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The Impact of Commercial Banking Development on Economic Growth: A Principal Component Analysis of Association Between Banking Industry and Economic Growth in Europe

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THE IMPACT OF COMMERCIAL BANKING DEVELOPMENT ON ECONOMIC GROWTH: A PRINCIPAL COMPONENT ANALYSIS OF ASSOCIATION BETWEEN BANKING INDUSTRY AND ECONOMIC GROWTH IN EUROPE

by

Hugh L. Davis III

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ABSTRACT

THE IMPACT OF COMMERCIAL BANKING DEVELOPMENT ON ECONOMIC GROWTH: A PRINCIPAL COMPONENT ANALYSIS OF ASSOCIATION BETWEEN BANKING INDUSTRY AND ECONOMIC GROWTH IN EUROPE

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There are significant differences in the economic growth trajectories of Western, Central and Eastern Europe since the beginning of the democratic movements of the early 1990s. It may be observed that the more developed the region, the lower the growth rate. There are a number of explanations for this growth rate variance, e.g. cultural, resources, institutional and/or political. An explanation this research is pursuing is institutional - the correlation between banking development and economic growth. More specifically, does banking development have a greater impact on growth where economic development begins at a lower level?

Very little research has been directed toward the distinction between market and banking development, and which channel is more effective in stimulating economic growth. In the research that has utilized banking development metrics, the number of metrics have been few and very broad spectrum. Because of multicollinearity, increasing the number of metrics is problematic. A solution is necessary to manage the multicollinearity that is expected in the expansion of the number of independent variables. Principal component analysis (PCA) is one option.

This study makes three contributions to the literature with respects to the banking-to-growth nexus: a) reconstructs the explanation and measurement of banking

development; b) uses principal component analysis to reduce a large number of banking metrics into a smaller number of components; and, c) the specification of multiple models focused on the banking development-to-economic growth dynamic. Through PCA, twenty-one banking variables measuring access, depth, efficiency, and stability are transformed into components to test the strength of the correlation between banking development and economic growth in Western, Central and Eastern Europe during the period (2004 – 2013).

ACKNOWLEDGMENTS

I am deeply grateful to Dr. Shahdad Naghshpour, for his attentiveness and guidance throughout my dissertation process. He managed my progress in a personal and customized manner that allowed me the greatest opportunity to succeed. Always the encourager, even significant revisions to methodology were seen as positive steps to producing research that was forward moving.

This research is quantitative in nature, but it most certainly is influenced by the political, cultural, and security backdrop for the theory and intuition. Collectively, Doctors Pauly, St. Marie, and Butler greatly broadened my worldview and reignited a thirst for knowledge. Individually, they challenged my preconceptions and introduced me to new frames of reference. Additionally, each introduced me to their own method of pedagogy which I have adopted and incorporated in my teaching method. Perhaps that will be their most lasting contribution.

This body of work, this life opus, has been empowered by many – mentors, dear friends, and family. Some continue to sojourn while some have gone to be with the Lord, together, they contributed to shaping my vision for life's purpose and proffer an alternative model of life. To Dr. Will Norton, Sr., Walter A. Henrichsen, Captain James Downing, and Reverend James F. Remeur: forever grateful for a model of life that is missional which knows no retirement, just a "changing of speed and gears." To Dr. David Foster, Dr. William Rhey, Dr. Charles Mason, and Dr. Marcelo Eduardo: for the challenge and support to be bold enough to undertake a monumental task late in life.
To my classmates, Shawn Lowe, Ed Bee, Richard Baker, Greg Bonadies, Joy Patton, Melissa Aho, and Madeline Messick: had it not been because of their friendship, it is

doubtful that I would have ever completed this chapter of my life. I am reminded of Ecclesiastes 4:9, 10 … Two are better than one because they have a good return for their labor: If either of them falls down, one can help the other up. But pity anyone who falls and has no one to help them up.

.

DEDICATION

Perhaps the greatest cost in any effort like this is the stress and alienation that is imposed on those you love. I am so very grateful to my wife, Robin, and my sons David, Layton, and Thomas, for their love, patience, and forbearance as they shared this journey with me, experiencing the many alternating highs and lows. Blessed is the man whose family endures these trials and continues to love him anyway.

I am reminded of one of the timeless truths declared in God's Word: Psalm 16:11 "You make known to me the path of life; in your presence, there is fullness of joy; at your right hand are pleasures forevermore." This body of work, exercise of faith, and the new beginning it affords is dedicated to Him who raised me up and carried me through, my Lord and God. During this journey, His sovereign hand brought me into relationships with so many that would shape my preparation and help shoulder the burden of the task to completion. Through so many, He showed me mercy. May the fruits of this effort bring Him glory.

