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Finance, Governments, and Trade

Giuseppe Bertola [+] and Anna Lo Prete *

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We study how financial transactions may respond to exogenous variation in trade opportunities not only directly, but also through policy channels. In more open economies, governments may find it more difficult to fund and enforce public policies that substitute private financial transactions, and more appealing to deregulate financial markets. We propose a simple theoretical model of such policy-mediated relationships between trade and financial development. Empirically, we document in a country panel dataset that, before the 2007-08 crisis, financial market volumes were robustly and negatively related to the share of government consumption in GDP in regressions that also include indicators of financial regulation and trade openness, and we seek support for a causal interpretation of this result in instrumental variable specifications.

JEL Classification: E60, F13, G18.

Keywords: private credit, financial reforms, openness, government size.

[+] EDHEC Business School and CEPR; *University of Turin, Department of Economics and Statistics. For helpful comments we thank an anonymous referee and presentation audiences at GEP-University of Nottingham, MWP Lustrum Conference, 26th Annual Congress of the EEA, University of Turin, and EDHEC.

1. Introduction

Between the 1980s and the 2000s international trade and financial volumes both grew considerably. In this paper we argue theoretically and document empirically that international economic integration influences financial development not only directly, as international trade openness may entail higher risks and new investment opportunities, but also by triggering financial deregulation and reducing governments' economic role within each country. We outline a theoretical perspective that lets governments choose financial deregulation, openness, and government activity. If the costs and benefits of these policy choices differ across countries and periods according to observable geographical, historical, and exogenous time-varying forces, it is possible to estimate their financial development effects by running regressions that address endogeneity as well as unobserved heterogeneity issues. In a sample of 65 countries, we document that between 1980 and 2007 the increase in financial market volumes has been significantly related to government retrenchment from economic activity through the indirect links resulting from policy choices that, in more open economies, substitute private financial transactions for public policies.

Our work is related to various strands of literature that focus on bivariate relationships between finance, trade, and government activities. Many empirical studies document a positive association between trade and finance, and suggest various channels of interaction between these two variables. Rajan and Zingales (2003) argue that international trade opened new financial contracting opportunities and foreign competitive pressure reduced domestic firms' lobbying power and rents, making it more necessary for them to draw on external finance. Svaleryd and Vlachos (2002) use various trade measures to assess whether higher exposure to external risk increases the demand for finance, Huang and Temple (2005) use panel data techniques to characterize dynamic impacts of trade on financial development, and Do and Levchenko (2007) show that deeper trade integration influences production specialization in ways that foster financial development; reverse causation channels have been studied by Beck (2002), who documents that manufacturing production and exports are larger in more financially developed countries.

Other relevant studies focus on interactions between financial development and government policies. Obviously, governments may repress financial transactions, or foster them by making available a suitable legal and informational infrastructure. Like *de facto* financial development, *de jure* aspects of financial markets have evolved strongly over the last few decades. Abiad and Mody (2005) show that liberalization may occur in response to economic and political shocks, especially in more open and initially highly regulated countries. Tressel and Detragiache (2008) document that

financial reform indicators are in turn very significantly associated with *de facto* financial depth, controlling for various country-level characteristics (including other liberalization indicators). Less obviously, financial development is also influenced by government policies such as public pensions, unemployment insurance, public education, public housing, and many other government programs that, just like financial contracts, reallocate resources over time and across *ex post* income realizations. This type of government activity crowds out private financial transactions to an extent that depends on the substitutability of private markets and public programs, which is generally imperfect as public policies and private contracts deliver similar services but under different constraints and for different purposes (Chetty and Saez, 2010). This has implications for the composition and intensity of public and private income- and consumption-smoothing mechanisms, as governments should intervene more extensively when poorly structured financial markets make it difficult to fund investment and smooth consumption privately (Bertola and Koeniger, 2007). From previous works we also know that government activities are related to the process of international economic integration. Given the structure of the private financial market, public policy should be more interventionist when incomes and investment opportunities are more heterogeneous and volatile, as may be the case in more open economies (Rodrik, 1998; Agell, 2002). While openness may through this channel call for more redistribution and regulation, it also weakens the economic power of national governments. Empirically, government size is lower in more open economies when country-specific characteristics are controlled for by fixed effects (Rodrik, 1997; Bertola and Lo Prete, 2009), indicating that race-to-the-bottom tensions may be operating along country-specific trajectories.

Bringing together insights from these strands of literature, this paper offers a multivariate interpretation of the relationship between financial development, trade, and country-level policies. Section 2 introduces relevant country-level empirical indicators of credit, trade, and government activity, and inspects bivariate and multivariate relationships. Section 3 sets up a simple model economy where both government policies and private financial transactions contribute to make consumption smoother than income. International openness can influence demand for financial transaction services directly if it makes incomes more volatile, which may but need not be the case empirically, but also through the restraining effect of international competition on government activity, which makes financial deregulation more attractive. Section 4 outlines how policy choices depend in such an economy on the relative effectiveness of public policies and private finance, and on the costs and benefits of international trade. This theoretical perspective suggests that some of the empirical cross-country and time-series variation of financial development's determinants can

then be explained by the shape of policy trade-offs, rather than by heterogeneous political motivations.

Statistical assessment of this insight's empirical relevance is a challenging task, because a relatively elaborate multivariate perspective makes the usual limitations of macroeconomic data all the more apparent. In the empirical portion of the paper, we use a variety of specifications and statistical tests to seek and find at least suggestive support for key aspects of our theoretical perspective. Treating all the three policy variables of interest (financial regulation, openness to trade, and government activities) as simultaneously determined by underlying structural features of specific countries and periods, and exploiting the panel dimension of the dataset to account for unobserved heterogeneity, in Section 5 we outline how interactions between relevant country-specific characteristics and common time effects might proxy the exogenous determinants of the relative effectiveness of public policies and private financial contracts, and of the costs and benefits of international trade. In Section 6 we obtain estimates of policy effects from instrumental variable (IV) specifications based on those instruments, as well as from dynamic ordinary least squares (OLS) specifications. The results, and additional robustness checks, suggest that government economic activity is a significantly negative determinant of financial development. Section 7 concludes.

2. Data and correlations

We proceed to introduce the data we will be analyzing in the rest of the paper and to inspect descriptive relationships between empirical indicators of the phenomena of interest. To measure "Financial Development", we draw from the World Bank Financial Development and Structure Database the "Private Domestic Credit by Deposit Money Banks and Other Financial Institutions" ratio to GDP. This volume measure of financial market activity is certainly related to business investment and household housing purchases, and includes consumer credit's self-insuring role in the presence of labor income volatility. We proxy the factors that may determine Financial Development by three indicators: "Financial Structure," the summary of seven dimensions of the financial sector's institutional structure from the IMF Financial Reform Database; "Trade" (the ratio of imports plus exports to GDP from the Penn World Table, see Heston et al., 2009), which we will view as resulting from both structural factors and policy choices; and "Government" (the Penn World Table's Government Consumption Share of GDP): this broad index of public economic activity offers an admittedly partial, but internationally comparable gauge of the government's finance-substituting

role in such areas as education and housing, as well as in the administration of unemployment and old-age redistribution schemes.[1]

The dataset includes 65 countries. To smooth out cyclical relationships between government's share of economic activity and financial depth, we average available observations over non-overlapping four-year sub-periods, from 1980-1983 to the final 2004-07 period before the financial crisis. Appendix B reports detailed definitions and data sources, as well as summary statistics.

Table 1 explores in these data the bivariate relationships analyzed by previous studies. The correlation between Trade and Financial Development is significantly positive in levels, and stronger when deviations from country means remove the influence on both variables of constant country characteristics. The Financial Structure index is positively related to credit volumes across the countries and periods in our sample.[2] The relationship between Trade and Government is insignificant in levels and negative in deviations from country means, as in Rodrik (1997) and Bertola and Lo Prete (2009). We also see in Table 1 that, regardless of whether country-specific unobservable features are controlled for, the correlation between Government and Financial Development is negative, which is consistent with the idea that public economic activity crowds out private financial contracts.

Figure 1 illustrates multivariate relationships between the three indicators we focus on and Financial Development. In the top panel we see that, controlling for Trade and Government, the partial association of Financial Development with Financial Structure is very significantly positive. Controlling for Financial Structure and Government, there is no partial association of Trade and Financial Development in the middle panel, while in the bottom panel Government is negatively and

[1] This variable measures government activity in terms of general government consumption of goods and services, which mostly corresponds to the salaries of public employees, such as teachers and administrators of tax and subsidy schemes which obviously reduce private financial activity. The transfers entailed by such schemes are potentially more relevant but very difficult to measure consistently across countries. World Development Indicators, The World Bank (data.worldbank.org/data-catalog/world-development-indicators) include a "Public Transfers" variable that is sparse and of dubious quality, and indeed proves uninformative in Epifani and Gancia's (2009) regressions aimed at testing the hypothesis that openness influences the size of government through its effect on tax policy's ability to change the terms of trade. Exploring the relevance of the "Public Social Expenditure" indicator from the OECD Social Expenditure Database (www.oecd.org/els/social/expenditure) in the small sample of countries for which it is available, we have found that demographic trends explain much of its variation and confound the empirical picture.

[2] This indicator, which aggregates information on a wide variety of financial market institutions, is also significantly correlated with the stock market capitalization to GDP ratios considered in Section 6, when we assess the results' robustness to alternative measures of *de facto* financial market activity.

significantly associated with Financial Development after controlling for Financial Structure and Trade.

This descriptive evidence indicates that the positive correlation between Financial Development and Trade is mostly accounted for by the correlations between Trade and Government and between Trade and Financial Structure, and suggests that a direct link between trade and finance may not be as empirically relevant as the indirect ones resulting from substitution of private financial transactions for public policies in more open economies. While the point estimate and significance of the Government partial correlation with Financial Development is remarkably robust to inclusion of country effects (coefficient -1.44, t-statistic -4.65), and of both country and period fixed effects (coefficient -1.21, t-statistic -4.03), the partial association between Financial Development and Financial Structure changes sign when country and period effects are controlled for. The lack of partial correlation between Trade and Financial Development is robust to inclusion of such effects, but turns significantly positive, as in Table 1, in regressions that control for Government only.

This evidence does not deny that Trade and Financial Development are related. Rather, it suggests that their relationship is mediated by covariation with Financial Structure, quite possibly through the politico-economic channels analyzed by Rajan and Zingales (2003). In these data, time effects also suffice to remove the significance of Financial Development's partial correlation with Trade, while Government's significantly negative association with Financial Development is remarkably robust. In what follows we first argue that some types of government activity are in fact theoretically expected to crowd out financial intermediation, and discuss how the extent to which they do so in practice depends on country- and period-specific features. Then, we apply the resulting perspective to estimation of the financial development effects of financial regulation, openness to trade, and government activities.

3. Finance and government activity

We proceed to outline a simple formal model of consumption smoothing across individuals in different contingencies or at different points in the lifecycle. In each of the two periods and/or contingent realizations, let available resources be high at y_H for half of the individuals, low at $y_L < y_H$ for the other half. Full smoothing of the corresponding c_H and c_L consumption levels would be optimal if the period utility function is concave and, for simplicity, discount and return rates are both normalized to zero. To represent financial market imperfections that make it impossible to set

$c_H = c_L = (y_L + y_H)/2$, let each purchase or sale of private financial securities entail a per-unit cost μ, so that every individual's resource constraint reads

$$c_H + c_L = y_H + y_L - (y_H - c_H + c_L - y_L)\mu.$$

Financial contracts are active if

$$\frac{y_H}{y_L} > \frac{1+\mu}{1-\mu}, \tag{1}$$

and imply that the ratio of marginal utilities, $u'(c_L)/u'(c_H)$, equals the rate of transformation $(1+\mu)/(1-\mu)$. A closed-form solution is readily available if utility is logarithmic: inserting $c_L = c_H(1-\mu)/(1+\mu)$ in the resource constraint yields

$$c_H = \frac{y_L + y_H - (y_H - y_L)\mu}{2(1-\mu)}, \quad c_L = \frac{y_L + y_H - (y_H - y_L)\mu}{2(1+\mu)},$$

and each individual's expected utility

$$\log(c_H) + \log(c_L) = \log\left(\frac{(y_H + y_L - (y_H - y_L)\mu)^2}{4(1-\mu^2)}\right) \tag{2}$$

depends positively on total income and negatively, to the extent that μ>0 prevents consumption smoothing, on income fluctuations.

