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Financial Development and Economic Growth

An examination of the growth-enhancing view of financial development using real world data

Abstract

This paper examines whether the growth-enhancing view of financial development posed by Levine (1997) and Pagano (1993) can be proven with real world data. I attempt to address issues of endogeneity using Levine et al.'s (2000) Two Stage Least Squares Instrumental Variable (2SLS IV) method for cross-sectional and panel data. For the cross-sectional data, by using the legal origins of a country as an instrumental variable for financial development, I find an insignificant relationship between financial development and growth. With the panel data, I run a 'difference' regression (using lagged variables as instruments) and a 'levels' regression (using the lagged differences as instruments). For both of these panel data regressions, I find a mixture of insignificant and negatively significant coefficients. Upon closer inspection, these results may be driven by external factors, and so a broader consideration of these factors may provide a fruitful avenue for future research on the causal relationship between financial development and economic growth.

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Section 1: The theory behind the relationship between financial development and economic growth

The theories put forward by Pagano's 'AK' model and Levine's 'functional approach' describe how financial development can accelerate growth. Pagano's 'AK' model can be used to briefly explain the theory behind the positive impact of financial development on economic growth (Pagano, 1993), but Levine's 'functional approach' gives a more detailed understanding of relationship between the financial structures and functioning of the financial system in the economy, and thus better describes how financial development can fuel economic growth (Levine, 1997).

To begin with, Pagano illustrates the link between financial development and economic growth via the 'AK' model as shown in equation 1. Part (1) shows that productivity in a firm ('A') is an increasing function of the aggregate capital stock ('K_t'). Part (2) shows that gross investment is equal to capital in the next period minus the depreciation of capital in the current period. Part (3) shows that, in a closed economy, investment is equal to the amount of savings not expended in the process of financial intermediation (financial intermediaries are institutions that bridge the gap between borrowers and lenders (firms and savers, respectively) (Efayena, 2014)). Combining the parts (1), (2) and (3) of the equation, Pagano computes the steady-state growth rate as part (4). Ceteris paribus, this steady state equation shows that financial development can affect growth by influencing the saving rate ('s'), increasing the social marginal propensity of capital ('A') or by raising the proportion of savings channelled to investment 'ø'.

Equation 1

Part (1) $Y_t = AK_t$

Part (2) $I_t = K_{t+1} - (1 - \delta)K_t$

Part (3) $\phi S_t = I_t$

Part (4) $g = A\frac{1}{Y} - \delta = A\phi s - \delta$

However, it is important to take a step back and examine the financial structures that must first exist to enable these effects on growth – as outlined by Levine's 'functional approach'. Financial markets and institutions arise to minimise the costs associated with acquiring information and making transactions. These cost minimisations can be achieved by five financial functions: risk amelioration, resource allocation and information acquisition, corporate control, savings mobilisation and the facilitation of exchange. These functions help promote growth via the channels of capital accumulation and technological innovations.

So, taken together, the two prongs of Pagano's 'AK' model and Levine's 'functional approach' help illustrate the sequential process by which financial development affects growth. Levine's theory effectively sets the scene by discussing the financial structures that must first exist to enable financial development to affect growth, whilst Pagano's theory gives a more detailed analysis of how financial development affects growth via two growth channels (capital accumulation and technological innovation). However, as admitted by Pagano himself, the direction of the relationship between financial development and economic growth is often ambiguous (Pagano, 1993, p. 616) as it will depend on the particular financial market concerned. Therefore, greater examination of the five functions outlined in Levine's 'functional approach' can enable a clearer evaluation of how financial development affects economic growth in different financial markets.

The first financial function, risk amelioration, can help savers overcome the liquidity risk and idiosyncratic risk associated with holding an asset. The liquidity risk is the inability of an economic agent to exchange their wealth for goods and services (Nikolaou, 2009), due to informational asymmetries (the imbalance of information between buyer and seller) whilst idiosyncratic risk is the firm-specific risk caused by changes in the price of an asset (Market Business News, 2020). By mitigating these risks through risk amelioration, financial development enhances economic growth by incentivising savers to invest in more high-return projects. To begin with, liquidity risk arises when

savers investing must renounce control of their savings for long periods of time, (Diamond & Dybvig, 1983) restricting their propensity to invest in illiquid long term but high return investments. Following on from the Diamond-Dyvbig model, financial intermediaries may encourage greater investment in these less popular high-return illiquid investments by investing in a diversified mixture of low-return liquid and high-return illiquid investments to provide immediate liquidity to deposit holders. Savers are now more incentivised by high-return illiquid investments, as this diversification provides immediate liquidity to deposit holders and so with more capital flowing to these high-return and more profitable investments, growth will accelerate. Liquidity risk also means that savers may be less inclined to invest in those productive technologies which have long gestation periods, due to the transaction cost of transferring ownership of the investment to different individuals over the lifetime of the investment (Bencivenga, et al., 1996). Therefore, secondary securities markets emerge to ameliorate these transaction costs (such as by facilitating communication between the buyer and holder of the security), reducing the liquidity risk of assets with long gestation periods. And so, in the same way as before, with more capital flowing to productive and efficient technologies, economic growth will rise. Lastly, financial intermediaries may reduce idiosyncratic risk via risk diversification. By combining risky and non-risky investments, financial intermediaries allow savers to invest in risky high-return projects as they will be less exposed to the risk aspect (Saint-Paul, 1991).

Levine's next function is information acquisition i.e. the way in which financial systems facilitate the information acquisition of investments in order to reduce the information costs faced by savers. These costs arise as savers lack the capability to accumulate information on investments (such as the economic conditions affecting an investment); this is detrimental to growth as savers are discouraged from investing in areas with little information available, but with the potential to generate large returns. Therefore, financial intermediaries step in with the skills needed to appraise investments and select the most successful firms that will generate the highest returns (Greenwood & Jovanovic, 1990). This information will be passed onto the savers, incentivising savers to invest in high-return projects

(leading to improvements in growth via the channel of capital accumulation). Moreover, the public accessibility of share prices reported by financial institutions - such as stock markets – can also indicate to savers the probability of high returns on a particular investment. The public accessibility of share prices may reduce information costs as savers can see for themselves the profitability of investments (without the need for evaluation by financial intermediaries). Therefore, with less resources wasted acquiring information, more will be available for investment. So with stock markets and financial intermediaries indicating which firms to invest in, capital will flow to the most efficient firm and stimulate higher rates of growth.

Moving on, Levine considers the role of corporate control. As defined by Ruback and Jensen, the market for corporate control involves managerial groups interacting with one another in order to get the exclusive right to manage corporate resources (Ruback & Jensen, 1983, p. 1). The provision of corporate control by financial intermediaries will reduce the monitoring costs and (indirectly) the asymmetric costs of a firm's activities; I say indirectly as through monitoring, firms are less able to falsify information, thus reducing asymmetric costs. Asymmetric costs occur when a party has private information that another party does not have, so when both of these parties interact, there is market failure (such as in the form of adverse selection) (Sell & Reese, 2014). To begin with, financial instruments such as collateral and financial contracts can be used to lower these monitoring and asymmetric costs (Williamson, 1986). Delving deeper into the effects of financial contracts, by binding the contractual terms to current actions, the borrower will only receive the second part of the contract if the borrower does not default in the first period. And so, by the law of large numbers, if this process is repeated over time then the default rate will give information about the ability of the firm (Webb, 1991). Therefore, by the financial system enabling the monitoring of firms, information costs are minimised, so more resources will be directed towards efficient projects, which will prompt growth. Going one step further on this, financial intermediaries may be able to economise on monitoring costs to keep them as minimal as possible. This is because the benefits yielded by monitoring a firm can be

extended to large number of savers, diminishing the monitoring cost to each individual saver (Diamond, 1984). Monitoring costs are further minimised by the financial intermediary holding a diversified portfolio, meaning savers will have no need to monitor the intermediary (as the intermediary should always be able to pay out). In addition, with the long-run relationships between financial intermediaries and firms, information costs will be kept even lower due to the 'learning effect' of repeated lending to the firm (Sharpe, 1990). Thus, these ongoing improvements in the financial intermediaries' knowledge of firms will make the evaluation of firms by financial intermediaries more credible to savers (enticing them to invest). To conclude, the greater implementation of corporate control by financial intermediaries may keep monitoring and information costs to a minimum. This should encourage greater investment by savers, and so improve growth.

