

# The short-run and long-run effects of trade openness on financial development: Some panel evidence for Europe

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## Abstract

This paper analyses the short- and long-run effects of trade openness on financial development in a panel including data on 35 European countries over the period 2001–2019. For this purpose, it uses the pooled mean group (PMG) estimator for dynamic panels developed by Pesaran et al. (*Journal of the American Statistical Association*, 1999;94:621). The results differ depending on the income, governance and financial development level of the countries considered. In particular, it appears that in the middle-income countries trade openness tends to strengthen financial development in the long run but to have an adverse effect in the short run. By contrast, in the case of high-income countries with better institutions and a higher level of financial development, there is a positive and significant impact in the short run. Some policy implications of these findings are drawn.

## KEYWORDS

dynamic panel models, financial development, gravity models, long run and short run, PMG estimator, trade openness

## 1 | INTRODUCTION

The relationship between financial development and international trade has been analysed extensively in the literature. However, despite the fact that the causal linkages between these two variables could be bidirectional, most studies have focused mainly on the impact of the former on the latter and on whether or not a well-developed financial system can increase trade volumes and also have an impact on the trade structure. The underlying idea is that differences in financial development can generate comparative advantages and gains from specialization. In particular, countries with better financial systems are expected to specialize in goods and sectors that rely on external finance for production (Beck, 2002, 2003; Becker et al., 2013; Bilas et al., 2017; Hur et al., 2006; Kim et al., 2011; Kletzer & Bardhan, 1987; Manova, 2013; Svaleryd & Vlachos, 2005).

By contrast, only a relatively small number of papers have examined the reverse link, namely whether or not higher trade openness boosts financial development (Baltagi et al., 2009; Do & Levchenko, 2004, 2007; Huang & Temple, 2005; Kim et al., 2010; Rajan & Zingales, 2003). In this case, the latter is assumed to be endogenous and to be affected by demand for external finance in each country. Since industries and goods differ in the extent they rely on it, the financial system should be more developed in countries specializing in goods requiring external finance. Thus, financially intensive sectors should develop more in such countries as a result of trade opening (Do & Levchenko, 2007).

The present paper aims to contribute to the latter strand of the literature, which investigates the effects of international trade on financial development. More precisely, it provides evidence on whether or not the degree

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of trade openness affects financial development in a panel of 35 European countries over the period 2001–2019. This European focus differentiates our contribution from earlier papers examining other groups of developed and developing countries. It is noteworthy that our sample includes both EU and non-EU countries, which adds another interesting dimension to the analysis, since these two sets of countries have different levels of trade openness and financial development. Moreover, our study also sheds light on whether or not the trade–finance link varies with the level of economic development, governance and financial development by dividing the chosen set of countries in sub-groups on the basis of these criteria and then comparing the results. Finally, our analysis distinguishes between the short- and the long-run effects of trade on financial development, an issue not much investigated in the previous literature, especially in the case of the European countries. For this purpose, a state-of-the-art econometric method designed for heterogeneous panels is employed, namely the pooled mean group (PMG) estimator proposed by Pesaran et al. (1999).

The paper is structured as follows. Section 2 provides a brief review of the relevant literature; Section 3 outlines the econometric framework; Section 4 describes the data and presents the empirical findings; Section 5 offers some concluding remarks.

## 2 | LITERATURE REVIEW

The literature concerning the effects of trade on financial development has focused mainly on the relationship between trade openness and financial development (Braun & Raddatz, 2005; Do & Levchenko, 2004, 2007; Huang & Temple, 2005; Kim et al., 2010) or on that between financial openness, trade openness and financial development (Baltagi et al., 2009; Rajan & Zingales, 2003; Zhang et al., 2015). The available evidence generally implies positive linkages between trade openness and financial development and also between trade openness, financial openness and financial development. The rationale for these findings is that trade may create demand for financial services and thus promote financial development. External financing is required by exporters and importers for international payments as well as for the necessary investments to be competitive in the international markets. Trade openness creates an opportunity to exploit economies of scale, but undertaking large-scale operations and mass manufacturing for foreign markets requires additional funds.

Do and Levchenko (2004, 2007) analysed the effects of comparative advantage in international trade on a country's level of financial development using data for

96 countries over the period 1970–1999. In their model financial development is determined endogenously by demand for external finance in production. They showed empirically that countries with a comparative advantage in financially intensive goods will experience a higher demand for external finance, and therefore will be characterized by higher financial development. By contrast, countries that primarily export goods not relying on external finance will have lower financial development. Finally, countries importing finance-dependent goods will see their financial system deteriorate, with access to finance becoming more difficult for domestic firms.

Huang and Temple (2005) instead examined whether higher openness has a positive effect on financial development by using cross-section and panel data for 88 countries over the period 1960–99. They found strong support for this hypothesis, especially in the lower-income group. Their results suggest that increases in goods market openness are typically followed by sustained increases in financial depth. Kim et al. (2010) also analysed the dynamic effects of trade openness on financial development using a sample of 88 countries over the period 1960–2005. Their findings imply that there exists a positive long-run relationship between trade openness and financial development and a negative short-run one; by splitting their sample into different income or inflation groups, they were able to establish that this holds only for relatively low-income or high-inflation economies.

