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Financial Development and Macroeconomic Volatility: Evidence from OECD Countries

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Abstract

This paper discusses the link between financial development and macroeconomic volatility by exploring some of the ways through which financial development may affect business cycle fluctuations. To be specific, we examine whether stock market development exerts an unambiguous effect on macroeconomic volatility. Building on theoretical work related to two different strands, we also investigate the role financial development has in the propagation of real and monetary shocks. Using a panel data set covering 22 OECD countries over the period 1970 through 2000 we find a robust relationship between stock market development and the severity of the macroeconomic cycle, and evidence that well-developed financial systems magnify monetary shocks and dampen real ones. The results also indicate that the size of the stock market matters when interaction with stock market volatility is controlled for.

JEL classification: E22, G00, G30, O16, O40

Keywords: business cycle, macroeconomic fluctuation, financial system, stock market, panel analysis

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1. Introduction

Empirical evidence is increasingly supporting the view that stock markets do matter as an overall growth factor. Only recently has an OECD study provided new empirical evidence suggesting that since the 1970s stock market development may have promoted economic growth in high-income countries (see *Leahy et al.*, 2001). These findings have been questioned by *Hahn* (2002A, 2002D) on the grounds that in these studies use financial development indicators which are highly biased by price effects. *Hahn* (2002A, 2002D) shows that when price effects are appropriately controlled for the positive linkage between stock market development and economic growth in high-income countries is no longer statistically significant.

Another topic, closely related to the "finance matters discussion" but only recently brought to the forefront is the link between the depth and structure of a country's financial sector and the magnitude or severity of its macroeconomic cycle. In contrast to the finance-growth literature where empirical and theoretical research is roughly balanced, most work dealing with the finance-cycle nexus is still theoretical. The substance of this literature is that economies with highly developed financial markets are superior to financially less-developed economies in allocating resources and in sharing risks, respectively. As a result, economies with well-developed financial markets are supposed to serve as shock absorbers and as such are to be better capable of reducing aggregate output fluctuations than bank-based economies. Yet, in following *Allen – Gale* (2000), there is also a sense in which economies with fewer choices of financial instruments can offer superior sharing of macroeconomic (or nondiversifiable) risks. By pointing to countries such as Japan, Germany and France, *Allen – Gale* (2000) praise the virtue of holding large amounts of wealth in the form of bank deposits in order to shield private households from fluctuations in the value of assets that are marked to market. This view is in line with empirical research indicating that the risk management and information processing provided by banks may be particularly important in reducing overall output volatility (*Denizer – Iyigun – Owen*, 2000).

In this paper, we revisit the link between financial development and macroeconomic volatility by exploring some of the ways through which financial development may affect business cycle fluctuations. First of all, we examine whether financial development exerts an unambiguous effect on macroeconomic volatility. Building on theoretical work related to at least two different strands, we then investigate the role financial development has in the propagation of real and monetary shocks. The latter work suggests overwhelmingly that the effect of real shocks be dampened by well-developed financial systems while monetary shocks are magnified.

The remainder of the paper is structured as follows. In section 2, we give a short overview of the relevant lines of theoretical work studying the effects of financial systems on output fluctuations. In section 3, we discuss our estimation strategy and data. In section 4 we present our main findings and conduct a sensitivity analysis. Section 5 concludes.

2. Theoretical Motivation

2.1 Financial Development, Competition and Insurance

A widely held presumption is that markets tend to accentuate the difference between the incompetent, the unskilled, or the untalented and the more qualified, thus exacerbating the need for insurance (*Rajan – Zingales*, 1999A). Competitive markets are often accused of lightly destroying old relationship-based structures of insurance while not providing enough protection against risks which come naturally with a more advanced competitive outside environment. In general, risks created by the expansion of markets are assumed to be hard to diversify away.

As to financial markets, it is widely undisputed that market-based financial systems are better than relationship-based financial systems at supplying investors with state-of-the-art opportunities for diversifying idiosyncratic risks. Moreover, market-driven systems are also said to have the greater allocative efficiency capacity than intermediation-driven systems. In good times, the advantages of developed financial markets, by making everybody better off, by far outweigh the disadvantages associated with markets such as the lack of insurance which, of course, is not considered as a loss in times of plenty. In bad times, however, even almost perfectly hedged positions all too often turn out not to be much of a cover, since counterpart risks tend to be, to a large extent, highly positively correlated with macro-economic shocks. This breeds systemic risks which, in overly market-oriented economies, are said to be particularly hard to cope with without government assistance. Thus, as put in *Rajan – Zingales* (1999A), competition, when coupled with the lack of commitment that leads to incomplete contracting and free-riding, makes it hard for markets to provide the necessary cross-subsidies that mitigate its harshness. In order to provide insurance in countries with market-oriented financial systems, the respective governments are often called upon to play an active role, or at least convey to the electorate their firm determination to intervene in the working of markets whenever shocks occur, triggering trouble too big for a markets system to settle on its own.

Proceeding along this line of reasoning, *Allen – Gale* (2000) explore a strategy suitable to hedge for nondiversifiable risks. They argue that where incomplete markets do not provide for effective intertemporal smoothing, long-lived financial institutions such as banks can do so. Intermediaries are said to be capable of providing insurance ex post by making transfers that act as a substitute for missing markets. However, banks can only supply this service as long they are not subject to competition from financial markets. The point is that "in good times individuals would rather opt out of the banking system and invest in the market, so in the long run, intertemporal smoothing by banks is not viable in the presence of competition from markets" (*Allen – Gale*, 2000, p. 156).

The substance of this literature is that financial development proceeds along the lines of more arm's length financing at the expense of relationship lending, of more competition at the expense of crony capitalism, and of higher standards of disclosure and accountability at the expense of business opaqueness. The downside is that financial development is assumed to be closely associated with increasing macroeconomic volatility. That is to say, this view suggests that there be an unambiguous, positive relationship between financial development and business cycle volatility. Among other things, this hypothesis is being tested in this paper.

2.2 Financial Development and Shock Propagation

An interesting aspect of the relationship between finance and macroeconomic volatility is the interaction of financial development and real and monetary volatility and its effect on aggregate output fluctuation. Contrary to the view just outlined, this strand of work does not propose an unambiguous effect of financial development on the business cycle volatility. However, as so often theoretical evidence on shock propagation through financial development (that is, arm's length financing or relationship lending) is rather mixed.

A relevant line of work based on capital market imperfections stresses the amplifying effects on the propagation of real shocks due to finance. Not surprisingly, the channels through which capital markets imperfections work their way through the economy depend heavily on the structure of the model. In their seminal paper, *Kiyotaki – Moore* (1997) argue that the effects of temporary productivity shocks may be amplified by capital market imperfections which tend to affect the net wealth of credit-constrained borrowers. Similarly, *Bernanke – Gertler* (1990) show that business cycle volatility is very likely to be exacerbated by shocks to the net worth of borrowers due to an accelerator effect on investment.