Upon closer inspection of the role of corporate control, the existence of stock markets may enable greater corporate control both within the firm and between the firm and its owners (further reducing costs). Between the firm and owners, owners may exert corporate control over the managers by compensating the managers in line with the stock price, assuming owners take the public stock share information about the firm as an indication of the performance of the firm (Diamond & Verrecchia, 1982). This control may be intensified as, by stock markets facilitating the takeovers of inefficient firms, the credibility of a takeover threat is exacerbated. So monitoring costs are kept even lower because managers are incentivised to act in accordance with the preferences of the owners in keeping the share price up without the need for the owners to monitor the managers (Scharfstein, 1988). These reductions in monitoring costs within a firm free up more resources for reinvestment in a firm, again enhancing growth.

Next, financial systems provide the mobilisation of savings to bridge firms' capital demands with savers' investment demands. When firms are restricted to their own earnings, they are constrained to produce at inefficient levels (Crane, et al., 1995). Without any connections, firms may be unable to

mobilise savings for themselves, and are unwilling to pay the vast transaction costs associated with locating potential investors. Therefore, financial intermediaries arise to mobilise savings for the firms. Financial intermediaries mitigate information asymmetries by gaining a trustworthy reputation (such as by obtaining an official government approval), incentivising savers to entrust their savings to the intermediary (De Long, 1991). Furthermore, financial intermediaries lower the transaction costs associated with collecting savings from a variety of individuals by establishing connections that will deliver capital on a large scale. This can be exemplified by the way in which US investment banks used European connections to raise capital abroad for investment in the US in the 1880s (Carosso, 1970). To finish, financial intermediaries can economise on transaction costs and information costs. Multilateral contracts between a set of investors and a set of firms lead to thousands of investors commending their wealth to a single financial intermediary, which can then invest in hundreds of firms (Crane, et al., 1995). By exponentially lowering the costs of firms raising capital, they are better able to take advantage of economies of scale, bringing greater efficiency to production and thus enhancing growth.

Levine's final factor is that financial markets enable greater specialisation by facilitating exchange. According to Adam Smith, specialisation will lead to big productivity improvements as workers that specialise foster a "learning-by-doing" effect, which channels into higher growth rates by enabling technological innovation (Smith, 1776). Since specialisation requires more transactions, financial arrangements that lower transaction costs can enable more efficient specialisation (Greenwood & Smith, 1997). The facilitation of exchange may lower transaction costs as, by introducing an easily recognisable medium of exchange, less resources are used to evaluate the returns on a good. Therefore, as the facilitation of exchange enables greater specialisation, so too can it enhance growth rates.

Having discussed the theory in some detail, I now turn to the literature on the finance-growth link to provide evidence supporting this theory using real world data.

Section 2: A review of past literature

A monumental economic debate exists between economists in determining the magnitude and direction of the relationship between financial development and economic growth. Whilst earlier work on this debate tends to suggest that it is financial development that fuels economic growth (Bagehot, 1873) (Schumpeter, 1912) (Hicks, 1969), more recent studies may give support to the possibility that it is growth that fuels financial development.

Opoku et al. discuss the different schools of thought on the finance-growth nexus (Opoku, et al., 2019). These theories include the 'supply-leading hypothesis', the 'demand-following hypothesis', the 'feedback hypothesis' and the 'neutrality hypothesis'. The 'supply-leading hypothesis' explains how financial development leads to economic growth (Abu-Bader & Abu-Qarn, 2008). The 'demand-following hypothesis' shows that economic growth fuels financial development by increasing the demand for financial services (Odhiambo, 2004). The 'feedback hypothesis' claims there to be a duplex (or bi-directional) causality path between financial development and economic growth (Akinboade, 1998). Lastly, the 'neutrality hypothesis' reports an insignificant relationship between financial development and economic growth (Atindehou, et al., 2005). In this particular study, Opoku et al. use a panel of 47 African countries over the period 1980-2016. They construct a robust measure of financial development by using a range of indices on the depth, access and efficiency of the financial institutions in a country. Using a frequency-domain spectral causality technique, they examine the causality effect in the short, medium and long run of the 'supply-leading' and 'demand-following' hypothesises, which actually resulted in evidence for the 'neutrality' hypothesis on the finance-growth link.

Leading on from this, Akinboade uses country-specific time series data between 1972-1995 to examine the direction of causality between financial development and economic growth in Botswana (Akinboade, 1998). Botswana is an interesting case study as it went from being one of the poorest

countries globally in 1966 to becoming a middle income economy by 1980s (and this time period is roughly contained in the dataset range). He measures Botswana's economic growth by the real non-mineral GDP per capita (to exclude the bias coming from the immense influence of Botswana's mineral sector), and measures the financial development by the ratio of bank claims on private sector to nominal and non-mineral GDP and by the ratio of bank deposit liabilities to nominal non-mineral GDP. Using the Granger causality technique, Akinboade finds a bi-directional causality loop between the financial development and economic growth indicators, thus supporting the 'feedback' hypothesis.

Other economists find evidence of the 'demand-following' hypothesis. Using time series data on South Africa between 1986-2000, Odhiambo investigated the direction of causality between financial development and economic growth (Odhiambo, 2004). He regressed three proxies for financial development (a monetarisation variable, a currency ratio and a ratio of bank claims on the private sector to nominal GDP) against a proxy for economic growth (real per capita income). Since these variables are non-stationary, he uses first-differencing to transform them into stationary ones. His results then revealed evidence of a 'demand-following' response between financial development and economic growth.

Meanwhile, economists such as Guru and Yadav find further evidence to support the 'supply-leading' theory (Guru & Yadav, 2019). Using a panel of the five emerging BRICS countries (Brazil, Russia, India, China and South Africa) over the period 1993-2014, they model the relationship between financial development and economic growth. Using BRICS economies enables the authors to make broader external conclusions as the BRICS economies have contrasting economic growth rates (ranging from 1.18%-9.14% (Guru & Yadav, 2019, p. 115)), whilst being largely free from bias as they are mostly heterogeneous (such as by geographical region). They model a country's banking sector development by its size, credit to deposit ratio and the domestic credit to private sector (CPS), and model its stock market development by the value of shares traded and the turnover ratio. With real

GDP as a proxy for economic growth, they use the Generalised Method of Moments (GMM) system estimation to estimate the finance-growth link. The results obtained not only supported the 'supply-leading' hypothesis, but also showed that there is no trade-off between the development of banks and of stock markets since they complement each other.