Other studies also stress the importance of financial openness. Rajan and Zingales (2003) analysed the relationship between trade openness, financial openness, and financial development using a sample of 24 industrialized countries over the period 1913–1999. They argued that trade openness leads to higher financial development when it is correlated with financial openness. They proposed an interest group theory of financial development according to which incumbents (especially industrial and financial ones) oppose financial development because it breeds competition and erodes their interests, and thus their opposition becomes weaker when an economy is open to both trade and finance; institutions also play a role as they have an impact on the activities of the interest groups. Braun and Raddatz (2005, 2008) emphasized that a well-developed financial system enhances competition in the industrial sector by allowing easier entry. They showed that trade liberalization reduces the power of groups opposed to financial development and thus improve the financial system.

Baltagi et al. (2009) examined empirically the simultaneous openness hypothesis of Rajan and Zingales's (2003) according to which both trade and financial openness are necessary for financial development to occur. They used annual data for both developing and industrialized

countries and applied dynamic panel estimation techniques. Their model allows for an interactive effect of trade and financial openness on financial development and produces evidence that both types of openness are statistically significant determinants of financial development. Thus, relatively closed economies stand to benefit most from opening up their trade and/or capital accounts; however, opening up one without the other can still generate gains in terms of banking sector development. Therefore, these results provide only partial support for the Rajan and Zingales's (2003) hypothesis. Zhang et al. (2015) investigated the impact of trade and financial openness on financial development in China in the context of a dynamic panel. They found that both trade and financial openness are statistically significant determinants of financial efficiency and competition, but openness has a negative impact on financial development because local incumbents strongly oppose the latter. Thus, their study also provides only partial support to the Rajan and Zingales's (2003) hypothesis.

On the whole, the existing empirical evidence suggests that trade openness boosts financial development; however, it also appears that the linkages between trade openness/financial openness and financial development may differ significantly across countries.

### 3 | FINANCIAL DEVELOPMENT AND TRADE OPENNESS: AN EMPIRICAL FRAMEWORK

As already mentioned we analyse the effects of trade openness on financial development using a panel which includes data for 35 European countries over the period 2001–2019. More specifically, first we estimate the impact of trade openness on financial development for the whole sample. Second, we split the sample into subgroups of countries to examine whether the trade–finance link varies with the level of economic development, governance and financial development.

The general theoretical framework used to study the effects of trade on financial development is the following:

$$\text{Finance}_{i,t} = \alpha_i + \beta_{i,1} \text{Trade}_{i,t} + \sum_{k=1}^K \text{CV}_{i,t}^k + \mu_i + \varepsilon_{i,t} \quad (1)$$

where,  $\text{Finance}_{i,t}$  is an indicator of financial development,  $\text{Trade}_{i,t}$  is an indicator of trade openness,  $\text{CV}_{i,t}$  is a set of control variables,  $\varepsilon_{i,t}$  stands for the error term and  $\mu_i$  is a country-specific component, where  $i = 1, 2, \dots, N$  denotes the observational unit (country) and  $t = 1, 2, \dots, T$  the time period.

There are various measures of financial development capturing the size, activity and efficiency of the financial

sector that have been used in the existing literature such as domestic credit (Beck, 2002; Kim et al., 2011), market capitalization (Beck, 2003), liquid liabilities (Menyah et al., 2014), the value of share trade - all as a share of GDP. In the present paper, we use private credit (more precisely, credit to the private sector from commercial banks and other financial institutions) as a share of GDP, which is considered the most appropriate measure by the majority of studies on the trade-finance nexus (Beck, 2002; Kim et al., 2010). Trade openness is calculated as the sum of imports and exports divided by GDP; this measure accounts for the level of integration and has already been used in many of the studies previously discussed (Baltagi et al., 2009; Do & Levchenko, 2004, 2007; Kim et al., 2010).

Following the empirical literature on this topic we also include a set of control variables, specifically real GDP per capita (RGDPC), inflation (INFL), an uncertainty index (WUI) and a governance index (GOVIND) as determinants of financial development. RGDPC is meant to control for the link between the income level and financial development (Do & Levchenko, 2004; Rajan & Zingales, 2003): as the level of per capita income increases, the financial systems develop further. Inflation (INFL) is used as an indicator of macroeconomic stability as in other studies (Kim et al., 2011). The world uncertainty index (WUI) captures the uncertainty related to economic and political events, a higher value indicating higher uncertainty. The governance index (GOVIND) reflects the process by which governments are selected, monitored and replaced, the ability of the government to formulate and implement sound and effective policies and the respect of citizens for the institutions that govern economic and social interactions among them; better governance and institutions are expected to enhance trade and financial development (Andrianova et al., 2008; Baltagi et al., 2009).

