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This contribution investigates the direct and indirect causal interactions between financial deepening, trade openness and economic growth for 13 Latin American and Caribbean countries. Using a rather general approach to identify indicators for financial deepening and to detect Granger causality within a VAR/VECM framework, we find almost no evidence for the popular hypothesis of finance-led growth. Evidence of bidirectional finance-growth causality is stronger but mostly unstable in the long run. Most results indicate a demand-following or insignificant relationship between finance and growth in Latin America. This finding seems to be consistent with regard to the weakness and deficiencies of the region's financial systems. Further, there is no evidence that finance indirectly and unilaterally induces growth via the channel of trade openness. Thus, policies that prioritize financial and trade liberalization cannot be supported by this study. Instead, a holistic policy approach seems to be preferable that promotes the determinants of both real sector growth and financial development. As a result, financial factors may positively and significantly contribute to economic development in the region.

Keywords. — Financial Markets, Economic Growth, Openness, Hsiao's Granger Causality, Latin America and Caribbean

JEL Classification: C32, O16, O55

[*] Running Title: *Finance, Openness and Growth*

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This contribution investigates the direct and indirect causal interactions between financial deepening, trade openness and economic growth for 13 Latin American and Caribbean countries. Using a rather general approach to identify indicators for financial deepening and to detect Granger causality within a VAR/VECM framework, we find almost no evidence for the popular hypothesis of finance-led growth. Evidence of bidirectional finance-growth causality is stronger but mostly unstable in the long run. Most results indicate a demand-following or insignificant relationship between finance and growth in Latin America. This finding seems to be consistent with regard to the weakness and deficiencies of the region's financial systems. Further, there is no evidence that finance indirectly and unilaterally induces growth via the channel of trade openness. Thus, policies that prioritize financial and trade liberalization cannot be supported by this study. Instead, a holistic policy approach seems to be preferable that promotes the determinants of both real sector growth and financial development. As a result, financial factors may positively and significantly contribute to economic development in the region.

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I. Introduction

With the emergence of the endogenous growth theory, the direct and indirect influence of financial markets on economic growth has drawn considerable attention, particularly with regard to sound development strategies. The most influential contributions on the relationship between finance and growth identify financial development as a crucial precondition of long-run growth, suggesting that financial liberalization is an important instrument of economic policy. Accordingly, financial sector reforms have been implemented in the Latin American region since the early 1990s (Herrero *et al.*, 2000; Aizenman, 2005). The hope was that such measures would unleash finance-growth interactions, e.g. through an increase in savings or the allure of external financing which would drive investments and ultimately growth rates (Aizenman, 2005). However, the effectiveness of such policies requires that causality between financial deepening and economic growth runs conveniently and significantly.

The aim of this contribution is to assess whether financial deepening has actually swayed economic development in Latin America and the Caribbean in the past and whether liberalization strategies in this context constitute appropriate policy tools to foster development in the region. In general, we therefore test for causality between financial development and economic growth, capturing further indirect linkages between finance and growth by also scrutinizing the relationship between finance and trade openness.

The remainder of this contribution is structured as follows: Section 2 provides a summary of the theoretical considerations that form the basis of our empirical analysis. In addition, some empirical evidence is referred to. Section 3 introduces the applied methodology and data. Section 4 presents and discusses the results of the

causality analyses, deducing implications for economic theory and policy. Section 5 concludes with a summary.

II. Literature Review

Links between Finance, Openness and Growth: Theory and Evidence

Financial markets provide an economy with certain vital services which e.g. comprise the management of risk and information, or the pooling and mobilization of savings. In general, more ample and efficient, i.e. *deeper* financial systems are associated with a more effective supply of such financial services to the real sector. From a theoretical point of view, linkages between financial and economic development may take different forms. On the one hand, the financial sector is expected to affect growth through two channels, the *accumulation channel* and the *allocation channel*. The accumulation channel emphasizes the growth-driving effects of physical and human capital accumulation (e.g. Pagano, 1993). The allocation channel focuses on a finance-induced increase in the efficiency of resource allocation and its growth-enhancing effects (e.g. King and Levine, 1993). In general, following these considerations causality then runs from finance to growth (*supply-leading hypothesis*). On the other hand, the development of the financial sector may also be stimulated by economic growth. For instance, in a growing economy the private sector may demand new financial instruments and an increasing access to external finance. Hence, financial sector activities then simply expand in step with general economic development (Robinson, 1952; Patrick, 1966), positing the so-called *demand-following hypothesis*. Additionally, finance and growth may be mutually dependent. For instance, the real sector may provide the financial system with the funds necessary to enable financial deepening, eventually allowing for a capitalization on financial economies of scale which facilitate economic development

in consequence (e.g. Berthelemy and Varoudakis, 1996; Blackburn and Hung, 1998). The latter hypothesis therefore postulates *bidirectional causality* between finance and growth.[1] Following views that are more sceptical towards finance-growth linkages, the financial and real sector may also be independent from each other, thereby naturally putting emphasis on other factors that may determine economic development instead (*insignificant causation*).[2]

Empirical evidence suggests that there are economies that have indeed benefited from well-developed financial systems in the past.[3] Other evidence is more inconclusive. For some of the very successful emerging market economies, finance appears to have been a crucial factor for economic success, e.g. in Taiwan (Chang and Caudill, 2005). However, it is not always possible to identify such a strong effect of finance on growth in mature OECD countries (e.g. Shan and Morris, 2002). For developing economies, the results are similarly diverse. Some studies find a strong impact of finance on growth (Christopoulos and Tsionas, 2004), while others find the finance-growth relationship to be more complex (Demetriades and Hussein, 1996; Arestis and Demetriades, 1997; Al-Awad and Harb, 2005). In general, empirical

[1] In addition, the relationship between finance and growth may also change over time as a country passes through different stages of development. In the early stages finance either leads growth but its impact on growth diminishes as an economy develops (Patrick, 1966), or finance follows growth but eventually becomes a factor that contributes to growth after a threshold of financial development is reached (Berthelemy and Varoudakis, 1996).