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LIST OF ABBREVIATIONS

USM	The University of Southern Mississippi
WCU	William Carey University
EMEs	Emerging market economies
FDI	Foreign direct investment
GDP	Gross Domestic Product
IMF	International Monetary Fund
LDC	Less developed countries
M2	Broad money
OECD	Organization for Economic Co-operations and Development
OLS	Ordinary least square
PCA	Principal Component Analysis
PCR	Principal Component Regression
TFP	Total factor productivity
VAR	Vector Auto Regression
WB	World Bank

CHAPTER I - INTRODUCTION

According to Levine (1997) "…a growing body of theoretical and empirical work would push even skeptics toward the belief that the development of financial markets and institutions is critical to economic growth…" If financial development is an important contributor to economic growth, then policies should be developed to facilitate that development. Cole (1989) defines financial development as:

a) The expansion of financial intermediation;
b) The development of processes, and,
c) The differentiations of instruments.

Financial intermediation is the activity of financial institution serving as a contractual link between parties with surplus capital and those in need of capital. Intermediary processes encompass the solutions, systems, and contracts that bring the parties together. Competition between the intermediaries results in a differentiation (an increase in the number and variety) of financial instruments (Cole, 1989).

Levine (1997) suggests that based upon a country's level of economic development, different causal relationships may occur between financial development and economic growth. Two theories have been advanced: financial development causes economic growth, and in contrast, economic growth causes financial development. The direction of causality between financial development and economic growth is the most significant point of dispute. The evidence indicates that there is a different direction of causality for less developed countries (LDCs) than for developed countries. Shaw (1973) suggests that LDCs benefit from a finance-to-growth nexus because they transition away from self-financing mechanisms. This is in contrast to developed economies where sophisticated borrowers require more advanced financial services.

There are numerous directions for additional research, e.g. effectiveness of different channels of finance, improvement in the measurement of financial development, and resolution of the competing theories of the finance-to-growth nexus. The next section more formally addresses these issues as unresolved problems

Problem Statement

A number of issues in the finance to growth discussion have not been successful resolved. The following list three of the most promising for additional research:

1) Little research has focused on which specific financial development channel (i.e. markets, banking, insurance, mortgages, or foreign direct investment) is the most effective. The majority of the studies have tested the markets and banking channels combined, but only Choong (2010) examines banking specifically.
2) There is also a failure to improve upon the measures of financial development. The World Bank (2012) offers reflections on different dimensions to describe financial development, but the literature has not adopt new metrics to follow suit.
3) Finally, there is ambiguity in the supply-leading versus demand-following debate. There is no satisfactory explanation in the contrasting studies. Alternative notions to resolve this discussion have not been successfully offered and tested.

From these problems, this research can formulate a methodology to address some of the issues presented and advance the discussion of the finance-to-growth debate.

Purpose Statement

This dissertation addresses the three aforementioned unresolved issues.

1) Based upon Choong (2010) this research hypothesizes that banking development is the most significant channel for economic growth. This is particularly true in lesser developed economies as banking intermediaries are the first source of capital beyond retained earnings.
2) Adopting the World Bank (2012) broadened description of financial development, this study sources additional metrics to quantify access, depth, efficiency, and stability of the banking channel. This changes the pattern of using three to five independent variables that describe financial development to more than twenty new metrics that focus exclusively on measuring the banking channel.
3) This research proffers that the supply-leading demand-following debate may be better explained in the context of a country's level of economic development. Less developed economies may depend upon the products and services initiated by banking institutions. As economies become more developed a shift occurs to the demand-following hypothesis where economic growth drives banking development.

Research Question/Hypothesis

This research will address two points:

1) Can financial/banking development be explained by using a larger number of variables representing a number of dimensional aspects?
2) Is Patrick (1966) stages of development hypothesis the most reasonable explanation for the bi-directional causality of the finance-to-growth argument?

Significance of the Study

The literature addresses:

a) Development of theory (Schumpeter, 1911; Patrick, 1966; Shaw, 1973; Goldsmith, 1968; Merton and Bodie, 1995; and Allen and Gale, 2000)
b) Empirical testing of causality (Goldsmith, 1968; King and Levine, 1993; Levine, 1999; Levine, Loayza and Beck, 2000; Aghion, Howitt and Mayer-Foulkes, 2005); and
c) Expansion of the determinants of financial development (Shaw, 1973; World Bank, 2004).