We next suppose that it is possible for government programs to reduce the variability of available resources, at a cost in terms of average production. If transferring τ units of income entails a quadratic deadweight loss $f(\tau) = \lambda\tau^2$, then it is possible to increase the low income y_L by $\tau - \frac{1}{2}\lambda\tau^2$ and decrease the high income y_H by $\tau + \frac{1}{2}\lambda\tau^2$. In an interior solution where both public policies and private financial contracts are active, the tax rate should be set so that the total welfare loss due to deadweight, $\lambda\tau^2$, is offset at the margin by the savings, $2\tau\mu$, on the cost of intermediation in the financial market. The optimal $\tau = \mu/\lambda$ is larger when the deadweight losses indexed by λ are small and/or when the private financial costs indexed by μ are large. These intuitive properties are qualitatively valid for more general specifications; in particular, it would be straightforward to let financial transaction costs be increasing in the amounts transacted, and tax costs could then be constant.

When $\tau = \mu/\lambda$, the sum of disposable incomes is $y_H + y_L - \lambda\tau^2 = y_H + y_L - \mu^2/\lambda$, their difference is $y_H - y_L - 2\tau = y_H - y_L - 2\mu/\lambda$, and the typical individual's welfare expression (2) neatly simplifies to

$$U(\mu, \lambda, Y, \Delta) = \log\left(\left(Y + \frac{\mu^2}{\lambda} - \mu\Delta\right)^2 \frac{1}{4(1-\mu^2)}\right), \tag{3}$$

where $Y \equiv y_H + y_L$ is the economy's total income and $\Delta \equiv y_H - y_L$ is a measure of pre-tax income dispersion.

In this simple model, deadweight losses and transaction costs limit the extent to which governments and markets may smooth consumption, and decrease welfare: the expression in (3) is decreasing in λ, and we show in Appendix A that it is also decreasing in μ over the range of parameters where financial transactions are positive. Just as intuitively, larger mean income Y increases welfare, while larger income dispersion Δ reduces it as long as transaction costs prevent full smoothing of its consumption implications.

The difference between net income and consumption, normalized by aggregate income, is the model counterpart of the *de facto* measure of financial development examined in Section 2. We show in Appendix A that it is larger if the government engages less in finance-substituting policies (i.e., τ is smaller), if private financial transactions are less costly (a smaller μ), and if incomes are more heterogeneous across market participants (a larger Δ). These three factors are related to the empirical facts documented above. The significant partial correlations with Financial Development of Financial Structure and Government are consistent with the model's predictions that smaller financial frictions should increase financial market volumes, and that private financial transactions substitute public policies; the insignificant partial correlation between Trade and Financial Development in Figure 1 may indicate that the third channel is not as empirically relevant as the others. A proper interpretation of such empirical patterns, however, needs to identify exogenous sources of variation, across countries and periods, of Financial Development's determinants.

4. Theoretical determinants of country-level choices

In the model, government policies may fill the gap left by financial market imperfections between individual income and desired consumption patterns. In reality, the costs and benefits of doing so depend on potentially observable exogenous characteristics of the policy-making environment. To model such aspects of the data-generating process we consider the role of openness, denoted ω, and of other variables, denoted $\boldsymbol{Z}$, as determinants of total income, income dispersion, and deadweight losses. Since international market integration makes it difficult for governments to design and enforce tax, subsidy, and public service policies, the deadweight loss parameter λ may be increasing in openness, ω, which may also influence income dispersion according to a function

$\Delta(\omega, \mathbf{Z})$, and should increase total income, $Y(\omega, \boldsymbol{Z})$. In the model, the smoother financial transactions represented by a smaller μ improve welfare.[3] In reality, this obvious benefit has to be traded off against the administration costs of a suitably supervised financial market framework, or the higher instability implied by financial deregulation. To model this trade-off, and ensure that financial market regulation poses a well-defined policy choice problem, we simply suppose that a higher μ decreases welfare linearly, with slope α.

The first-order conditions for maximization of $U(\mu, \lambda(\omega, \boldsymbol{Z}), Y(\omega, \boldsymbol{Z}), \Delta(\omega, \boldsymbol{Z})) - \alpha\mu$ are

$$U_\mu(\cdot) - \alpha = 0 \tag{4}$$

$$U_\lambda(\cdot)\lambda_\omega(\omega, \boldsymbol{Z}) + U_Y(\cdot)Y_\omega(\lambda(\omega, \boldsymbol{Z})) + U_\Delta(\cdot)\Delta_\omega(\omega, \boldsymbol{Z}) = 0 \tag{5}$$

where subscripts denote the partial derivatives of the function defined in (3). In (4), the optimal choice of the financial market spread, μ, balances at the margin the consumption-smoothing benefits and administration/instability costs of smaller financial frictions. In (5), the optimal choice of openness, ω, balances its presumably positive effect on output with possibly negative effects through more variable income and through more difficult implementation of finance-substituting government programs that prevent unfettered international trade from being the obvious policy choice. Since the optimal choice of finance-substituting policies is embedded in the functional form (3), the solution of (4-5) satisfies

$$\tau = \frac{\mu}{\lambda(\omega, \boldsymbol{Z})}. \tag{6}$$

As long as first-order conditions identify an interior global optimum, these equations identify $\mu^*(\boldsymbol{Z}), \omega^*(\boldsymbol{Z})$, and $\tau^*(\boldsymbol{Z})$ as the financial structure, openness to trade, and government programs resulting from the policy choices that are optimal in an environment characterized by a $\boldsymbol{Z} = (z_1, z_2, \dots)$ vector of relevant characteristics. The policy implications of such characteristics can be characterized by standard comparative-statics methods. In general, exogenous features of the policy-making environment influence the marginal welfare effect of each policy choice, and their influence on other policy choices depends on the sign of the objective function's mixed derivatives. Suppose, for example, that a specific z_1 feature of a country's exogenous circumstances only influences the cost of reducing financial frictions. If a larger z_1 decreases α, and makes it less costly for the country to develop financially, it is optimal to choose a smaller spread. Similarly, a variable z_2 that

[3] It would be possible to extend the model to allow for individual-level investment. Then, a smaller μ could improve the quality of investment-savings matching, to imply higher output, and/or increase the pre-tax income dispersion indexed by Δ, as leverage amplifies the *ex post* implications of idiosyncratic shocks.

strengthens the output effect of openness makes it optimal to choose more openness.[4] This offers useful guidance for identification of sources of cross-country and time-series policy variation.

5. Instrumental variables

To estimate the impact of three endogenous determinants of Financial Development (Financial Structure, Trade, and Government) on Financial Development, we need sufficiently many exogenous observable instrumental variables that are not directly relevant to Financial Development, and suitably related to those determinants. Politico-economic factors are certainly empirically relevant, as policy-makers generally pursue different objectives in different countries and at different times.[5] The determinants of such heterogeneity, however, are difficult to pin down, and need not be exogenous to country-level developments. In general, financial development variation across countries and periods may be explained by variables that not only determine policy choices, as in the optimality conditions (4-6), but also influence financial development for given policies. In a specific country and period, a government pursuing liberalization objectives might for example deregulate financial markets, remove trade barriers and also, independently of those and other observable reforms, trigger financial development through investors' enthusiasm. Other endogenous mechanisms could generate different biases: if Financial Structure responds to exogenous Financial Development variation (such as that generated by financial crises), the association between financial policy and financial development includes reverse causation channels.

For any policy objective, however, the model outlined above suggests that if trade is more beneficial and more difficult to restrain, then we should observe smaller barriers to trade, less government

[4] Totally differentiating the first-order conditions,

$$\frac{\partial \mu}{\partial z_1} = -\frac{\partial^2 U}{\partial \omega^2}\frac{1}{|H|}\frac{\partial \alpha}{\partial z_1}, \quad \frac{\partial \omega}{\partial z_2} = -\frac{\partial^2 U}{\partial \mu^2}\frac{1}{|H|}\frac{\partial U}{\partial Y}\frac{\partial^2 Y}{\partial \omega \partial z_2}$$

where $|H|$ denotes the Hessian determinant, which is positive at a maximum. For example, if more openness increases the dispersion of incomes, then the same factors that foster openness may also foster financial development (as in Rajan and Zingales, 2003) as less expensive private financial contracts substitute the income-smoothing public policies that international openness makes more costly to implement.

[5] Many contributions do choose to interpret the relationship between government activities and economic outcomes in terms of differently oriented policy-making frameworks. La Porta et al. (2002), for example, view the fact that public ownership of banks is negatively related to financial and economic development as evidence that intrusive economic policies aim at inefficient rent appropriation. The constrained-maximization mechanism we outline is an arguably plausible element of the process that generates policy data. We do not try to disentangle its implications from those of variation of policy objectives, which is observationally equivalent in general and may in practice be related to the instrumental variables we use.

activity, and more financial market deregulation. These choices, and the resulting financial development, may also differ according to how easy it is for private contracts to substitute government activities. While this perspective neglects many other sources of observed policy variation, it isolates a component that can be explained by exogenous indicators of differences (across countries and over time) of economic integration's appeal, of the implications of economic integration for government activity, and of the ease with which financial markets may be structured so as to substitute government activities.

Empirically, we examine the explanatory power as instruments for observed policies of *interactions* between common trends, which are suitably exogenous to policies if the global forces they represent are only weakly (if at all) influenced by country-level variables, and time-invariant country-specific indicators of the intensity and shape of the relevant policy trade-offs. The sources of policy variation we focus on are geographic characteristics and more or less remote historical events that may shape each country's policy response to new developments. As a gauge of the country-specific intensity of economic integration forces, we consider the Frankel and Romer (1999) "Natural Openness" indicator, based on estimates on a 1985 sample of bilateral trade equations including geographic characteristics. To capture differences across countries in the ease of substituting private markets with public sector intervention, we use the La Porta et al. (1999) indicator of how each country's "Legal Origin" might shape different countries' inclination to administer public programs or to enforce private contracts. [6]

These interactions are exogenous if period-specific forces (such as technological and global trade integration processes) are not correlated with country-specific shocks, or with financial development directly rather than only though the policy variables of interest. This source of omitted-variable bias can be eliminated by including fixed country effects among the determinants of Financial Development. Time effects can similarly absorb spurious covariation, such as declines in government size due to the same common ideological trends that drive trade liberalization and financial reforms. Identification then hinges on the role of exogenous variables that vary both across countries and over time in shaping responses to common driving factors of the Financial Development policy

[6] Such pre-determined indicators are preferable for our purposes to time-varying measures that might be causally influenced by shocks that also drive financial development. As regards ease of trade, tariff indexes convey information on both policy choices and exogenous shocks. It would be similarly hard to disentangle structural relationships in the co-variation between Financial Development and time-varying features of legal systems (such as those documented in Armour et al., 2009), which is empirically strong but arguably less causal, and more difficult to interpret, than the influence exerted by the remote historical roots captured by the Legal Origin indicator.

determinants of interest (Financial Structure, Trade, and Government). Interactions with period effects of Natural Openness and Legal Origin are theoretically plausible determinants of country-specific choices if common developments have different implications for countries that are more or less naturally open, or have different legal traditions: global trade liberalization may have a different impact on geographically different countries, and common advances in computer technology may have different implications for countries more inclined to adopt administrative rather than contract-based solutions to financial problems. The empirical validity of this identification strategy can to some extent be assessed by tests of the strength of first-stage and of over-identifying restrictions, as we do in the next section. Such tests, however, cannot be conclusive in general, and have to be interpreted especially cautiously when, as is the case for interaction terms, a large number of potentially blunt instruments may introduce severe biases.

The first-stage relationship between instruments and policies is illustrated in Table 2 by regressions of the three endogenous determinants of Financial Development on interactions between Natural Openness, Legal Origin, and a time trend (rather than the more flexible unrestricted time effects used in the next section's IV estimates, which would make the table unwieldy and unreadable).[7] Unreported country fixed effects absorb the main effects of Natural Openness and Legal Origin as well as of any other country characteristic that does not vary between periods. Interactions of the time trend with country-specific variables are jointly very significant, and many of their coefficients are significantly different from each other. While the details of the relationship between exogenous instruments and endogenous policies are not as important as its overall plausibility and statistical strength, some of the observed patterns capture plausible effects. More naturally open countries, and their government, appear to be disproportionately affected by the trade-relevant portion of global technological and political trends; the negative trend and natural openness interaction with Scandinavian legal origin as a determinant of Trade might reflect some Nordic countries' choices regarding EU or EMU membership; for countries of English Legal Origin, higher Natural Openness implies a stronger inclination (relative to the French reference, and to the German Legal Origin group) to choose less Government.

[7] The results are virtually identical if the trend is replaced by indicators of the intensity of world trade, or shipping costs, or financial globalization. All these phenomena followed tightly correlated trends over the sample period, and all are arguably exogenous to country-specific policies since most countries are either too small or too closed to account for more than a small portion of global imports and exports.

6. Regression results

Second-stage coefficient estimates of the Financial Development implications of the three variables of interest recognize that some of their variation is potentially endogenous, and isolate the component explained by exogenous sources of country- and time-specific variation. To disentangle the separate effects on Financial Development of multiple endogenous variables, these should not only have sufficiently strong explanatory power for each endogenous variable, but also have sufficiently different implications for each of them.