A second strand of literature questions the presumption that capital market imperfections systematically destabilize the business cycle. This line of research raises the point that the seemingly exacerbating impact of imperfect capital markets on business cycle volatility is mainly due to models constructed on special assumptions. *Bacchetta – Caminal* (2000) develop a dynamic general equilibrium macroeconomic model with asymmetric information in credit markets which allows for analyzing in greater detail the propagation of shocks by accounting for the nature of the shocks. They show that the output response to shocks may go either way depending on how the composition of external and internal funds for credit-constrained firms is affected by the shocks. *Beck – Lundberg – Majnoni* (2001) extend this model and show that well-developed financial intermediaries, while dampening the effect of real sector shocks on output volatility, do magnify the impact of monetary shocks on macro-economic volatility (that is, shocks to the banks' balance sheet). The latter is explained by considerations very similar to the credit channel view of monetary policy. *Beck – Lundberg – Majnoni* (2001) argue that firms depend more on external resources in financially developed economies and are thus more exposed to monetary shocks that are transmitted through the financial sector. As to real shocks the argument goes that better-developed financial intermediaries alleviate the cash flow constraint on firms which rely on external funding and therefore dampen the impact of shocks to the production function.

We base our empirical approach mainly on the work of *Beck – Lundberg – Majnoni* (2001). Additionally, we attempt to extend it in various ways by applying a broader set of financial development indicators, such as measures for stock market size and stock market efficiency, and by including different interactions of financial markets with different sources of volatility. Though the model by *Beck – Lundberg – Majnoni* (2001) abstract from channels other than the bank-based credit channel, there are good reasons to conjecture that their main findings hold under conditions in which shock propagation is propelled by the stock or bond market. To be more specific, we will test the following hypotheses: First, we test if there is an unambiguous effect of the stock market on the business cycle volatility as suggested by the conjecture outlined in section 2.1. Second, we check if there is empirical support for the view that not only the credit market, as predicted by the model of *Beck – Lundberg – Majnoni* (2001), but also the stock market magnifies monetary shocks and dampens real shocks. Finally, we also test whether stock market volatility matters as an independent source of macroeconomic volatility.

3. Data and Econometric Methodology

3.1 The Data

The empirical analysis is based on a panel data set for 22 OECD countries built over the period 1970 through 2000. Data quality, data coverage and the high degree of homogeneity of production technology are the main reasons why we restrict our analysis to the OECD countries. The empirical analyses are based on a six-period panel where the data are averaged over non-overlapping five-year intervals aggregated over the periods 1971 through 1975, 1976 through 1980, with 1996 through 2000 representing the last period. The size of the interval is supposed to approximately cover a full length of a normal business cycle. Details as to the OECD countries covered, the variables defined and the data sources referred to are given in the Appendix (Table A). To allow for an examination of the importance of the frequency of the data used, we also average over ten-year periods between 1971 and 2000 aggregated over the periods 1971 through 1980, 1981 through 1990, and 1991 through 2000.

As indicators for fluctuation, we use ex post measures of volatility based on the historical data. A few studies choose an ex ante approach which separates out the unexpected part of volatility by using some form of forecast or expectations formation procedures (i. e., *Ramey – Ramey*, 1995). Since ex ante measures are difficult to construct satisfactorily and, in addition, are likely to lean towards unintentionally removing valuable information from the data we stick to the ex post approach. Departing from *Beck – Lundberg – Majnoni* (2001) we use the standard deviation of the aggregate output gap (CY_SD) and the absolute difference between the maximum and the minimum of the output gap (CY_DIFF) as indicators for macroeconomic volatility. In the sensitivity analysis the set of macroeconomic volatility measures is extended by the standard deviation of annual changes of the real GDP per capita (GDPC_SD) as used by *Beck – Lundberg – Majnoni* (2001).

Thus, as the dependent variable in our regression approach, we alternately use, according to the period chosen (i. e., five or ten-year period), CY_SD and CY_DIFF, respectively. Though these indicators are certainly imperfect output volatility measures they seem to portray sufficiently well those short-lived shocks which are mainly associated with the business cycle.

Further, we identify CAP defined as the value of listed shares on domestic exchanges divided by GDP, LIQ defined as the value of the trades of domestic shares on domestic exchanges divided by GDP, and TURN defined as LIQ divided by CAP as indicators for the strength of arm's length financing and, according to the reasoning in the preceding section, as indicators for the level of overall financial development. CAP measures the size of the stock market while LIQ and TURN are supposed to capture the liquidity and efficiency level of the stock market, respectively. CREDIT equals the value of credits by financial intermediaries to the private sector divided by GDP and is our preferred indicator for the strength of relationship lending. According to *Levine – Loayza – Beck* (2000), CREDIT is a reasonably accurate measure of a country's level and sophistication of financial intermediation and relatively unbiased by the relative importance of state-owned enterprises and the overall level of nationalization.

In addition, we use as an overall measure of financial development a conglomerate index of financial structure constructed by *Demirgüc-Kunt – Levine* (2001). This index, denoted STRUCTURE, is based on measures of size, activity, and efficiency. Higher values of STRUCTURE indicate that the financial system is relatively more market-based than bank-based. For the countries covered STRUCTURE ranges from –0.75 to 2.00.

The set of variables that serves as conditioning information consists of OPEN equaling exports plus imports of goods divided by GDP, of KQ representing the sum of foreign inflows and domestic outflows of capital divided by GDP, of GOV as measured by government consumption expenditure divided by GDP, of INF denoting the annual inflation rate and of INF_SD representing the standard deviation of the quarterly inflation rate, respectively. The latter two variables are to reflect demand shocks. Given an upward sloping aggregate supply curve inflation and its volatility are correlated with output growth variability.

OPEN stands for the "real outward orientation" of an economy and thus for the overall degree to which a country is exposed to external real shocks while KQ is taken as a measure of financial openness and capital account liberalization.

Measuring the size of the government, GOV provides a convenient summary of the strength of the internally stabilizing economic conditions in a given country.

According to the volatility measures approach chosen, we use – thereby following *Beck – Lundberg – Majnoni* (2001) – the standard deviation of terms of trade changes (TOT_SD) as a proxy for real shocks and the standard deviation of the inflation rate (INF_SD) as a proxy for monetary shocks, respectively. The standard deviation of the quarterly changes of the money market rate (R3M_A1_SD) also provides valuable information on the size of monetary shocks and monetary policy interventions, respectively.

The standard deviation of KQ on a quarterly basis, denoted by KQ_SD, is used as an indicator for the exposure of a country to the variability of international financing.

Finally, stock market volatility is calculated by (a) the procedure proposed by *Schwert* (1989) and (b) the standard deviation of monthly share price changes. The former is denoted VOL, the latter VOL_SD.

For the purpose of detecting whether financial development has a role in shock propagation, we also construct a set of interaction terms between financial development indicators such as CAP, TURN, CREDIT and STRUCTURE and monetary and real volatility measures such as INF_SD and TOT_SD, respectively.

An overview of the summary statistics and correlation is given in the Appendix, Table B.