Therefore, the empirical counterpart to model (1) is the following:

$$\text{DCPS}_{it} = \alpha_1 + \beta_1 \text{TO}_{it} + \beta_2 \text{RGDPC}_{it} + \beta_3 \text{INFL}_{it} + \beta_4 \text{GOVIND}_{it} + \beta_5 \text{WUI}_{it} + \mu_i + \varepsilon_{it} \quad (2)$$

where, DCPS = domestic credit to the private sector as a percentage of GDP; TO = trade openness as a share of GDP, RGDPC = real income per capita; INFL = inflation (based on the CPI), GOVIND = governance index (ranging between -2.5 and 2.5); WUI = uncertainty index (ranging between 0 and 1).

For the empirical modelling we follow the autoregressive distributed lag (ARDL) approach originally introduced by Pesaran and Shin (1999) in a time series context, which is also suitable for variables exhibiting different orders of integration. Pesaran et al. (1999) extended it to the case of heterogenous panels; within this framework both

short- and long-run linkages can be estimated consistently despite the possible presence of endogeneity by including lags of both the dependent and independent variables. We use the PMG estimator whose advantages over the dynamic fixed effects (DFE) and the mean group (MG) ones have been shown by Pesaran et al. (1999). In particular, it lets the short-run dynamics be data-determined for each country and assumes homogeneous long-run coefficients; it represents a useful alternative to estimating separate regressions (which allows the coefficients and error variances to differ across the groups) and using conventional fixed-effects estimators (which assumes the same slope coefficients and error variances in all cases).<sup>1</sup>

The dynamic heterogeneous panel regression is the following:

$$\begin{aligned} \Delta DCPS_{i,t} = & \sum_{l=1}^{p-1} \gamma_{i,l} \Delta DCPS_{i,t-l} + \sum_{l=0}^{q-1} \left( \tau_i \Delta TO_{i,t-l} \right. \\ & + \rho_{i,1} \Delta RGDPC_{i,t-l} + \rho_{i,2} \Delta INFL_{i,t-l} \\ & \left. + \rho_{i,3} \Delta GOVIND_{i,t-l} + \rho_{i,4} \Delta WUI_{i,t-l} \right) \\ & + \varphi_i \left[ DCPS_{i,t-1} - \left\{ \beta_{i,0} + \varrho_{i,1} TO_{i,t-1} \right. \right. \\ & + \beta_{i,1} RGDPC_{i,t-1} + \beta_{i,2} INFL_{i,t-1} \\ & \left. \left. + \beta_{i,3} GOVIND_{i,t-1} + \beta_{i,4} WUI_{i,t-1} \right\} \right] + \mu_i + \varepsilon_{i,t} \end{aligned} \quad (3)$$

where,  $\gamma_{i,l}$  denotes the short-run coefficients on the lagged dependent variable and  $\tau_i$  and  $\rho_{i,k}$  ( $k = 1, 2, \dots, 4$ ) those on the independent variables,  $\varrho_i$  and  $\beta_{i,j}$  ( $j = 1, 2, \dots, 4$ ) are the long-run coefficients,  $\varphi_i$  is the speed of adjustment to the long-run equilibrium also known as the error correction coefficient, and  $\Delta$  stands for the first-difference operator. The subscripts  $i$  and  $t$  denote country and time, respectively, and  $l$  is the lag length. Finally, the term in square brackets represents the long-run equilibrium. The error term  $\varepsilon_{i,t}$  is assumed to be independently distributed across  $i$  and  $t$ , but the variances may be heterogeneous across countries. By an appropriate choice of the lag length  $p$  and  $q$  for the dependent and independent variables, respectively, the estimation of Equation (3) can help to solve the ‘reverse causality’ issue between international trade and financial development.

## 4 | EMPIRICAL ANALYSIS

### 4.1 | Data

Our panel consists of annual data for 35 European countries over the period 2001–2019 (for a list of the countries

and of the variables see Table A1 and A2 respectively in Appendix B). The series were obtained from the World Bank database, including the World Governance Indicators (WGIs) constructed by Kaufmann et al. (2010), and from the International Monetary Fund, including the WUI (Ahir et al., 2018). The governance index (GOVIND) includes six dimensions of governance (namely voice and accountability, political stability, government effectiveness, regulatory quality rule of law and control of corruption) and is averaged for each country over the sample. For each dimension the estimated value is between  $-2.5$  (weak) and  $2.5$  (strong) governance performance; higher values of GOVIND indicate a high governance performance and better quality of institutions and thus should boost trade and financial development. As for WUI, it is based on the frequency of the word ‘uncertainty’ in the country reports of the Economist Intelligence Unit.<sup>2</sup>

### 4.2 | Results

Table 1 reports the PMG estimation results<sup>3</sup> for the whole sample as well as for two subgroups of countries, namely high- and middle-income countries according to the World Bank’s classification.<sup>4</sup> There appears to be positive long-run effects of trade openness on financial development in the case of the middle-income but not of the high-income countries; instead, the short-run effects are significant in all cases but they are found to be negative in the former ones and positive in the latter ones, which are characterized by a higher level of financial development and international trade based on sectors relying on external finance. The findings for the middle-income countries might reflect the fact that trade openness, which is associated with greater risk and increased exposure to foreign competition, results in more frequent economic shocks and thus a negative impact on financial development in the short run, whilst in the long run it leads to restructuring and more investment and lending to cope with increasing competition, both of which create demand for external finance, and thus it boosts financial development. On the whole, it is clear that the trade-finance link varies with the development stage.