Moving beyond the debate on the direction of causality, some economists find that the initial level of economic development can determine the relationship between financial development and economic growth. First off, Skully et al. use panel data on 90 countries between 1980-2011 to test if the stage of a country's economic development impacts the finance-growth link (Skully, et al., 2019). Using a system GMM method with 3 dummy variables (low, middle and high income), they test the significance of 4 financial development proxies (banking, stock market, bond market and insurance) on growth. As these dummy variables reported different results on the finance-growth connection for different income groups, the exact relationship on the finance-growth link must instead depend on their initial level of economic development. Using a full sample period (1980-2011) and a pre-crisis period (1980-2006), they also find that financial crashes can impact upon the ability of stock markets to fuel growth in high income countries.

Yang advances this assessment of the effect of initial economic development on the relationship (Yang, 2018). Using data from the World Bank over the period 1970-2015, Yang divides 47 countries into 3 categories: 'trapped' middle-income (countries that began as middle income countries in 1970 and remained this way by 2015), 'graduated' middle-income (countries that also began as middle-income countries but managed to grow into high-income countries) and high-income (countries that began and ended as high-income countries). Using the financial development indicators: 'broad money', credit to private sector and size/liquidity of stock markets, he models time series tests to identify the causality relationships between economic growth and financial development indicators for the different income groups. The results of this test enabled Yang to suggest that middle-income

countries are 'trapped' due to the development of their banking sector. The more credit provided to the economy via banking, the higher the inflation (and vice-versa) and this higher inflation impedes growth (suggesting that financial development in the banking sector is detrimental to growth).

In examining the broader causes behind the relationship, Haber examines the effect of political regimes on the levels of finance restrictions in an economy and their impact on the finance-growth link (Haber, 1991). Using time series data on the US, Brazil and Mexico over the period 1840-1930, he examines how the four-firm industrial concentration ratio of the textile industry is affected by changes in financial development (choosing the textile industry as the lack of barriers to entry means that changes in the concentration can be directly attributed to changes in financial development). With the concentrations initially similar between Mexico and Brazil, the overthrow of the Brazilian monarchy in 1889 led to the Brazilian financial markets becoming considerably more liberalised than Mexico. With this greater access to credit in Brazil, the textile industrial concentration fell from 0.357 in 1880 to 0.161 in 1930, increasing industrial production and thus growth. Meanwhile, the constant concentration in Mexico shows how restrictions can be detrimental to growth regardless of any changes in financial development.

Rajan and Zingales advance the debate by showing that financial development can reduce the cost of external finance, meaning industries that are more dependent on external finance will benefit more from financial development (Rajan & Zingales, 1998). Using the cost of external finance as an instrumental variable for financial development, they model the causal effect of financial development on growth. Using a large cross-section of countries, they measure the external financial dependence of an industry by summing firms' capital expenditures over the period 1980-90. They found that when young firms are externally dependent, financial development had twice the impact on growth compared with the mature less externally dependent firms. Assuming young firms are a major source

of innovation, then these results imply that financial development that permits the emergence of young firms may better enhance growth.

Other economists examine the reasons behind these contrasting results for the finance-growth link. Mensah et al. use time series data from Ghana between 1961-2010 to show that the growth effect of financial development is sensitive to the particular proxy used (Mensah, et al., 2013). The initially large number of proxies (eight) makes their regression vulnerable to multicollinearity (due to high correlation between proxies in such a small sample), leading to them applying principal component analysis to produce four sub-proxies of financial development (which still explain 95% of the total variation but don't have the between-proxy correlation). They find that the sub-proxies 'credit to the private sector as a ratio of GDP' and 'total domestic credit' have statistically positive effects on growth rates, whilst the sub-proxy 'broad money stock to GDP ratio' has a statistically negative effect. These results support their theory that the decision on which financial development proxy to use can determine the growth effect of financial development.

Perera & Paudel complement Mensah el al.'s view that different indicators for financial development determine the results for the relationship between financial development and economic growth (Perera & Paudel, 2009). Using time series data on Sri Lanka between 1955-2005, they construct six measures of financial development and they test the cointegration between financial development and growth using Johansen's Vector Autoregression Approach. After finding cointegration between economic and financial development variables, they then use an error correction model to perform a Granger causality test. These results report a two-way causality loop between the financial development variable 'broad money' and economic growth, whilst other financial development variables such as 'private sector credit' report a one-way causality path from financial development to economic growth.

To conclude, some economists have shown that the direction of causality flows from financial development to economic growth, whilst others have shown the reverse. Additionally, some have

shown a bi-directional causality path or none at al. Furthermore, it has been shown that initial levels of economic development can also determine this relationship. Moreover, economists point out that there are certain factors that can spur this relationship, such as political liberalisations on finance or the number of young vs. mature firms in the economy. To close, the reasons for these different results can be attributed to the authors' decisions on which financial development proxies to use, as considered in the sensitivity analysis of section 4.

Section 3: Econometric method for cross-sectional data and panel data

In order to test the growth-enhancing view of financial development presented by Pagano's 'AK model' and Levine's 'functional approach' in section 1, I follow the techniques adopted by Levine et al. (2000) to extract the exogenous component of financial development and examine how this affects economic growth (Levine, et al., 2000). Firstly, I produce a cross-sectional dataset (consisting of variables taken at a given point in time) and a panel dataset (consisting of a time series for each cross-sectional variable). I use the cross-sectional dataset to run a Two Stage Least Squares (2SLS) regression, in which I instrument a country's financial development by its legal origin. As for the panel dataset, I run two different 2SLS regressions: a 'difference' regression (in which I take the first-difference of each variable and instrument them by their lagged values) and a 'levels' regression (in which I do not first-difference the variables but I do instrument them by their lagged-difference values). Data-wise, I use the World Bank to gather information on the explanatory and dependent variables and Daniel Treisman's data on legal origins (Treisman, 2007).

In terms of the explanatory variables, I use 3 of the 4 variables used in King and Levine (1993) to proxy for financial development: BANK, LLY and PRIVY. BANK compares commercial bank allocation decisions on savings compared to the central bank, LLY measures the relative size of the financial sector, and PRIVY measures the provision of financial services provided in a country (King & Levine, 1993). As for the dependent variable, I proxy economic growth for the cross-sectional

dataset by GYP (real average long run GDP), and for the panel dataset by GROWTHRATE (real long run GDP). In terms of controlled variables, I use two of the three conditioning sets used by Levine et al.: the simple conditioning set (including the constant, log of initial income and the log of initial educational attainment) and the policy conditioning set (including the simple conditioning set along with government expenditure, inflation and a measure of trade). I control for these variables as they are assumed to affect the dependent variable (for example, initial income captures the convergence effect in which high income countries grow more slowly than low income countries (OpenStax, n.d.)). I proceed to prove the validity of the econometric method and how it addresses the endogeneity issues plaguing the finance-growth link.

I begin by examining the benefits of using 2SLS regressions for resolving endogeneity issues. As shown by the literature review, the explanatory variables in the finance-growth relationship are not exogenous, in which case 2SLS is more efficient than OLS (Wooldridge, 2013, p. 534). With this improvement in efficiency, 2SLS will report lower standard errors, thus improving the precision of the estimation. In terms of the 2SLS technique, the first step involves using instruments to extract the exogenous component of the explanatory variable. In the second step, one regresses this exogenous component of the explanatory variable on the dependent variable. The process will mean that the explanatory variables are no longer jointly determined with the dependent variable, proving that simultaneity bias will not be driving the results. As shown by economists such as Odhiambo (2004) in section 2, simultaneity has been a big issue facing economists due to the existence of the "demand-following" response in which economic growth can fuel financial development. This 'demand-following' response rests on the theory that, as economic growth can increase the level of income in an economy, it will reduce the burden of the fixed cost associated with entering the financial sector (enabling greater financial development).