The first-stage regressions of the instrumental variable estimates we report in this section include country and period effects, and interactions of Legal Origin and Natural Openness with period effects.[8] The strength of the instruments is assessed in the following tables by the Kleibergen--Paap test of the relevant covariance matrix's rank, which extends in heteroskedasticity-robust ways simpler tests applicable in asymptotically independently distributed settings (Kleibergen and Paap, 2006).[9]

In Table 3 we report results from specifications that allow Financial Development to depend on unobservable country characteristics, on time effects that capture period-specific factors that may plausibly influence financial development directly, and on exogenous policy variation. The results of column 1 show that the partial effects not only of Trade (as in the OLS regression shown in Figure 1) but also of Financial Structure are insignificant. The effect of Government on Financial Development is precisely estimated instead and negative, suggesting that some substitution of private financial transactions for public housing, education, and other government programs may have occurred in the sample we are analyzing. The test statistics reported in Table 3 help assessing the relevance and exogeneity of our interacted instrumental variables. The p-value of the test of over-identifying restrictions is above 0.05, indicating that the data do not strongly reject the exclusion restrictions that rule out correlation between the interacted instruments and Financial Development errors. The

[8] It is not possible to report or interpret the many coefficients of these first-stage regressions. Their partial R2s for the residual variation unexplained by country fixed effects is 0.32 for Government, 0.53 for Trade, and 0.88 for Financial Structure. All Shea's partial R2 (Shea, 2007) are in the 0.2-0.3 range. When instruments are constructed as in Table 2, using a trend instead of period effects, Shea's partial R2s lower than 0.10 give weak statistical evidence of instrument relevance; the second-stage coefficients are very similar, but less reliably estimated.

[9] The distribution of these statistics depends on details of the data generating process, and significance levels depend on the specific relative-bias null hypothesis one wishes to test; to foster complete confidence in the instruments' strength, the test statistic should exceed the critical values (in the order of 10) for the Cragg-Donald statistic it generalizes (see Baum et al., 2007).

instruments are rather weak, as the subtle exogenous influences detected by interaction effects barely suffice to disentangle the separate effects of policies.

Since some of the effects at work may naturally involve lags across the observations' 4-year time span, we also report specifications that include a lag of the dependent variable, and lagged as well as current values of the endogenous regressors, along with country and time effects. The test statistics point to weaknesses of the IV specification, as it is difficult to disentangle the many effects of policies and of the lagged dependent and independent variables. The message of this regression is similar to that of the static specification: either the current or the lagged value of Financial Structure and of Government is significant, with positive and negative signs respectively; the lag of Trade turns out to be significantly positive, indicating that it may indeed take time for it to influence Financial Development. The information content of the data, however, does not suffice to identify precise timing patterns. In fact, with only 7 sub-periods it is not possible reliably to account for the likely serial correlation induced by error clustering in fixed-effects IV estimation, and this makes it necessary to interpret the specification tests very cautiously.

To address potential worries about the statistical properties of the tests, as well as about the choice of instruments, we report simpler estimates of possibly causal policy effects based on timing considerations. In the last two columns of Table 3, we run OLS regressions of Financial Development on the first (in column 3) and the first and second (in column 4) lags of the three policy variables and of the dependent variable, controlling for country and time effects. The test statistics we report are robust to error clustering by country, as well as to arbitrary heteroskedasticity. When only one lag is included, the significance pattern of the policy variables is similar to that of static IV specifications. The OLS specification with two lags suggests that lagged Government is a very significant determinant of Financial Development (the p-value of the joint significance test for its two lags is less than 0.001 regardless of covariance matrix estimation method), while Trade and Financial Structure are less relevant (the joint significance tests for their two lags have p-values of 0.08 and 0.07 when standard error estimates are robust to heteroskedasticity; both exceed 0.10 when, as in the table, test statistics account for clustering by country). This evidence is certainly more descriptive than definitive, but it nicely complements and confirms the main message of the instrumental variables estimates.

While the estimated effects of Financial Structure and Trade are sensitive to details of the specifications reported in Table 3, the data indicate clearly that the effect of Government is large and negative. Identification of course relies on exclusion restrictions that may be invalid. Many possible theoretical channels depend on functional forms in ways that need not be completely captured by

country and period dummies: for example, economies or diseconomies of scale in the production of financial services may plausibly influence Financial Development; and government size has been shown to be related to the size of countries (e.g., Alesina and Wacziarg, 1998). To assess the empirical relevance of such plausible phenomena, we extend the specification to include aggregate GDP and population (drawn from the Penn World Table).[10] The results in column 1 of Table 4 unsurprisingly indicate that richer countries are more financially developed, and that economies of scale appear to operate at the per-capita income level: aggregate income is individually significant, and population is negatively associated with Financial Development. More importantly for our purposes, inclusion of these controls leaves unchanged the main results of interest: the direct influence of Financial Structure and Trade is not significant;[11] and the effect of Government is always significantly negative.

Columns 2 and 3 assess sub-sample robustness of the results. We split the sample across Advanced and Developing countries, according to the World Bank classification. This substantially reduces the variation of Legal Origin within each of the samples (all Scandinavian Legal Origin countries are in the Advanced sub-sample, and all but one of the Socialist Legal Origin countries are in the Developing sub-sample) and the precision of the estimates. In the more numerous Developing sub-sample, the point estimate of the coefficient of Government is similar to that from regressions run on the full sample, while its effect is not as precisely estimated in the smaller Advanced sub-sample.

In columns 4 to 5, we measure Financial Development in terms of stock market capitalization as well as, or instead of, the private credit volume indicator considered so far. The Government indicator is always significantly negative across these specifications, while the coefficients of the other policy variable are rather unstable.

[10] Some of these variables' variation may be exogenous to the policies and outcomes of interest, and some may be determined by the same historical and natural characteristics that we bring to bear on the data, by policy choices, and by unobserved independent sources of Financial Development variation. Our main estimation results are also robust to inclusion of GDP and population as endogenous variables (results not reported).

[11] When each of the seven dimensions of financial sector policy aggregated by the IMF index is included separately as a Financial Reforms indicator, only "Prudential regulations and supervision of the banking sector" remains significantly positive; this is the only dimension coded so that more government intervention is expected to support financial development, and excluding it from the Financial Reform Index leaves our results unchanged.

7. Summary and conclusions

We suggest a possible interpretation of financial development patterns in terms of different costs and benefits of policy choices in different countries and periods, and explore the relevance as policy determinants of country characteristics captured by simple geographical and historical indicators, interacted with global time-dependent factors. While the data do not convey a clear message as to the effects of trade, which appear weak, and of financial regulation policies, which do not vary differently enough across countries and are mildly related to exogenous instruments, government size stands out as the most robustly relevant policy determinants of financial development. Not only in simple least-square regressions, but also in specifications that focus on the variation of exogenous interactions after removing country and time effects, smaller governments increase financial volumes. These results admit a causal interpretation: the Government indicator of public economic activity, of which we isolate a time-and-country-specific exogenous component, exerts a significant negative effect on Financial Development, suggesting that private financial contracts substitute government programs when international competition makes it more difficult to implement the latter.

Our theoretical and empirical perspective interprets the relationship between trade and financial development in terms of indirect policy channels, also influenced by other factors in a multivariate settings. All else equal, economic integration is more appealing when trade is easier and more difficult to restrict, and international competition also induces policy-makers to deregulate financial markets and governments to retreat from economic activity. The resulting financial development, like all things, has benefits as well as costs that may or may not have been taken into account correctly at the time policy choices were made. In the absence of information about the costs of financial reforms and the benefits of international economic integration, normative views unavoidably depend strongly on one's priors, notably as regards whether regulation and government activity reflect rent-seeking motives (as in e.g., Rajan and Zingales, 2003) or well-intentioned attempts to remedy markets' shortcomings in addressing inequality and risk issues (as in e.g., Rodrik, 1998). This paper's perspective and results do suggest that, to the extent that the 2008-09 crisis has highlighted some fragility of finance-based systems, a "great reversal" may occur not only through protectionism and financial repression, but also because policy-makers aim to strengthen the protection afforded by collective redistribution policies in the face of poorly functioning financial markets. Further work may try and characterize the sources and consequences of policy variation in terms of their implications for the growth, inequality, and instability of income and consumption.

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Appendix

A. Mathematical derivations

By equation (1), the private financial market is active if disposable incomes are sufficiently different across the model's two periods or contingencies: the condition

$$\left(y_H - \tau - \frac{1}{2}\lambda\tau^2\right)(1-\mu) > \left(y_L + \tau - \frac{1}{2}\lambda\tau^2\right)(1+\mu)$$

with $\tau = \mu/\lambda$ implies that

$$(y_L + y_H)\mu - (y_H - y_L) < \frac{\mu^3 - 2\mu}{\lambda}$$

and that the partial derivative of the welfare expression (3) with respect to the financial market spread parameter,

$$\frac{\partial}{\partial\mu}\log\left(\left(Y + \frac{\mu^2}{\lambda} - \mu\Delta\right)^2 \frac{1}{4(1-\mu^2)}\right) = \left(\left(Y + \frac{\mu^2}{\lambda} - \mu\Delta\right)^2 \frac{1}{(1-\mu^2)}\right)^{-1}\left(Y\mu - \Delta + \frac{2\mu-\mu^3}{\lambda}\right),$$

is negative.

Financial market activity allows net incomes to differ from the consumption levels

$$c_H = \frac{y_H + y_L - \lambda\tau^2 - (y_H - y_L - 2\tau)\mu}{2(1-\mu)}, c_L = \frac{y_H + y_L - \lambda\tau^2 - (y_H - y_L - 2\tau)\mu}{2(1+\mu)}.$$

Using the $\tau = \mu/\lambda$ optimality condition to substitute λ, the difference between disposable incomes and consumption in high-income realizations is

$$y_H - \tau - \frac{1}{2}\lambda\tau^2 - c_H = \frac{1}{2(1-\mu)}(\Delta - \mu Y - (2-\mu^2)\tau).$$

Dividing this by Y yields an indicator of financial market activity,

$$D\left(\frac{\Delta}{Y}, \frac{\tau}{Y}, \mu\right) = \frac{1}{2(1-\mu)}\left(\frac{\Delta}{Y} - \mu - (2-\mu^2)\frac{\tau}{Y}\right).$$

Using $0 < \mu < 1$ and $\frac{\Delta}{Y} = \frac{y_H - y_L}{y_H + y_L} < 1$, its derivatives can be signed unambiguously:

$$\frac{\partial D\left(\frac{\Delta}{Y}, \frac{\tau}{Y}, \mu\right)}{\partial\frac{\Delta}{Y}} = \frac{1}{2(1-\mu)} > 0,$$

$$\frac{\partial D\left(\frac{\Delta}{Y}, \frac{\tau}{Y}, \mu\right)}{\partial\frac{\tau}{Y}} = -\frac{2-\mu^2}{2(1-\mu)} < 0,$$

$$\frac{\partial D\left(\frac{\Delta}{Y}, \frac{\tau}{Y}, \mu\right)}{\partial\mu} = \frac{1}{2(1-\mu)^2}\left(\frac{\Delta}{Y} - 1 - (1 + (1-\mu)^2)\frac{\tau}{Y}\right) < 0.$$

B. Data definitions and sources

Financial Development. "Private Credit by Deposit Money Banks and Other Financial Institutions to GDP" from the World Bank "Financial Development and Structure Database" (Beck and Demirgüç-Kunt, 2009).

Financial Structure. This is the IMF "Financial Reform Index", drawn from the "Financial Reform Database" documented in Abiad et al. (2010). It considers seven dimensions of financial sector policy (credit controls and reserve requirements, interest rate controls, entry barriers, state ownership, prudential regulation of securities markets, banking regulations, and restrictions on the capital account). Each dimension is scored on a graded scale from zero to three, with zero corresponding to the highest degree of repression and three indicating full liberalization for all dimensions except prudential regulation, which is scored higher when more intense. Scores for each category are summed to obtain a country-and-period specific index that takes values between 0 and 21.

Trade. This is "Openness in Current Prices", drawn from the Penn World Table, Version 6.3, compiled by Heston et al. (2009). It is defined as the ratio of exports plus imports to GDP.

Government. The variable "Government consumption share of PPP converted GDP per capita at current prices," drawn from the Penn World Table, Version 6.3 (Heston et al., 2009).

Natural Openness. As measured by Frankel and Romer (1999) on the basis of bilateral gravity estimates including only geographic characteristics, aggregated to country-specific averages.

Legal Origin. Dummy variables equal to unity for countries in each of the La Porta et al. (1999) legal-origin groups: English Common Law; French Commercial Code; German Commercial Code; Scandinavian Commercial Code; Social/Communist Laws.

GDP. The product of the variables "Real GDP per capita" and "Population" drawn from the Penn World Table, Version 6.3 (Heston et al., 2009). The variable is in millions of US$.