Table 1 also reports the estimated coefficients on the control variables. RGPDC has a positive and more sizeable short-run impact on financial development in the case of higher-income countries, as in other studies (Do & Levchenko, 2004). Inflation has a negative short- and long-run effect in the case of the middle-income countries; this is not surprising, since higher inflation generates more uncertainty, which can be detrimental to international trade and financial development (Khan et al., 2006; Rousseau & Wachtel, 2002). It is noteworthy

TABLE 1 PMG results on the trade-finance nexus in the short and long run by income level

Independent variable: DCPS			
Sample	Full sample of European countries	High income countries	Middle income countries
Method	PMG	PMG	PMG
Variables	(1)	(2)	(3)
Long-run coefficients			
TO	0.291 (1.09)	0.600 (1.11)	1.311 (3.08)**
RGDPC	1.149 (2.38)**	0.565 (5.12)***	0.320 (0.93)
INFL	-0.145 (0.73)	-0.290 (1.11)	-0.667 (1.77)*
GOVIND	0.467 (1.79)*	0.103 (0.43)	0.545 (1.92)*
WUI	-0.157 (0.59)	0.050 (0.88)	-0.017 (1.53)
Error correction coefficient (Phi)	-0.042 (4.24)***	-0.106 (4.99)***	-0.059 (2.32)**
Short-run coefficients			
$\Delta$ TO	0.068 (0.72)	0.117 (1.80)*	-0.057 (1.66)*
$\Delta$ RGDPC	0.180 (1.66)*	0.408 (2.18)**	0.257 (1.88)*
$\Delta$ INFL	-0.243 (1.08)	-0.009 (1.61)	-0.047 (1.81)*
$\Delta$ GOVIND	0.046 (0.76)	0.053 (1.82)*	-0.133 (1.83)*
$\Delta$ WUI	-0.003 (1.79)*	0.001 (0.54)	-0.002 (2.24)**
Constant	0.525 (4.18)***	-0.318 (5.02)***	0.269 (2.12)**
Observations	649	442	207

Note: Absolute value of z statistics in parentheses.

Abbreviation: PMG, pooled mean group.

\*Significant at 10%.

\*\*Significant at 5%.

\*\*\*Significant at 1%.

that the effect of inflation on financial development appear to be stronger in the case of the middle-income countries, which tend to have higher inflation compared to the higher-income ones (see Figure A1 in Appendix B). Better governance is expected to strengthen trade and reinforce financial development. We find evidence of a positive and significant long-run effect for both sets of

countries, but of a short-run one only in the case of the high-income countries. Finally, the uncertainty index has a negative impact. Note that the average level of uncertainty is higher in the middle-income economies, possibly because of greater political instability, which also leads to greater economic fluctuations (see Figure A2 in Appendix B). On the whole, the effects of the control



**TABLE 2** PMG results on the trade-finance nexus in the short and long run by governance level

	<b>Dependent variable: DCPS</b>	
	<b>Low governance countries</b>	<b>High governance countries</b>
Long-run coefficients		
Trade openness (TO)	0.259 (2.48)**	0.094 (1.86)*
Error correction coefficient (Phi)	-0.108 (1.69)*	-0.066 (4.30)***
Short-run coefficients		
$\Delta$ TO	-0.071 (1.89)*	0.017 (2.24)**
Constant	-0.217 (0.59)	0.462 (4.72)***
Sample	151	498

Abbreviation: PMG, pooled mean group.

\*Significant at 10%.

\*\*Significant at 5%.

\*\*\*Significant at 1%.

variables are not often significant for the sample as a whole but are more frequently so in the case of the middle-income countries.

Next we split the sample on the basis of governance since, according to the literature (Baltagi et al., 2009), the quality of institutions is an important determinant of financial development. Table 2 reports the estimated short- and long-run effects of trade openness on financial development for two sub-samples including countries with high- and low-governance, respectively.<sup>5</sup> As expected, we find a negative short-run effect of trade openness in the case of the low-governance countries, whose weak institutions seems to impair financial development, and a positive one for high-governance countries. However, in the long run reforms can improve governance and the quality of institutions, reducing corruption and political instability, and thus increasing confidence in the rule of law, the quality of contract enforcement or property rights and the credibility of the government's commitments. Consequently, in the long run trade openness can affect positively financial development owing to an improvement in governance. On the whole, it appears that the trade-finance link also varies with the level of governance, consistently with previous studies (Kim et al., 2011).

