This stresses that policy-makers should attempt to reduce financial risk in order to prevent high output volatility stemming from financial openness.

For that matter, policy-makers are given clear criteria on how to improve their financial risk. If a country's financial risk is below the threshold value of 28, policy-makers should make an effort to improve in terms of one or more

components of the risk rating. For example, the financial risk component "foreign debt as a percentage of GDP" can be raised from an initial five risk points to its maximum value of ten risk points if policy-makers are able to reduce foreign debt from 50% to less than 5% of GDP. In the case of the financial risk component "exchange rate stability", the currency of a country having five risk points in this component has an annual depreciation with respect to the US dollar of more than 50% or an appreciation between 30% and 34.9%. In order to increase the risk rating to the maximum of 10 risk points, the country must ensure that its exchange rate changes only within the boundary of -5% to 10%. Accordingly, policymakers have clear criteria on how to reap the benefits of financial openness for output volatility.

The risk class of all countries for each period can be found in Table 7.7 in the Appendix. Table 6.1 summarizes the number of countries that belong to either one of the three risk classes in a given year. In the 1980s, countries were relatively evenly spread over the risk classes. However, a shift from higher risk classes to lower risk classes over time becomes apparent. Therefore, more and more countries may benefit from financial globalization in terms of reduced output volatility.

7 Concluding Remarks

This paper identifies financial risk as a variable that determines whether financial openness increases or decreases output volatility. I hypothesized that financial risk affects an investor's decision on whether to make pro- or counter-cyclical investments. In the case of low-risk countries, investors invest during recessions because firms with good future prospects are relatively cheap. Furthermore, they lend money to prospering projects which domestic banks might not be willing to finance as they are less able to bear risk

in recessions.[14] Therefore, international capital inflows are counter-cyclical and reduce output volatility. In the case of high-risk countries, investors fear big losses due to government default, exchange rate collapse or panic selling by other investors. Investors carefully observe changes in growth expectations and the action of other investors. If there are signs of a recession, they withdraw their money as soon as possible. In that case, international capital inflows are pro-cyclical and financial openness increases output volatility.

The results of an empirical analysis using a threshold model support this hypothesis. They indeed indicate that financial openness increases output volatility if a country has high-risk (financial risk rating of 28 or below) and it decreases output volatility for low-risk countries (financial risk rating above 28). As the risk rating is based on objective criteria, countries have clear guidance on what they need to improve in order to profit from financial openness in terms of reduced output volatility. Therefore, the result of this paper is important for policy decisions. Nevertheless, output volatility is not the only issue policy-makers are concerned with when taking decisions on financial market regulations. It might be the case that growth opportunities outweigh high output volatility, see Ranciere et al. (2006). In this case, high-risk countries should not take the route of constraining capital markets but of decreasing financial risk. Most likely, such a strategy will not have a negative effect on growth, while significantly reducing volatility. However, a thorough analysis of the interacting effects between financial risk, output volatility and growth is not pursued here but left for further research. In general, the paper provides evidence that financial openness becomes more favorable in the context of output volatility as financial risk decreases.

Properly implemented, financial openness is an important determinant of output volatility. Based on the finding of this paper, the effect of financial openness on output volatility depends on the country's financial risk. Therefore, financial openness should be included as a function of financial risk in

[14] Easterly et al. (2000) argue that during recessions, the default rate of credits is higher for domestic financial institutions. Therefore, banks are less willing or able to bear risk and they provide fewer credits.

macroeconomic models and regressions explaining output volatility. If financial risk is not used as a mediating variable, then the two opposing effects of financial openness might cancel each other out, rendering financial openness insignificant. Financial risk is therefore likely to be what Buch et al. (2005) call the "missing link" in determining the effect of financial openness on output volatility.