Population. Drawn from the Penn World Table, Version 6.3 (Heston et al., 2009). The variable is expressed in millions of inhabitants.

Stock Market Capitalization. The "Stock market capitalization to GDP" from the World Bank "Financial Development and Structure Database" (Beck and Demirgüç-Kunt, 2009). Data are not available for eight countries belonging to the French Legal Origin groups and to the Developing countries sample.

Observations are averaged for each country over seven non-overlapping sub-periods of four years each. Annual data are interpolated when occasionally missing, and filled backwards and forward using, respectively, the first and last value available in the time series. Variables expressed as ratios

to GDP are in percentage points. We report results for the sample of 65 countries listed in Table A.1. We follow the common practice of excluding countries with Trade larger than 200 percentage points (Singapore, Malaysia, Hong Kong). We also drop Jordan, which has implausibly large Government observations; Nigeria, where Government jumps from 6 to 25% in 2000s; and Switzerland and Denmark, where the Financial Development indicators have abnormal level and dynamics. If all available countries are included, the message of the data is broadly similar in most substantive respects.

Table A.1. Countries in the sample

1. Algeria [a]	18. Egypt [a]	35. Kenya [a]	52. South Africa [a]
2. Argentina [a]	19. El Salvador [a]	36. Madagascar [a]	53. South Korea
3. Australia	20. Ethiopia [a]	37. Mexico [a]	54. Spain
4. Austria	21. Finland	38. Morocco [a]	55. Sri Lanka [a]
5. Bangladesh [a]	22. France	39. Mozambique [a]	56. Sweden
6. Belgium	23. Germany	40. Nepal [a]	57. Tanzania [a]
7. Bolivia [a]	24. Ghana [a]	41. Netherlands	58. Thailand [a]
8. Brazil [a]	25. Greece	42. New Zealand	59. Tunisia [a]
9. Bulgaria [a]	26. Guatemala [a]	43. Norway	60. Turkey [a]
10. Burkina Faso [a]	27. Hungary	44. Pakistan [a]	61. Uganda [a]
11. Cameroon [a]	28. India [a]	45. Paraguay [a]	62. United Kingdom
12. Canada	29. Indonesia [a]	46. Peru [a]	63. United States
13. Chile [a]	30. Ireland	47. Philippines [a]	64. Uruguay [a]
14. Colombia [a]	31. Israel	48. Poland [a]	65. Venezuela [a]
15. Costa Rica [a]	32. Italy	49. Portugal	
16. Dominican Republic [a]	33. Jamaica [a]	50. Romania [a]	
17. Ecuador [a]	34. Japan	51. Senegal [a]	

Notes: [a] indicates developing countries, according to the World Bank classification.

Table A.2. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Financial Development	455	47.00	39.17	1.39	192.03
Financial Structure	455	11.57	6.08	0	21
Trade	455	58.25	28.16	11.39	172.23
Government	455	16.61	5.74	7.32	35.63
GDP level (millions of US$)	455	507	1245	6	1251
Population (millions)	455	51	118	2	1102
Stock Market Capitalization	399	31.55	37.27	0.10	228.68
Private Credit plus Stock Mkt. Capitalization	399	82.53	71.03	2.27	364.98

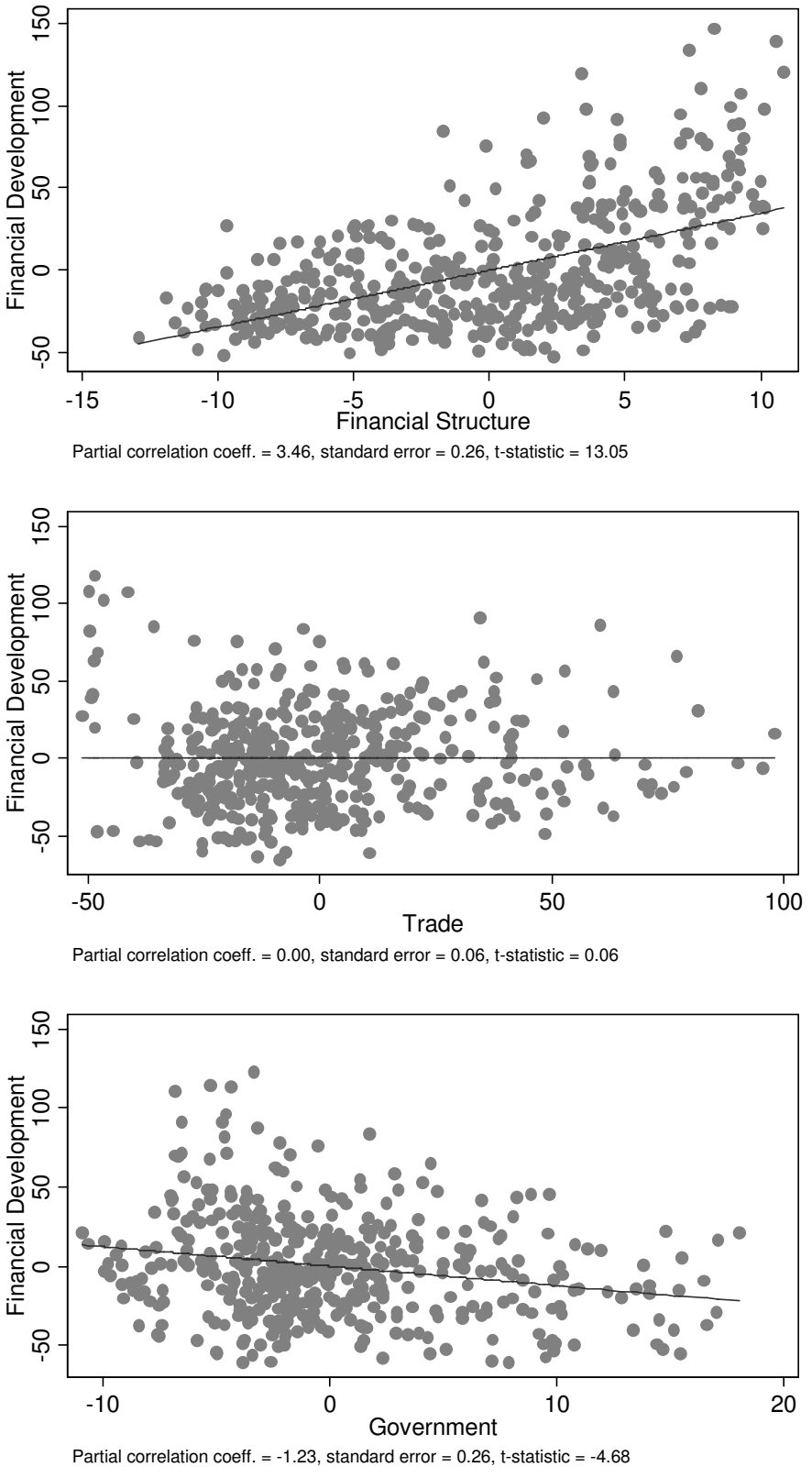

Figure 1. The panels show partial correlations from OLS regressions with Financial Development of Financial Structure, Trade, and Government.

Table 1. Correlations between finance, trade, and government indicators

Levels \ Dev. from country means	Financial Development	Financial Structure	Trade	Government
Financial Development		0.34**	0.23**	-0.26**
Financial Structure	0.57**		0.54**	-0.20**
Trade	0.21**	0.37**		-0.09*
Government	-0.27**	-0.16**	-0.05	

Notes: ** indicates significance at the 1% level, * at the 10% level. Correlations above the diagonal are between variables in deviations from country means.

Table 2. First-stage regressions

Dependent variable:	Financial Structure	Trade	Government
Interactions of time trend with:			
German Legal Origin	-1.26	-3.26	0.34
	(0.26)	(1.33)	(0.24)
English Legal Origin	-0.46	0.45	0.49
	(0.18)	(0.91)	(0.16)
Scandinavian Legal Origin	-0.10	18.01	-2.87
	(2.59)	(5.80)	(1.07)
Socialist Legal Origin	1.05	-3.29	-0.48
	(0.67)	3.25)	(1.11)
NatOp*German Legal Origin	0.24	1.70	-0.15
	(0.11)	(0.55)	(0.08)
NatOp*English Legal Origin	0.11	0.30	-0.40
	(0.07)	(0.55)	(0.08)
NatOp*Scandinavian Legal Origin	-0.34	-8.84	1.21
	(1.18)	(2.70)	(0.52)
NatOp*Socialist Legal Origin	-0.29	4.04	0.73
	(0.29)	(1.48)	(0.57)
Time trend	2.22	3.38	-0.31
	(0.07)	(0.34)	(0.08)
Partial R2	0.82	0.46	0.17
Shea's Partial R2	0.10	0.07	0.10
Observations	455	455	455
N	65	65	65
T	7	7	7

Notes: Fixed effects regressions, "within" partial R2. Robust standard errors in parentheses.

Table 3. Second-stage IV and dynamic OLS regressions

Dependent variable: Financial Development				
Estimator:	IV	IV	OLS	OLS
Column:	1	2	3	4
Financial Structure	-1.79	1.74		
	(1.06)	(1.03)		
Trade	-0.31	-0.40		
	(0.18)	(0.22)		
Government	-1.48	-0.37		
	(0.63)	(0.46)		
First lag of				
Financial Structure		0.53	0.62	-0.13
		(0.97)	(0.36)	(0.34)
Trade		0.78	0.14	0.17
		(0.28)	(0.09)	(0.09)
Government		-1.33	-0.91	-1.27
		(0.52)	(0.27)	(0.30)
Financial Development		0.80	0.70	0.95
		(0.13)	(0.06)	(0.09)
Second lag of				
Financial Structure				-0.73
				(0.40)
Trade				-0.00
				(0.08)
Government				0.38
				(0.25)
Financial Development				-0.51
				(0.09)
Statistics:				
Over-identifying restrictions	68.92	39.83		
	[0.05]	[0.39]		
Specification test	2.81	5.03		
	[0.42]	[0.66]		
Weak identification test	4.70	3.37		
Observations	455	390	390	325
N	65	65	65	65
T	7	6	6	5

Notes: Fixed effects regressions, controlling for time effects. Standard errors, in parentheses, are robust in FE-IV regressions, and clustered by country in FE-OLS regressions. The "within" R2s of the models in columns 3 and 4 are 0.60 and 0.59, respectively. *Instrumental variables*: interaction terms between Natural Openness, Legal Origin, and time effects. *Statistics* (p-values in square brackets) computed by the ivreg2 (Baum et al., 2007) and xtivreg2 (Schaffer, 2010) Stata modules, definitions: test of over-identifying restrictions, under the null that all instrumental variables are orthogonal to the second-stage error term; specification test, under the null: estimates from OLS and IV are both consistent; weak identification test: Kleibergen--Paap Wald rk F statistic, robust to non-i.i.d. errors.

Table 4. Robustness checks

Dependent variable:	Financial Development			Stock Market Capitalization	Private Credit plus Stock Market Capitalization
Sample:	All	Advanced	Developing	All	All
Column:	1	2	3	4	5
Financial Structure	-1.04	1.44	-2.61	-1.87	-2.40
	(1.02)	(1.38)	(1.81)	(0.97)	(1.30)
Trade	-0.27	-0.40	0.36	0.32	-0.05
	(0.17)	(0.32)	(0.31)	(0.18)	(0.25)
Government	-1.54	-1.75	-2.22	-1.85	-3.23
	(0.63)	(1.57)	(0.83)	(0.56)	(0.92)
Control variables:					
GDP	0.01	0.01	0.00	0.01	0.02
	(0.00)	(0.02)	(0.02)	(0.00)	(0.00)
Population	-0.12	0.35	0.01	0.04	-0.10
	(0.03)	(2.03)	(0.12)	(0.03)	(0.05)
Statistics:					
Over-identifying restrictions	67.17	56.52	22.21	49.37	43.97
	[0.06]	[0.03]	[0.73]	[0.54]	[0.75]
Specification test	3.25	3.16	6.77	1.25	3.34
	[0.35]	[0.37]	[0.08]	[0.74]	[0.34]
Weak identification test	4.75	3.98	9.75	4.41	4.41
Observations	455	147	301	399	399
N	65	21	43	57	57
T	7	7	7	7	7

Notes: Fixed effects instrumental variables regressions, controlling for time effects. Robust standard errors in parentheses. In column 2, the only Socialist legal origin country, Hungary, is dropped. *Instrumental variables*: interaction terms between Natural Openness, Legal Origin, and time effects. *Statistics* (p-values in square brackets) computed by the ivreg2 (Baum et al., 2007) and xtivreg2 (Schaffer, 2010) Stata modules, definitions: test of over-identifying restrictions, under the null that all instrumental variables are orthogonal to the second-stage error term; specification test, under the null: estimates from OLS and IV are both consistent; weak identification test: Kleibergen--Paap Wald rk F statistic, robust to non-i.i.d. errors.