Next, I turn to the validity of the legal origin instruments used in the 2SLS IV cross-sectional regression. Levine et al.'s cross-sectional method rests on the information provided by La Porta et al., which enables Levine et al. to support the validity of legal origins as an instrument (La Porta, et al., 1998). A country's legal origin identifies which civil or commercial code it historically adopted (La Porta, et al., 1998, p. 1122). Whilst other economists use different classification methods on legal origins (such as including an Islamic legal origin (Wood, 2016)), I follow La Porta et al.'s classification style (categorising a country's legal origin as of British, French, German or Scandinavian descent). So, in order to be valid, an instrument must satisfy the exogeneity condition (stating that the instrument must be uncorrelated with the error term) and the relevance condition (stating that the instrument must be correlated with the explanatory variable it is instrumenting). The legal origins of countries may satisfy the exogeneity condition due to the historic heritage. Financial laws were typically transplanted into countries via the process of colonialism (Watsin, 1974), meaning they would have little impact on any omitted variables contained in the error term (all other variables affecting current growth that are not included in the regression). Next, La Porta et al.'s findings support the relevance condition of legal origins as they find that the laws that were embedded into legal and financial framework of countries in the 17th and 18th centuries may influence the ability of the current financial system to produce quality financial services. For example: countries originating from British 'common-law' typically gave the strongest legal protection (in terms of the levels of enforcement and the rights attached to securities) to current investors due to this British heritage. To close the cross-sectional analysis, I use robust standard errors to allow for potential heteroskedasticity in the error terms, meaning inference will not be invalidated.

But despite these steps taken by the cross-sectional 2SLS IV regression method in addressing issues of endogeneity, there are major flaws – most of which are rooted in this cross-sectional data type. Cross-sectional data may be worse than panel data in terms of addressing omitted variables bias and unobserved constant individual effects. This is due to the time-series element of panel data, which adds

greater variability and allows for inspection of how financial development over time can affect the growth rate of a country. Furthermore, by using panel data, one can control for the unobserved constant individual effects (which were previously caught in the error term of the cross-sectional data, causing omitted variables bias in the results). Lastly, the time-series element enables the use of lagged instruments in the panel regressions, meaning the panel data regressions can control for the potential endogeneity of both the explanatory and control variables (whereas the cross-sectional data could only control for the potential endogeneity of the explanatory variables). Therefore, I run additional panel data regressions to exploit these benefits and thus better solve issues of endogeneity.

Equation 2

$$y_{i,t} - y_{i,t-1} = \beta\left(x_{i,t} - x_{i,t-1}\right) + \gamma\left(z_{i,t} - z_{i,t-1}\right) + \left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)$$

To begin with, the 'difference' regression as shown by Equation 2[1], involves taking the first-difference of the explanatory, controlled and dependent variables. Taking the first-difference of a variable over time removes the unobserved constant individual effects (which was previously a source of endogeneity due to its correlation with the explanatory variables (Wooldridge, 2013, p. 460)). To at least ensure 'weakly exogenous' variables (meaning financial development variables are correlated with current and past realisations of growth but not with future realisations), the 'difference' regression uses the lagged values of the explanatory and controlled variables as instruments. The 'weakly exogenous' assumption that future shocks to the growth rate do not impact current financial development or the controlled variables is obviously a valid assumption. Furthermore, by using cluster-robust standard errors, I control for the possibility of persistence and serial correlation in the data (Wooldridge, 2013, p. 511) (both of which invalidates inference by creating heteroskedastic error terms). Since serial correlation is a likely consequence of panel data (due to panel data's time series

[1] $y_{i,t} - y_{i,t-1}$ = first-difference of real per capita GDP growth rate. $x_{i,t} - x_{i,t-1}$ = first-difference of the financial development proxy. $z_{i,t} - z_{i,t-1}$ = first-difference of the controlled variables. $\varepsilon_{i,t} - \varepsilon_{i,t-1}$ = first-difference of the error term.

element), first-differencing is a better regression method than fixed-effects for removing the unobserved individual specific effect (Wooldridge, 2013, p. 490). Using these two assumptions of weak exogeneity and no serial correlation in the error terms, I can conclude that the lagged values are uncorrelated with the new error term ($\varepsilon_{i,t} - \varepsilon_{i,t-1}$), thus satisfying the exogeneity condition of the instruments. As for the relevance condition, it is quite clear that a lagged value of a variable will be sufficiently correlated with its current value.

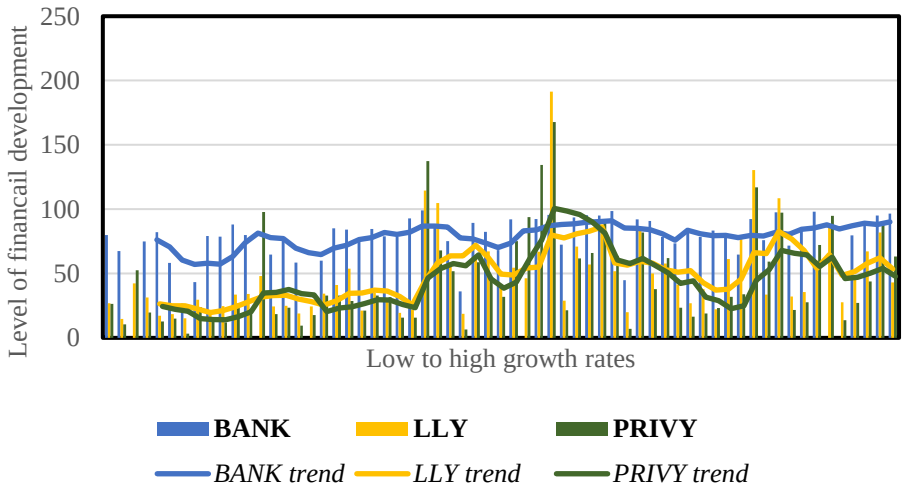
However, the 'difference' regression does not come without its own issues. By eliminating the unobserved constant individual effects, one cannot assess how cross-country differences in financial development can affect growth (thus reducing the reliability and precision of the 'difference' estimator). Therefore, I turn to the 'levels' regression. By not first-differencing the variables, I allow and control for unobserved constant individual effects, thus extracting the full effect of financial development on growth. But in order to allow the presence of unobserved constant individual effects, I must improve the quality of the instruments by using the lagged differences of variables as instruments. As shown by Levine et al., there is no correlation between the lagged difference of these variables and the unobserved constant individual effects, thus allowing for the presence of unobserved constant individual effects (Levine, et al., 2000, p. 52). As cluster-robust standard errors are again a feature of the 'levels' regression, I do not need to test for potential serial correlation of the error term (as was done for the 'difference' and 'levels' regressions in Levine et al.).

With each of these three regression methods solving different areas of endogeneity, the results together may paint a more vivid and full picture of how financial development affects growth. In a somewhat sequential process: the cross-sectional regression resolves simultaneity issues, the 'difference' regression allows for variation over time, and finally the 'levels' regression improves upon the 'difference' regression by controlling for unobserved constant individual effects. As shown in the literature review, the results of each proxy for financial development will show how different areas of

the financial system can affect growth differently. And so, with the interpretation of each proxy for each regression firmly in place, I can see if the theory presented in section 1 is truly applicable to real world data.