[2] In this connection, Lucas (1988, p.6) famously states: "In general, I believe that the importance of financial matters is very badly over-stressed in popular and even much professional discussion and so am not inclined to be apologetic for going to the other extreme."

[3] For long-term studies with a historic focus that emphasize the role of financial development in economic takeoff, see e.g. Rousseau and Wachtel (1998) and Sylla (2002).

evidence strongly suggests there is a country-specific dimension to finance-growth dynamics that accounts for the frequently ambiguous results across countries.[4]

A potentially strong relationship between financial markets and trade opens up a further channel through which financial systems and real sectors may interact. On the one hand, better financial systems may constitute a comparative advantage for industrial sectors that heavily rely on external financing (Kletzer and Bardhan, 1987; Beck, 2003). Therefore, countries with developed financial systems are expected to exhibit industrial and trade structures that are linked to finance-dependent industry sectors. On the other hand, increased trade openness may trigger the demand for new financial products. As argued by Svaleryd and Vlachos (2002), trade carries risks that are linked to external shocks and foreign competition. Thus, more trade openness may lead to more ample financial instruments and institutions that are able to provide appropriate insurance and risk diversification. Rajan and Zingales (2003) argue that trade openness may also induce financial development with respect to effects from political economy. Domestic interest groups have a natural interest in obstructing financial development in order to prevent competitors from entering the market. As international competition increases, such groups shift their interests towards positive financial sector development.

Empirically, Beck (2003) shows that countries with better financial systems exhibit higher trade shares in industries that depend on external finance, concluding that finance is a crucial determinant of trade structures. Similarly, Svaleryd and Vlachos (2005) find that financial sectors significantly determine industrial specialization patterns across OECD countries. In general, the relationship between

[4] For a far more extensive discussion of potential theoretical and empirical connections between finance and growth, we refer to the excellent surveys of Pagano (1993) and Levine (2005).

finance and openness has yet not been studied exhaustively. However, evidence indicates that a nexus between the two factors indeed exists.

The interaction between finance and openness subsequently also allows for more complex paths to economic development. If finance induces openness, it may subsequently foster growth when openness is found to be a growth-driving factor. As for related mechanics, openness may induce economic growth by, among others, increasing a country's level of specialization and positively affecting innovation and technological diffusion (Harrison, 1996). Conversely, economic development may also trigger a country's level of trade openness, e.g. with shifts in production and demand patterns as well as increased levels of international integration that accompany national industrialization experiences.[5] What is more, if increasing trade openness leads to an increase in financial development, it may promote economic growth where financial deepening is found to enhance growth via the allocative and accumulative channels, as discussed above.

Economic Development and Financial Systems in Latin America and the Caribbean

With an average per capita income growth of 1.3% between 1960 and 2000, the Latin American region has experienced comparatively disappointing economic development during the last 40 years (De Gregorio and Lee, 2004). The region's financial systems are strongly bank-based, where the levels of financial development and financial efficiency are comparatively low, even after attempts to reform the

[5] Empirically, Edwards (1998) provides some empirical evidence for the hypothesis that trade openness leads economic growth, finding that more open economies experience greater productivity growth. In contrast, Rodriguez and Rodrik (2001) generally find only very limited support for a strong and positive link between openness and economic development.

financial sector since the early 1990s (Herrero *et al.*, 2002). The levels of trade openness have been similarly low.

De Gregorio and Guidotti (1995) find that financial development and economic growth negatively correlated in the 1970s and 1980s, and that poor levels of financial intermediation impacted negatively on investment allocation efficiency. In contrast, Nazmi (2005) detects a positive impact of financial development on economic growth and investment between 1960 and 1995. These positive effects are explained as a result of financial sector liberalization. This rare and inconclusive empirical evidence on the interaction between finance, openness and growth motivates our analysis even further.

III. Econometric Procedure and Data

General Concept

We start with a brief description of our methodological framework. We first create a composite indicator of financial deepening via *principal component analysis*. Thereby, we should be able to capture developments in the financial sector in a broader sense while avoiding problems associated with multicollinearity, over-parameterization and over-fitting. Second, we employ *unit root and cointegration tests* to identify the stationary properties and possible cointegration relationships of the investigated time series. By building on integration and cointegration results accordingly, we evade spurious regression results in the following causality analyses. Third, we test for *Granger causality* in a modified framework following Hsiao (1979, 1982), using bivariate and trivariate vector autoregressive (*VAR*) or vector error correction models (*VECM*).[6] Misspecifications within such models may lead to

[6] This causality testing procedure has been employed in a number of previous studies, e.g. in Bajo-Rubio and Montavez-Garces (2002), beyond the applications given in Hsiao (1979, 1982).

spurious and inconsistent results (Braun and Mittnik, 1993). Standard Granger causality analyses may suffer from problems of arbitrary lag length selection because the considered variables are constrained to enter at the same lag length. Our procedure avoids such problems as all variables may enter at different lag lengths. We are also able to differentiate between short-run and long-run causality. Here, we take any error correction (*ECM*) term estimate as evidence of a long-run causal relationship between the considered variables. However, such an interpretation is only feasible if the ECM term is negative and statistically significant (Wickens, 1996).

When we first test for causality between finance and growth, we build on the hypotheses sketched in the previous section. That is, we try to find evidence for the supply-leading, demand-following, bidirectional causality or insignificant causation hypotheses. When we later test for causality between finance and openness, and growth and openness, we hypothesize by analogy. Thus, causality again may run in only one or both directions, or may found to be insignificant.

Data

Two standard data sources have been exploited.[7] We use annual time series observations that are absolutely sufficient to ensure the quality of our analyses, as argued by Hakkio and Rush (1991). Level data for the individual financial institution indicators used in the subsequent principal component analysis is taken from the

[7] Using data from several sources may prove inappropriate. Hanousek *et al.* (2007) point out that estimation results may be sensitive to the choice of data sources. Hence, data sensitivity problems may contaminate the results. However, in our case the considered series that employ data from different sources generally exhibit a high level of correlation, thus reducing problems associated with data choice.