3.2 Econometric Methodology

Methodologically, we use two econometric techniques: (a) an instrument-variable (IV) estimator and (b) the standard fixed effects estimator. Obviously, given the nature of the investigation the application of static panel estimators appears to be appropriate due to the very small efficiency gains which can be expected by using dynamic panel estimators such as the Arellano-Bond's one step GMM estimator in the given context. However, the relationships studied in this paper suggest that joint endogeneity of most variables involved cannot be excluded for sure, though it may not be very likely that two-way causality or simultaneity cause substantial consistency losses. To play it safe we apply a two-stage instrumental variable procedure to ensure that the estimates of the coefficients are consistent. Since GMM-type instruments have not performed well, we rather apply the IV estimator advocated by *Anderson – Hsiao* (1982) to our static set-up. In so doing, we control as rigorously as possible for the potential consistency problems caused by simultaneity, omitted variables and unobserved country-specific effects in the given framework.

Encouraged by various endogeneity checks, we hold that consistency losses due to joint endogeneity of the explanatory variables are of a minor order and thus take the computationally simpler standard fixed effects model to be an appropriate alternative specification. The fixed effects estimator is designed to capture variation across countries and time periods in simple shifts of the regression function (i. e. changes in the intercepts). According to *Judson – Owen* (1999), the fixed effects estimator compares quite well to other estimators in typical static macro panel set-ups for two reasons: first, a macro panel most likely encompasses most of the countries of interest and, second, given that the individual effect represents omitted variables the country-specific characteristics are very likely to be correlated with the other regressors. Under these preconditions, the fixed effects least squares, also known as least squares dummy variable estimator (LSDV), generates an unbiased estimate of the coefficients.

The basic regression equation estimated by both techniques takes the following form:

$$\sigma_{i,t} = \alpha + \beta\, FINANCE_{i,t} + \gamma[INTERACTING\ SET]_{i,t} + \delta[CONDITIONING\ SET]_{i,t} + \lambda_t + \eta_i + \varepsilon_{i,t}$$

with time periods *t=1,….,T*; and countries *i=1,….,N*. The λ_t and η_i are respectively time- and country-specific effects, and $\varepsilon_{i,t}$ is the remainder stochastic disturbance term. The dependent variable $\sigma_{i,t}$ equals either CY_SD, or CY_DIFF, the regressor FINANCE equals either CAP, TURN, CREDIT, or STRUCTURE, the INTERACTING SET consists of interaction terms of FINANCE variables with variables of the CONDITIONING SET such as INF_SD, TOT_SD, VOL_SD and VOL, respectively. The set of conditioning information also contains the variables KQ_SD, KQ, OPEN, and GOV. As already mentioned, the latter three variables are included to control for the prime external and internal factors closely associated with the magnitude of output growth fluctuations at the macroeconomic level.

As specification tests for the IV estimator we use a Sargan test of overidentifying restrictions and a test of lack of residual serial correlation. A persistent serial correlation of the residuals indicates that unobserved group-specific effects are present.

4. The Findings

4.1 Regressions Results

We start with presenting the regression results from our 22 OECD country panel, with data averaged over six sub-periods from 1970 through 2000, based on the reduced-form regression similar in spirit to the specification run by *Beck – Lundberg – Majnoni* (2001). The specification used in this paper differs from that in *Beck – Lundberg – Majnoni* (2001) in that the variables defined to capture the interaction of financial development and real or monetary volatility enter the equation lagged by one period in order to avoid instability in the parameter estimates due to multicollinearity. The latter is caused by the correlation of the interaction terms with their components. In addition, the conditioning information set of our regression approach also contains the logarithm of GOV, which is an appropriate measure of government size and thus most suitable to capture the independent and supposedly mitigating impact of a large government sector on macroeconomic volatility.

The results in Table 1 confirm the findings of *Beck – Lundberg – Majnoni* (2001) as to the magnifying effect of financial intermediary development on the propagation of monetary volatility, but show far stronger evidence in favor of a mitigating effect of financial intermediary development on the propagation of real shocks. We should here mention that the empirical analysis of *Beck – Lundberg – Majnoni* (2001) is primarily based on a three-period panel data set aggregated over the periods 1960 through 1972, 1973 through 1985, and 1986 through 1997, covering 63 countries including the OECD region as subset.

In accordance with *Beck – Lundberg – Majnoni* (2001), we also detect no unambiguous relationship between financial intermediary development, as represented by the logarithm of CREDIT, and the magnitude of business cycle volatility. The regression results also indicate that more open economies face larger business cycle fluctuations, while countries with a large government enjoy the opposite. Both results meet our expectations. Not surprisingly, inflation and terms of trade volatility enhance macro volatility independently.

However, when introducing stock market measures as indicators for financial development, we get partly strong empirical evidence for the popular view that there is an independent and robust relationship of arm's length financing with the severity of macroeconomic volatility. The results displayed suggest that both stock market size (less significantly) and stock market efficiency (more significantly), as measured by the logarithm of CAP and TURN, do magnify cycle fluctuations, even when controlling for interactions terms. In almost all estimations, the used stock market measures CAP and, particularly, TURN enter positively and mostly significantly at the standard 5 percent level. The same applies to their interaction with the standard deviation of inflation and the standard deviation of terms-of-trade changes, respectively, though with the expected offsetting signs on the two interaction terms. However, as the results in Table 2 show that this evidence weakens when both CREDIT and CAP, or TURN, enter the equation simultaneously. This is most likely due to multicollinearity which increases the size of the estimated variance.

The results presented in Table 3 and Table 4 are obtained by IV-estimations of an augmented version of the basic specification. Empirical evidence suggests that increasing financial openness tends to decrease short-term macro volatility, while theory is still rather mixed on this topic (see, among others, *Basu – Taylor*, 1999, and *Buch – Döpke – Pierdzioch*, 2002). Financial openness is assumed to alleviate external funding constraints of leveraged firms and ease risk diversification for private households, both of which is expected to smooth out aggregate output growth intertemporally. However, there is also the presumption that international financial integration favors the flow of highly volatile short-term capital, thereby increasing business cycle fluctuations. We account for these seemingly offsetting independent impacts of financial openness on macro volatility by adding the variables KQ and KQ_SD to the