Since 2000, a growing number of researchers have utilized principal component analysis (PCA) to improve upon measurement of financial development. PCA is a data transformational tool which provides a solution to the inherent problem of multicollinearity found in testing the finance-to-growth dynamic.

This study's main contribution will be the expansion of the PCA approach by greatly increasing the number of variables describing the multiple dimensions of financial development. It also focuses on the banking channel of the bank versus market debate by drawing on a large number of variables that measure banking access, depth, efficiency, and stability. Finally, the finance-to-growth debate will be tested among less developed, developing and developed economies of Europe with respect to Patrick (1966) stages of development hypothesis.

Delimitations

This study utilizes data available from the World Bank from 2004 through 2013 for forty-one countries within a geographic region that would contain eastern, central and Western Europe. Three countries were not included as the availability of data was severely limited. This omission is not expected to make a material impact on the results. Missing variable data accounts for less than six percent of the total data utilized. It is replaced with estimates derived from interpolative and extrapolative methods. Exogenous factors for capital investment, human capital, openness, and government spending are controlled. Finally, this study does not account for the financial impact of the 2007/2008 recession.

Definition of Terms

Financial Development:

a) the expansion of financial intermediation, development of processes, and differentiations of instruments (World Bank, 2004);
b) Shaw (1973) defines financial development as "a widening of the range of financial instruments and a growing involvement in financial markets;"
c) "The policies, factors and the institutions lead to the efficient intermediation and effective financial markets, aiming to reduce market information acquisition costs and transaction costs, and other market imperfections." (McKinnon, 1973); and,

d) The costs of acquiring information, enforcing contracts, and making transactions create incentives for the emergence of particular types of financial contracts, markets, and intermediaries (Levine, 2005).

Finance Led Growth Theory

Financial development advances economic growth.

Supply-Leading Hypothesis

Financial deepening induces real economic growth.

Demand-Following Hypothesis

Economic growth leads to financial development.

Stages of Development Hypothesis

The stage of economic development determines the direction of causality.

Backwardness Hypothesis

Where countries have more degrees of backwardness, spillover and externalities have greater effects.

Catchup Hypothesis

The ability or speed of a lesser developed economy to converge with a developing of developed.

Principal Component Analysis (PCA)

A statistical technique that linearly transforms an original set of variables into a substantially smaller set of uncorrelated variables that represent most of the information in the ordinal set of variables (Dunteman, 1989).

Components

Clusters of observations as well as outlying and influential observations deduced from multivariate inter-correlational variables (Dunteman, 1989).

Organization of the Remaining Chapters

Chapter II presents the chronological development of the literature germane to this dissertation's hypotheses. The narrative begins with notions dating back to John Law and Adam Smith and continues with significant contributions from Bagehot, Schumpeter, Patrick, Goldsmith, and Levine. It covers the development of theory and the development of methods to test the hypotheses proffered by this research.

Chapter III provides an explanation of the methodology adopted for the examination of this research's hypotheses. Following the lead of Griese et al. (2009), the time series panel data is transformed into principal components and then subjected to principal component regression. Chapter IV discusses the findings of the principal component regression and resulting models. Chapter V concludes this research with a summary and recommendations for further study.

CHAPTER II – LITERATURE REVIEW

The literature review is divided into three section: Historical Narrative; Theories and Hypotheses; and, Empirical Analysis. The Historical Narrative is intended to show the organized flow of thought as it developed from the earliest discussions to the current debates. Each successive generation improves upon the research and provides new questions. The Theories and Hypotheses section provides a more thorough explanation of the theories that support and the hypotheses that drive the discussion. Finally, the Empirical Analysis section covers the direction of the hypotheses, researcher tests results, conflicts between study findings, and statistical testing solutions.

Historical Narrative

The current finance-to-growth debate builds upon a foundation of successive discussions. The roots of the importance of a financing mechanism find themselves as far back as John Law and Adam Smith and continued up to Gurley and Shaw in the early 1930s. In the early 1950s counter hypotheses began to be discussed, first with Robinson (1952) and later refined and defined by Patrick (1966). A third period led by Goldsmith (1969) and McKinnon (1973) narrowed the focus and began the discussion of the intermediary roles of markets and banking. The current period includes the introduction of the endogenous growth theory (Romer, 1986) and empirical analysis by King and Levine (1993).