Financial Development and Structure Database of Beck *et al.* (2000). It is referred to the latest database version of 2005.[8] Specifically, we extract *commercial bank assets to commercial bank plus central bank assets* (*DBMA*), *liquid liabilities to GDP* (*LL*), *private credit by deposit money banks to GDP* (*PC*) and *bank deposits to GDP* (*BDGDP*) as finance proxies. Further level data for economic growth and trade openness is taken from the *PENN World Table*, version 6.2, compiled by Heston *et al.* (2006). As for economic growth, the standard proxy of real GDP per capita is employed, labelled *GROWTH* (*G*). As for trade openness, the sum of exports plus imports to real GDP is utilized, labelled *TRADE* (*T*). As Harrison (1996) suggests, this measure constitutes a simple and common indicator of trade openness.[9] In the case of real GDP per capita and trade openness, GDP is measured in international US dollars. *GROWTH* and *TRADE* are taken as the differences of logarithms.

Principal Component Analysis

In related literature, several proxies for financial deepening are used, e.g. monetary aggregates such as *M2 to GDP* or financial intermediation parameters such as the *ratio of domestic credit to the private sector to GDP*. To date there is no consensus on the superiority of any of these indicators. Following the recent example by Ang and McKibbin (2007), we construct a broad composite indicator of financial deepening. Specifically, we use the finance proxies *DBMA*, *LL*, *PC* and *BDGDP* to construct this index which is labelled *DEPTH* (*D*). We utilize finance indicators

[8] In the case of Colombia, a few variables are missing and therefore have to be imputed by average.

[9] As suggested by, inter alia, Harrison (1996) and Edwards (1998), a number of potentially more sophisticated measures for trade openness exist. Still, these measures raise the question of availability. In general, we consider *TRADE* to be a rather rough openness indicator that however constitutes a convenient trade off between accessibility and accuracy.

associated with bank development due to the strongly bank-based nature of the region's financial systems. Methodologically, principal component analysis is commonly used to reduce data sets to lower dimensions while retaining as much information of the original sets as possible. Having transformed the finance indicators into natural logarithms, only the first unrotated principal component is extracted in the course of the analysis and employed as *DEPTH*.[10]

Table 1 gives an overview of the results of the principal component analysis as well as a descriptive overview of the chosen countries. Our index *DEPTH* is usually the only component to show fitting characteristics. It generally exhibits at least 60% of the initial variance of the considered series and hence provides a sufficient amount of information on financial deepening. In reference to the respective component matrices, it is obvious that *DEPTH* does not measure exactly the same aspect of financial deepening, i.e. of financial efficiency and size of the financial sector, across all countries. Still, we regard the composite indicator as a functional measure, particularly when considering the discussion about a general lack of a truly consistent measure of financial development.

Table 1 here

Unit Root and Cointegration Tests

As a next step, a unit root test is employed in order to check if the considered time series are stationary, i.e. *I(0)*, or first difference-stationary, i.e. *I(1)*. We use the unit root test of Phillips and Perron (1998), the *PP test*. Our choice for the PP is based on

[10] The Principal Component Analysis was conducted using SPSS, version 13. Other software packages utilized during this analysis include EViews, version 5.0, Stata, version 9.2, and Gretl, version 1.6.4, available at http://gretl.sourceforge.net.

Choi and Chung (1995) who argue that the PP test is more powerful when low sampling frequency data, i.e. annual data is employed, compared to other unit root tests.

As reported in Table 2, in almost all cases the PP test does not reject the null hypothesis of the existence of a unit root for the data at levels, whereas in almost all cases the null hypothesis is rejected strongly when the first difference is taken. The examined time series are thus I(1) at levels and I(0) when taking the first difference, so we employ a difference filter to obtain stationarity.[11]

Table 2 here

As a third step of the analysis, we test for the rank of cointegration in bivariate and trivariate VAR models, following Johansen (1988) and Johansen and Juselius (1990). Generally, this complex procedure involves testing how many eigenvalues of a cointegrating matrix significantly depart from zero in order to obtain its cointegrating rank. Two tests are available, namely the trace statistic and the maximum eigenvalue test. In the following, only the trace statistic is used to estimate the rank of the respective models so as to obtain more robust results (Cheung and Lai, 1993). The test for cointegration is conducted within a VAR framework. The optimal lag length of the considered time series is chosen by the more conservative

[11] In the case of Chile and Suriname where the results are not always as expected, we conduct an alternative unit root test following Kwiatkowski *et al.* (1992). Here, the results generally confirm the assumption that the time series are indeed all I(1) at levels and first-difference stationary. The unexpected unit root test results may hence be mainly attributed to the comparably smaller number of observations.

Bayesian Information Criterion (*BIC*) due to its superior accuracy (Koehler and Murphree, 1988).

Table 3 shows the cointegration results for the trivariate VAR models.[12] For Mexico, Ecuador and El Salvador, no cointegration relationship in the trivariate models is detected. For the other countries, at most one cointegration relationship between the three series is found at either the 5% or 10% significance level. When a cointegration relationship is present, finance, growth and trade openness share a common trend and long-run equilibrium, as suggested theoretically. Due to a cointegration relationship, we include an ECM and hence any VAR passes into a VECM (Engle and Granger, 1987).[13]

Table 3 here

Hsiao's Version of the Granger Causality Test

The Granger (1969) definition of non-causality states that if one is able to better predict a series x_t when including information from a series y_t instead of only employing lagged values of x_t, then y_t Granger-causes x_t, denoted $y_t \Rightarrow x_t$. Bidirectional causality, or feedback, is present when x_t also Granger-causes y_t, where such feedback is denoted $y_t \Leftrightarrow x_t$. By combining this definition of causality with Akaike's (1969) Final Prediction Error (FPE), Hsiao's approach towards causality can be conducted.