Table 1: Fixed Effects Estimation

1971 through 2000, five-year averages

Dependent Variables	CY_SD	CY_DIFF	CY_SD	CY_DIFF	CY_SD	CY_DIFF
Regressors						
Constant	-0,0022	0,0002	0,0043	0,0163	0,0087	0,0217
	(0,687)	*(0,988)*	*(0,297)*	*(0,086)*	*(0,096)*	*(0,060)*
$\ln(GOV)_t$	-0,0093	-0,0158	-0,0053	-0,0065	-0,0051	-0,0054
	(0,004)	*(0,028)*	*(0,018)*	*(0,215)*	*(0,071)*	*(0,420)*
$\ln(OPEN)_t$	0,0036	0,0086	0,0038	0,0090	0,0054	0,0115
	(0,007)	*(0,003)*	*(0,004)*	*(0,003)*	*(0,006)*	*(0,013)*
INF_SD_t	0,0008	0,0029	0,0008	0,0030	0,0008	0,0027
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
TOT_SD_t	0,0098	0,0290	0,0107	0,0308	0,0110	0,0325
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,001)*	*(0,000)*
$\ln(CREDIT)_t$	-0,0008	-0,0024				
	(0,642)	*(0,586)*				
interaction	0,0003	0,0008				
$(\ln(CREDIT)*INF\_SD)_{t-1}$	*(0,000)*	*(0,000)*				
interaction	-0,0765	-0,1638				
$(\ln(CREDIT)*TOT\_SD)_{t-1}$	*(0,001)*	*(0,001)*				
$\ln(CAP)_t$			0,0012	0,0037		
			(0,308)	*(0,087)*		
interaction			0,0001	0,0003		
$(\ln(CAP)*INF\_SD)_{t-1}$			*(0,001)*	*(0,000)*		
interaction			-0,0470	-0,1105		
$(\ln(CAP)*TOT\_SD)_{t-1}$			*(0,010)*	*(0,003)*		
$\ln(TURN)_t$					0,0027	0,0054
					(0,017)	*(0,035)*
interaction					0,0002	0,0003
$(\ln(TURN)*INF\_SD)_{t-1}$					*(0,000)*	*(0,013)*
interaction					-0,0546	-0,1314
$(\ln(TURN)*TOT\_SD)_{t-1}$					*(0,014)*	*(0,003)*
R^2	0,426	0,499	0,380	0,473	0,389	0,472
Wald test for			p-values			
joint significance	0,000	0,000	0,000	0,000	0,000	0,000
joint dummy significance	0,000	0,000	0,000	0,000	0,000	0,000
time dummy significance	0,000	0,000	0,000	0,000	0,000	0,000
Serial correlation test						
AR(1)	0,935	0,969	0,367	0,633	0,812	0,791
AR(2)	0,347	0,413	0,231	0,309	0,478	0,486

Countries: 22; number of observations: 110. – The regressions also include dummy variables for the different time periods that are not reported; p-values in parentheses; heteroskedasticity-consistent standard errors are used.

Table 2: Fixed Effects Estimation

1971 through 2000, five-year averages

Dependent Variables	CY_SD	CY_DIFF	CY_SD	CY_DIFF
Regressors				
Constant	-0,0008	0,0060	-0,0016	0,0062
	(0,890)	*(0,637)*	*(0,818)*	*(0,661)*
$\ln(GOV)_t$	-0,0079	-0,0119	-0,0091	-0,0134
	(0,019)	*(0,105)*	*(0,011)*	*(0,076)*
$\ln(OPEN)_t$	0,0035	0,0082	0,0055	0,0116
	(0,006)	*(0,003)*	*(0,001)*	*(0,002)*
INF_SD_t	0,0008	0,0029	0,0009	0,0030
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*
TOT_SD_t	0,0103	0,0305	0,0087	0,0284
	(0,000)	*(0,000)*	*(0,002)*	*(0,000)*
$\ln(CREDIT)_t$	-0,0022	-0,0067	-0,0013	-0,0045
	(0,283)	*(0,205)*	*(0,526)*	*(0,377)*
interaction	0,0008	0,0017	0,0003	0,0007
$(\ln(CREDIT)*INF\_SD)_{t-1}$	*(0,252)*	*(0,156)*	*(0,349)*	*(0,156)*
interaction	-0,0705	-0,1276	-0,0480	-0,0792
$(\ln(CREDIT)*TOT\_SD)_{t-1}$	*(0,061)*	*(0,107)*	*(0,075)*	*(0,164)*
$\ln(CAP)_t$	0,0009	0,0036		
	(0,340)	*(0,056)*		
interaction	-0,0002	-0,0005		
$(\ln(CAP)*INF\_SD)_{t-1}$	*(0,471)*	*(0,392)*		
interaction	-0,0064	-0,0309		
$(\ln(CAP)*TOT\_SD)_{t-1}$	*(0,769)*	*(0,467)*		
$\ln(TURN)_t$			0,0023	0,0046
			(0,004)	*(0,016)*
interaction			0,0000	0,0000
$(\ln(TURN)*INF\_SD)_{t-1}$			*(0,911)*	*(0,929)*
interaction			-0,0292	-0,0856
$(\ln(TURN)*TOT\_SD)_{t-1}$			*(0,106)*	*(0,012)*
R^2	0,448	0,522	0,461	0,531
Wald test for	p-values			
joint significance	0,000	0,000	0,000	0,000
joint dummy significance	0,000	0,000	0,000	0,000
time dummy significance	0,000	0,000	0,000	0,000
Serial correlation test				
AR(1)	0,715	0,846	0,597	0,666
AR(2)	0,318	0,369	0,383	0,450

Countries: 22; number of observations: 110. – The regressions also include dummy variables for the different time periods that are not reported; p-values in parentheses; heteroskedasticity-consistent standard errors are used.

Table 3: Two-Stage Instrument Variable Estimation
1971 through 2000, five-year averages

Dependent Variables	CY_SD	CY_DIFF	CY_SD	CY_DIFF	CY_SD	CY_DIFF
Regressors						
Constant	-0,0015	0,0029	0,0056	0,0195	0,0065	0,0201
	(0,750)	*(0,792)*	*(0,183)*	*(0,043)*	*(0,244)*	*(0,090)*
$\ln(GOV)_t$	-0,0104	-0,0164	-0,0073	-0,0091	-0,0067	-0,0075
	(0,000)	*(0,012)*	*(0,001)*	*(0,104)*	*(0,004)*	*(0,193)*
$\ln(OPEN)_t$	0,0059	0,0118	0,0064	0,0130	0,0064	0,0128
	(0,000)	*(0,000)*	*(0,000)*	*(0,001)*	*(0,000)*	*(0,002)*
INF_SD_t	0,0008	0,0029	0,0008	0,0030	0,0009	0,0030
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
TOT_SD_t	0,0190	0,0504	0,0189	0,0495	0,0165	0,0446
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*	*(0,001)*	*(0,000)*
KQ_t	-0,0385	-0,0856	-0,0336	-0,0749	-0,0235	-0,0515
	(0,004)	*(0,001)*	*(0,014)*	*(0,016)*	*(0,077)*	*(0,078)*
KQ_SD_t	0,0263	0,0613	0,0221	0,0521	0,0160	0,0380
	(0,012)	*(0,004)*	*(0,036)*	*(0,031)*	*(0,124)*	*(0,100)*
$\ln(CREDIT)_t$	0,0002	-0,0009				
	(0,885)	*(0,814)*				
interaction	0,0003	0,0008				
$(\ln(CREDIT)*INF\_SD)_{t-1}$	*(0,000)*	*(0,000)*				
interaction	-0,0799	-0,1689				
$(\ln(CREDIT)*TOT\_SD)_{t-1}$	*(0,000)*	*(0,000)*				
$\ln(CAP)_t$			0,0021	0,0051		
			(0,094)	*(0,038)*		
interaction			0,0001	0,0003		
$(\ln(CAP)*INF\_SD)_{t-1}$			*(0,001)*	*(0,000)*		
interaction			-0,0460	-0,1083		
$(\ln(CAP)*TOT\_SD)_{t-1}$			*(0,012)*	*(0,003)*		
$\ln(TURN)_t$					0,0029	0,0063
					(0,019)	*(0,031)*
interaction					0,0002	0,0004
$(\ln(TURN)*INF\_SD)_{t-1}$					*(0,000)*	*(0,000)*
interaction					-0,0599	-0,1431
$(\ln(TURN)*TOT\_SD)_{t-1}$					*(0,007)*	*(0,001)*
Wald test for			p-values			
joint significance	0,000	0,000	0,000	0,000	0,000	0,000
joint dummy significance	0,000	0,000	0,000	0,000	0,000	0,000
time dummy significance	0,000	0,000	0,000	0,000	0,000	0,000
Sargan test[1)]	0,608	0,496	0,503	0,381	0,424	0,471
Serial correlation test						
AR(1)	0,578	0,870	0,273	0,615	0,644	0,866
AR(2)	0,096	0,107	0,104	0,135	0,188	0,192