Finally, we examine possible differences between three sub-groups of countries characterized by high,

middle and low financial development according to the IMF index. The Financial Development (FD) index is a new and more broadly based one constructed by the IMF which reflects the multidimensional nature of financial development (Svirydzenka, 2016). It aggregates two indices, namely the Financial Institutions and the Financial Markets ones, and thus it takes into account depth, access and efficiency. Higher values (which are typical of high-income countries) indicate greater financial development, namely a higher degree of efficiency of financial institutions and markets in providing funding to business at low cost while maintaining sustainable profits and sufficient liquidity. The key estimation results are reported in Table 3.

It is immediately apparent that the relationship under examination is affected by the level of financial development. In countries where this is low or medium trade openness has a negative impact in the short run. A plausible explanation is that such countries have a comparative disadvantage since they specialize mainly in goods with constant or very small increasing returns to scale and exports of goods not relying on external finance. However, the effect is positive in the long run when changes in trade patterns can boost financially intensive sectors. By contrast, in countries with a high level of financial development there is a positive effect in both the short and the long run – such economies have a comparative advantage in manufacturing industries (Kletzer & Bardhan, 1987).

## 5 | CONCLUSIONS

This paper analyses the impact of trade openness on financial development in both the short and the long run in the case of 35 European countries over the period 2001–2019. Dynamic panel methods are used for this purpose, more specifically the PMG estimator developed by Pesaran et al. (1999), which has been shown to have a number of advantages over alternative methods. The chosen countries are relatively diverse in terms of their financial development, governance and per capita income; this offers an interesting opportunity to examine whether these variables affect the trade-finance nexus by splitting the sample into subgroups on their basis and estimating the model for each subgroup. Note that according to the World Bank, European countries can be classified as either middle- or high-income ones, and financial development tends to be higher in the latter group.

Our findings suggest that trade openness is an important determinant of financial development in the countries under examination, although there are differences

TABLE 3 PMG results on the trade-finance nexus in the short and long run by financial development level

<b>Dependent variable: DCPS</b>			
	<b>Low financial development countries</b>	<b>Mid financial development countries</b>	<b>High financial development countries</b>
Long-run coefficients			
Trade openness (TO)	0.103 (2.69)**	0.335 (1.86)*	0.206 (1.00)
Error correction coefficient (Phi)	-0.018 (2.30)**	-0.016 (1.92)*	-0.138 (3.62)***
Short-run coefficients			
$\Delta$ TO	-0.077 (1.84)*	-0.023 (0.37)	0.326 (1.67)*
Constant	-0.173 (1.54)	0.133 (0.56)	0.193 (2.18)**
Sample	170	221	258

\*Significant at 10%.

\*\*Significant at 5%.

\*\*\*Significant at 1%.

between short- and long-run effects and also between the sub-groups created on the basis of the income, governance and financial development level. In particular, we find evidence that in the middle-income countries trade openness tends to strengthen financial development in the long run but to have an adverse effect in the short run. This result also holds for the countries characterized by low governance, weaker institutions and lower financial development. By contrast, in the case of high-income countries with better institutions and a high level of financial development, there is a positive and significant impact of trade openness on financial development in the short run. Our results are in line with those of other studies finding significant effects of trade openness on financial development (Huang & Temple, 2005; Kim et al., 2011).

To sum up, our findings confirm that trade openness boosts financial development and also that the trade-finance link is affected by the level of economic development, governance and financial development in the European countries. Interestingly, in the case of middle-income, low-governance and low and middle financial development countries there is an adverse impact of trade openness on financial development in the short run, but this effect becomes positive in the long run when higher openness, followed by restructuring and the implementation of trade and financial reforms, boosts trade as well as financial development.

These findings are also of interest to policy makers given the fact that international trade and financial development are both key drivers of economic growth (Levine, 2005). Trade can improve living standards not only directly, through specialization and economies of scale, but also indirectly, by boosting financial development. The latter effect depends to some extent on policy makers, since the degree of trade openness is at least partly a matter of policy choice.

**CONFLICT OF INTEREST**

The authors declare no potential conflict of interest.

**ENDNOTES**

- <sup>1</sup> See Appendix A for more details on those three estimators.
- <sup>2</sup> For more details on both the governance and uncertainty indices see Appendix C.
- <sup>3</sup> Note that estimates were also obtained using the DFE method; however, the Hausman test confirms that the PMG results are to be preferred and therefore we only report the PMG results.
- <sup>4</sup> The middle-income countries are the following: Albania, Bulgaria, Bosnia, Belarus, Moldavia, Macedonia, Montenegro, Romania, Russia, Serbia, Ukraine. The high-income countries include: Austria, Belgium, Cyprus, Czech Republic, Germany, Denmark, Spain, Finland, France, UK, Greece, Croatia, Hungary, Ireland, Island, Italy, Luxembourg, Malta, Nederland, Norway, Poland, Portugal Switzerland, Sweden.
- <sup>5</sup> Note that in the remainder of the discussion we only focus on these effects and do not report the other estimated coefficients;

these additional results are available from the authors upon request.