The result is robust. Several variables were included in the threshold regression to control for the quality of fiscal and monetary policy, for supply shocks, for trade openness and for financial risk. Furthermore, time and country specific fixed effects were included. As a robustness check, the measures of the variables were changed: FDIs were excluded from financial openness, output volatility was measured as the standard deviation of the business-cycle component of GDP and different measures for the control variables were used. Further, the robustness to modifications of the threshold model specifications was tested: using the logarithm of output volatility, using three thresholds or an interaction term of financial openness and financial risk. It was argued by means of an information criterion that the effect of financial risk on the relation between financial openness and output volatility is better captured by a threshold model than an interaction term. Moreover, country groups were included in and excluded from the sample. None of these modifications changed the result that financial openness increases output volatility in high-risk countries and decreases output volatility in low-risk countries.

Over the past three decades, the number of countries in the sample having very high or high-intermediate risk decreased. Therefore, more and more countries may benefit from financial globalization in terms of reduced output volatility rather than suffer from economic crises. This conclusion might seem at odds with the current worldwide financial and economic crisis. It is not, however. Admittedly, the crisis could spread because of integrated financial markets, but its *source* was not financial openness. The crisis was not triggered by pro-cyclical capital flows or by a flight of "hot money" as was the case in the Asian crisis. Rather, it might be speculated that the source is mainly rooted in each of the affected *domestic* financial markets, but this is

still under debate. Independently of the source, low-risk countries probably continue to profit from capital inflows in this crisis and should therefore not restrict capital accounts. It will be interesting to observe to what extent the finding of this paper is borne out in the ongoing crisis.

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Appendix

Table 7.1: List of Countries in the Balanced Sample

26 developed countries
Australia; Austria; Belgium; Canada; Denmark; Finland; France; Germany; Greece; Hong Kong; Iceland; Ireland; Israel; Italy; Japan; Netherlands; New Zealand; Norway; Portugal; Singapore; South Africa; Spain; Sweden; Taiwan; United Kingdom; United States
36 developing countries
Argentina; Bolivia; Brazil; Cameroon; Costa Rica; Dominican Republic; Ecuador; Egypt; Haiti; Indonesia; Iran; Jamaica; Jordan; Kenya; Kuwait; Lebanon; Libya; Malawi; Mexico; Morocco; Nicaragua; Pakistan; Panama; Paraguay; Peru; Philippines; Senegal; Sri Lanka; Sudan; Syria; Tanzania; Thailand; Togo; Tunisia; United Arab Emirates; Zambia

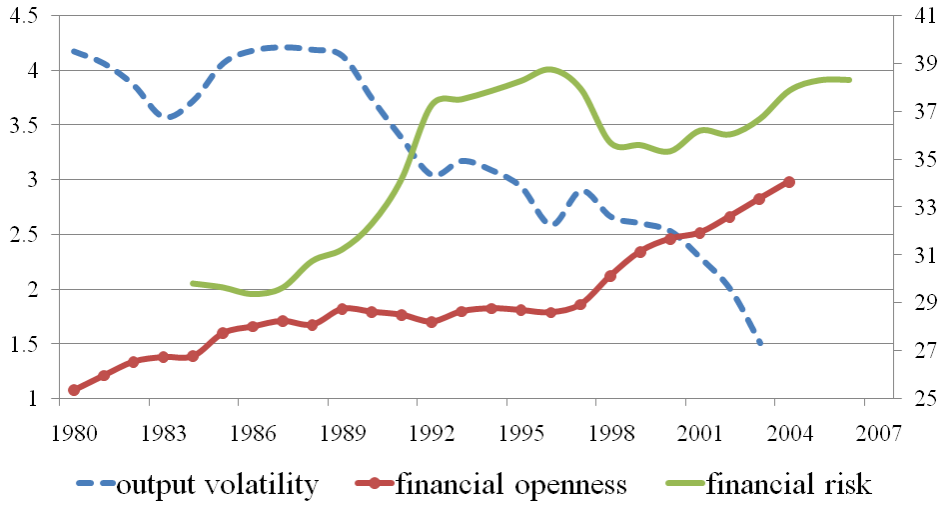
Note: Singapore; Taiwan and Hong Kong are termed neither as 'developed' nor 'developing' countries. However, they belong to the group of 'advanced' economies as termed by the IMF and are therefore included in the group of 'developed' countries.