Countries: 21; number of observations: 105. – The regressions also include dummy variables for the different time periods that are not reported; the respective lagged one endogenous variable and private fixed investment divided by gross domestic product are added as additional instruments; p-values in parentheses; heteroskedasticity-consistent standard errors are used. – [1]) The null hypothesis is that the instruments used are not correlated with the residuals.

Table 4: Two-Stage Instrument Variable Estimation
1971 through 2000, five-year averages

Dependent Variables	CY_SD	CY_DIFF	CY_SD	CY_DIFF
Regressors				
Constant	0,0010	0,0101	0,0024	0,0114
	(0,830)	*(0,353)*	*(0,697)*	*(0,399)*
$\ln(GOV)_t$	-0,0101	-0,0148	-0,0090	-0,0121
	(0,000)	*(0,020)*	*(0,007)*	*(0,091)*
$\ln(OPEN)_t$	0,0063	0,0128	0,0062	0,0124
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*
INF_SD_t	0,0008	0,0030	0,0008	0,0030
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*
TOT_SD_t	0,0207	0,0539	0,0179	0,0478
	(0,000)	*(0,000)*	*(0,000)*	*(0,000)*
KQ_t	-0,0436	-0,0946	-0,0327	-0,0695
	(0,002)	*(0,001)*	*(0,033)*	*(0,018)*
KQ_SD_t	0,0290	0,0655	0,0226	0,0508
	(0,006)	*(0,002)*	*(0,059)*	*(0,032)*
$\ln(CREDIT)_t$	-0,0017	-0,0056	-0,0011	-0,0048
	(0,339)	*(0,202)*	*(0,572)*	*(0,325)*
interaction	0,0010	0,0021	0,0004	0,0009
$(\ln(CREDIT)*INF\_SD)_{t-1}$	*(0,107)*	*(0,053)*	*(0,221)*	*(0,062)*
interaction	-0,0837	-0,1529	-0,0557	-0,0936
$(\ln(CREDIT)*TOT\_SD)_{t-1}$	*(0,013)*	*(0,034)*	*(0,029)*	*(0,088)*
$\ln(CAP)_t$	0,0020	0,0053		
	(0,032)	*(0,015)*		
interaction	-0,0004	-0,0007		
$(\ln(CAP)*INF\_SD)_{t-1}$	(0,245)	(0,189)		
interaction	0,0013	-0,0159		
$(\ln(CAP)*TOT\_SD)_{t-1}$	(0,952)	(0,703)		
$\ln(TURN)_t$			0,0023	0,0057
			(0,042)	*(0,032)*
interaction			-0,0000	-0,0001
$(\ln(TURN)*INF\_SD)_{t-1}$			*(0,867)*	*(0,702)*
interaction			-0,0234	-0,0741
$(\ln(TURN)*TOT\_SD)_{t-1}$			*(0,231)*	*(0,044)*
Wald test for		p-values		
joint significance	0,000	0,000	0,000	0,000
joint dummy significance	0,000	0,000	0,000	0,000
time dummy significance	0,000	0,000	0,000	0,000
Sargan test[1)]	0,599	0,400	0,617	0,525
Serial correlation test				
AR(1)	0,469	0,734	0,541	0,760
AR(2)	0,083	0,098	0,148	0,157

Countries: 21; number of observations: 105. – The regressions also include dummy variables for the different time periods that are not reported; the respective lagged one endogenous variable and private fixed investment divided by gross domestic product are added as additional instruments; p-values in parentheses; heteroskedasticity-consistent standard errors are used. – [1]) The null hypothesis is that the instruments used are not correlated with the residuals.

regression equation. We use these simple measures rather than constructing more complex ones (i. e., based on principal components) because of the poor quality of the available capital account data. For this reason, we also refrain from controlling for the interaction of financial openness with the sources of real and monetary shocks as suggested by theory.

We take it as an encouraging sign that the Sargan and serial correlation tests support this extended version of our base model.

As to financial openness the results match the predictions just outlined while not interfering with the results already established. The degree of financial integration of a high-income economy as measured by KQ dampens the business cycle while the volatility of international capital flows as measured by KQ_SD magnifies overall macro output fluctuations.

Building on the results obtained by these estimations we ran various regressions, all of which aimed to search for an independent relationship of financial development, as measured by the importance of arm's length financing, with overall business cycle volatility. The results are shown in Table 5 to Table 7 and mostly confirm the robustness of our main finding that there seems to be an unambiguous effect of financial development on the business cycle in high-income countries. Most importantly, these results indicate, particularly significantly when CY_DIFF is used as the independent variable, that it is the interaction of stock market size and stock market volatility that matters as a source of business cycle destabilization. A noteworthy result is also that monetary shocks as measured by the monthly variability of the three-month money market rate (R3M_A1_SD) increase the amplitude of the cycle. This effect tends to be stronger in countries with more market-based financial systems.

4.2 Sensitivity Analyses

In order to gauge the robustness of our findings we have carried out a large number of checks. To this end, we divided our data set in ten-year periods, aggregated over the periods 1971 through 1980, 1981 through 1990, and 1991 through 2000, included GDPC_SD as an additional measure of macro output volatility and re-estimated various model specifications with LSDV. To sum up, the results in Table 8 to Table 10 show that the presented findings as to the empirical relevance of an independent relationship of stock market development with macroeconomic volatility survive many of the robustness tests conducted. More sensitivity results are available on request.