Finance, Governments, and Trade

Giuseppe Bertola [+] and Anna Lo Prete *

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We study how financial transactions may respond to exogenous variation in trade opportunities not only directly, but also through policy channels. In more open economies, governments may find it more difficult to fund and enforce public policies that substitute private financial transactions, and more appealing to deregulate financial markets. We propose a simple theoretical model of such policy-mediated relationships between trade and financial development. Empirically, we document in a country panel dataset that, before the 2007-08 crisis, financial market volumes were robustly and negatively related to the share of government consumption in GDP in regressions that also include indicators of financial regulation and trade openness, and we seek support for a causal interpretation of this result in instrumental variable specifications.

JEL Classification: E60, F13, G18.

Keywords: private credit, financial reforms, openness, government size.

[+] EDHEC Business School and CEPR; *University of Turin, Department of Economics and Statistics. For helpful comments we thank an anonymous referee and presentation audiences at GEP-University of Nottingham, MWP Lustrum Conference, 26th Annual Congress of the EEA, University of Turin, and EDHEC.

1. Introduction

Between the 1980s and the 2000s international trade and financial volumes both grew considerably. In this paper we argue theoretically and document empirically that international economic integration influences financial development not only directly, as international trade openness may entail higher risks and new investment opportunities, but also by triggering financial deregulation and reducing governments' economic role within each country. We outline a theoretical perspective that lets governments choose financial deregulation, openness, and government activity. If the costs and benefits of these policy choices differ across countries and periods according to observable geographical, historical, and exogenous time-varying forces, it is possible to estimate their financial development effects by running regressions that address endogeneity as well as unobserved heterogeneity issues. In a sample of 65 countries, we document that between 1980 and 2007 the increase in financial market volumes has been significantly related to government retrenchment from economic activity through the indirect links resulting from policy choices that, in more open economies, substitute private financial transactions for public policies.

Our work is related to various strands of literature that focus on bivariate relationships between finance, trade, and government activities. Many empirical studies document a positive association between trade and finance, and suggest various channels of interaction between these two variables. Rajan and Zingales (2003) argue that international trade opened new financial contracting opportunities and foreign competitive pressure reduced domestic firms' lobbying power and rents, making it more necessary for them to draw on external finance. Svaleryd and Vlachos (2002) use various trade measures to assess whether higher exposure to external risk increases the demand for finance, Huang and Temple (2005) use panel data techniques to characterize dynamic impacts of trade on financial development, and Do and Levchenko (2007) show that deeper trade integration influences production specialization in ways that foster financial development; reverse causation channels have been studied by Beck (2002), who documents that manufacturing production and exports are larger in more financially developed countries.

Other relevant studies focus on interactions between financial development and government policies. Obviously, governments may repress financial transactions, or foster them by making available a suitable legal and informational infrastructure. Like *de facto* financial development, *de jure* aspects of financial markets have evolved strongly over the last few decades. Abiad and Mody (2005) show that liberalization may occur in response to economic and political shocks, especially in more open and initially highly regulated countries. Tressel and Detragiache (2008) document that

financial reform indicators are in turn very significantly associated with *de facto* financial depth, controlling for various country-level characteristics (including other liberalization indicators). Less obviously, financial development is also influenced by government policies such as public pensions, unemployment insurance, public education, public housing, and many other government programs that, just like financial contracts, reallocate resources over time and across *ex post* income realizations. This type of government activity crowds out private financial transactions to an extent that depends on the substitutability of private markets and public programs, which is generally imperfect as public policies and private contracts deliver similar services but under different constraints and for different purposes (Chetty and Saez, 2010). This has implications for the composition and intensity of public and private income- and consumption-smoothing mechanisms, as governments should intervene more extensively when poorly structured financial markets make it difficult to fund investment and smooth consumption privately (Bertola and Koeniger, 2007). From previous works we also know that government activities are related to the process of international economic integration. Given the structure of the private financial market, public policy should be more interventionist when incomes and investment opportunities are more heterogeneous and volatile, as may be the case in more open economies (Rodrik, 1998; Agell, 2002). While openness may through this channel call for more redistribution and regulation, it also weakens the economic power of national governments. Empirically, government size is lower in more open economies when country-specific characteristics are controlled for by fixed effects (Rodrik, 1997; Bertola and Lo Prete, 2009), indicating that race-to-the-bottom tensions may be operating along country-specific trajectories.

Bringing together insights from these strands of literature, this paper offers a multivariate interpretation of the relationship between financial development, trade, and country-level policies. Section 2 introduces relevant country-level empirical indicators of credit, trade, and government activity, and inspects bivariate and multivariate relationships. Section 3 sets up a simple model economy where both government policies and private financial transactions contribute to make consumption smoother than income. International openness can influence demand for financial transaction services directly if it makes incomes more volatile, which may but need not be the case empirically, but also through the restraining effect of international competition on government activity, which makes financial deregulation more attractive. Section 4 outlines how policy choices depend in such an economy on the relative effectiveness of public policies and private finance, and on the costs and benefits of international trade. This theoretical perspective suggests that some of the empirical cross-country and time-series variation of financial development's determinants can

then be explained by the shape of policy trade-offs, rather than by heterogeneous political motivations.

Statistical assessment of this insight's empirical relevance is a challenging task, because a relatively elaborate multivariate perspective makes the usual limitations of macroeconomic data all the more apparent. In the empirical portion of the paper, we use a variety of specifications and statistical tests to seek and find at least suggestive support for key aspects of our theoretical perspective. Treating all the three policy variables of interest (financial regulation, openness to trade, and government activities) as simultaneously determined by underlying structural features of specific countries and periods, and exploiting the panel dimension of the dataset to account for unobserved heterogeneity, in Section 5 we outline how interactions between relevant country-specific characteristics and common time effects might proxy the exogenous determinants of the relative effectiveness of public policies and private financial contracts, and of the costs and benefits of international trade. In Section 6 we obtain estimates of policy effects from instrumental variable (IV) specifications based on those instruments, as well as from dynamic ordinary least squares (OLS) specifications. The results, and additional robustness checks, suggest that government economic activity is a significantly negative determinant of financial development. Section 7 concludes.

2. Data and correlations

We proceed to introduce the data we will be analyzing in the rest of the paper and to inspect descriptive relationships between empirical indicators of the phenomena of interest. To measure "Financial Development", we draw from the World Bank Financial Development and Structure Database the "Private Domestic Credit by Deposit Money Banks and Other Financial Institutions" ratio to GDP. This volume measure of financial market activity is certainly related to business investment and household housing purchases, and includes consumer credit's self-insuring role in the presence of labor income volatility. We proxy the factors that may determine Financial Development by three indicators: "Financial Structure," the summary of seven dimensions of the financial sector's institutional structure from the IMF Financial Reform Database; "Trade" (the ratio of imports plus exports to GDP from the Penn World Table, see Heston et al., 2009), which we will view as resulting from both structural factors and policy choices; and "Government" (the Penn World Table's Government Consumption Share of GDP): this broad index of public economic activity offers an admittedly partial, but internationally comparable gauge of the government's finance-substituting

role in such areas as education and housing, as well as in the administration of unemployment and old-age redistribution schemes.[1]

The dataset includes 65 countries. To smooth out cyclical relationships between government's share of economic activity and financial depth, we average available observations over non-overlapping four-year sub-periods, from 1980-1983 to the final 2004-07 period before the financial crisis. Appendix B reports detailed definitions and data sources, as well as summary statistics.

Table 1 explores in these data the bivariate relationships analyzed by previous studies. The correlation between Trade and Financial Development is significantly positive in levels, and stronger when deviations from country means remove the influence on both variables of constant country characteristics. The Financial Structure index is positively related to credit volumes across the countries and periods in our sample.[2] The relationship between Trade and Government is insignificant in levels and negative in deviations from country means, as in Rodrik (1997) and Bertola and Lo Prete (2009). We also see in Table 1 that, regardless of whether country-specific unobservable features are controlled for, the correlation between Government and Financial Development is negative, which is consistent with the idea that public economic activity crowds out private financial contracts.

Figure 1 illustrates multivariate relationships between the three indicators we focus on and Financial Development. In the top panel we see that, controlling for Trade and Government, the partial association of Financial Development with Financial Structure is very significantly positive. Controlling for Financial Structure and Government, there is no partial association of Trade and Financial Development in the middle panel, while in the bottom panel Government is negatively and

[1] This variable measures government activity in terms of general government consumption of goods and services, which mostly corresponds to the salaries of public employees, such as teachers and administrators of tax and subsidy schemes which obviously reduce private financial activity. The transfers entailed by such schemes are potentially more relevant but very difficult to measure consistently across countries. World Development Indicators, The World Bank (data.worldbank.org/data-catalog/world-development-indicators) include a "Public Transfers" variable that is sparse and of dubious quality, and indeed proves uninformative in Epifani and Gancia's (2009) regressions aimed at testing the hypothesis that openness influences the size of government through its effect on tax policy's ability to change the terms of trade. Exploring the relevance of the "Public Social Expenditure" indicator from the OECD Social Expenditure Database (www.oecd.org/els/social/expenditure) in the small sample of countries for which it is available, we have found that demographic trends explain much of its variation and confound the empirical picture.

[2] This indicator, which aggregates information on a wide variety of financial market institutions, is also significantly correlated with the stock market capitalization to GDP ratios considered in Section 6, when we assess the results' robustness to alternative measures of *de facto* financial market activity.

significantly associated with Financial Development after controlling for Financial Structure and Trade.

This descriptive evidence indicates that the positive correlation between Financial Development and Trade is mostly accounted for by the correlations between Trade and Government and between Trade and Financial Structure, and suggests that a direct link between trade and finance may not be as empirically relevant as the indirect ones resulting from substitution of private financial transactions for public policies in more open economies. While the point estimate and significance of the Government partial correlation with Financial Development is remarkably robust to inclusion of country effects (coefficient -1.44, t-statistic -4.65), and of both country and period fixed effects (coefficient -1.21, t-statistic -4.03), the partial association between Financial Development and Financial Structure changes sign when country and period effects are controlled for. The lack of partial correlation between Trade and Financial Development is robust to inclusion of such effects, but turns significantly positive, as in Table 1, in regressions that control for Government only.

This evidence does not deny that Trade and Financial Development are related. Rather, it suggests that their relationship is mediated by covariation with Financial Structure, quite possibly through the politico-economic channels analyzed by Rajan and Zingales (2003). In these data, time effects also suffice to remove the significance of Financial Development's partial correlation with Trade, while Government's significantly negative association with Financial Development is remarkably robust. In what follows we first argue that some types of government activity are in fact theoretically expected to crowd out financial intermediation, and discuss how the extent to which they do so in practice depends on country- and period-specific features. Then, we apply the resulting perspective to estimation of the financial development effects of financial regulation, openness to trade, and government activities.

3. Finance and government activity

We proceed to outline a simple formal model of consumption smoothing across individuals in different contingencies or at different points in the lifecycle. In each of the two periods and/or contingent realizations, let available resources be high at y_H for half of the individuals, low at $y_L < y_H$ for the other half. Full smoothing of the corresponding c_H and c_L consumption levels would be optimal if the period utility function is concave and, for simplicity, discount and return rates are both normalized to zero. To represent financial market imperfections that make it impossible to set

$c_H = c_L = (y_L + y_H)/2$, let each purchase or sale of private financial securities entail a per-unit cost μ, so that every individual's resource constraint reads

$$c_H + c_L = y_H + y_L - (y_H - c_H + c_L - y_L)\mu.$$

Financial contracts are active if

$$\frac{y_H}{y_L} > \frac{1+\mu}{1-\mu}, \tag{1}$$

and imply that the ratio of marginal utilities, $u'(c_L)/u'(c_H)$, equals the rate of transformation $(1+\mu)/(1-\mu)$. A closed-form solution is readily available if utility is logarithmic: inserting $c_L = c_H(1-\mu)/(1+\mu)$ in the resource constraint yields

$$c_H = \frac{y_L + y_H - (y_H - y_L)\mu}{2(1-\mu)}, \quad c_L = \frac{y_L + y_H - (y_H - y_L)\mu}{2(1+\mu)},$$

and each individual's expected utility

$$\log(c_H) + \log(c_L) = \log\left(\frac{(y_H + y_L - (y_H - y_L)\mu)^2}{4(1-\mu^2)}\right) \tag{2}$$

depends positively on total income and negatively, to the extent that μ>0 prevents consumption smoothing, on income fluctuations.

We next suppose that it is possible for government programs to reduce the variability of available resources, at a cost in terms of average production. If transferring τ units of income entails a quadratic deadweight loss $f(\tau) = \lambda\tau^2$, then it is possible to increase the low income y_L by $\tau - \frac{1}{2}\lambda\tau^2$ and decrease the high income y_H by $\tau + \frac{1}{2}\lambda\tau^2$. In an interior solution where both public policies and private financial contracts are active, the tax rate should be set so that the total welfare loss due to deadweight, $\lambda\tau^2$, is offset at the margin by the savings, $2\tau\mu$, on the cost of intermediation in the financial market. The optimal $\tau = \mu/\lambda$ is larger when the deadweight losses indexed by λ are small and/or when the private financial costs indexed by μ are large. These intuitive properties are qualitatively valid for more general specifications; in particular, it would be straightforward to let financial transaction costs be increasing in the amounts transacted, and tax costs could then be constant.