[12] Cointegration analyses are also conducted in all bivariate cases but not reported in order to save space.

[13] We do not consider more than one cointegration relationship in our analysis, even though this may not be ruled out completely in certain cases. The relative shortness of our time series and the desire for a good interpretation of the ECM motivate this more cautious approach.

In its basic form, the causality testing procedure requires us to first consider the subsequent autoregressive process:

$$y_t = \alpha + \sum_{i=1}^{m} (L)\beta y_t + u_t \tag{1}$$

The sigma sign in front of L indicates the lag order of the series, L is the lag operator $Ly_t = y_{t-1}$, u_t is a white noise term with the usual statistical properties, α is a constant term and β is the coefficient of the exogenous variables.

We choose the lag order that yields the smallest FPE, denoted $FPE_y(m,0)$, where the individual FPE are calculated in accordance with the following equation with lags varying from 1 to m:

$$FPE_y(m,0) = \frac{(T+m+1)}{(T-m-1)} \times \frac{SSE}{T} \tag{2}$$

Here, T is the number of observations and SSE is the residual sum of squares.

Now, we allow another variable x_t to enter the model, so we receive the subsequent VAR:

$$y_t = \alpha + \sum_{i=1}^{m} (L)\beta y_t + \sum_{j=1}^{n} (L)\gamma x_t + u_t \tag{3.1}$$

$$x_t = \alpha + \sum_{j=1}^{n} (L)\gamma x_t + \sum_{i=1}^{m} (L)\beta y_t + v_t \tag{3.2}$$

Again, the sigma sign in front of L indicates the lag order of the respective series, L is the lag operator $Ly_t = y_{t-1}$, u_t and v_t are white noise terms with the usual statistical properties, α is a constant term and β, γ are the coefficients of the exogenous variables.

While y_t steadily enters (3.1) with the lag order from (2) that yields the smallest FPE, $m*$, x_t enters with a sequence of lags varying from 1 to n.

Analogously, the FPE of (3.1) are computed, with the specific lag order m^*, n^* being chosen that generates the smallest FPE, denoted as $FPE_y(m^*, n^*)$, from:

$$FPE_y(m^*, n) = \frac{(T + m + n + 1)}{(T - m - n - 1)} \times \frac{SSE}{T} \tag{4}$$

By comparing the two minimal FPE, we can draw conclusions on causality. If $FPE_y(m^*,0) > FPE_y(m^*, n^*)$, then $x_t \Rightarrow y_t$, thus Granger causality is established. If $FPE_y(m^*,0) < FPE_y(m^*, n^*)$, then $x_t \not\Rightarrow y_t$ and no Granger causality is detected. Testing for causality from y_t to x_t requires us to repeat the previously described steps, now with x_t as the dependent variable.

IV. Causality Analysis

Model Specification

With respect to the specific conditions of our analysis, Hsiao's original approach needs to be adjusted. First, we use our results on integration and cointegration, i.e. we employ a first difference filter to achieve stationarity and an ECM whenever cointegration evidence requires this to be applied. Second, in order to obviate the possibility of spurious causality detection, the causality procedure is conducted in a trivariate model, so we test for causality between two series, conditional upon the presence of a third. The previous discussion of possible interactions between finance, openness and growth provides the ground for such specifications. As the theory suggests interactions between all three considered series, a subsequent exchange of control variables is implemented, possibly rendering a richer picture of interdependencies between financial deepening, economic growth and openness.

Besides, causal interactions are established and interpreted according to the previous introduction. In the short run, causality inferences are made by analogy by

comparing the minimal FPE of the bivariate and trivariate case. If we include an ECM term to account for cointegration relationships, we take the ECM term as an indicator of long-run causality accordingly. If no cointegration relationship is included, then we conduct the analyses in simple trivariate VAR in differences. In these cases, we refer to the results of respective F-tests that indicate if the regression coefficients of the VAR are statistically significant. If the F-test statistics indicate no sufficient significance, then any possible causality inference may be spurious, having only limited explanatory and analytical power.

Finance-Growth Causality and Further Implications

First, we investigate the causal interaction between financial deepening and economic growth. The theory suggests that finance may either be an important or a negligible factor of economic development. As for the former, we may expect support for the supply-leading or bidirectional hypotheses. As for the latter, we may expect evidence for demand-following or insignificant finance-growth causation.

Table 4 gives the results of the interaction between *DEPTH* and *GROWTH*, conditional on *TRADE*. The results generally show no sign of autocorrelation or multicollinearity and appear to be statistically significant and stable, especially with respect to the lag orders chosen in accordance with the causality testing procedure.

Table 4 here

Our causality analysis indicates that financial deepening and economic growth have shared a rather weak relationship over the past decades in Latin America, specifically that finance has not unidirectionally promoted economic development. We find support for the supply-leading hypothesis only in the case of

Colombia. There is more ample evidence of bidirectional causality which is detectable in the cases of Costa Rica, Chile, the Dominican Republic and Suriname. However, bidirectional causality appears to be truly stable in the long run only in the case of Chile. For Mexico, Honduras, Paraguay and Guatemala, evidence indicates that finance follows growth, where the results are not stable in the cases of Mexico and Honduras. Our results suggest that financial and real sectors are independent in Venezuela, Ecuador, El Salvador and Jamaica. That is, in about 65% of all investigated countries we find support for the demand-following or insignificant causation hypothesis. Hence, our findings generally echo more sceptical theoretical and empirical considerations that likewise suggest rather weak and instable finance-growth linkages.

Our results also fit in reasonably well with findings that financial systems play only a minor role in development processes in South and Central America due to financial sector weaknesses and inefficiencies. Any demand-following or disconnected causal relationship may support the hypothesis that a matching of financial development and the general development level has not yet been reached in a considerable number of countries. It seems that only if financial deepening corresponds to the needs of the development process will the financial sector become a growth driving factor for an economy. Such a hypothesis also corresponds with our limited evidence of any long-run finance-growth causality emerging through the ECM.