Law to Gurley and Shaw

The vast majority of studies begin their finance-to-growth discussion with Walter Bagehot (1873) or Joseph Schumpeter (1911) but, there is earlier evidence of this discussion. By deconstruction the institution of banking into banking functions prescribed by Levine (2005) - mobilization of savings (liquidity), evaluation of project viability, and continuous risk management throughout the life of a project, the discussion can be found in John Law (1705) and Smith (1776) (De Boyer des Roches, 2013). The functions Levine list have been a part of banking for centuries in one form or another.

Green (1989) identifies one of these functions, liquidity, with the "real bills doctrine," originating in the 17th and 18th centuries. The real bills doctrine asserts that money can be issued for short term commercial bill of exchange due within the same production cycle. Output generates its own means of liquidity and banknotes directly serve the legitimate needs of commerce and trade. John Law in Money and Trade Considered (1705) proposed that these banknotes could be issued and secured by real property (Humphrey, 1982). This financing mechanism stimulates manufacturing and trade, resulting in economic growth (Davis, 1966).

A generation later, Adam Smith in The Wealth of Nations recommended real bills as a safe commercial bank portfolio asset. Banks in Scotland's who were considered to be strong and competitive institutions held these types of notes in their portfolios. The replacement of specie with paper money like real bills makes his banking theory central to his theory of economic growth (Laidler, 1981).

Bageot (1873) and Schumpeter (1911) began to formalize the notion that banking was a significant channel in boosting economic activity. Bagehot (1873) boasted that "money is economical power … very few are aware how much greater the ready balance – floating loan fund which can be lent to anyone or for any purpose – is in England." Lombard Street fueled the expansion of enterprise in the empire. According to Schumpeter (1911), as financial intermediaries between savers and borrowers, banks direct surplus capital into investment and investment leads to growth. As agents for pooled surpluses, resources are reallocated to capital and result in economic growth.

Fisher (1933) explains that creation of debt promotes growth because it allows a higher rate of return on the use of that debt – investment in capital. Though his article's direct point deals with the downside of the overextension of debt, it also stands to reason that "with ordinary profits and interest, such as through new inventions, new industries, development of new resources, opening of new lands or new market" economies grow from the use of debt to fuel this expansion.

Noting a comparative neglect of the financial aspects in the development discussion, Gurley and Shaw (1955) emphasize the role of financial intermediaries in improving the efficiency of increasing the supply of loanable funds. Their argument is based on an observed correlation between economic development and the system of financial intermediation. Commercial banking is typically the first significant financial intermediary beyond self-financing through retained earnings. Growth is hindered if financial intermediaries do not evolve and leaving expansion to be dependent upon self-financing.

Robinson to Patrick: Contrarian View

Not all economists have agreed with the notion that finance causes growth. A contrarian opinion asks why do some countries have ineffective financial sectors and poor economic growth. Joan Robinson (1952) argues that finance development responds to the growth in demands from the economy. As the economy expands, it requires not just more of the same financial services, but a broader selection of services. Policy focused on supplying financial services is misapplied. Direct stimulation of the economy is favored. She is quoted: “where enterprise leads, finance follows.” Other economists accepted Robinson (1952) and based upon the result of Solow (1956) believed that financial systems have only minor effects on the rate of investment in physical capital, and any resulting economic growth (Levine, 1993).

Patrick (1966) followed by providing two terms for the competing hypotheses: the “supply leading” and the “demand following” relationship between finance and growth. Supply-leading means that the intentional creation of financial institutions leads to additional financial products and services which positively affects economic growth. Demand following postulates that increased demand for financial services occurs because of economic growth. Patrick (1966) advanced the argument further by proposing a “stage of development” hypothesis whereby supply-leading financial development can induce real capital formation in the early stages of economic development … as financial and economic development proceed, the supply-leading characteristics of financial development diminish gradually and are eventually dominated by demand-following development.

Goldsmith-McKinnon-Shaw to Greenwood and Jovanovic

Goldsmith (1968), McKinnon (1973), and Shaw (1973) all stress that the financial superstructure facilitates the allocation of funds to the best use in the economic system where the funds yield the highest social return. The quantity and quality of services provided by this superstructure could partly explain why countries grow at different rates (King and Levine, 1993).

Goldsmith (1968) makes the case that the separation of the functions of savings and investment as well as the increasing the range of financial assets increases the efficiency of investment and raises capital formation. This is accomplished through financial institutions serving as intermediaries, creating products and services for the pooling and redeployment of capital from savers to borrowers. Financial activities through these channels increase the rate of economic growth.