Section 4: Results

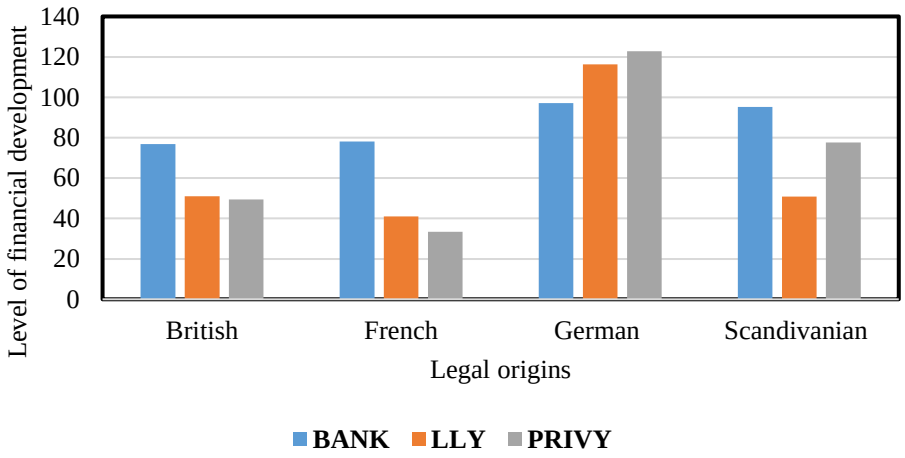
Fig. 1. Financial development across economic growth rates



Before looking at the results, I turn to figure 1, which illustrates the initial relationship between financial development and growth without any attempts to remove endogeneity (for example: omitted variables bias). At first, there appears to be a lack of any significant correlation between financial development and growth (supporting the 'neutrality hypothesis' from section 2). Using the per five period moving average trend line for each financial development indicator (to show the broader trend between financial development and growth with less outlier bias), higher growth rates do not seem to be accompanied with higher levels of financial development. In accordance with the growth-enhancing view of financial development discussed in section 1, one would expect the peak of variables such as PRIVY to be located at the far right side of the graph (as opposed to being roughly in the middle as in figure 1). It is worth noting here that PRIVY and LLY follow a closer trend than BANK, which may be reflected in the regression results. So, as shown by figure 1's fairly random trend in financial

development and economic growth, the more sophisticated econometric technique outlined in section 3 is needed to accurately test for the existence of section 1's theory using real world data.

Fig. 2. The distribution of Financial Development indicators across legal origins



Next, it is important to examine how closely related the distribution of the legal origins are in respect to those used in Levine et al. to assess the consistency of the cross-sectional regression technique used in this paper. As I am employing roughly the same econometric technique as Levine et al., then one would expect the legal origins of countries to report similar effects on the financial development indicators. Figure 2 supports the results of Levine et al.'s regressions, in which countries with a German legal origin are accompanied with a better-functioning financial system as shown by the financial development proxies reporting higher values than those of the other legal origins. This suggests that the cross-sectional results produced in this paper should conform to the cross-sectional results of Levine et al..

Table 1: Summary Statistics					
	Obs	**Mean**	**Std. Dev**	**Min**	**Max**
GYP	63	1.5374	1.582383	-1.60187	6.011562
BANK	57	79.26458	15.63656	26.739	99.1103
LLY	63	48.5646	32.16728	14.6437	191.368
PRIVY	63	45.35725	36.14035	3.36133	167.738

A final check employed is on the level of variation in the data, which is displayed by the table 1 (summary statistics). There is large variation across countries in terms of both financial development and growth. For example, in terms of the financial sector size, LLY is below 20% of GDP for developing African countries such as Niger, Cameroon and Ghana, whilst for more developed countries such as Japan and Switzerland, LLY is above 100% of GDP. This variation in the dataset may provide sufficient evidence to support the random sampling assumption of linear models as it shows how the data is truly representative of the global population of countries (Wooldridge, 2013, p. 59). The validity of these linear model assumptions will lend support to the unbiasedness of the regression estimator in each of the three regressions.

Table 2 - Financial development and economic growth: cross-section regressions, 1980-2009.
Dependent variable: Real average per capita GDP growth, 1980-2009. Instrumental variable: legal origin. *, **, *** mean statistically significant at the 10%,5% and 1% level respectively

		Coeff.	Robust Standard Error	T stat	P value	Observations	J test[2]
Simple controls	**BANK**	.2145368	.1548052	1.39	0.166	57	0.7433
	LLY	.0228115	.0253989	0.90	0.369	63	0.1662
	PRIVY	.0262938	.0209819	1.25	0.210	63	0.7761
Policy controls	**BANK**	.008338	.1783205	0.05	0.963	56	0.1647
	LLY	.0134395	.0212997	0.63	0.528	62	0.1522
	PRIVY	.0231134	.0226456	1.02	0.307	62	0.4688

Table 3 - Financial development and economic growth: dynamic panel regressions, 1980-2009.
Dependent variable: First differenced real per capita GDP growth, 1980-2009. Instrumental variable: lagged first difference. *, **, *** mean statistically significant at the 10%,5% and 1% level respectively

		Coeff.	Cluster Robust Standard Error	T stat	P value	Observations
Simple controls	**BANK**	.0695241	.0424521	1.64	0.101	1,593
	LLY	-.1139674	.0681983	-1.67	0.095*	1,764
	PRIVY	-.0893687	.0386053	-2.31	0.021**	1,764
Policy controls	**BANK**	.1438922	.0918779	1.57	0.117	1,560
	LLY	-.084524	.0766628	-1.10	0.270	1,731
	PRIVY	-.1029305	.0506702	-2.03	0.042**	1,731

Table 4 – Financial development and economic growth: dynamic panel regressions, 1980-2009.
Dependent variable: Real per capita GDP growth 1980-2009. Instrumental variable: difference in lags (between [_n-1] and [_n-2]). *, **, *** mean statistically significant at the 10%,5% and 1% level respectively

		Coeff.	Cluster Robust Standard Error	T stat	P value	Observations
Simple controls	**BANK**	.0499599	.0337414	1.48	0.139	1,593
	LLY	-.0386096	.0347721	-1.11	0.267	1,764
	PRIVY	-.0622827	.0206099	-3.02	0.003***	1,764
Policy controls	**BANK**	.1134498	.1072771	1.06	0.290	1,560
	LLY	-.0153601	.0391849	-0.39	0.695	1,731
	PRIVY	-.0423424	.0184865	-2.29	0.022**	1,731

[2] In the presence of 2SLS regressions, the over-identification test follows Sargan's (1958) and Basmann's (1960) Chi squared distribution (stata.com, n.d.) with 2 degrees of freedom). The J stat column reports the p value of the over-identification test (null hypothesis: all instruments are exogenous). The rejection of the null shows a possible obstruction of the exogeneity condition. It is worth noting that the over-identification of instruments can only be performed on the cross sectional-regressions as there are more instruments than exogenous variables.

The cross-sectional results reported in table 2 indicate weak support for any significant connection between the exogenous component of financial development and economic growth (shown by the insignificance reported by the p values). To fully encapsulate the meaning of the insignificance reported between financial development and growth, a closer inspection of the coefficients is required. For example: the coefficient on PRIVY for the policy conditioning set shows that, when all controlled variables are held constant, a 1% increase in PRIVY will lead to a 0.2% increase in growth. But upon closer inspection, the coefficients show that when a country moves from the average PRIVY for low income countries (12.7% of GDP) to the average PRIVY for high income countries (74.8% of GDP), they would only yield 1.2% increase in growth. This is a small payoff considering the monumental required increase in PRIVY of 62.1% of GDP needed, proving the insignificance of the relationship reported in table 2.