<sup>6</sup>  $p$  and  $q$  are the lag lengths of the dependent and independent variables respectively.

<sup>7</sup> Pesaran and Shin (1999) argue that panel ARDL can be used even with variables with different order of integration irrespective of whether these are  $I(0)$  or  $I(1)$ .

## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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## REFERENCES

- Ahir, H., Bloom, N., & Furceri, D. (2018). *The world uncertainty index*. Stanford Mimeo.
- Andrianova, S., Demetriades, P. O., & Shortland, A. (2008). Government ownership of banks, institutions and financial development. *Journal of Development Economics*, 85, 218–252.
- Baltagi, B. H., Demetriades, P. O., & Law, S. H. (2009). Financial development and openness: Evidence from panel data. *Journal of Development Economics*, 89(2), 285–296.
- Beck, T. (2002). Financial development and international trade: Is there a link? *Journal of International Economics*, 57(1), 107–131.
- Beck, T. (2003). Financial dependence and international trade. *Review of International Economics*, 11, 296–316.
- Becker, B., Chen, J., & Greenberg, D. (2013). Financial development, fixed costs, and international trade. *The Review of Corporate Finance Studies*, 2(1), 1–28.
- Bilas, V., Bosnjak, M., & Novak, I. (2017). Examining the relationship between financial development and international trade in Croatia. *South East European Journal of Economics and Business*, 12(1), 80–88.
- Braun, M., & Raddatz, C. (2005). *Trade liberalization and the politics of financial development*. World Bank Working Paper 3517.
- Braun, M., & Raddatz, C. (2008). *Trade liberalization and the politics of financial development*. World Bank Working Paper 3517.
- Do, Q.-T., & Levchenko, A. A. (2004). *Trade and financial development*. World Bank Working Paper 3347.
- Do, Q.-T., & Levchenko, A. A. (2007). Comparative advantage, demand for external finance, and financial development. *Journal of Financial Economics*, 86, 796–834.
- Huang, Y., & Temple, J. (2005). *Does external trade promote financial development?* CEPR Discussion Papers DP5150.
- Hur, J., Raj, M., & Riyanto, Y. E. (2006). Finance and trade: A cross-country empirical analysis on the impact of financial development and asset tangibility on international trade. *World Development*, 34(10), 1728–1741.
- Kaufmann, D. A., Kraay, A., & Mastruzzi, M. (2010). *The worldwide governance indicators: Methodology and analytical issues*. World Bank Policy Research Working Paper No. 5430.
- Khan, M. S., Senhadji, A. S., & Smith, B. D. (2006). Inflation and financial development. *Macroeconomic Dynamics*, 10, 165–182.
- Kim, D.-H., Lin, S.-C., & Suen, Y.-B. (2010). Dynamic effects of trade openness on financial development. *Economic Modelling*, 27, 254–261.
- Kim, D.-H., Lin, S.-C., & Suen, Y.-B. (2011). Interactions between financial development and trade openness. *Scottish Journal of Political Economy*, 58, 567–588.
- Kletzer, K., & Bardhan, P. (1987). Credit markets and patterns of international trade. *Journal of Development Economics*, 27, 57–70.
- Levine, R. (2005). Finance and growth: Theory and evidence. In P. Aghion & S. Durlauf (Eds.), *Handbook of economic growth*. Elsevier Science.
- Manova, K. (2013). Credit constraints, heterogeneous firms, and international trade. *Review of Economic Studies*, 80, 711–744.
- Menyah, K., Nazlioglu, S., & Wolde-Rufael, Y. (2014). Financial development, trade openness and economic growth in African countries: New insights from a panel causality approach. *Economic Modelling*, 37(C), 386–394.
- Nickell, S. (1981). Biases in dynamic models with fixed effects. *Econometrica*, 49(6), 1417–1426.
- Pesaran, H., & Shin, Y. (1999). An autoregressive distributed lag modelling approach to Cointegration. In *Econometrics and economic theory in the 20th century; the Ragnar Frisch centennial symposium* (pp. 371–413). Cambridge University Press Chapter 4.
- Pesaran, M. H., Shin, Y., & Smith, R. P. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, 94(446), 621–634.
- Pesaran, M. H., & Smith, R. P. (1995). Estimating long-run relationships from dynamic heterogeneous panels. *Journal of Econometrics*, 68(1), 79–113.
- Rajan, R. G., & Zingales, L. (2003). The great reversals: The politics of financial development in the twentieth century. *Journal of Financial Economics*, 69, 5–50.
- Rousseau, P., & Wachtel, P. (2002). Inflation thresholds and the finance–growth nexus. *Journal of International Money and Finance*, 21, 777–793.
- Svaleryd, H., & Vlachos, J. (2005). Financial markets, the pattern of industrial specialization and comparative advantage: Evidence from OECD countries. *European Economic Review*, 49(1), 113–144.
- Svirydenka, K. (2016). *Introducing a new broad-based index of financial development*. IMF Working Papers 16/5.
- Zhang, C., Zhu, Y., & Lu, Z. (2015). Trade openness, financial openness, and financial development in China. *Journal of International Money and Finance*, 59, 287–309.