Our findings moreover suggest that recent financial liberalization which has taken place in Latin America since the 1990s had disappointing effects on economic performance because of the apparent lack of a close link between finance and growth. Thus, we argue that big push policies of financial liberalization and financial reforms should be considered carefully. The rather poor economic performance of

Latin America over the past decades has to a considerable extent been due to low levels of investment and deficiencies in physical and human capital accumulation (De Gregorio, 1992; De Gregorio and Lee, 2004). However, as discussed before, we may link an increase in financial development to an increase in an economy's accumulative capabilities and allocative efficiency. Given our empirical evidence, we may at least partially attribute low growth rates in Latin America to a deficient match of financial and real sector development. Sound economic policies should aim to sway financial development accordingly. For instance, better macroeconomic stability, improved institutional quality or a stronger focus on development-specific institutional surroundings of financial systems may influence financial deepening and financial sector policies favorably (Rousseau and Wachtel, 2002; Arestis and Stein, 2005; Demetriades and Law, 2006). Through this, over time the development of regional financial systems may correspond more adequately to real sector activities, in consequence facilitating economic development.

Finance-Openness Causality and Further Implications

Next, we look at the causation between financial deepening and trade openness. Part of the theory suggests that finance may unilaterally lead openness as a comparative advantage for outward-oriented industries, or that openness may induce financial development as a consequence of trade-associated internal and external influences. A nexus between finance and openness may additionally allow for bidirectional causality. Following more sceptical views, we may also find no evidence for significant causality between finance and openness.

Table 5 shows the results for the causal inferences of *DEPTH* and *TRADE*, controlling for *GROWTH*. Our results again show no sign of autocorrelation or

multicollinearity and appear to be statistically significant and stable, particularly with respect to the chosen lag orders.

Table 5 here

We find no clear support for the hypothesis that financial development induces trade openness or for the reverse causation. Both patterns of causation are present, yet not convincingly predominant. Our evidence rather indicates that trade openness and financial deepening share a feedback relationship, with finance acting on the structure of outward-oriented industries and trade openness simultaneously impacting the process of financial deepening. Even though our results do not appear to suggest stable long-run finance-openness causality for all examined countries, we find that the theoretical assumption of a nexus between finance and openness is generally valid. Only in the case of Mexico and Guatemala do the two series indeed share no causal linkage.

Still, the effects of such interactions on general economic development appear to be marginal. On the one hand, the impact of openness on financial deepening has not translated into higher growth rates, as our previous results indicate. On the other hand, neither do we find evidence of any indirect effect of finance on growth via its impact on trade openness, as shown by the results of the causality analysis for *GROWTH* and *TRADE*, conditional on *DEPTH*, that are reported in Table 6.

Table 6 here

Mostly, the two series either share a feedback relationship or growth causes openness unilaterally. We find support for the hypothesis of a unidirectional, growth-

promoting effect of trade openness only in the cases of Guatemala and Suriname, where these results are not stable in the long run.

Our findings tend to confirm studies that neglect a leading influence of openness on economic development. Furthermore, our results are also consistent with former findings that detect no significant impact of openness on growth in the presence of weak financial systems (Berthelemy and Varoudakis, 1996). We can additionally assert that financial development does not indirectly induce growth in a unilateral way by promoting openness which in turn positively acts on growth. Rather, we can assess that such interactions commonly happen only feedback-wise for some examined countries, e.g. in the cases of Chile and Honduras.

More generally, our results suggest that for Latin America and the Caribbean policies that center on the liberalization of both the financial and trade sectors affect overall economic performance only to a limited extent, particularly in the short run.

V. Summary

Drawing on conflicting theoretical considerations about the causal interactions between financial deepening, economic growth and trade openness, we have tested for causality in 13 Latin American and Caribbean countries. We used principal component analysis to determine an indicator of financial deepening. Subsequently employing Hsiao's version of Granger causality within a VAR/VECM framework has several advantages which were discussed.

Our empirical findings and policy implications can be summarized as follows. First, for Latin America and the Caribbean we detect almost no evidence of finance-led growth. Second, evidence of bidirectional causality is stronger, yet appears to be unstable in the long run. Third, most results point at a demand-following or insignificant causal interaction between finance and growth in the Latin American

region. We thus provide support for a more sceptical view on the finance-growth relationship. While we find some evidence that suggests interdependencies between the financial sector and trade openness, such interactions do not appear to significantly translate into enhanced economic performance. There is no evidence that finance indirectly induces growth via the channel of promoting trade openness. In the light of our results, we question policies that prioritize financial sector and trade liberalization. Financial sector and trade development do not appear to be preconditions of economic development in Latin America. Instead, we advocate a more balanced policy approach that also takes into account other fundamental growth factors, such as factor endowments, institutions or a country's general stage of development. A combined strengthening of these growth factors may significantly alter finance-growth dynamics.[14]

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[14] Chile may serve as a role model or Latin America. Our causality analysis reveals that Chile has probably most solidly benefited from the virtuous circle of finance, openness and growth in the past. In this connection, we may attribute Chile's relative economic success to the interaction between macroeconomic stability, the 'good' quality of its institutions and its rather strong and efficient financial system that matches its stage of development, with all factors reinforced by sound economic policies.