When $\tau = \mu/\lambda$, the sum of disposable incomes is $y_H + y_L - \lambda\tau^2 = y_H + y_L - \mu^2/\lambda$, their difference is $y_H - y_L - 2\tau = y_H - y_L - 2\mu/\lambda$, and the typical individual's welfare expression (2) neatly simplifies to

$$U(\mu, \lambda, Y, \Delta) = \log\left(\left(Y + \frac{\mu^2}{\lambda} - \mu\Delta\right)^2 \frac{1}{4(1-\mu^2)}\right), \tag{3}$$

where $Y \equiv y_H + y_L$ is the economy's total income and $\Delta \equiv y_H - y_L$ is a measure of pre-tax income dispersion.

In this simple model, deadweight losses and transaction costs limit the extent to which governments and markets may smooth consumption, and decrease welfare: the expression in (3) is decreasing in λ, and we show in Appendix A that it is also decreasing in μ over the range of parameters where financial transactions are positive. Just as intuitively, larger mean income Y increases welfare, while larger income dispersion Δ reduces it as long as transaction costs prevent full smoothing of its consumption implications.

The difference between net income and consumption, normalized by aggregate income, is the model counterpart of the *de facto* measure of financial development examined in Section 2. We show in Appendix A that it is larger if the government engages less in finance-substituting policies (i.e., τ is smaller), if private financial transactions are less costly (a smaller μ), and if incomes are more heterogeneous across market participants (a larger Δ). These three factors are related to the empirical facts documented above. The significant partial correlations with Financial Development of Financial Structure and Government are consistent with the model's predictions that smaller financial frictions should increase financial market volumes, and that private financial transactions substitute public policies; the insignificant partial correlation between Trade and Financial Development in Figure 1 may indicate that the third channel is not as empirically relevant as the others. A proper interpretation of such empirical patterns, however, needs to identify exogenous sources of variation, across countries and periods, of Financial Development's determinants.

4. Theoretical determinants of country-level choices

In the model, government policies may fill the gap left by financial market imperfections between individual income and desired consumption patterns. In reality, the costs and benefits of doing so depend on potentially observable exogenous characteristics of the policy-making environment. To model such aspects of the data-generating process we consider the role of openness, denoted ω, and of other variables, denoted $\boldsymbol{Z}$, as determinants of total income, income dispersion, and deadweight losses. Since international market integration makes it difficult for governments to design and enforce tax, subsidy, and public service policies, the deadweight loss parameter λ may be increasing in openness, ω, which may also influence income dispersion according to a function

$\Delta(\omega, \boldsymbol{Z})$, and should increase total income, $Y(\omega, \boldsymbol{Z})$. In the model, the smoother financial transactions represented by a smaller μ improve welfare.[3] In reality, this obvious benefit has to be traded off against the administration costs of a suitably supervised financial market framework, or the higher instability implied by financial deregulation. To model this trade-off, and ensure that financial market regulation poses a well-defined policy choice problem, we simply suppose that a higher μ decreases welfare linearly, with slope α.

The first-order conditions for maximization of $U(\mu, \lambda(\omega, \boldsymbol{Z}), Y(\omega, \boldsymbol{Z}), \Delta(\omega, \boldsymbol{Z})) - \alpha\mu$ are

$$U_\mu(\cdot) - \alpha = 0 \tag{4}$$

$$U_\lambda(\cdot)\lambda_\omega(\omega, \boldsymbol{Z}) + U_Y(\cdot)Y_\omega(\lambda(\omega, \boldsymbol{Z})) + U_\Delta(\cdot)\Delta_\omega(\omega, \boldsymbol{Z}) = 0 \tag{5}$$

where subscripts denote the partial derivatives of the function defined in (3). In (4), the optimal choice of the financial market spread, μ, balances at the margin the consumption-smoothing benefits and administration/instability costs of smaller financial frictions. In (5), the optimal choice of openness, ω, balances its presumably positive effect on output with possibly negative effects through more variable income and through more difficult implementation of finance-substituting government programs that prevent unfettered international trade from being the obvious policy choice. Since the optimal choice of finance-substituting policies is embedded in the functional form (3), the solution of (4-5) satisfies

$$\tau = \frac{\mu}{\lambda(\omega, \boldsymbol{Z})}. \tag{6}$$

As long as first-order conditions identify an interior global optimum, these equations identify $\mu^*(\boldsymbol{Z}), \omega^*(\boldsymbol{Z})$, and $\tau^*(\boldsymbol{Z})$ as the financial structure, openness to trade, and government programs resulting from the policy choices that are optimal in an environment characterized by a $\boldsymbol{Z} = (z_1, z_2, \dots)$ vector of relevant characteristics. The policy implications of such characteristics can be characterized by standard comparative-statics methods. In general, exogenous features of the policy-making environment influence the marginal welfare effect of each policy choice, and their influence on other policy choices depends on the sign of the objective function's mixed derivatives. Suppose, for example, that a specific z_1 feature of a country's exogenous circumstances only influences the cost of reducing financial frictions. If a larger z_1 decreases α, and makes it less costly for the country to develop financially, it is optimal to choose a smaller spread. Similarly, a variable z_2 that

[3] It would be possible to extend the model to allow for individual-level investment. Then, a smaller μ could improve the quality of investment-savings matching, to imply higher output, and/or increase the pre-tax income dispersion indexed by Δ, as leverage amplifies the *ex post* implications of idiosyncratic shocks.

strengthens the output effect of openness makes it optimal to choose more openness.[4] This offers useful guidance for identification of sources of cross-country and time-series policy variation.

5. Instrumental variables

To estimate the impact of three endogenous determinants of Financial Development (Financial Structure, Trade, and Government) on Financial Development, we need sufficiently many exogenous observable instrumental variables that are not directly relevant to Financial Development, and suitably related to those determinants. Politico-economic factors are certainly empirically relevant, as policy-makers generally pursue different objectives in different countries and at different times.[5] The determinants of such heterogeneity, however, are difficult to pin down, and need not be exogenous to country-level developments. In general, financial development variation across countries and periods may be explained by variables that not only determine policy choices, as in the optimality conditions (4-6), but also influence financial development for given policies. In a specific country and period, a government pursuing liberalization objectives might for example deregulate financial markets, remove trade barriers and also, independently of those and other observable reforms, trigger financial development through investors' enthusiasm. Other endogenous mechanisms could generate different biases: if Financial Structure responds to exogenous Financial Development variation (such as that generated by financial crises), the association between financial policy and financial development includes reverse causation channels.

For any policy objective, however, the model outlined above suggests that if trade is more beneficial and more difficult to restrain, then we should observe smaller barriers to trade, less government

[4] Totally differentiating the first-order conditions,

$$\frac{\partial \mu}{\partial z_1} = -\frac{\partial^2 U}{\partial \omega^2}\frac{1}{|H|}\frac{\partial \alpha}{\partial z_1}, \quad \frac{\partial \omega}{\partial z_2} = -\frac{\partial^2 U}{\partial \mu^2}\frac{1}{|H|}\frac{\partial U}{\partial Y}\frac{\partial^2 Y}{\partial \omega \partial z_2}$$

where $|H|$ denotes the Hessian determinant, which is positive at a maximum. For example, if more openness increases the dispersion of incomes, then the same factors that foster openness may also foster financial development (as in Rajan and Zingales, 2003) as less expensive private financial contracts substitute the income-smoothing public policies that international openness makes more costly to implement.

[5] Many contributions do choose to interpret the relationship between government activities and economic outcomes in terms of differently oriented policy-making frameworks. La Porta et al. (2002), for example, view the fact that public ownership of banks is negatively related to financial and economic development as evidence that intrusive economic policies aim at inefficient rent appropriation. The constrained-maximization mechanism we outline is an arguably plausible element of the process that generates policy data. We do not try to disentangle its implications from those of variation of policy objectives, which is observationally equivalent in general and may in practice be related to the instrumental variables we use.

activity, and more financial market deregulation. These choices, and the resulting financial development, may also differ according to how easy it is for private contracts to substitute government activities. While this perspective neglects many other sources of observed policy variation, it isolates a component that can be explained by exogenous indicators of differences (across countries and over time) of economic integration's appeal, of the implications of economic integration for government activity, and of the ease with which financial markets may be structured so as to substitute government activities.

Empirically, we examine the explanatory power as instruments for observed policies of *interactions* between common trends, which are suitably exogenous to policies if the global forces they represent are only weakly (if at all) influenced by country-level variables, and time-invariant country-specific indicators of the intensity and shape of the relevant policy trade-offs. The sources of policy variation we focus on are geographic characteristics and more or less remote historical events that may shape each country's policy response to new developments. As a gauge of the country-specific intensity of economic integration forces, we consider the Frankel and Romer (1999) "Natural Openness" indicator, based on estimates on a 1985 sample of bilateral trade equations including geographic characteristics. To capture differences across countries in the ease of substituting private markets with public sector intervention, we use the La Porta et al. (1999) indicator of how each country's "Legal Origin" might shape different countries' inclination to administer public programs or to enforce private contracts. [6]

These interactions are exogenous if period-specific forces (such as technological and global trade integration processes) are not correlated with country-specific shocks, or with financial development directly rather than only though the policy variables of interest. This source of omitted-variable bias can be eliminated by including fixed country effects among the determinants of Financial Development. Time effects can similarly absorb spurious covariation, such as declines in government size due to the same common ideological trends that drive trade liberalization and financial reforms. Identification then hinges on the role of exogenous variables that vary both across countries and over time in shaping responses to common driving factors of the Financial Development policy

[6] Such pre-determined indicators are preferable for our purposes to time-varying measures that might be causally influenced by shocks that also drive financial development. As regards ease of trade, tariff indexes convey information on both policy choices and exogenous shocks. It would be similarly hard to disentangle structural relationships in the co-variation between Financial Development and time-varying features of legal systems (such as those documented in Armour et al., 2009), which is empirically strong but arguably less causal, and more difficult to interpret, than the influence exerted by the remote historical roots captured by the Legal Origin indicator.

determinants of interest (Financial Structure, Trade, and Government). Interactions with period effects of Natural Openness and Legal Origin are theoretically plausible determinants of country-specific choices if common developments have different implications for countries that are more or less naturally open, or have different legal traditions: global trade liberalization may have a different impact on geographically different countries, and common advances in computer technology may have different implications for countries more inclined to adopt administrative rather than contract-based solutions to financial problems. The empirical validity of this identification strategy can to some extent be assessed by tests of the strength of first-stage and of over-identifying restrictions, as we do in the next section. Such tests, however, cannot be conclusive in general, and have to be interpreted especially cautiously when, as is the case for interaction terms, a large number of potentially blunt instruments may introduce severe biases.

The first-stage relationship between instruments and policies is illustrated in Table 2 by regressions of the three endogenous determinants of Financial Development on interactions between Natural Openness, Legal Origin, and a time trend (rather than the more flexible unrestricted time effects used in the next section's IV estimates, which would make the table unwieldy and unreadable).[7] Unreported country fixed effects absorb the main effects of Natural Openness and Legal Origin as well as of any other country characteristic that does not vary between periods. Interactions of the time trend with country-specific variables are jointly very significant, and many of their coefficients are significantly different from each other. While the details of the relationship between exogenous instruments and endogenous policies are not as important as its overall plausibility and statistical strength, some of the observed patterns capture plausible effects. More naturally open countries, and their government, appear to be disproportionately affected by the trade-relevant portion of global technological and political trends; the negative trend and natural openness interaction with Scandinavian legal origin as a determinant of Trade might reflect some Nordic countries' choices regarding EU or EMU membership; for countries of English Legal Origin, higher Natural Openness implies a stronger inclination (relative to the French reference, and to the German Legal Origin group) to choose less Government.

[7] The results are virtually identical if the trend is replaced by indicators of the intensity of world trade, or shipping costs, or financial globalization. All these phenomena followed tightly correlated trends over the sample period, and all are arguably exogenous to country-specific policies since most countries are either too small or too closed to account for more than a small portion of global imports and exports.

6. Regression results

Second-stage coefficient estimates of the Financial Development implications of the three variables of interest recognize that some of their variation is potentially endogenous, and isolate the component explained by exogenous sources of country- and time-specific variation. To disentangle the separate effects on Financial Development of multiple endogenous variables, these should not only have sufficiently strong explanatory power for each endogenous variable, but also have sufficiently different implications for each of them.