Table 5: Fixed Effects Estimation

1971 through 2000, five-year averages

Dependent Variables	CY_SD	CY_DIFF	CY_SD	CY_DIFF	CY_SD	CY_DIFF
Regressors						
Constant	0,0116	0,0327	0,0110	0,0311	0,0109	0,0317
	(0,031)	*(0,024)*	*(0,039)*	*(0,033)*	*(0,055)*	*(0,033)*
$\ln(GOV\_I)_t$	-0,0081	-0,0170	-0,0084	-0,0178	-0,0084	-0,0170
	(0,006)	*(0,028)*	*(0,004)*	*(0,021)*	*(0,011)*	*(0,035)*
$\ln(OPEN\_I)_t$	0,0024	0,0053	0,0025	0,0055	0,0028	0,0065
	(0,038)	*(0,075)*	*(0,033)*	*(0,065)*	*(0,023)*	*(0,042)*
INF_I_t	0,0003	0,0006				
	(0,000)	*(0,000)*				
$DEFL\_I_t$			0,0003	0,0006		
			(0,000)	*(0,000)*		
$R3M\_A1\_SD_t$					0,0009	0,0022
					(0,000)	*(0,000)*
$STRUCTURE_t$	0,0043	0,0105	0,0044	0,0108	0,0037	0,0091
	(0,012)	*(0,029)*	*(0,014)*	*(0,033)*	*(0,044)*	*(0,079)*
interaction	0,0000	0,0005	-0,0000	0,0004	0,0000	0,0006
$(STRUCTURE*INF\_SD)_t$	*(0,339)*	*(0,000)*	*(0,569)*	*(0,002)*	*(0,284)*	*(0,000)*
interaction	-0,1437	-0,3548	-0,1413	-0,3478	-0,1300	-0,3208
$(STRUCTURE*TOT\_SD)_t$	*(0,011)*	*(0,020)*	*(0,015)*	*(0,026)*	*(0,034)*	*(0,055)*
R^2	0,335	0,331	0,328	0,322	0,275	0,274
Countries	22	22	22	22	22	22
Number of obervations	132	132	132	132	129	129
Wald test for			p-values			
joint significance	0,000	0,000	0,000	0,000	0,000	0,000
joint dummy significance	0,000	0,000	0,000	0,000	0,000	0,000
time dummy significance	0,000	0,000	0,000	0,000	0,000	0,000
Serial correlation test						
AR(1)	0,205	0,569	0,208	0,594	0,178	0,433
AR(2)	0,879	0,520	0,906	0,574	0,466	0,256

_I ... Initial values. – The regressions also include dummy variables for the different time periods that are not reported; p-values in parentheses; heteroskedasticity-consistent standard errors are used.

Table 6: Fixed Effects Estimation

1971 through 2000, five-year averages

Dependent Variables	CY_SD	CY_DIFF	CY_SD	CY_DIFF	CY_SD	CY_DIFF
Regressors						
Constant	0,0044	0,0196	0,0024	0,0138	0,0022	0,0134
	(0,519)	*(0,258)*	*(0,744)*	*(0,439)*	*(0,778)*	*(0,472)*
$\ln(GOV\_I)_t$	-0,0116	-0,0234	-0,0116	-0,0233	-0,0117	-0,0235
	(0,008)	*(0,030)*	*(0,011)*	*(0,035)*	*(0,010)*	*(0,034)*
$\ln(OPEN\_I)_t$	0,0039	0,0083	0,0042	0,0091	0,0041	0,0089
	(0,035)	*(0,075)*	*(0,034)*	*(0,067)*	*(0,033)*	*(0,067)*
INF_I_t	0,0008	0,0019				
	(0,001)	*(0,001)*				
INF_t			0,0766	0,2051	0,0740	0,1993
			(0,020)	*(0,006)*	*(0,018)*	*(0,006)*
interaction	0,0002	0,0006	0,0003	0,0007		
$(\ln(CAP)*VOL\_SD)_t$	*(0,116)*	*(0,062)*	*(0,103)*	*(0,038)*		
interaction					0,0003	0,0009
$(\ln(CAP)*VOL)_t$					*(0,168)*	*(0,086)*
R^2	0,239	0,241	0,219	0,224	0,214	0,219
Wald test for			p-values			
joint significance	0,000	0,000	0,039	0,017	0,031	0,008
joint dummy significance	0,000	0,000	0,000	0,000	0,000	0,000
time dummy significance	0,000	0,000	0,000	0,000	0,000	0,000
Serial correlation test						
AR(1)	0,161	0,113	0,201	0,144	0,218	0,156
AR(2)	0,644	0,519	0,758	0,559	0,791	0,592

_I ... Initial values. – Countries: 18; number of observations: 108. – The regressions also include dummy variables for the different time periods that are not reported; p-values in parentheses; heteroskedasticity-consistent standard errors are used.

Table 7: Fixed Effects Estimation

1971 through 2000, five-year averages

Dependent Variables	CY_SD	CY_DIFF	CY_SD	CY_DIFF	CY_SD	CY_DIFF
Regressors						
Constant	0,0119	0,0298	0,0172	0,0422	0,0171	0,0421
	(0,044)	*(0,074)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,000)*
$\ln(GOV\_I)_t$	-0,0087	-0,0203				
	(0,012)	*(0,026)*				
$\ln(OPEN\_I)_t$	0,0029	0,0060				
	(0,038)	*(0,067)*				
INF_t			0,0742	0,1946	0,0714	0,1884
			(0,024)	*(0,005)*	*(0,022)*	*(0,005)*
TOT_SD_t			0,0188	0,0484	0,0188	0,0485
			(0,001)	*(0,000)*	*(0,001)*	*(0,000)*
interaction	-0,0961	-0,1988				
$(STRUCTURE*TOT\_SD)_t$	*(0,005)*	*(0,055)*				
interaction	0,0009	0,0023				
$(STRUCTURE*R3M\_A1\_SD)_t$	*(0,000)*	*(0,003)*				
interaction			0,0002	0,0006		
$(\ln(CAP)*VOL\_SD)_t$			*(0,134)*	*(0,043)*		
interaction					0,0003	0,0008
$(\ln(CAP)*VOL)_t$					*(0,234)*	*(0,107)*
R^2	0,268	0,245	0,201	0,233	0,197	0,228
Countries	22	22	18	18	18	18
Number of observations	129	129	108	108	108	108
Wald test for			p-values			
joint significance	0,000	0,000	0,012	0,001	0,011	0,001
joint dummy significance	0,000	0,000	0,000	0,000	0,000	0,000
time dummy significance	0,000	0,000	0,000	0,000	0,000	0,000
Serial correlation test						
AR(1)	0,216	0,510	0,160	0,128	0,177	0,143
AR(2)	0,351	0,217	0,405	0,190	0,427	0,194

_I ... Initial values. – The regressions also include dummy variables for the different time periods that are not reported; p-values in parentheses; heteroskedasticity-consistent standard errors are used.