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Appendix

Table 1. Summary Statistics and Results of Principal Component Analysis

Country	*Data Availability*	*Country Income Class*	*DEPTH*	*Component Matrix*			
				DMBA	*LL*	*PC*	*BDGDP*
Mexico	1960-2004	UMI	63.08%	0.341	0.948	0.796	0.935
Venezuela	1960-2004	UMI	75.86%	0.513	0.959	0.968	0.936
Costa Rica	1960-2004	UMI	61.53%	-0.818	0.913	-0.380	0.903
Ecuador	1960-2004	LMI	65.22%	0.549	0.896	0.831	0.902
Honduras	1960-2004	LMI	85.26%	0.763	0.958	0.974	0.981
El Salvador	1960-2003	LMI	72.12%	-0.010	0.989	0.964	0.988
Paraguay	1960-2003	LMI	84.64%	0.781	0.982	0.935	0.968
Guatemala	1960-2003	LMI	68.66%	0.020	0.978	0.927	0.964
Dominican Republic	1960-2003	LMI	86.78%	0.817	0.959	0.941	0.987
Colombia	1960-2003	LMI	78.55%	0.787	0.891	0.948	0.911
Chile	1974-2004	UMI	94.91%	0.948	0.979	0.985	0.984
Suriname	1970-2003	LMI	84.06%	-0.818	0.990	0.858	0.988
Jamaica	1960-2003	LMI	70.61%	-0.738	0.963	0.674	0.948

Notes: The Column *Country Income Class* follows the usual measurement of the World Bank and is taken from Beck *et al.* (2000). *UMI* denotes Upper Middle Income, *LMI* Lower Middle Income. The column *DEPTH* gives the value of the initial eigenvalues as percentage of the total variance the first principal component contains (percentage of variance criterion) that represents the composite indicator for financial deepening.

Table 2. Phillips-Perron Unit Root Test Statistics

Country		*Level*		*First Difference*	
		$Z(t_a)$	$Z(t_{at})$	$Z(t_a)$	$Z(t_{at})$
Mexico	G	-2.313	-1.690	-4.850***	-5.173***
	T	1.871	-1.375	-4.196***	-4.636***
	D	-2.080	-2.129	-5.296***	-5.228***
Venezuela	G	-2.310	-1.890	-5.221***	-5.310***
	T	-1.661	-1.437	-8.973***	-9.083***
	D	-1.029	-1.203	-5.473***	-5.630***
Costa Rica	G	-0.736	-1.616	-4.825***	-4.799***
	T	-0.330	-1.970	-5.227***	-5.159***
	D	-1.651	-0.791	-4.807***	-5.101***
Ecuador	G	-1.661	-0.992	-4.477***	-4.754***
	T	-1.085	-1.933	-6.808***	-6.763***
	D	-1.806	-2.626	-5.489***	-5.427***
Honduras	G	-1.671	-1.387	-6.498***	-11.505***
	T	-2.406	-2.532	-4.653***	-4.628***
	D	-0.613	-1.778	-3.757***	-3.704**
El Salvador	G	-1.708	-2.041	-3.443**	-3.561**
	T	-0.113	-0.712	-5.895***	-5.973***
	D	-1.004	-2.499	-4.449***	-4.381***
Paraguay	G	-1.792	-0.081	-3.380**	-3.729**
	T	-1.058	-2.377	-6.128***	-6.064***
	D	-1.248	-1.953	-3.657***	-3.691**
Guatemala	G	-2.376	-1.644	-4.051***	-4.274***
	T	-1.629	-1.623	-6.073***	-6.002***
	D	-1.862	-2.038	-5.031***	-5.047***
Dominican	G	-0.462	-2.442	-5.919***	-5.832***
Republic	T	-2.408	-2.319	-6.808***	-6.934***
	D	-0.520	-2.023	-5.580***	-5.546***
Colombia	G	-2.004	-0.469	-3.787***	-4.143**
	T	-0.348	-2.203	-7.257***	-7.335***
	D	-0.410	-1.772	-3.824***	-3.877**
Chile	G	0.486	-2.536	-4.982***	-4.773***
	T	-2.279	-2.422	-4.934***	-4.898***
	D	-4.320***	-2.543	-1.786	-2.726
Suriname	G	-1.144	-1.480	-5.781***	-5.778***
	T	-2.716*	-2.729	-9.511***	-8.895***
	D	-1.548	-1.684	-3.178**	-3.045
Jamaica	G	-2.170	-2.161	-4.633***	4.599***
	T	-1.235	-2.032	-6.113***	-6.047***
	D	-2.055	-1.499	-3.653***	-3.745**

Notes: $Z(t_a)$ and $Z(t_{at})$ denote the PP test statistics with a constant and constant with a linear trend, respectively. (***), (**), (*) denote significance at 1%, 5% and 10% levels, respectively. G, T, D indicate the series for growth, trade openness and financial depth, respectively.

Table 3. Johansen Cointegration Trace Statistics for Trivariate VAR

Country	*Hypothesized No. of Cointegration equations (H_0)*	*Trace Statistic*	*0.05 Critical Value*	*0.1 Critical Value*
Mexico	None	24.45902	29.79707	27.06695
	At most 1	11.56195	15.49471	13.42878
	At most 2	0.056557	3.841466	2.705545
Venezuela	None	31.08861	29.79707**	27.06695*
	At most 1	11.92365	15.49471	13.42878
	At most 2	3.497589	3.841466	2.705545*
Costa Rica	None	33.40523	29.79707**	27.06695
	At most 1	14.15922	15.49471	13.42878*
	At most 2	1.675720	3.841466	2.705545*
Ecuador	None	19.98839	29.79707	27.06695
	At most 1	6.104672	15.49471	13.42878
	At most 2	1.000068	3.841466	2.705545
Honduras	None	29.22760	29.79707	27.06695*
	At most 1	10.98845	15.49471	13.42878
	At most 2	1.649849	3.841466	2.705545
El Salvador	None	17.19267	29.79707	27.06695
	At most 1	8.997328	15.49471	13.42878
	At most 2	1.115795	3.841466	2.705545
Paraguay	None	27.36907	29.79707	27.06695*
	At most 1	11.57968	15.49471	13.42878
	At most 2	3.647710	3.841466	2.705545*
Guatemala	None	34.20709	29.79707**	27.06695*
	At most 1	15.39020	15.49471	13.42878*
	At most 2	6.397096	3.841466**	2.705545*
Dominican Republic	None	28.48669	29.79707	27.06695*
	At most 1	8.309928	15.49471	13.42878
	At most 2	1.418959	3.841466	2.705545
Colombia	None	28.30022	29.79707	27.06695*
	At most 1	9.032229	15.49471	13.42878
	At most 2	3.573916	3.841466	2.705545*
Chile	None	51.02365	29.79707**	27.06695*
	At most 1	6.914879	15.49471	13.42878
	At most 2	0.172307	3.841466	2.705545
Suriname	None	28.14208	29.79707	27.06695*
	At most 1	13.29969	15.49471	13.42878
	At most 2	1.689383	3.841466	2.705545
Jamaica	None	29.71583	29.79707	27.06695*
	At most 1	13.34400	15.49471	13.42878
	At most 2	4.978295	3.841466	2.705545*

Notes: (**) and (*) denote rejection of the respective hypothesis at the 5% and 10% significance level, respectively. The test was conducted under the assumption of a linear deterministic trend. The respective lag order of the underlying VAR was chosen via the BIC, where the maximum lag length was 5, with the exceptions being Chile (maximum of 3 lags) and Suriname (maximum of 4 lags) due to shorter time horizons.