The first-stage regressions of the instrumental variable estimates we report in this section include country and period effects, and interactions of Legal Origin and Natural Openness with period effects.[8] The strength of the instruments is assessed in the following tables by the Kleibergen--Paap test of the relevant covariance matrix's rank, which extends in heteroskedasticity-robust ways simpler tests applicable in asymptotically independently distributed settings (Kleibergen and Paap, 2006).[9]

In Table 3 we report results from specifications that allow Financial Development to depend on unobservable country characteristics, on time effects that capture period-specific factors that may plausibly influence financial development directly, and on exogenous policy variation. The results of column 1 show that the partial effects not only of Trade (as in the OLS regression shown in Figure 1) but also of Financial Structure are insignificant. The effect of Government on Financial Development is precisely estimated instead and negative, suggesting that some substitution of private financial transactions for public housing, education, and other government programs may have occurred in the sample we are analyzing. The test statistics reported in Table 3 help assessing the relevance and exogeneity of our interacted instrumental variables. The p-value of the test of over-identifying restrictions is above 0.05, indicating that the data do not strongly reject the exclusion restrictions that rule out correlation between the interacted instruments and Financial Development errors. The

[8] It is not possible to report or interpret the many coefficients of these first-stage regressions. Their partial R2s for the residual variation unexplained by country fixed effects is 0.32 for Government, 0.53 for Trade, and 0.88 for Financial Structure. All Shea's partial R2 (Shea, 2007) are in the 0.2-0.3 range. When instruments are constructed as in Table 2, using a trend instead of period effects, Shea's partial R2s lower than 0.10 give weak statistical evidence of instrument relevance; the second-stage coefficients are very similar, but less reliably estimated.

[9] The distribution of these statistics depends on details of the data generating process, and significance levels depend on the specific relative-bias null hypothesis one wishes to test; to foster complete confidence in the instruments' strength, the test statistic should exceed the critical values (in the order of 10) for the Cragg-Donald statistic it generalizes (see Baum et al., 2007).

instruments are rather weak, as the subtle exogenous influences detected by interaction effects barely suffice to disentangle the separate effects of policies.

Since some of the effects at work may naturally involve lags across the observations' 4-year time span, we also report specifications that include a lag of the dependent variable, and lagged as well as current values of the endogenous regressors, along with country and time effects. The test statistics point to weaknesses of the IV specification, as it is difficult to disentangle the many effects of policies and of the lagged dependent and independent variables. The message of this regression is similar to that of the static specification: either the current or the lagged value of Financial Structure and of Government is significant, with positive and negative signs respectively; the lag of Trade turns out to be significantly positive, indicating that it may indeed take time for it to influence Financial Development. The information content of the data, however, does not suffice to identify precise timing patterns. In fact, with only 7 sub-periods it is not possible reliably to account for the likely serial correlation induced by error clustering in fixed-effects IV estimation, and this makes it necessary to interpret the specification tests very cautiously.

To address potential worries about the statistical properties of the tests, as well as about the choice of instruments, we report simpler estimates of possibly causal policy effects based on timing considerations. In the last two columns of Table 3, we run OLS regressions of Financial Development on the first (in column 3) and the first and second (in column 4) lags of the three policy variables and of the dependent variable, controlling for country and time effects. The test statistics we report are robust to error clustering by country, as well as to arbitrary heteroskedasticity. When only one lag is included, the significance pattern of the policy variables is similar to that of static IV specifications. The OLS specification with two lags suggests that lagged Government is a very significant determinant of Financial Development (the p-value of the joint significance test for its two lags is less than 0.001 regardless of covariance matrix estimation method), while Trade and Financial Structure are less relevant (the joint significance tests for their two lags have p-values of 0.08 and 0.07 when standard error estimates are robust to heteroskedasticity; both exceed 0.10 when, as in the table, test statistics account for clustering by country). This evidence is certainly more descriptive than definitive, but it nicely complements and confirms the main message of the instrumental variables estimates.

While the estimated effects of Financial Structure and Trade are sensitive to details of the specifications reported in Table 3, the data indicate clearly that the effect of Government is large and negative. Identification of course relies on exclusion restrictions that may be invalid. Many possible theoretical channels depend on functional forms in ways that need not be completely captured by

country and period dummies: for example, economies or diseconomies of scale in the production of financial services may plausibly influence Financial Development; and government size has been shown to be related to the size of countries (e.g., Alesina and Wacziarg, 1998). To assess the empirical relevance of such plausible phenomena, we extend the specification to include aggregate GDP and population (drawn from the Penn World Table).[10] The results in column 1 of Table 4 unsurprisingly indicate that richer countries are more financially developed, and that economies of scale appear to operate at the per-capita income level: aggregate income is individually significant, and population is negatively associated with Financial Development. More importantly for our purposes, inclusion of these controls leaves unchanged the main results of interest: the direct influence of Financial Structure and Trade is not significant;[11] and the effect of Government is always significantly negative.

Columns 2 and 3 assess sub-sample robustness of the results. We split the sample across Advanced and Developing countries, according to the World Bank classification. This substantially reduces the variation of Legal Origin within each of the samples (all Scandinavian Legal Origin countries are in the Advanced sub-sample, and all but one of the Socialist Legal Origin countries are in the Developing sub-sample) and the precision of the estimates. In the more numerous Developing sub-sample, the point estimate of the coefficient of Government is similar to that from regressions run on the full sample, while its effect is not as precisely estimated in the smaller Advanced sub-sample.

In columns 4 to 5, we measure Financial Development in terms of stock market capitalization as well as, or instead of, the private credit volume indicator considered so far. The Government indicator is always significantly negative across these specifications, while the coefficients of the other policy variable are rather unstable.

[10] Some of these variables' variation may be exogenous to the policies and outcomes of interest, and some may be determined by the same historical and natural characteristics that we bring to bear on the data, by policy choices, and by unobserved independent sources of Financial Development variation. Our main estimation results are also robust to inclusion of GDP and population as endogenous variables (results not reported).

[11] When each of the seven dimensions of financial sector policy aggregated by the IMF index is included separately as a Financial Reforms indicator, only "Prudential regulations and supervision of the banking sector" remains significantly positive; this is the only dimension coded so that more government intervention is expected to support financial development, and excluding it from the Financial Reform Index leaves our results unchanged.

7. Summary and conclusions

We suggest a possible interpretation of financial development patterns in terms of different costs and benefits of policy choices in different countries and periods, and explore the relevance as policy determinants of country characteristics captured by simple geographical and historical indicators, interacted with global time-dependent factors. While the data do not convey a clear message as to the effects of trade, which appear weak, and of financial regulation policies, which do not vary differently enough across countries and are mildly related to exogenous instruments, government size stands out as the most robustly relevant policy determinants of financial development. Not only in simple least-square regressions, but also in specifications that focus on the variation of exogenous interactions after removing country and time effects, smaller governments increase financial volumes. These results admit a causal interpretation: the Government indicator of public economic activity, of which we isolate a time-and-country-specific exogenous component, exerts a significant negative effect on Financial Development, suggesting that private financial contracts substitute government programs when international competition makes it more difficult to implement the latter.

Our theoretical and empirical perspective interprets the relationship between trade and financial development in terms of indirect policy channels, also influenced by other factors in a multivariate settings. All else equal, economic integration is more appealing when trade is easier and more difficult to restrict, and international competition also induces policy-makers to deregulate financial markets and governments to retreat from economic activity. The resulting financial development, like all things, has benefits as well as costs that may or may not have been taken into account correctly at the time policy choices were made. In the absence of information about the costs of financial reforms and the benefits of international economic integration, normative views unavoidably depend strongly on one's priors, notably as regards whether regulation and government activity reflect rent-seeking motives (as in e.g., Rajan and Zingales, 2003) or well-intentioned attempts to remedy markets' shortcomings in addressing inequality and risk issues (as in e.g., Rodrik, 1998). This paper's perspective and results do suggest that, to the extent that the 2008-09 crisis has highlighted some fragility of finance-based systems, a "great reversal" may occur not only through protectionism and financial repression, but also because policy-makers aim to strengthen the protection afforded by collective redistribution policies in the face of poorly functioning financial markets. Further work may try and characterize the sources and consequences of policy variation in terms of their implications for the growth, inequality, and instability of income and consumption.

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Appendix

A. Mathematical derivations

By equation (1), the private financial market is active if disposable incomes are sufficiently different across the model's two periods or contingencies: the condition

$$\left(y_H - \tau - \frac{1}{2}\lambda\tau^2\right)(1-\mu) > \left(y_L + \tau - \frac{1}{2}\lambda\tau^2\right)(1+\mu)$$

with $\tau = \mu/\lambda$ implies that

$$(y_L + y_H)\mu - (y_H - y_L) < \frac{\mu^3 - 2\mu}{\lambda}$$

and that the partial derivative of the welfare expression (3) with respect to the financial market spread parameter,

$$\frac{\partial}{\partial\mu}\log\left(\left(Y + \frac{\mu^2}{\lambda} - \mu\Delta\right)^2 \frac{1}{4(1-\mu^2)}\right) = \left(\left(Y + \frac{\mu^2}{\lambda} - \mu\Delta\right)^2 \frac{1}{(1-\mu^2)}\right)^{-1}\left(Y\mu - \Delta + \frac{2\mu-\mu^3}{\lambda}\right),$$

is negative.

Financial market activity allows net incomes to differ from the consumption levels

$$c_H = \frac{y_H + y_L - \lambda\tau^2 - (y_H - y_L - 2\tau)\mu}{2(1-\mu)}, c_L = \frac{y_H + y_L - \lambda\tau^2 - (y_H - y_L - 2\tau)\mu}{2(1+\mu)}.$$

Using the $\tau = \mu/\lambda$ optimality condition to substitute λ, the difference between disposable incomes and consumption in high-income realizations is

$$y_H - \tau - \frac{1}{2}\lambda\tau^2 - c_H = \frac{1}{2(1-\mu)}(\Delta - \mu Y - (2-\mu^2)\tau).$$

Dividing this by Y yields an indicator of financial market activity,

$$D\left(\frac{\Delta}{Y}, \frac{\tau}{Y}, \mu\right) = \frac{1}{2(1-\mu)}\left(\frac{\Delta}{Y} - \mu - (2-\mu^2)\frac{\tau}{Y}\right).$$

Using $0 < \mu < 1$ and $\frac{\Delta}{Y} = \frac{y_H - y_L}{y_H + y_L} < 1$, its derivatives can be signed unambiguously:

$$\frac{\partial D\left(\frac{\Delta}{Y}, \frac{\tau}{Y}, \mu\right)}{\partial\frac{\Delta}{Y}} = \frac{1}{2(1-\mu)} > 0,$$

$$\frac{\partial D\left(\frac{\Delta}{Y}, \frac{\tau}{Y}, \mu\right)}{\partial\frac{\tau}{Y}} = -\frac{2-\mu^2}{2(1-\mu)} < 0,$$

$$\frac{\partial D\left(\frac{\Delta}{Y}, \frac{\tau}{Y}, \mu\right)}{\partial\mu} = \frac{1}{2(1-\mu)^2}\left(\frac{\Delta}{Y} - 1 - (1 + (1-\mu)^2)\frac{\tau}{Y}\right) < 0.$$

B. Data definitions and sources

Financial Development. "Private Credit by Deposit Money Banks and Other Financial Institutions to GDP" from the World Bank "Financial Development and Structure Database" (Beck and Demirgüç-Kunt, 2009).

Financial Structure. This is the IMF "Financial Reform Index", drawn from the "Financial Reform Database" documented in Abiad et al. (2010). It considers seven dimensions of financial sector policy (credit controls and reserve requirements, interest rate controls, entry barriers, state ownership, prudential regulation of securities markets, banking regulations, and restrictions on the capital account). Each dimension is scored on a graded scale from zero to three, with zero corresponding to the highest degree of repression and three indicating full liberalization for all dimensions except prudential regulation, which is scored higher when more intense. Scores for each category are summed to obtain a country-and-period specific index that takes values between 0 and 21.

Trade. This is "Openness in Current Prices", drawn from the Penn World Table, Version 6.3, compiled by Heston et al. (2009). It is defined as the ratio of exports plus imports to GDP.

Government. The variable "Government consumption share of PPP converted GDP per capita at current prices," drawn from the Penn World Table, Version 6.3 (Heston et al., 2009).

Natural Openness. As measured by Frankel and Romer (1999) on the basis of bilateral gravity estimates including only geographic characteristics, aggregated to country-specific averages.

Legal Origin. Dummy variables equal to unity for countries in each of the La Porta et al. (1999) legal-origin groups: English Common Law; French Commercial Code; German Commercial Code; Scandinavian Commercial Code; Social/Communist Laws.

GDP. The product of the variables "Real GDP per capita" and "Population" drawn from the Penn World Table, Version 6.3 (Heston et al., 2009). The variable is in millions of US$.

Population. Drawn from the Penn World Table, Version 6.3 (Heston et al., 2009). The variable is expressed in millions of inhabitants.