Table 8: Sensitivity Test – Fixed Effects Estimation
1971 through 2000, ten-year averages

Dependent Variables	GDPC_SD	CY_SD	GDPC_SD	CY_SD	GDPC_SD	CY_SD
Regressors						
Constant	-0,0030	0,0089	0,0082	0,0199	0,0022	0,0145
	(0,518)	*(0,150)*	*(0,239)*	*(0,005)*	*(0,751)*	*(0,048)*
$\ln(GOV)_t$	-0,0114	-0,0044	-0,0095	-0,0015	-0,0109	-0,0058
	(0,005)	*(0,260)*	*(0,053)*	*(0,669)*	*(0,030)*	*(0,170)*
$\ln(OPEN)_t$	0,0044	0,0015	0,0053	0,0024	0,0048	0,0040
	(0,093)	*(0,353)*	*(0,030)*	*(0,159)*	*(0,115)*	*(0,160)*
INF_SD_t	0,0035	0,0023	0,0018	0,0010	0,0016	0,0007
	(0,000)	*(0,000)*	*(0,020)*	*(0,001)*	*(0,000)*	*(0,000)*
TOT_SD_t	-0,0307	-0,0343	-0,0553	-0,0614	-0,0756	-0,0704
	(0,037)	*(0,094)*	*(0,013)*	*(0,015)*	*(0,019)*	*(0,092)*
$\ln(CREDIT)_t$	-0,0005	0,0040				
	(0,898)	*(0,354)*				
interaction	0,0018	0,0012				
$(\ln(CREDIT)*INF\_SD)_t$	*(0,000)*	*(0,000)*				
interaction	-0,1147	-0,1439				
$(\ln(CREDIT)*TOT\_SD)_t$	*(0,006)*	*(0,020)*				
$\ln(CAP)_t$			0,0037	0,0054		
			(0,014)	*(0,019)*		
interaction			0,0004	0,0002		
$(\ln(CAP)*INF\_SD)_t$			*(0,102)*	*(0,047)*		
interaction			-0,0916	-0,1091		
$(\ln(CAP)*TOT\_SD)_t$			*(0,002)*	*(0,003)*		
$\ln(TURN)_t$					0,0014	0,0040
					(0,478)	*(0,093)*
interaction					0,0005	0,0002
$(\ln(TURN)*INF\_SD)_t$					*(0,001)*	*(0,079)*
interaction					-0,1040	-0,1009
$(\ln(TURN)*TOT\_SD)_t$					*(0,005)*	*(0,046)*
R^2	0,508	0,410	0,448	0,400	0,467	0,335
Wald test for			p-values			
joint significance	0,000	0,000	0,000	0,000	0,000	0,000
joint dummy significance	0,150	0,003	0,384	0,000	0,491	0,001
time dummy significance	0,142	0,041	0,271	0,026	0,319	0,033
Serial correlation test						
AR(1)	0,749	0,816	0,406	0,551	0,624	0,870
AR(2)	0,945	0,414	0,955	0,280	0,485	0,275

Countries: 22; number of observations: 66. The regressions also include dummy variables for the different time periods that are not reported; p-values in parentheses; heteroskedasticity-consistent standard errors are used.

Table 8

Table 9: Sensitivity Test – Fixed Effects Estimation
1971 through 2000, ten-year averages

Dependent Variables	GDPC_SD	CY_SD	GDPC_SD	CY_SD
Regressors				
Constant	-0,0016	0,0129	-0,0043	0,0081
	(0,755)	*(0,089)*	*(0,511)*	*(0,318)*
$\ln(GOV)_t$	-0,0120	-0,0041	-0,0093	-0,0056
	(0,004)	*(0,325)*	*(0,032)*	*(0,229)*
$\ln(OPEN)_t$	0,0045	0,0019	0,0028	0,0020
	(0,048)	*(0,269)*	*(0,319)*	*(0,409)*
INF_SD_t	0,0034	0,0016	0,0036	0,0022
	(0,004)	*(0,045)*	*(0,000)*	*(0,003)*
TOT_SD_t	-0,0313	-0,0493	-0,0314	-0,0255
	(0,082)	*(0,025)*	*(0,342)*	*(0,379)*
$\ln(CREDIT)_t$	-0,0030	-0,0004	-0,0002	0,0036
	(0,562)	*(0,926)*	*(0,954)*	*(0,452)*
interaction	0,0021	0,0011	0,0017	0,0013
$(\ln(CREDIT)*INF\_SD)_t$	*(0,001)*	*(0,008)*	*(0,000)*	*(0,002)*
interaction	-0,1088	-0,0909	-0,1026	-0,1601
$(\ln(CREDIT)*TOT\_SD_t$	*(0,063)*	*(0,142)*	*(0,033)*	*(0,013)*
$\ln(CAP)_t$	0,0022	0,0039		
	(0,259)	*(0,020)*		
interaction	-0,0002	-0,0002		
$(\ln(CAP)*INF\_SD)_t$	*(0,676)*	*(0,445)*		
interaction	-0,0029	-0,0456		
$(\ln(CAP)*TOT\_SD)_t$	*(0,936)*	*(0,053)*		
$\ln(TURN)_t$			-0,0015	0,0002
			(0,423)	*(0,890)*
interaction			0,0002	-0,0002
$(\ln(TURN)*INF\_SD)_t$			*(0,433)*	*(0,390)*
interaction			-0,0099	0,0190
$(\ln(TURN)*TOT\_SD)_t$			*(0,812)*	*(0,597)*
R^2	0,520	0,440	0,521	0,416
Wald test for		p-values		
joint significance	0,000	0,000	0,000	0,000
joint dummy significance	0,170	0,001	0,057	0,016
time dummy significance	0,179	0,030	0,062	0,060
Serial correlation test				
AR(1)	0,986	0,951	0,873	0,792
AR(2)	0,989	0,385	0,897	0,356

Countries: 22; number of observations: 66. The regressions also include dummy variables for the different time periods that are not reported; p-values in parentheses; heteroskedasticity-consistent standard errors are used.

Table 10: Sensitivity Test – Fixed Effects Estimation
1971 through 2000, ten-year averages

Dependent Variables	GDPC_SD	CY_SD	GDPC_SD	CY_SD	GDPC_SD	CY_SD	GDPC_SD	CY_SD
Regressors								
Constant	0,0163	0,0115	0,0180	0,0169	0,0177	0,0175	0,0158	0,0116
	(0,000)	*(0,011)*	*(0,000)*	*(0,001)*	*(0,000)*	*(0,000)*	*(0,000)*	*(0,008)*
INF_t	0,1216	0,1385					0,1224	0,1439
	(0,000)	*(0,001)*					*(0,000)*	*(0,001)*
INF_SD_t			0,0026	0,0019	0,0027	0,0019		
			(0,000)	*(0,010)*	*(0,000)*	*(0,006)*		
TOT_SD_t	0,0190	0,0195	0,0199	0,0209	0,0199	0,0210	0,0188	0,0194
	(0,000)	*(0,000)*	*(0,000)*	*(0,001)*	*(0,000)*	*(0,001)*	*(0,000)*	*(0,000)*
interaction					0,0006	0,0005	0,0007	0,0006
$(\ln(CAP)*VOL\_SD)_t$					*(0,002)*	*(0,046)*	*(0,000)*	*(0,003)*
interaction	0,0010	0,0007	0,0008	0,0005				
$(\ln(CAP)*VOL)_t$	*(0,001)*	*(0,017)*	*(0,008)*	*(0,166)*				
R^2	0,266	0,272	0,284	0,217	0,300	0,238	0,278	0,298
Wald test for				p-values				
joint significance	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
joint dummy significance	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
time dummy significance	0,534	0,008	0,141	0,145	0,252	0,076	0,699	0,001
Serial correlation test								
AR(1)	0,422	0,522	0,763	0,772	0,977	0,644	0,629	0,608
AR(2)	0,094	0,103	0,060	0,069	0,069	0,063	0,117	0,097

Countries: 18; number of observations: 54. The regressions also include dummy variables for the different time periods that are not reported; p-values in parentheses; heteroskedasticity-consistent standard errors are used.