Table 4. Causality Analysis for DEPTH and GROWTH

Country	*FPE (m,0,p)*	*FPE (m,n,p)*	*ECM*	$D \Rightarrow G$ *i) short-run ii) long-run*	*FPE (m,0,p)*	*FPE (m,n,p)*	*ECM*	$G \Rightarrow D$ *i) short-run ii) long-run*
Mexico	0.00117 (1,0,1)	0.00123 (1,1,1)	---	i) NO ii) ---	0.32190 (1,0,1)	0.31352 (1,1,1)	---	i) YES[a] ii) ----
Venezuela	0.00280 (2,0,1)	0.00314 (2,1,1)	-0.001	i) NO ii) NO	0.12037 (1,0,1)	0.12189 (1,1,1)	+0.067	i) NO ii) NO
Costa Rica	0.00073 (1,0,1)	0.00061 (1,1,1)	+0.070***	i) YES ii) NO[b]	0.04045 (1,0,1)	0.03872 (1,1,1)	-0.102**	i) YES ii) YES
Ecuador	0.00192 (1,0,1)	0.00199 (1,1,1)	---	i) NO ii) ---	0.27524 (2,0,2)	0.27981 (2,1,2)	---	i) NO ii) NO
Honduras	0.00145 (2,0,2)	0.00153 (2,1,2)	+0.036	i) NO ii) NO	0.01837 (1,0,1)	0.01736 (1,3,1)	+0.013*	i) YES ii) NO[b]
El Salvador	0.00043 (1,0,3)	0.00045 (1,1,3)	---	i) NO ii) ---	0.00609 (3,0,1)	0.06326 (3,1,1)	---	i) NO ii) ---
Paraguay	0.00066 (1,0,1)	0.00068 (1,1,1)	+0.006	i) NO ii) NO	0.02792 (1,0,4)	0.02179 (1,2,4)	-0.363***	i) YES ii) YES
Guatemala	0.00029 (1,0,5)	0.00033 (1,1,5)	+0.007***	i) NO ii) NO	0.05273 (3,0,4)	0.04900 (3,2,4)	-0.049***	i) YES ii) YES
Dom. Rep.	0.00126 (5,0,2)	0.00122 (5,3,2)	+0.020	i) YES ii) NO[b]	0.11240 (3,0,5)	0.08670 (3,4,5)	-0.140***	i) YES ii) YES
Colombia	0.000202 (5,0,1)	0.000158 (5,1,1)	-0.004***	i) YES ii) YES	0.04212 (1,0,4)	0.04251 (1,1,4)	-0.097	i) NO ii) NO
Chile	0.00223 (1,0,2)	0.00122 (1,3,2)	-0.287***	i) YES ii) YES	0.00785 (1,0,3)	0.00627 (1,1,3)	-0.160***	i) YES ii) YES
Suriname	0.01876 (1,0,1)	0.01278 (1,1,1)	+0.077***	i) YES ii) NO[b]	0.10591 (2,0,1)	0.10536 (2,1,1)	+0.145**	i) YES ii) NO[b]
Jamaica	0.00117 (1,0,1)	0.00124 (1,1,1)	-0.148***	i) NO ii) NO	0.07160 (2,0,1)	0.07199 (2,1,1)	-0.020	i) NO ii) NO

Notes: *m*, *n* and *p* denote the lags leading to the respective smallest FPE, where the maximum lag length was 5, with the exception of Chile (maximum of 3 lags) and Suriname (maximum of 4 lags) due to shorter time horizons. (*), (**) and (***) denote significance of the ECM at 10%, 5% and 1% levels, respectively. (a) indicates an insignificant F-statistic of the respective estimation, while (b) indicates an ECM term that is insignificant or has a wrong sign.