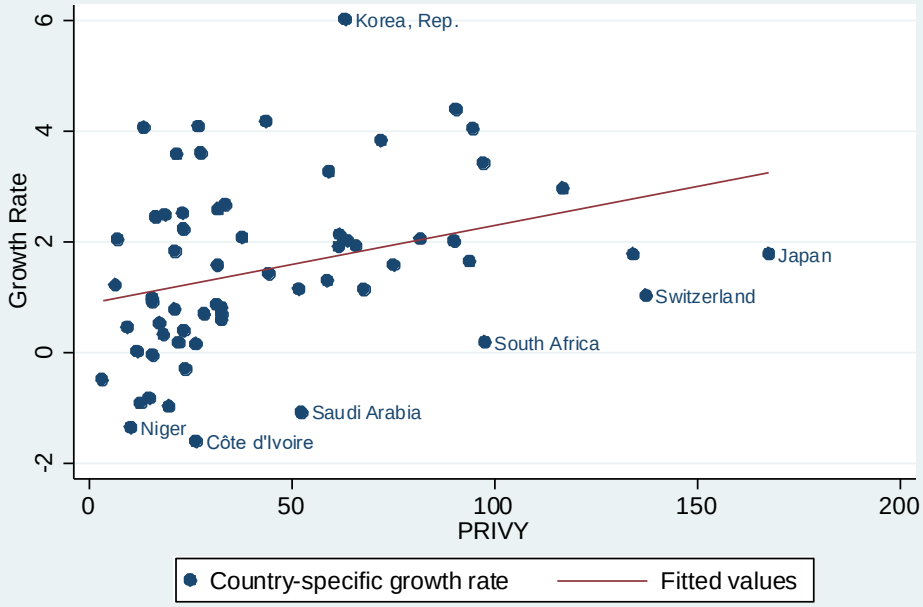
As for the panel data results, tables 3 and 4 reveal there to be some significance between financial development and growth, but not in the growth-enhancing direction as predicted by the theory discussed in section 1. To begin with, the 'difference' regression in table 3 shows a significantly negative effect on growth for LLY and PRIVY under the simple conditioning set (at the 10% and 5% significance level, respectively), but a significantly negative effect on growth only for PRIVY under the policy conditioning set (at the 5% significance level). This shows how LLY suffers from omitted variables bias under the simple conditioning set, as the additional variables in the policy conditioning set affect growth and are correlated with financial development[3]. In the policy conditioning set, Table 3 shows that a 1% increase in the first-difference of PRIVY will decrease the first-difference of growth by 0.1% (when instrumented by its lag). For table 4, the policy conditioning set shows that a 1% increase in PRIVY will decrease growth by 0.04% (when instrumented by its difference in lags). The difference in the significance and direction between the financial indicators in the panel regression

[3] The improvement in the unbiasedness of the coefficients justifies the use of just the policy conditioning set in the application of sensitivity checks.

tables supports Mensah et al. (2013) and Perera & Paudel's (2009) claim discussed in section 2 that different financial development proxies report different relationships. So, in order to determine a definitive acceptance or rejection of the theory in section 1, I consider which financial development proxy best tests the existence of Levine's 'functional approach' and Pagano's 'AK model'. As discussed in King and Levine (1993), a higher PRIVY means more credit is funnelled to the private sector as opposed to state-owned enterprise, meaning the financial system is placing more emphasis on the five financial functions outlined in Levine's 'functional approach' (King & Levine, 1993, p. 721). Therefore, with the improved accuracy (in terms of data) of the panel regressions over the cross-sectional regressions, the significantly negative coefficient on PRIVY in tables 3 and 4 shows that financial development may be detrimental to growth, disproving the growth-enhancing view presented by section 1.

To evaluate this conclusion, I run several sensitivity checks. To assess the sensitivity of the financial development indicators, I repeat the cross-sectional and panel data regressions using different financial development indicators, in which: BANK is reproduced by DEPST_GDP (measuring the size of deposit money bank assets to GDP), LLY by FINDEPST_GDP (measuring the value of financial sector deposits to GDP) and PRIVY by PRIVDEPST_GDP (measuring the ratio of credit to the private sector issued by banks, to GDP). I find no changes in significance, except for DEPST_GDP, which reports different results for the panel regressions to its predecessor - BANK. Furthermore, I examine whether the income group of the country affects the relationship between financial development and growth (as shown by Yang (2018) in section 2). By repeating the regressions using only high income OECD countries, I find no changes in the significance levels of the results, except for PRIVY in tables 3 and 4 reporting an insignificant coefficient (compared to being significantly negative). As a final sensitivity check, I identify the labelled countries that lie furthest from the line of best fit in figure 3 as outliers. I repeat original regressions without the outliers in the dataset, but report no changes in significance (meaning outliers cannot be driving the results).

Figure.3. Scatter plot to show outliers



In view of the sensitivity check on income groups, it could be the case that developing countries report a more negative relationship between financial development and growth than developed countries. This leads me to consider the possibility that potential distortions caused by multinational companies (MNCs) on host economies (which are commonly developing countries) may be driving the significantly negative result reported by PRIVY in the panel regressions. MNCs may distort the financial development of a host economy by not fully taking part in the host economy's financial system, for example: not being listed in the host economy's stock exchange or repatriating profits. In accordance with Levine's theory, a rise in PRIVY could be caused by more credit being funnelled to the private firms that are likely to generate high returns, such as MNCs. But as these MNCs have a tendency to repatriate their profits, the financial resources channelled to MNCs may be withdrawn from the host economy, leading to lower growth rates than if these financial resources had been channelled to the private firms that would have kept their profits in the host economy.

To test this assumption that MNC profit repatriation is what makes PRIVY significantly negative, I substitute the growth variable Gross Domestic Product (GDP) with Gross National Product (GNP)[4] from the World Bank. The profits generated by MNCs will be reflected in the host country's GDP rate but not its GNP rate, meaning GNP does not account for MNC repatriated profit (Perkins, et al., 2013). Running the 'levels' policy set regression using GNP produces a positive but insignificant result for PRIVY, showing that MNC profit repatriation could at least account for part of the significantly negative coefficient on PRIVY.

However, to complete the evaluation of the results it appears that key issues in the dataset may impede any credible conclusions being made from tables 2, 3 and 4. In terms of the cross-sectional regressions, the data on legal origins may be unrepresentative of the population (as whilst there are data on 35 French and 22 British legal origin countries, there are only 3 on German and Scandinavian). In support of this, the distribution of financial development across different legal origins (as shown by figure 2) does not conform to La Porta et al.'s results (which showed the British legal origin to indicate the most financially developed countries). Furthermore, whilst table 1 suggests the data exhibit variation, the variation is greatly limited by the exclusion of the current top 10 countries as a share of GDP (including China, Germany, UK, France and Canada (Worldometer, 2020)), contributing to the bias.

To conclude, the initial results reported in tables 2, 3 and 4 do not support the growth-enhancing view of financial development posed by Pagano and Levine; but upon closer inspection, this may be accounted for by the effects of MNCs on host economies. But a potentially more noteworthy implication of this paper that may further the debate on the finance-growth relationship is that GNP may be a preferable proxy for economic growth, as it controls for the effect that profit repatriation has on the finance-growth relationship. However, with the weaknesses in the dataset, the results in this

[4] In accordance with the 1993 System of National Accounts, the World Bank refers to GNP as Gross National Income (The World Bank, n.d.)

paper cannot categorically prove or disprove the theory presented in section 1, but can act as a further avenue of enquiry for future economists to test this growth-enhancing theory.