McKinnon (1973) investigates the relationship between financial systems (specifically, domestic capital markets) and economic development. It expanded the observations to include Argentina, Brazil, Chile, Germany, Korea, Indonesia, and Taiwan. These case studies strongly suggest that better functioning capital markets, providing greater liquidity and less friction support economic growth.

Shaw (1973) produces evidence that the health and development of the financial sector critically matters in economic growth. Monetary systems must have efficiency in mobilizing savings to induce an increased flow to risk-adjusted loan opportunities (Moore, 1975). Financial liberalization and deepening stimulate savings and raise rates of return on investment. Shaw concludes that policies that "deepen" finance stimulate development (Levine, 2005). The main policy implication of the Goldsmith-McKinnon-Shaw notion is that government restriction on the banking system (such as interest rate ceilings, high reserve requirements, and directed credit programs) hinders financial development and ultimately reduces growth (Khan and Senhadji, 2000).

Financial intermediation promotes growth because it allows for a higher return on capital. The resulting growth, in turn, provides the additional means to broaden and deepen financial structures (Greenwood and Jovanovic, 1990). As a result, intermediation and growth are linked in a continuous development cycle. Freeman (1986) illustrates how some industries or sectors of the economy have very large capital requirements and thus necessitate the pooling of funds from many different sources. Financial intermediaries perform this pooling task. This is demonstrated in the direct customer relationship of the deposit and loan functions of commercial banks as well as in the indirect connection provided by the stock, bond and futures markets. Regulations, limits or interference by regulatory authorities on intermediaries, inherently restrict the finance-to-growth dynamic.

Romer-Lucas-Rebelo to Levine

The Romer (1986), Lucas (1988), and Rebelo (1991) contribution to the body of knowledge is in the endogenous process of the growth model, where it does not depend on exogenous technological change. They focus on two channels through which each financial function may affect economic growth – capital accumulation and innovation. The financial system affects capital accumulation either by altering the savings rate or by reallocating savings among different capital producing technologies. Innovation focuses on the invention of new production processes and goods. Intermediation facilitates modernization capital and improvement of labor (Romer 1990 and Aghion and Howitt, 1992). The latter is a broader interpretation of "capital" that includes human capital. Development of human capital (labor) is a driving force behind economic growth (Grossman and Helpman, 1991). Human capital's importance is in its ability to overcome the steady state.

King and Levine (1993) is one of the first to empirically define financial development using four indicators, each designed to measure some aspect of the financial services sector. These determinants include: a) the ratio of liquid liabilities to GDP; b) the ratio of credit issued to nonfinancial private firms to total credit extended; c) the ratio of credit issued to nonfinancial private firms to GDP; and d) distinguishing between central bank and private bank functions as well as size of intermediaries. King and Levine's use of these variables provides a more complete picture of financial development than a single measure.

Researchers have developed rigorous theories of the evolution of the financial structures and how the mixture of markets and banks influences economic growth: Patrick (1966), Merton and Bodie (1995), and Levine (2005) for example. Some theories stress the advantages of market-based systems, especially in the promotion of innovative and more R&D based industries (Allen, 1993), while others emphasize how commercial banking exerts a positive discipline and governance over corporate structure (Levine, 1999) and (Arestis and Demetriades, 1997). Financial instruments, markets, and institutions arise to mitigate the effects of information and transaction costs (Levine, 1997).

More recent models separate and test the benefits derived from the bank and securities markets influences (Arestis and Demetriades (1997), Greenwood and Smith (1997), and Levine (2002)). Within the financial development discussion, there is some debate over the contribution of commercial banking versus markets. Arestis and Demetriades (1997) finds "the effects of banks are more powerful … suggest that the contribution of stock markets on economic growth may have been exaggerated." Banking is a primary, first contact intermediary, necessary for early stimulation of growth. Greenwood and Smith (1996) investigate the specific markets to growth and growth to markets discussion and sides with markets providing efficient channeling of investment capital for large capital investments. Levine (2002) in a broad cross-country review determines that there is no evidence that one channel (markets or banking) is superior to the other. Among lesser developed countries Tadesse (2002) finds that the banking channel outperforms the securities market in its effects on economic growth. This lends support to Patrick's (1966) stages of growth hypothesis, that the banking channel is more effectual than the other channels in lesser developed economies. Levine (2005) summarizes that the body of literature suggests that where there are countries with better functioning banks and market, the countries grow faster.

According to King and Levine (1993), better financial services expand the scope and improve the efficiency of factors of growth. This leads to an acceleration of economic growth. In contrast, policies that repress financial development, impede innovative activity and slows economic growth. This is due to reduced services provided by the financial system to savers, entrepreneurs, and producers.