Table 7.2: Descriptive Statistics

Variable	Mean	σ	Min	Max	1980	2000
Output Volatility (σ_Y)	3.47	3.71	0.30	32.55	4.36	2.26
Monetary Policy (π)	1.89	1.35	-1.28	8.00	2.61	1.14
Fiscal Policy (Δ_{Gov})	-0.04	1.56	-8.43	7.79	0.35	0.03
Supply Shock (σ_{ToT})	9.14	11.78	0.00	94.77	13.13	6.28
Trade openness ($TraOpen$)	0.74	0.54	0.14	4.21	0.71	0.85
Financial Risk ($FinRisk$)	33.99	9.49	9.71	49.83	29.81	36.95
Financial openness ($FinOpen$)	1.88	2.05	0.26	16.23	1.28	2.68

Notes: Statistics are calculated using 310 observations for the first columns and 62 for the last two columns. '1980' ('2000') is the mean of the variable in 1980-1984 (2000-2007). For definitions of the variables see Table 7.3.

Figure 7.1: Country-Averages over Time



Note: In order to make this graph more informative, output volatility is presented as the 5-year *rolling* window, financial openness and financial risk are presented as their respective value in a given year and *not* as its 5-year mean.

Table 7.3: Variables: Definition and Source

Variable	Definition	Source
Output Volatility	(standard deviation of real per capita GDP growth) *100	Real per capita GDP (2000 international dollars): PWT[N3] and WEO[N4]
Monetary Policy Quality	ln(|inflation|)	Inflation (% change in CPI): WEO and WDI[N5]
Fiscal Policy Quality	government expenditures (% of GDP) growth	General Government Expenditure and Net Lending (% of GDP): WEO
Supply Shock	standard deviation of terms of trade growth	Terms of trade in goods and services: WEO
Trade Openness	(exports + imports)/GDP	exports and imports of goods and services: WDI and WEO
Financial Openness	(total liabilities[N1] + total assets[N2])/GDP	Lane and Milesi-Ferretti (2007)
Financial Risk Indicator	aggregation of financial risk components	Index constructed by PRS group[N6]

Standard deviations are taken over a 5-year non-overlapping window, otherwise averages are taken over the same period. Most data were kindly provided to me by Nikola Spatafora who used the data in Spatafora and Sommer (2007). [N1]Total Liabilities = portfolio equity liabilities + FDI liabilities +debt liabilities + financial derivatives liabilities; [N2]Total Assets = portfolio equity assets + FDI assets + debt assets + financial derivatives assets + total reserves - gold; [N3]PWT: Heston, Summers, and Aten's Penn World Tables Version 6.2 (2006); [N4]WEO: IMF's World Economic Outlook database; [N5]WDI: the World Bank's World Development Indicators database (2007); [N6]PRS group: Political Risk Service group; International Country Risk Guide. More information on http://www.prsgroup.com.

Table 7.4: Alternative Measure of Output Volatility

$\sigma^*_{Yit} = \alpha_i + \delta\mathbf{Q_{it}} + \sum_{k=0}^{K-1} \beta_{k+1} FO_{it} I(\gamma_k < FR_{it} \leq \gamma_{k+1}) + \beta_{K+1} FO_{it} I(\gamma_K < FR_{it}) + \varepsilon_{it}$		
$\hat{\gamma}_1$	20.2	[20.1, 22.5]
$\hat{\gamma}_2$	28.9	[26.5, 39.7]
$FinOpen\ I(FinRisk \leq \hat{\gamma}_1)$	1.537**	(0.027)
$FinOpen\ I(\hat{\gamma}_1) < FinRisk \leq \hat{\gamma}_2)$	0.223	(0.143)
$FinOpen\ I(\hat{\gamma}_2) < FinRisk)$	-0.243**	(0.021)
$R^2[\bar{R}^2]$		0.39 [0.36]