Appendix

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Data Sources

Panel / cross-sectional data on financial development, economic growth and controlled variables from the World Bank. The data on the GNP of countries was taken from a separate area of the World Bank (The World Bank, 2019).

The data on the legal origins of countries are taken from the paper “What have we learned about the causes of corruption from ten years of crossnational empirical research?” by Daniel Treisman (2006).

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import excel "O:\AppliedEconomicsDissertation\Section 3 A\Data\Cross-sectional dataset with legal origins sensitivity check.xlsx", sheet("Sheet1") firstrow clear
xi: ivregress 2sls gyp (depst_gdp = leg_british leg_french leg_german leg_scandinavian) loginitialincome loginitialschooling govexp_gdp inflation trade_gdp, rob
xi: ivregress 2sls gyp (privdepst_gdp = leg_british leg_french leg_german leg_scandinavian) loginitialincome loginitialschooling govexp_gdp inflation trade_gdp, rob
xi: ivregress 2sls gyp (findepst_gdp = leg_british leg_french leg_german leg_scandinavian) loginitialincome loginitialschooling govexp_gdp inflation trade_gdp, rob
clear
use "O:\AppliedEconomicsDissertation\Section 3 A\Data\balancedpaneldataupdated.dta"
bysort countryid: gen loginitialincome=ln(gdppc_1980 )
bysort countryid: gen loginitialschooling=ln(ss_total_1980 )
egen countryid_n = group(countryid)
xtset countryid_n year
bysort countryid_n : gen dgrowthrate_fd=d.growthrate
bysort countryid_n : gen dbank_fd=d.bank
bysort countryid_n : gen dlly_fd=d.lly
bysort countryid_n : gen dprivy_fd=d.privy
bysort countryid_n : gen dgovexp_gdp_fd=d.govexp_gdp
bysort countryid_n : gen dinflation_fd=d.inflation
bysort countryid_n : gen dtrade_gdp_fd=d.trade_gdp
bysort countryid_n : gen ddepst_gdp_fd=d.depst_gdp
bysort countryid_n : gen dprivdepst_gdp_fd=d.privdepst_gdp
bysort countryid_n : gen dfindepst_gdp_fd=d.findepst_gdp
bysort countryid_n : gen bank_lag = bank[_n-1]
bysort countryid_n : gen lly_lag = lly[_n-1]
bysort countryid_n : gen privy_lag = privy[_n-1]
bysort countryid_n : gen govexp_gdp_lag = govexp_gdp[_n-1]
bysort countryid_n : gen inflation_lag = inflation[_n-1]
bysort countryid_n : gen trade_gdp_lag = trade_gdp[_n-1]
bysort countryid_n : gen depst_gdp_lag = depst_gdp[_n-1]
bysort countryid_n : gen privdepst_gdp_lag = privdepst_gdp[_n-1]
bysort countryid_n : gen findepst_gdp_lag = findepst_gdp[_n-1]
xi: xtivreg dgrowthrate_fd (ddepst_gdp_fd dgovexp_gdp_fd dinflation_fd dtrade_gdp_fd = depst_gdp_lag govexp_gdp_lag inflation_lag trade_gdp_lag depst_gdp_lag) i.year, vce(robust)
xi: xtivreg dgrowthrate_fd (dprivdepst_gdp_fd dgovexp_gdp_fd dinflation_fd dtrade_gdp_fd = privdepst_gdp_lag govexp_gdp_lag inflation_lag trade_gdp_lag) i.year, vce(robust)
xi: xtivreg dgrowthrate_fd (dfindepst_gdp_fd dgovexp_gdp_fd dinflation_fd dtrade_gdp_fd = findepst_gdp_lag govexp_gdp_lag inflation_lag trade_gdp_lag) i.year, vce(robust)
clear
use "O:\AppliedEconomicsDissertation\Section 3 A\Data\balancedpaneldataupdated.dta"
bysort countryid: gen loginitialincome=ln(gdppc_1980 )
bysort countryid: gen loginitialschooling=ln(ss_total_1980 )
egen countryid_n = group(countryid)
xtset countryid_n year
bysort countryid_n : gen govexp_gdp_lag_diff = govexp_gdp[_n-1] - govexp_gdp[_n-2]
bysort countryid_n : gen inflation_lag_diff = inflation[_n-1] - inflation[_n-2]
```

```
bysort countryid_n : gen trade_gdp_lag_diff = trade_gdp[_n-1] - trade_gdp[_n-2]
bysort countryid_n : gen depst_gdp_lag_diff = depst_gdp[_n-1] - depst_gdp[_n-2]
bysort countryid_n : gen privdepst_gdp_lag_diff = privdepst_gdp[_n-1] - privdepst_gdp[_n-2]
bysort countryid_n : gen findepst_gdp_lag_diff = findepst_gdp[_n-1] - findepst_gdp[_n-2]
xi: xtivreg growthrate (depst_gdp govexp_gdp inflation trade_gdp = depst_gdp_lag_diff
govexp_gdp_lag_diff inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
xi: xtivreg growthrate (privdepst_gdp govexp_gdp inflation trade_gdp = privdepst_gdp_lag_diff
govexp_gdp_lag_diff inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
xi: xtivreg growthrate (findepst_gdp govexp_gdp inflation trade_gdp = findepst_gdp_lag_diff
govexp_gdp_lag_diff inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
clear
import excel "O:\AppliedEconomicsDissertation\Section 3 A\Data\Cross-sectional dataset with legal
origins high income OECD only.xlsx", sheet("Sheet2") firstrow clear
xi: ivregress 2sls gyp (bank = leg_british leg_french leg_german leg_scandinavian) loginitialincome
loginitialschooling govexp_gdp inflation trade_gdp, rob
xi: ivregress 2sls gyp (lly = leg_british leg_french leg_german leg_scandinavian) loginitialincome
loginitialschooling govexp_gdp inflation trade_gdp, rob
xi: ivregress 2sls gyp (privy = leg_british leg_french leg_german leg_scandinavian) loginitialincome
loginitialschooling govexp_gdp inflation trade_gdp, rob
import excel "O:\AppliedEconomicsDissertation\Section 3 A\Data\Panel data high income OECD
only.xlsx", sheet("Sheet2") firstrow clear
xtset countryid_n year
bysort countryid_n : gen dgrowthrate_fd=d.growthrate
bysort countryid_n : gen dbank_fd=d.bank
bysort countryid_n : gen dlly_fd=d.lly
bysort countryid_n : gen dprivy_fd=d.privy
bysort countryid_n : gen dgovexp_gdp_fd=d.govexp_gdp
bysort countryid_n : gen dinflation_fd=d.inflation
bysort countryid_n : gen dtrade_gdp_fd=d.trade_gdp
bysort countryid_n : gen bank_lag = bank[_n-2]
bysort countryid_n : gen lly_lag = lly[_n-2]
bysort countryid_n : gen privy_lag = privy[_n-2]
bysort countryid_n : gen govexp_gdp_lag = govexp_gdp[_n-2]
bysort countryid_n : gen inflation_lag = inflation[_n-2]
bysort countryid_n : gen trade_gdp_lag = trade_gdp[_n-2]
xi: xtivreg dgrowthrate_fd (dbank_fd dgovexp_gdp_fd dinflation_fd dtrade_gdp_fd = bank_lag
govexp_gdp_lag inflation_lag trade_gdp_lag) i.year, vce(robust)
xi: xtivreg dgrowthrate_fd (dlly_fd dgovexp_gdp_fd dinflation_fd dtrade_gdp_fd = lly_lag
govexp_gdp_lag inflation_lag trade_gdp_lag) i.year, vce(robust)
xi: xtivreg dgrowthrate_fd (dprivy_fd dgovexp_gdp_fd dinflation_fd dtrade_gdp_fd = privy_lag
govexp_gdp_lag inflation_lag trade_gdp_lag) i.year, vce(robust)
import excel "O:\AppliedEconomicsDissertation\Section 3 A\Data\Panel data high income OECD
only.xlsx", sheet("Sheet2") firstrow clear
xtset countryid_n year
bysort countryid_n : gen bank_lag_diff = bank[_n-1] - bank[_n-2]
bysort countryid_n : gen lly_lag_diff = lly[_n-1] - lly[_n-2]
bysort countryid_n : gen privy_lag_diff = privy[_n-1] - privy[_n-2]
bysort countryid_n : gen govexp_gdp_lag_diff = govexp_gdp[_n-1] - govexp_gdp[_n-2]
bysort countryid_n : gen inflation_lag_diff = inflation[_n-1] - inflation[_n-2]
bysort countryid_n : gen trade_gdp_lag_diff = trade_gdp[_n-1] - trade_gdp[_n-2]
```