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**APPENDIX A**

**A.1 | DYNAMIC PANEL ESTIMATORS**

Pesaran et al. (1999) consider a dynamic heterogeneous panel regression model with the following autoregressive distributed lag ARDL ( $p, q, \dots, q$ )<sup>6</sup> specification:

$$\Delta(y_i)_t = \sum_{j=1}^{p-1} \gamma_j^i \Delta(y_i)_{t-1} + \sum_{j=0}^{q-1} \delta_j^i \Delta(X_j)_{t-1} + \varphi^i [(y_i)_{t-1} - \{\beta_0^i + \beta_1^i (X_i)_{t-1}\}] + \mu_i + \varepsilon_{it} \quad (A1)$$

where,  $y$  is the dependent variable,  $X$  is a set of independent variables,  $\gamma$  and  $\delta$  represent the short-run coefficients of the lagged dependent and independent variables, respectively, the  $\beta$  coefficients are the long-run ones,  $\varphi$  represents the speed of adjustment to the long run- equilibrium,  $\mu_i$  stands for the individual effects and  $\varepsilon_{it}$  for the error term, and the subscripts  $i$  and  $t$  refer to country and time, respectively. Within this framework consistent and efficient estimates can be obtained of the long-run cointegration parameters in square brackets.<sup>7</sup>

More precisely, Equation (A1) can be estimated using three different estimators: mean group (MG—Pesaran & Smith, 1995), pooled mean group (PMG—Pesaran et al. (1999), and dynamic fixed effects estimator (DFE – see Nickell, 1981, for some of the issues arising in this context); their features are briefly summarized next.

**A.1.1. | Mean group (MG) estimator**

This approach requires estimating separate regressions for each country and calculating the coefficients as unweighted means of the estimated coefficients for the individual countries. No restrictions are imposed, namely all coefficients are allowed to vary and be heterogeneous in both the long and the short run. However, a necessary condition for the consistency and validity of this

approach is a sufficiently large time-series dimension of the data.

**A.1.2. | Pooled mean group (PMG) estimator**

The main feature of the PMG approach is that it allows the short-run coefficients (including the intercepts, the speed of adjustment to the long-run equilibrium, and the error variances) to be heterogeneous across countries, while the long-run slope coefficients are restricted to be homogeneous. However, this method requires that the following conditions be met:

- the coefficient on the error–correction term should be negative and not lower than  $-2$  for a long-run equilibrium relationship to exist;
- the residuals from the ARDL model should be serially uncorrelated for the estimates to be consistent;
- a large size of  $T$  and  $N$  is desirable to avoid the bias in the average estimators and deal with the heterogeneity problem.

**A.1.3. | Dynamic fixed effects (DFE) estimator**

This estimator is similar to the PMG one in that it imposes homogeneity restrictions on the slope coefficient and error variances in the long run, but it also restricts the speed of adjustment and the short-run coefficients to be equal across countries.

Hausman tests can be carried out to select the preferred ones from the estimates obtained using these different methods.

**APPENDIX B**

See Tables A1 and A2.

**TABLE A1** List of countries

Albania	Denmark	Luxembourg	Romania
Austria	Finland	Malta	Russia
Belgium	France	Moldavia	Serbia
Bulgaria	Greece	Macedonia	Switzerland
Bosnia	Germany	Montenegro	Sweden
Belarus	Hungary	Nederland	Spain
Cyprus	Ireland	Norway	Ukraine
Czech Republic	Iceland	Poland	United Kingdom
Croatia	Italy	Portugal	

TABLE A2 List of variables

Code	Variables	Source
DCPS <sub>it</sub>	Domestic Credit to the private sector as share of GDP	World Bank-World Development Indicators (WDI)
TO	Trade openness as share of GDP	World Bank-World Development Indicators (WDI)
RGDPC	Real income per capita, (current international \$)	World Bank-World Development Indicators (WDI)
INFL	Inflation, consumer price index	World Bank-World Development Indicators (WDI)
GOVIND	World Governance index	World Bank-World Development Indicators (WDI) Authors' calculations based on the WDI database
WUI	World Uncertainty index	IMF database