According to Merton and Bodie (1995, p.12) "In a rising to ameliorate transaction and information costs, financial systems serve one primary function: they facilitate the allocation of resources, across space and time, in an uncertain environment." Levine (2005) states that financial intermediaries work principally to improve:

a) Acquisition of information on firms;
b) Intensity with which creditors may exert corporate control; and
c) Provide risk-reducing arrangements, the pooling of capital, and ease of making transactions.

Naghshpour (2013) proffers that banks: serve as a more efficient intermediary between borrower and savers; collecting, processing and evaluating information; reducing moral hazard; improving the ease and speed of transactions through the creation of money and decreasing frictions; and, innovating new financial products that create additional opportunities for the transfer of capital.

Theory

Theory suggests that financial institutions, their instruments, and resulting markets occur to mitigate the effects of information (asymmetric) and transaction cost (friction). To the degree they are successful, savings rates and investment decisions are influenced. This section discusses the theoretical foundation for the banking-to-growth nexus and its particular explanation for more rapid growth in the emerging economies of Eastern and Central Europe. The discussion is comprised of four parts:

a) Relevance of the endogenous growth theory;
b) Financial development's impact on resource allocation decisions and savings rates;
c) Financial development theory; and,
d) Effects of convergence, spillover, and backwardness.

Figure 1 below demonstrates the mapping of the theoretical foundation for the discussion in this research.

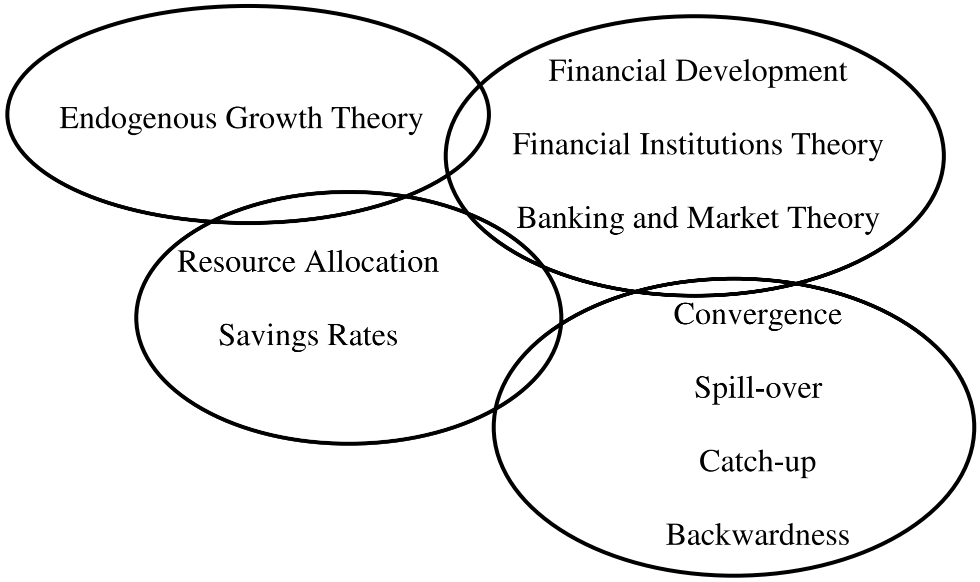

Figure 1. Theories and Hypotheses

The neoclassical theory (Solow-Swan model) states that with a proper mix of labor, capital, and technology economic growth will result. By varying the amounts of labor and capital in the production process, an equilibrium state can be accomplished. When innovation occurs, labor and capital adjust to achieve a new equilibrium. Perhaps the elevation of innovation in the endogenous growth model better explain the relationship between financial development and economic growth.

Endogenous Growth Theory

Numerous researchers propose that the endogenous growth model demonstrates that growth is related to financial development. King and Levine (1993) suggests innovation is the key engine of growth. When financial institutions evaluate innovative projects, provides the intermediation between savers and borrowers, and monitors the project going forward, they affect growth. Productivity may be demonstrated in increased human capital, increased capital efficiencies, and underwriting breakthrough innovations. Well-functioning financial markets improve productivity which affects growth (Demetriades and Hussein, 1996).

Resource Allocation Decisions

Levine (2005) stresses that the theoretical argument for a finance-to-growth causality should focus on finance's influence on resource allocation. Resource allocations do not occur in a vacuum or with randomness, rather they are influenced. The link between finance and resource allocations can be established by understanding the functions of finance and its effects.