Notes: The dependent variable is output volatility measured as the standard deviation of the cyclical component of GDP, multiplied by 100. γ = threshold. $FinRisk$ = financial risk rating. $FinOpen$ = financial openness. Country and time fixed effects are included. Definitions of the variables can be found in Table 7.3. 62 countries and five 5-year non-overlapping windows are used. 1,000 bootstrap replications were used to obtain [confidence intervals]. *** (**, *) denote significance at the 1% (5%, 10%) level. Robust p-values are given in parentheses.

Table 7.5: Estimation Results: Interaction Term

$\sigma_{Yit} = \alpha_i + \delta\mathbf{Q_{it}} + \beta_1 FinOpen_{it} + \beta_2 FinOpen_{it} * FinRisk_{it} + \varepsilon_{it}$		
$FinOpen$	1.993***	(0.001)
$FinOpen * FinRisk$	-0.055***	(0.001)
$R^2[\bar{R}^2]$		0.30 [0.27]

Notes: The dependent variable is output volatility. $FinRisk$ = financial risk rating. $FinOpen$ = financial openness. Definitions of the variables can be found in Table 7.3. 62 countries and five 5-year non-overlapping time periods are used, leading to 310 observations. Country and time fixed effects are included. *** (**, *) denote significance at the 1% (5%, 10%) level. Robust p-values are given in parentheses.

Table 7.6: Estimation Results: Excluding Income Groups

regressor	double threshold		triple threshold	
Excluding 9 "low income" countries				
$FinOpen2.1/\ 3.1$	*2.006****	(0.001)	*2.065****	(0.001)
$FinOpen2.2/\ 3.2$	0.464***	(0.002)	0.488***	(0.002)
$FinOpen2.3/\ 3.3$	-0.177	(0.191)	-0.162	(0.199)
$FinOpen3.4$			-0.435**	(0.029)
$R^2[\bar{R}^2]$	0.42 (0.39)		0.43 [0.40]	
Excluding 26 "middle income" countries				
$FinOpen2.1/\ 3.1$	*1.739****	(0.001)	*1.914****	(0.001)
$FinOpen2.2/\ 3.2$	*1.416***	(0.015)	*1.504****	(0.010)
$FinOpen2.3/\ 3.3$	-0.074	(0.538)	-0.093	(0.475)
$FinOpen3.4$			-0.392*	(0.087)
$R^2[\bar{R}^2]$	0.40 [0.35]		0.42 [0.37]	
Excluding 27 "high income" countries				
$FinOpen2.1/\ 3.1$	1.124**	(0.028)	1.206**	(0.022)
$FinOpen2.2/\ 3.2$	-0.057	(0.860)	-0.014	(0.967)
$FinOpen2.3/\ 3.3$	-1.820**	(0.046)	-1.719*	(0.059)
$FinOpen3.4$			*-3.092***	(0.011)
$R^2[\bar{R}^2]$	0.39 [0.35]		0.40 [0.35]	

Notes: The countries are divided according to their World Bank classification: low income, middle income and high income. The double and triple threshold regressions, (4.2) and (5.1), are estimated leaving out one income group at a time. If there are 30 or fewer observations in a certain risk class, the coefficient is printed in italics. Country and time fixed effects are included. *** (**, *) denote significance at the 1% (5%, 10%) percent level. Robust p-values are given in parentheses.