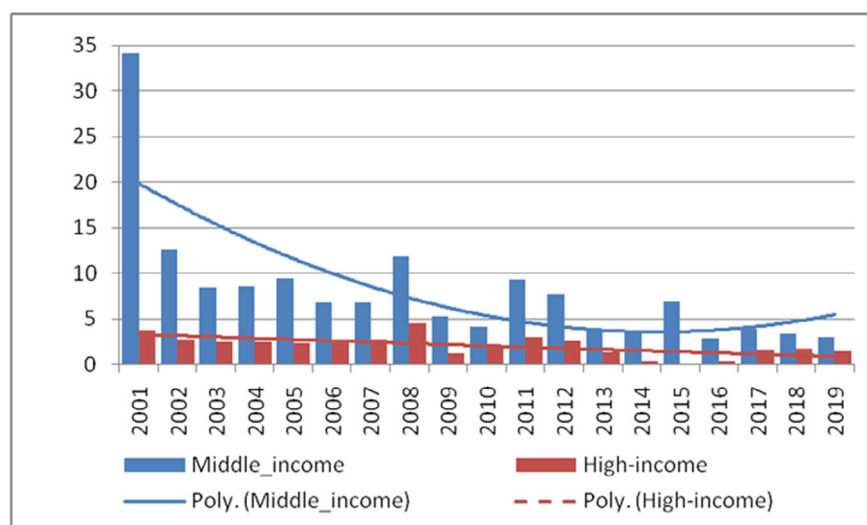


FIGURE A1 Inflation for middle income and high income countries, 2001–2019.

Source: Authors' calculations based on the WDI database [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

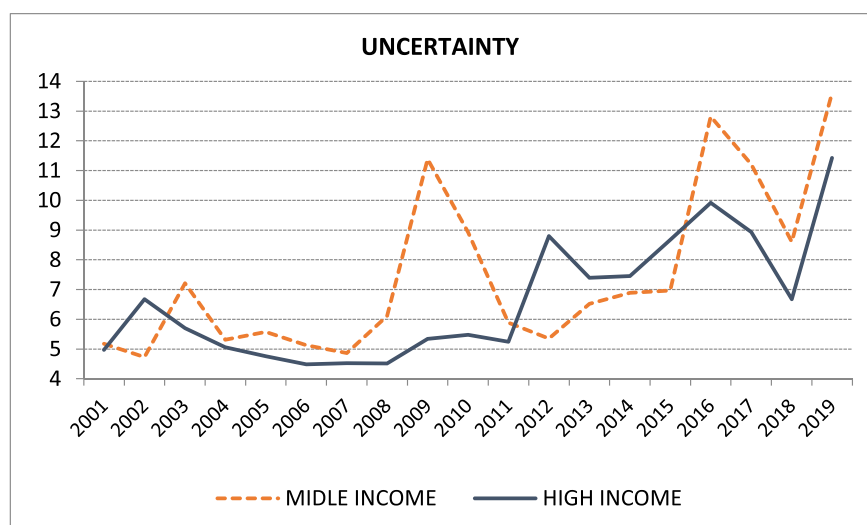


FIGURE A2 Uncertainty for middle income and high income countries, 2001–2019.

Source: Authors' calculations based on the WDI database [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

## APPENDIX C

### C.1 | THE WORLDWIDE GOVERNANCE INDICATORS (WGIS) AND THE WORLD UNCERTAINTY INDEX (WUI)

The following information and definitions can be found in the original source (<https://info.worldbank.org/governance/wgi/>)—The Worldwide Governance Indicators (WGI) World Bank project):

‘Governance consists of the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them.

The Worldwide Governance Indicators report on six broad dimensions of governance for over 200 countries and territories over the period 1996–2020:

Voice and accountability—captures perceptions of the extent to which a country’s citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media;

Political Stability and Absence of Violence/Terrorism—this measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism;

Government effectiveness—this captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies;

Regulatory quality—this captures perceptions of the ability of the government to formulate and implement sound

policies and regulations that permit and promote private sector development;

Rule of law—this captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.

Control of corruption—this captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as “capture” of the state by elites and private interests.’

All these six indicators are used to construct the governance index GOVIND. Each of them is reported in two ways: (1) in its standard normal units, ranging from approximately  $-2.5$  to  $2.5$ , and (2) in percentile rank terms from 0 to 100, with higher values corresponding to better outcomes. We use the first dimension in our analysis.

The WUI was constructed by Ahir et al. (2018) for 143 individual countries on a quarterly basis from 1996 onwards using the frequency of the word ‘uncertainty’ in the quarterly Economist Intelligence Unit country reports. It ranges from 0 (no uncertainty) to 1 (max uncertainty), it uses a single source for all countries (which allows to compare the level of uncertainty across countries) and it captures uncertainty related to economic and political events reflecting both short- and long-term concerns. It provides extremely valuable information to researchers. For instance, the fact that spikes to the index foreshadow output declines suggests that it could be used as an alternative measure of economic activity when those typically employed (such as quarterly GDP for many countries) are not available. It can also be used to investigate the impact of differences in the level of uncertainty across countries on key macroeconomic outcomes (such as foreign direct investment), the various drivers of uncertainty and the economic effects of policies in times of uncertainty.