Financial markets influence growth through resource allocation efficiencies (Greenwood and Jovanovic, 1990). Without financial markets, individuals would have far less access to information to consider liquidity, risk and return. Levine (1991) and Bencivenga and Smith (1991) each propose models that identify channels (markets, banking, insurance, and FDI) through which financial markets provide access to that information. Resource allocation decisions can be reinforced, altered, and rechanneled with improved information sourced from finance.

In a market economy information is valued in order to channel resources to their highest and best use. Financial institutions as intermediaries, find it necessary to assimilate, process and disseminate information. This could occur as an entrepreneurial enterprise or as a necessity to decrease risk and or raise return. If the lack of information or the cost of developing information provides too strong a "friction" then resource allocation is negatively affected. Boyd and Prescott (1986) suggests intermediaries relieve individual investors of the significant fixed cost associated with information. The cost of information is typically too expensive for an individual investor. Financial institutions and ancillary business can source information to the private sector at a much less cost. This is a reduction of friction and an inhibitor in resource allocation. Levine (2005) references Greenwood and Jovanovic (1990), "Assuming that entrepreneurs solicit capital and that capital is scarce, financial intermediaries that produce better information on firms will thereby fund more promising firms and induce a more efficient allocation of capital" (p. 871).

Savings Rates

Increasing and decreasing returns affect savings rate and invoke possibilities of consumer choice theory. Income and substitution effects are considered. As intermediaries provide services that result in lower risk and improved resource allocation savings rates may actually decrease. Financial development may negatively affect savings rates. Referencing Levhari and Srinivasan (1969), Levine (2005) concludes that the financial products and services that banks provide which leads to lower risk and improved resource allocation results in lower savings rates.

Financial Development

According to the Word Bank (2003), financial development means the improvement of the financial sector. More recently it has been defined in terms of improvement in access, depth, efficiency, and solvency. It can also be discussed in terms of benefits and functions.

McKinnon (1973) lists two significant benefits derived from liberalization of financial markets:

a) increased intermediation between savers and investors, and

b) the efficient flow of resources among people and institutions over time.

With less constraints, savings is encouraged and capital accumulation follows. Furthermore, efficiency in the transferring of capital from less productive to more productive sectors occurs. “The efficiency, as well as the level of investment, is thus expected to rise with the financial development that liberalization promotes” (McKinnon, 1973).

Fitzgerald (2007) further describes financial development by offering five broad functions financial systems provide:

1. Produce information ex ante about investments;
2. Mobilize and pool savings and allocate capital;
3. Monitor investments and exert corporate governance after providing finance;
4. They facilitate the trading, diversification, and management of risk; and
5. To ease the exchange of goods and services.

Information is a key function provided by financial institutions. Ex ante information regarding investment provides the basis for expectation. Financial institutions in general and commercial banks specifically create produce ex ante information to be shared with clients and the market.

The needs of many capital investments require significant financial backing. Financial institutions mobilize and pool savings from large number of savers, thus allowing the allocation of capital toward those projects. Patrick (1966) uses the development of railroad in the United States as an example of a project of such magnitude that it creates the necessity of a bond market to finance a project.

Intermediation is a continuous process requiring regular monitoring of the capital investment. Financial institutions exercise that monitoring through corporate governance after providing financing (LaPorta et al., 2000). The general welfare of the asset, asset class, and the financial system are secured with the continuous oversight and accountability.

Financial institutions measure and manage risk. Products and services within the industry efficiently transfer risk from one institution to another that is best able to bear that risk for a price. The creation of the trading opportunity and the counterparty willing to accept the risk is a significant function financial development affords for risk management (Hauner, 2009).

Finally, financial institutions create mechanisms that decreases the friction in the exchange of goods and services. Levine (1997) states "liquidity is the ease and speed with which agents can convert assets into purchasing power." Financial institutions add to the ease and speed by decreasing the friction – the time and effort that may be obstacles.

Financial Development and Growth

The simplest expression of the endogenous growth model (known as the AK model) is shown as $Y_t = A K_t L$ where output is a function of capital stock. According to Pagano (1993) financial development positively affects growth in three ways:

a) Raising the proportion of savings directed to investment;
b) Increases the social marginal productivity of capital; and,
c) May positively influences the private savings rate.

Leakage is a problem when transforming savings into investment. This occurs in loan spreads, fees regulations, taxation, and inefficiencies. If development occurs, the leakage is decreased and the growth rate increases. This raises the proportion of savings directed to investment.