Stock Market Capitalization. The "Stock market capitalization to GDP" from the World Bank "Financial Development and Structure Database" (Beck and Demirgüç-Kunt, 2009). Data are not available for eight countries belonging to the French Legal Origin groups and to the Developing countries sample.

Observations are averaged for each country over seven non-overlapping sub-periods of four years each. Annual data are interpolated when occasionally missing, and filled backwards and forward using, respectively, the first and last value available in the time series. Variables expressed as ratios

to GDP are in percentage points. We report results for the sample of 65 countries listed in Table A.1. We follow the common practice of excluding countries with Trade larger than 200 percentage points (Singapore, Malaysia, Hong Kong). We also drop Jordan, which has implausibly large Government observations; Nigeria, where Government jumps from 6 to 25% in 2000s; and Switzerland and Denmark, where the Financial Development indicators have abnormal level and dynamics. If all available countries are included, the message of the data is broadly similar in most substantive respects.

Table A.1. Countries in the sample

1. Algeria [a]	18. Egypt [a]	35. Kenya [a]	52. South Africa [a]
2. Argentina [a]	19. El Salvador [a]	36. Madagascar [a]	53. South Korea
3. Australia	20. Ethiopia [a]	37. Mexico [a]	54. Spain
4. Austria	21. Finland	38. Morocco [a]	55. Sri Lanka [a]
5. Bangladesh [a]	22. France	39. Mozambique [a]	56. Sweden
6. Belgium	23. Germany	40. Nepal [a]	57. Tanzania [a]
7. Bolivia [a]	24. Ghana [a]	41. Netherlands	58. Thailand [a]
8. Brazil [a]	25. Greece	42. New Zealand	59. Tunisia [a]
9. Bulgaria [a]	26. Guatemala [a]	43. Norway	60. Turkey [a]
10. Burkina Faso [a]	27. Hungary	44. Pakistan [a]	61. Uganda [a]
11. Cameroon [a]	28. India [a]	45. Paraguay [a]	62. United Kingdom
12. Canada	29. Indonesia [a]	46. Peru [a]	63. United States
13. Chile [a]	30. Ireland	47. Philippines [a]	64. Uruguay [a]
14. Colombia [a]	31. Israel	48. Poland [a]	65. Venezuela [a]
15. Costa Rica [a]	32. Italy	49. Portugal	
16. Dominican Republic [a]	33. Jamaica [a]	50. Romania [a]	
17. Ecuador [a]	34. Japan	51. Senegal [a]	

Notes: [a] indicates developing countries, according to the World Bank classification.

Table A.2. Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
Financial Development	455	47.00	39.17	1.39	192.03
Financial Structure	455	11.57	6.08	0	21
Trade	455	58.25	28.16	11.39	172.23
Government	455	16.61	5.74	7.32	35.63
GDP level (millions of US$)	455	507	1245	6	1251
Population (millions)	455	51	118	2	1102
Stock Market Capitalization	399	31.55	37.27	0.10	228.68
Private Credit plus Stock Mkt. Capitalization	399	82.53	71.03	2.27	364.98

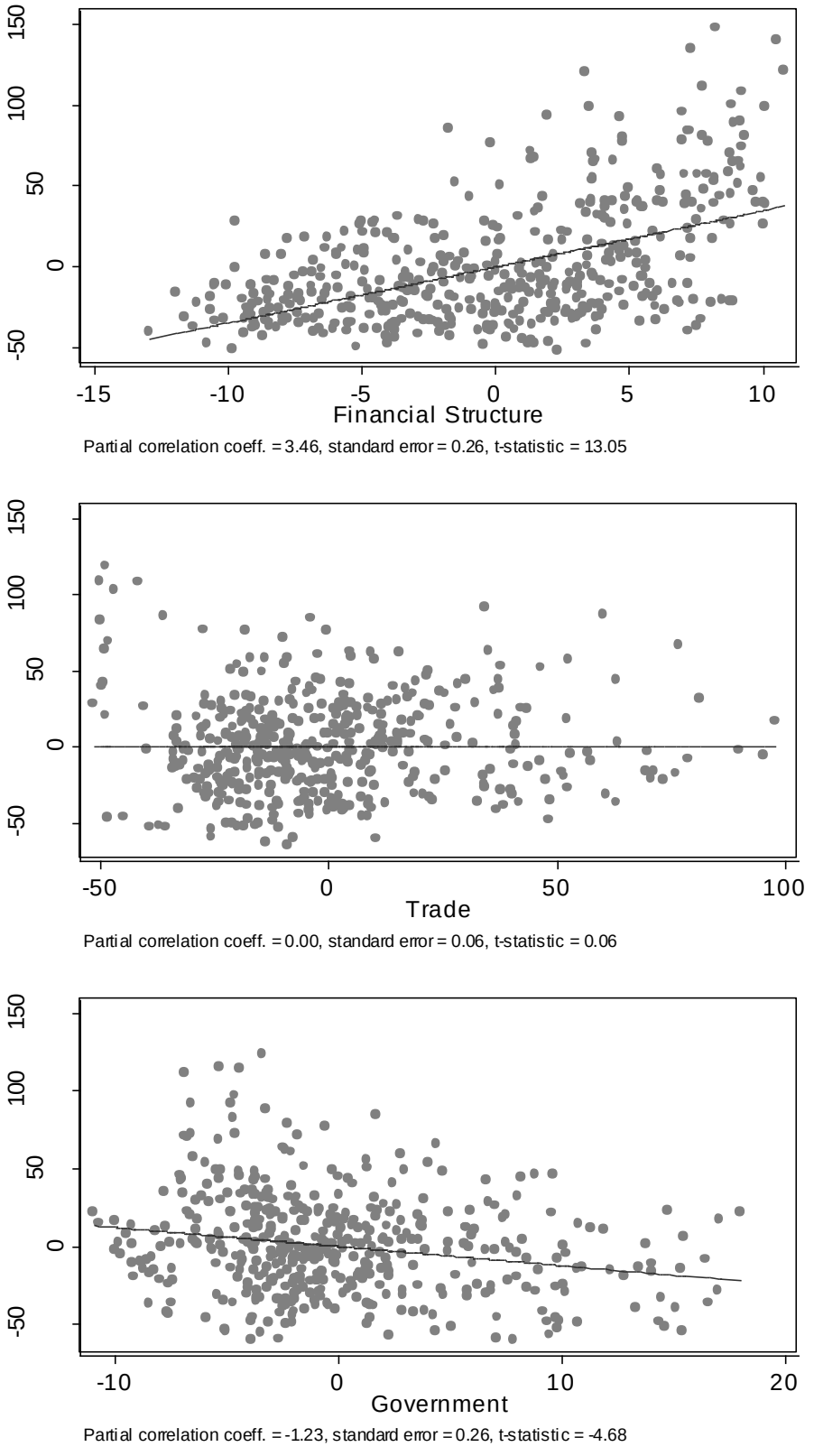

Figure 1. The panels show partial correlations from OLS regressions with Financial Development of Financial Structure, Trade, and Government.

Table 1. Correlations between finance, trade, and government indicators

Levels \ Dev. from country means	Financial Development	Financial Structure	Trade	Government
Financial Development		0.34**	0.23**	-0.26**
Financial Structure	0.57**		0.54**	-0.20**
Trade	0.21**	0.37**		-0.09*
Government	-0.27**	-0.16**	-0.05	

Notes: ** indicates significance at the 1% level, * at the 10% level. Correlations above the diagonal are between variables in deviations from country means.

Table 2. First-stage regressions

Dependent variable:	Financial Structure	Trade	Government
Interactions of time trend with:			
German Legal Origin	-1.26	-3.26	0.34
	(0.26)	(1.33)	(0.24)
English Legal Origin	-0.46	0.45	0.49
	(0.18)	(0.91)	(0.16)
Scandinavian Legal Origin	-0.10	18.01	-2.87
	(2.59)	(5.80)	(1.07)
Socialist Legal Origin	1.05	-3.29	-0.48
	(0.67)	3.25)	(1.11)
NatOp*German Legal Origin	0.24	1.70	-0.15
	(0.11)	(0.55)	(0.08)
NatOp*English Legal Origin	0.11	0.30	-0.40
	(0.07)	(0.55)	(0.08)
NatOp*Scandinavian Legal Origin	-0.34	-8.84	1.21
	(1.18)	(2.70)	(0.52)
NatOp*Socialist Legal Origin	-0.29	4.04	0.73
	(0.29)	(1.48)	(0.57)
Time trend	2.22	3.38	-0.31
	(0.07)	(0.34)	(0.08)
Partial R2	0.82	0.46	0.17
Shea's Partial R2	0.10	0.07	0.10
Observations	455	455	455
N	65	65	65
T	7	7	7

Notes: Fixed effects regressions, "within" partial R2. Robust standard errors in parentheses.

Table 3. Second-stage IV and dynamic OLS regressions

Dependent variable: Financial Development				
Estimator:	IV	IV	OLS	OLS
Column:	1	2	3	4
Financial Structure	-1.79	1.74		
	(1.06)	(1.03)		
Trade	-0.31	-0.40		
	(0.18)	(0.22)		
Government	-1.48	-0.37		
	(0.63)	(0.46)		
First lag of				
Financial Structure		0.53	0.62	-0.13
		(0.97)	(0.36)	(0.34)
Trade		0.78	0.14	0.17
		(0.28)	(0.09)	(0.09)
Government		-1.33	-0.91	-1.27
		(0.52)	(0.27)	(0.30)
Financial Development		0.80	0.70	0.95
		(0.13)	(0.06)	(0.09)
Second lag of				
Financial Structure				-0.73
				(0.40)
Trade				-0.00
				(0.08)
Government				0.38
				(0.25)
Financial Development				-0.51
				(0.09)
Statistics:				
Over-identifying restrictions	68.92	39.83		
	[0.05]	[0.39]		
Specification test	2.81	5.03		
	[0.42]	[0.66]		
Weak identification test	4.70	3.37		
Observations	455	390	390	325
N	65	65	65	65
T	7	6	6	5

Notes: Fixed effects regressions, controlling for time effects. Standard errors, in parentheses, are robust in FE-IV regressions, and clustered by country in FE-OLS regressions. The "within" R2s of the models in columns 3 and 4 are 0.60 and 0.59, respectively. *Instrumental variables*: interaction terms between Natural Openness, Legal Origin, and time effects. *Statistics* (p-values in square brackets) computed by the ivreg2 (Baum et al., 2007) and xtivreg2 (Schaffer, 2010) Stata modules, definitions: test of over-identifying restrictions, under the null that all instrumental variables are orthogonal to the second-stage error term; specification test, under the null: estimates from OLS and IV are both consistent; weak identification test: Kleibergen--Paap Wald rk F statistic, robust to non-i.i.d. errors.

Table 4. Robustness checks

Dependent variable:	Financial Development			Stock Market Capitalization	Private Credit plus Stock Market Capitalization
Sample:	All	Advanced	Developing	All	All
Column:	1	2	3	4	5
Financial Structure	-1.04	1.44	-2.61	-1.87	-2.40
	(1.02)	(1.38)	(1.81)	(0.97)	(1.30)
Trade	-0.27	-0.40	0.36	0.32	-0.05
	(0.17)	(0.32)	(0.31)	(0.18)	(0.25)
Government	-1.54	-1.75	-2.22	-1.85	-3.23
	(0.63)	(1.57)	(0.83)	(0.56)	(0.92)
Control variables:					
GDP	0.01	0.01	0.00	0.01	0.02
	(0.00)	(0.02)	(0.02)	(0.00)	(0.00)
Population	-0.12	0.35	0.01	0.04	-0.10
	(0.03)	(2.03)	(0.12)	(0.03)	(0.05)
Statistics:					
Over-identifying restrictions	67.17	56.52	22.21	49.37	43.97
	[0.06]	[0.03]	[0.73]	[0.54]	[0.75]
Specification test	3.25	3.16	6.77	1.25	3.34
	[0.35]	[0.37]	[0.08]	[0.74]	[0.34]
Weak identification test	4.75	3.98	9.75	4.41	4.41
Observations	455	147	301	399	399
N	65	21	43	57	57
T	7	7	7	7	7

Notes: Fixed effects instrumental variables regressions, controlling for time effects. Robust standard errors in parentheses. In column 2, the only Socialist legal origin country, Hungary, is dropped. *Instrumental variables*: interaction terms between Natural Openness, Legal Origin, and time effects. *Statistics* (p-values in square brackets) computed by the ivreg2 (Baum et al., 2007) and xtivreg2 (Schaffer, 2010) Stata modules, definitions: test of over-identifying restrictions, under the null that all instrumental variables are orthogonal to the second-stage error term; specification test, under the null: estimates from OLS and IV are both consistent; weak identification test: Kleibergen--Paap Wald rk F statistic, robust to non-i.i.d. errors.