Table 5. Causality Analysis for DEPTH and TRADE

Country	*FPE (m,0,p)*	*FPE (m,n,p)*	*ECM*	$D \Rightarrow T$ *i) short-run ii) long-run*	*FPE (m,0,p)*	*FPE (m,n,p)*	*ECM*	$T \Rightarrow D$ i) *short-run ii) long-run*
Mexico	0.00424 (1,0,1)	0.00445 (1,1,1)	---	i) NO ii) ---	0.30005 (1,0,1)	0.31352 (1,1,1)	---	i) NO ii) ----
Venezuela	0.00494 (4,0,1)	0.00491 (4,1,1)	-0.359***	i) YES ii) YES	0.12063 (1,0,1)	0.12189 (1,1,1)	+0.067	i) NO ii) NO
Costa Rica	0.00332 (1,0,1)	0.00342 (1,1,1)	+0.012	i) NO ii) NO	0.04249 (1,0,1)	0.03782 (1,2,1)	-0.131***	i) YES ii) YES
Ecuador	0.00384 (1,0,3)	0.00378 (1,1,3)	---	i) YES ii) ---	0.27190 (2,0,1)	0.27981 (2,2,1)	---	i) NO ii) ---
Honduras	0.00277 (2,0,4)	0.00280 (2,1,4)	-0.450***	i) NO ii) NO	0.01793 (1,0,3)	0.01736 (1,1,3)	+0.013*	i) YES ii) NO[b]
El Salvador	0.00485 (1,0,5)	0.00512 (1,1,5)	---	i) NO ii) ---	0.06527 (3,0,1)	0.06326 (3,1,1)	---	i) YES ii) ---
Paraguay	0.02240 (2,0,1)	0.02332 (2,1,1)	-0.041	i) NO ii) NO	0.03577 (1,0,1)	0.02088 (1,3,1)	-0.287***	i) YES ii) YES
Guatemala	0.00647 (3,0,1)	0.00715 (3,1,1)	-0.072	i) NO ii) NO	0.04049 (3,0,3)	0.05206 (3,5,3)	+0.012	i) NO ii) NO
Dom. Rep.	0.00632 (1,0,5)	0.00506 (1,1,5)	-0.281*	i) YES ii) YES	0.12448 (3,0,1)	0.08996 (3,5,1)	-0.033	i) YES ii) NO[b]
Colombia	0.00423 (2,0,1)	0.00387 (2,1,1)	+0.123**	i) YES ii) NO[b]	0.05065 (1,0,1)	0.03773 (1,1,1)	-0.171***	i) YES ii) YES
Chile	0.00169 (1,0,2)	0.00103 (1,1,2)	-0.060***	i) YES ii) YES	0.00614 (1,0,3)	0.00605 (1,1,3)	-0.186***	i) YES ii) YES
Suriname	0.24863 (1,0,1)	0.16430 (1,2,1)	-1.238***	i) YES ii) YES	0.18067 (2,0,1)	0.16430 (2,2,1)	+0.148***	i) YES ii) NO[b]
Jamaica	0.00653 (1,0,4)	0.00513 (1,2,4)	+0.044***	i) YES ii) NO[b]	0.07172 (2,0,1)	0.07025 (2,4,1)	-0.084***	i) YES ii) YES

Notes: *m*, *n* and *p* denote the lags leading to the respective smallest FPE, where the maximum lag length was 5, with the exception of Chile (maximum of 3 lags) and Suriname (maximum of 4 lags) due to shorter time horizons. (*), (**) and (***) denote significance of the ECM at 10%, 5% and 1% levels, respectively. (a) indicates an insignificant F-statistic of the respective estimation, while (b) indicates an ECM term that is insignificant or has a wrong sign.

Table 6. Causality Analysis for GROWTH and TRADE

Country	*FPE (m,0,p)*	*FPE (m,n,p)*	*ECM*	$G \Rightarrow T$ *i) short-run ii) long-run*	*FPE (m,0,p)*	*FPE (m,n,p)*	*ECM*	$T \Rightarrow G$ i) *short-run ii) long-run*
Mexico	0.00471 (1,0,1)	0.00445 (1,1,1)	---	i) YES ii) ---	0.00117 (1,0,1)	0.00123 (1,1,1)	---	i) NO ii) ----
Venezuela	0.00526 (4,0,1)	0.00491 (4,1,1)	-0.359***	i) YES ii) YES	0.00309 (2,0,1)	0.00314 (2,1,1)	-0.001	i) NO ii) NO
Costa Rica	0.00339 (1,0,1)	0.00342 (1,1,1)	+0.012	i) NO ii) NO	0.00069 (1,0,4)	0.00071 (1,1,4)	+0.065	i) NO ii) NO
Ecuador	0.00396 (1,0,1)	0.00378 (1,3,1)	---	i) YES ii) ---	0.00193 (1,0,1)	0.00200 (1,1,1)	---	i) NO ii) ---
Honduras	0.00472 (2,0,5)	0.00282 (2,3,5)	-0.532***	i) YES ii) YES	0.00154 (2,0,1)	0.00153 (2,2,1)	+0.036	i) YES ii) NO
El Salvador	0.00655 (1,0,1)	0.00512 (1,5,1)	---	i) YES ii) ---	0.00048 (1,0,3)	0.00050 (1,3,3)	---	i) NO ii) ---
Paraguay	0.02229 (2,0,1)	0.02194 (2,5,1)	-0.177	i) YES ii) NO[b]	0.00068 (1,0,1)	0.00061 (1,4,1)	-0.006***	i) YES ii) YES
Guatemala	0.00629 (3,0,1)	0.00706 (3,4,1)	-0.176**	i) NO ii) NO	0.00046 (1,0,1)	0.00033 (1,5,1)	+0.007***	i) YES ii) NO[b]
Dom. Rep.	0.00670 (1,0,5)	0.00563 (1,1,5)	-0.261*	i) YES ii) YES	0.00137 (5,0,1)	0.00102 (5,1,1)	+0.092***	i) YES ii) NO[b]
Colombia	0.00420 (2,0,1)	0.00351 (2,3,1)	+0.099***	i) YES ii) NO[b]	0.000208 (5,0,4)	0.000190 (5,1,4)	-0.001	i) YES ii) NO[b]
Chile	0.00093 (1,0,1)	0.00092 (1,3,1)	-0.236***	i) YES ii) YES	0.00156 (1,0,3)	0.00122 (1,2,3)	-0.287***	i) YES ii) YES
Suriname	0.15924 (1,0,1)	0.18475 (1,1,1)	-0.704***	i) NO ii) NO	0.01560 (1,0,2)	0.01425 (1,1,2)	+0.096	i) YES ii) NO[b]
Jamaica	0.00677 (1,0,2)	0.00513 (1,4,2)	+0.044***	i) YES ii) NO[b]	0.00150 (1,0,1)	0.00124 (1,1,1)	-0.148***	i) YES ii) YES

Notes: *m*, *n* and *p* denote the lags leading to the respective smallest FPE, where the maximum lag length was 5, with the exception of Chile (maximum of 3 lags) and Suriname (maximum of 4 lags) due to shorter time horizons. (*), (**) and (***) denote significance of the ECM at 10%, 5% and 1% levels, respectively. (a) indicates an insignificant F-statistic of the respective estimation, while (b) indicates an ECM term that is insignificant or has a wrong sign.

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