Table 7.7: Countries in Each Time Period by Class

Countries with very high financial risk	
1980:	Argentina, Bolivia, Brazil, Costa Rica, Dominican Republic, Ecuador, Haiti, Iran, Jamaica, Lebanon, Libya, Morocco, Nicaragua, Peru, Philippines, Sudan, Syria, Zambia
1985:	Argentina, Bolivia, Dominican Republic, Ecuador, Egypt, Haiti, Iran, Lebanon, Libya, Nicaragua, Pakistan, Peru, Philippines, Sri Lanka, Sudan, Syria, United Arab Emirates, Zambia
1990:	Haiti, Lebanon, Sudan, Zambia
1995:	Sudan
Countries with high-intermediate financial risk	
1980:	Cameroon, Egypt, Greece, Indonesia, Israel, Jordan, Kenya, Malawi, Mexico, Pakistan, Panama, Senegal, Sri Lanka, Tanzania, Togo, Tunisia
1985:	Brazil, Cameroon, Costa Rica, Greece, Indonesia, Israel, Jamaica, Jordan, Kenya, Malawi, Mexico, Morocco, Panama, Paraguay, Senegal, South Africa, Tanzania, Togo, Tunisia
1990:	Cameroon, Dominican Republic, Jordan, Kenya, Libya, Malawi, Nicaragua, Pakistan, Peru, Senegal, Sri Lanka, Syria, Tanzania, Togo
1995:	Haiti, Malawi, Nicaragua, Tanzania, Zambia
2000:	Argentina, Malawi, Nicaragua, Tanzania, Zambia
Countries with low-intermediate financial risk	
1980:	Hong Kong, Iceland, Italy, Kuwait, Paraguay, Portugal, South Africa, Spain, Taiwan, Thailand, United Arab Emirates
1985:	Hong Kong, Kuwait, Portugal, Singapore, Spain, Thailand
1990:	Argentina, Bolivia, Brazil, Costa Rica, Ecuador, Egypt, Greece, Iran, Israel, Jamaica, Kuwait, Mexico, Morocco, Panama, Paraguay, Philippines, South Africa, Tunisia, United Arab Emirates
1995:	Argentina, Australia, Bolivia, Brazil, Cameroon, Costa Rica, Dominican Republic, Ecuador, Egypt, Greece, Iceland, Indonesia, Iran, Israel, Italy, Jamaica, Jordan, Kenya, Lebanon, Libya, Mexico, Morocco, New Zealand, Pakistan, Panama, Paraguay, Peru, Philippines, Portugal, Senegal, South Africa, Sri Lanka, Sweden, Syrian Arab Republic, Thailand, Togo, Tunisia
2000:	Australia, Belgium, Bolivia, Brazil, Cameroon, Costa Rica, Dominican Republic, Ecuador, Egypt, Finland, France, Germany, Greece, Haiti, Iceland, Indonesia, Ireland, Israel, Italy, Jamaica, Jordan, Kenya, Lebanon, Mexico, Morocco, Netherlands, New Zealand, Pakistan, Panama, Paraguay, Peru, Philippines, Portugal, Senegal, South Africa, Spain, Sri Lanka, Sudan, Sweden, Syrian Arab Republic, Thailand, Togo, Tunisia, United Kingdom, United States
Countries with very low financial risk	
1980:	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Japan, Netherlands, New Zealand, Norway, Singapore, Sweden, United Kingdom, United States
1985:	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Sweden, Taiwan, United Kingdom, United States
1990:	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Iceland, Indonesia, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Singapore, Spain, Sweden, Taiwan, Thailand, United Kingdom, United States
1995:	Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Japan, Kuwait, Netherlands, Norway, Singapore, Spain, Taiwan, United Arab Emirates, United Kingdom, United States
2000:	Austria, Canada, Denmark, Hong Kong, Iran, Japan, Kuwait, Libya, Norway, Singapore, Taiwan, United Arab Emirates

Notes: List of countries belonging to a certain financial risk class during a certain period. In order to provide additional information, the low-risk class is divided into low-intermediate and very low-risk using the threshold which is estimated by the triple threshold model.

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