5. Concluding Remarks

This paper examined the nature of the linkage between financial development and economic fluctuation in 22 OECD countries over the period 1970 through 2000. We used two econometric techniques. The first, a cross-sectional instrument variable estimator, deals, to some degree, with the potential problems caused by simultaneity, omitted variables and unobserved country-specific effects. In addition, we used the standard fixed effects model. The latter is designed to capture variation across country and time period in simple shifts of the regression function (i. e., changes in the intercepts). The results obtained by these techniques confirm that arm's length financing has a role in destabilizing the business cycle in the OECD countries while relationship lending is neutral in this respect. The magnitude of the independent impact of the stock market on output growth fluctuation is significant. In accordance with theory, there is also a strong indication that both market-based and bank-based financial systems magnify the impact of monetary shocks on macroeconomic volatility whereas real shocks are dampened by well-developed financial systems. Finally, the results indicate that it is the interaction of stock market size and stock market volatility that matters as a source of business cycle destabilization.

It goes without saying that the presented results are highly preliminary, emphasizing very clearly that much more investigation is needed before we can be confident that there is a causal relationship between financial market developments and macroeconomic volatility.

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Appendix

Table A: Variables and Sources *Data Appendix*

Variable	Definition	Original source	Second source
CAP	Market capitalization of domestic shares divided by gross domestic product	World Federation of Exchanges (gross domestic product: WIFO database)	Own calculations for 1970 through 1973
CREDIT	Claims on private sector divided by gross domestic product	IMF, International Financial Statistics (lines 22d + 42d)	
CY_DIFF	Difference between minimum and maximum output gap (defined as deviation of real gross domestic product from potential gross domestic product divided by potential gross domestic product)	OECD, Economic Outlook	
DEFL	Annual changes of gross domestic product deflator	WIFO database	
GDPC	Real gross domestic product per capita	OECD, Economic Outlook	
GOV	Government consumption divided by gross domestic product	OECD, National Accounts (gross domestic product: WIFO database)	
INF	Annual changes of consumer price index	OECD, Main economic indicators	
KQ	Direct investment abroad and in reporting economy plus portfolio investment assets and liabilities divided by gross domestic product	IMF, Balance of Payments Statistics (lines 4505+4555+ 4602+4652; gross domestic product: WIFO database)	
LIQ	Values of domestic share trading divided by gross domestic product	World Federation of Exchanges (gross domestic product: WIFO database)	Own calculations for 1970 through 1983
OPEN	Exports of goods plus imports of goods divided by gross domestic product	IMF, International Financial Statistics (gross domestic product: WIFO database)	
R3M	Interbank 3-month interest rate	WIFO database	
STRUCTURE	Conglomerate index of financial development, constructed by *Demirgüc-Kunt – Levine* (2001)		
TOT	Terms of trade (export prices divided by import prices)	IMF, International Financial Statistics	
TURN	LIQ divided by CAP		
VOL	Share price volatility, based on *Schwert* (1989)		
CY_SD	Standard deviation of output gap		
GDPC_SD	Standard deviation of quarterly real gross domestic product per capita changes		
INF_SD	Standard deviation of quarterly inflation rate		
KQ_SD	Standard deviation of KQ		
R3M_A1_SD	Standard deviation of monthly changes of R3M		
TOT_SD	Standard deviation of quarterly terms of trade changes		
VOL_SD	Standard deviation of monthly share price changes		
Countries	Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Turkey, United Kingdom, USA.		

Table B: Summary Statistics

Cross-section 1971 through 2000

	CY_SD	CY_ DIFF	GDPC _SD	GOV	OPEN	KQ	CAP	LIQ	CRE- DIT	TURN	STRUC- TURE	INF	INF_SD	TOT _SD	KQ_SD	R3M _A1_SD	VOL	VOL _SD
Descriptive statistics																		
Means																		
	0,0242	0,0947	0,0210	0,1999	0,4784	0,0893	0,3720	0,1587	0,7224	0,3227	0,0869	5,7741	4,0771	0,0591	0,1439	1,1619	3,4840	5,1294
Standard deviation																		
	0,0071	0,0320	0,0055	0,0416	0,2413	0,0886	0,2013	0,0942	0,2604	0,1566	0,7160	1,6165	1,2270	0,0312	0,2242	0,2173	0,6585	0,9492
Correlations																		
CY_SD	1,0000	0,9648	0,8623	0,0006	-0,0067	-0,0328	0,0942	-0,0809	-0,2568	-0,2753	-0,0447	0,4454	0,4161	0,0722	-0,0263	0,2098	0,2228	0,2557
CY_DIFF		1,0000	0,8882	-0,0779	-0,0568	-0,0828	0,1498	-0,0226	-0,2788	-0,2614	0,0278	0,4668	0,4709	0,1052	-0,0724	0,3126	0,1174	0,1543
GDPC_SD			1,0000	-0,3255	-0,1802	-0,1777	0,0441	-0,0162	-0,1466	-0,0253	-0,0639	0,2683	0,3277	0,2416	-0,1433	0,2420	-0,0650	-0,0421
GOV				1,0000	0,5273	0,2823	-0,1420	-0,2120	-0,4091	-0,3209	0,1215	0,0394	-0,3026	-0,6488	0,2506	0,0579	0,2162	0,1715
OPEN					1,0000	0,8427	-0,2108	-0,3803	-0,2368	-0,3704	-0,3940	-0,2385	-0,3012	-0,4695	0,7978	-0,0892	-0,0670	-0,0305
KQ						1,0000	0,0035	-0,2465	-0,1320	-0,3809	-0,2520	-0,2113	-0,1737	-0,3757	0,9837	-0,1516	-0,1350	-0,1335
CAP							1,0000	0,8584	0,2636	0,1835	0,7180	0,0144	0,2650	0,0165	-0,0929	0,2928	-0,4377	-0,4275
LIQ								1,0000	0,5367	0,6176	0,6947	-0,2093	0,0557	0,1008	-0,3193	0,1414	-0,5025	-0,4803
CREDIT									1,0000	0,5435	0,0174	-0,4453	-0,0944	0,2526	-0,1317	-0,3006	-0,2251	-0,2193
TURN										1,0000	0,2294	-0,4570	-0,3048	0,3038	-0,3986	-0,1777	-0,3787	-0,3346
STRUCTURE											1,0000	0,0386	-0,0562	-0,1298	-0,2888	0,3144	-0,3248	-0,3915
INF												1,0000	0,8218	0,2432	-0,1851	0,5830	0,6829	0,6169
INF_SD													1,0000	0,4220	-0,1651	0,5041	0,4296	0,3838
TOT_SD														1,0000	-0,3397	0,2749	0,3034	0,3193
KQ_SD															1,0000	-0,1678	-0,0801	-0,0997
R3M_A1_SD																1,0000	0,1338	0,0206
VOL																	1,0000	0,9566
VOL_SD																		1,0000

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