```
xi: xtivreg growthrate (bank govexp_gdp inflation trade_gdp = bank_lag_diff govexp_gdp_lag_diff
inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
xi: xtivreg growthrate (lly govexp_gdp inflation trade_gdp = lly_lag_diff govexp_gdp_lag_diff
inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
xi: xtivreg growthrate (privy govexp_gdp inflation trade_gdp = privy_lag_diff govexp_gdp_lag_diff
inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
clear
import excel "O:\AppliedEconomicsDissertation\Section 3 A\Data\Cross-sectional dataset with legal
origins.xlsx", sheet("Sheet1") firstrow clear
xi: ivregress 2sls gyp (privy = leg_british leg_french leg_german leg_scandinavian) loginitialincome
loginitialschooling govexp_gdp inflation trade_gdp, rob
generate outlier_countries = countryid if countryid == "Korea, Rep." | countryid=="Niger" | countryid
=="Côte d'Ivoire" | countryid=="Saudi Arabia" | countryid =="South Africa"
|countryid=="Switzerland" | countryid=="Japan"
scatter gyp privy, mlabel(outlier_countries) || lfit gyp privy
clear
import excel "O:\AppliedEconomicsDissertation\Section 3 A\Data\Cross-sectional dataset with legal
origins outliers check.xlsx", sheet("Sheet1") firstrow clear
xi: ivregress 2sls gyp (bank = leg_british leg_french leg_german leg_scandinavian) loginitialincome
loginitialschooling govexp_gdp inflation trade_gdp, rob
xi: ivregress 2sls gyp (lly = leg_british leg_french leg_german leg_scandinavian) loginitialincome
loginitialschooling govexp_gdp inflation trade_gdp, rob
xi: ivregress 2sls gyp (privy = leg_british leg_french leg_german leg_scandinavian) loginitialincome
loginitialschooling govexp_gdp inflation trade_gdp, rob
clear
import excel "O:\AppliedEconomicsDissertation\Section 3 A\Data\Panel dataset outliers check.xlsx",
sheet("Sheet1") firstrow clear
xtset countryid_n year
bysort countryid_n : gen dgrowthrate_fd=d.growthrate
bysort countryid_n : gen dbank_fd=d.bank
bysort countryid_n : gen dlly_fd=d.lly
bysort countryid_n : gen dprivy_fd=d.privy
bysort countryid_n : gen dgovexp_gdp_fd=d.govexp_gdp
bysort countryid_n : gen dinflation_fd=d.inflation
bysort countryid_n : gen dtrade_gdp_fd=d.trade_gdp
bysort countryid_n : gen bank_lag = bank[_n-2]
bysort countryid_n : gen lly_lag = lly[_n-2]
bysort countryid_n : gen privy_lag = privy[_n-2]
bysort countryid_n : gen govexp_gdp_lag = govexp_gdp[_n-2]
bysort countryid_n : gen inflation_lag = inflation[_n-2]
bysort countryid_n : gen trade_gdp_lag = trade_gdp[_n-2]
xi: xtivreg dgrowthrate_fd (dbank_fd dgovexp_gdp_fd dinflation_fd dtrade_gdp_fd = bank_lag
govexp_gdp_lag inflation_lag trade_gdp_lag) i.year, vce(robust)
xi: xtivreg dgrowthrate_fd (dlly_fd dgovexp_gdp_fd dinflation_fd dtrade_gdp_fd = lly_lag
govexp_gdp_lag inflation_lag trade_gdp_lag) i.year, vce(robust)
xi: xtivreg dgrowthrate_fd (dprivy_fd dgovexp_gdp_fd dinflation_fd dtrade_gdp_fd = privy_lag
govexp_gdp_lag inflation_lag trade_gdp_lag) i.year, vce(robust)
clear
import excel "O:\AppliedEconomicsDissertation\Section 3 A\Data\Panel dataset outliers check.xlsx",
sheet("Sheet1") firstrow clear
```

```
xtset countryid_n year
bysort countryid_n : gen bank_lag_diff = bank[_n-1] - bank[_n-2]
bysort countryid_n : gen lly_lag_diff = lly[_n-1] - lly[_n-2]
bysort countryid_n : gen privy_lag_diff = privy[_n-1] - privy[_n-2]
bysort countryid_n : gen govexp_gdp_lag_diff = govexp_gdp[_n-1] - govexp_gdp[_n-2]
bysort countryid_n : gen inflation_lag_diff = inflation[_n-1] - inflation[_n-2]
bysort countryid_n : gen trade_gdp_lag_diff = trade_gdp[_n-1] - trade_gdp[_n-2]
xi: xtivreg growthrate (bank govexp_gdp inflation trade_gdp = bank_lag_diff govexp_gdp_lag_diff
inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
xi: xtivreg growthrate (lly govexp_gdp inflation trade_gdp = lly_lag_diff govexp_gdp_lag_diff
inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
xi: xtivreg growthrate (privy govexp_gdp inflation trade_gdp = privy_lag_diff govexp_gdp_lag_diff
inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
clear
import excel "O:\AppliedEconomicsDissertation\Section 3 A\Data\Panel dataset using GNP as a proxy
for growth.xlsx", sheet("Sheet2") firstrow clear
xtset countryid_n year
bysort countryid_n : gen bank_lag_diff = bank[_n-1] - bank[_n-2]
bysort countryid_n : gen lly_lag_diff = lly[_n-1] - lly[_n-2]
bysort countryid_n : gen privy_lag_diff = privy[_n-1] - privy[_n-2]
bysort countryid_n : gen govexp_gdp_lag_diff = govexp_gdp[_n-1] - govexp_gdp[_n-2]
bysort countryid_n : gen inflation_lag_diff = inflation[_n-1] - inflation[_n-2]
bysort countryid_n : gen trade_gdp_lag_diff = trade_gdp[_n-1] - trade_gdp[_n-2]
xi: xtivreg growthrate (bank govexp_gdp inflation trade_gdp = bank_lag_diff govexp_gdp_lag_diff
inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
xi: xtivreg growthrate (lly govexp_gdp inflation trade_gdp = lly_lag_diff govexp_gdp_lag_diff
inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
xi: xtivreg growthrate (privy govexp_gdp inflation trade_gdp = privy_lag_diff govexp_gdp_lag_diff
inflation_lag_diff trade_gdp_lag_diff) i.year i.countryid_n, vce(robust)
clear
log close
```