Risk adverse individuals will frequently forgo longer commitment investments which may be more productive but are also less liquid. Intermediaries (banks) can reduce this inefficiency by satisfying the liquidity risk of depositors and investing in longer-term, illiquid, and higher yielding projects. This is facilitated by asset/liability management practices by the intermediary, only maintaining a level of liquidity necessary to meet the actual aggregated needs of the depositors. This raises the productivity of capital.

Private savings rates may increase and in some cases decrease under different financial development dynamics. Higher liquidity and multiple risk diversification systems decrease the margin between borrowing and savings rates. According to Pagano (1993) development may reach such levels of sophistication and efficiency that savings rates decline.

Financial Institutions Theory

According to Allen and Gale (2000), financial systems are crucial for the allocation of resources in an economy. As intermediaries in the financial system, financial institutions channel the savings they receive from households to the corporate sector. The core of their intermediary role has been based upon reducing the friction of transaction cost and development asymmetric information. With the added complexity of products and market participants, Allen and Santomero (1997) offer additional roles – a) facilitators of risk transfer, and b) reducing participation costs.

Financial futures and options markets are examples of risk management. These risk management tools are typically shared between intermediaries instead of households and corporate firms. Other sectors desiring to participate in these products and markets may find the cost prohibitive. Financial institutions can be the gateway through reduced participation costs. While the former intermediary roles have decreased, these new purposes are increasing in importance as well as complexity (Allen and Santomero, 1997).

Banking vs Market-Based Theory

Within the finance-to-growth discussion, there is debate over the comparative importance of bank or market channels. The primary research in this area is in Allen and Gale (2000), Levine (2000), and Demirguc-Kunt and Levine (2001).

Allen and Gale (2000) discuss the merits of the bank-based vs market-based systems debate. They posit that it is an argument between two different perspectives – development economics and corporate finance. Development economics theory focuses on banks which take in deposits from savers and make loans to borrower. Corporate finance theory is directed at debt and equity issued by firms.

Levine (1999) offers a reconciling notion that the two are part on one discussion – financial services. The choice is not between banks or markets, but rather an environment whereby the particularly effective services are available at particular stages of economic development. In the earlier stages of development, economies may rely more on bank-based systems. Banks are first stage growth intermediaries. As the economies become more developed, market-based systems that depend upon well-functioning securities markets become more important. Market-based systems are second stage intermediaries and promote long-run economic growth (Demirguc-Kunt and Levine, 2001).

Convergence Theory

The convergence theory is a notion that all economies should eventually become equal (converge) in terms of per capita income. Poorer countries will tend to grow at a faster rate than their richer counterparts. This is attributable to two reasons: (a) poorer countries can enjoy innovation and technologies by duplication, and (b) developing countries are not burdened by diminishing returns to capital as the developed.

Easterly and Levine (2001) explains how this may be directly applied to financial development and growth. It adds an additional qualifier. Convergence is incumbent upon some threshold level of financial development. Those economies above this threshold will all converge to the long-run growth rate, while those below will have lower rates.

Spillover

The spillover or replication of financial depth from more developed economies may spur economic growth in less developed countries. Yet, the contribution may strongly depend on the circumstances in the recipient countries (Guiso, Sapienza, and Zingales, 2004). Chirot (1989) proposes that there are reasons for the problems of centuries of slow growth and a long history of economic backwardness. It points to Eastern Europe in contrast to Central Europe where the former was distant from the west, agriculturally based and had a significant history of elite rule. Central Europe enjoyed the spillovers from Western Europe because of proximity, but also because the political structure was more open to development.

Catchup Effect

The catch-up effect is that part of the convergence theory explaining why lesser developed nations may grow faster than developed. The reasoning for this phenomenon is primarily attributed to access to technology and innovation from nearby advanced economies. This access allows lesser developed nations to immediately adopt economies and efficiencies without sinking significant investment in transitioning capital.

It is necessary to state that this effect has not been universally successful. Many developing economies have failed to see substantial improvements, or at least growth rates comparable to the developed. Other factors that similarly influence growth like social, institutional or political differences are thought to limit or suppress growth. Acemoglu and Robinson (2006) offers a model where institutional development is blocked by political elites. The heart of this theory is that political elites resist change and innovation promote change.

Backwardness

"Backwardness" is a consideration in the distinction of varying growth rates. Gerschenkron, (1952) proposes that where countries have greater degrees of backwardness, spillover and externalities have greater effects. This is in contrast developed economies where there is less marginal benefits. Technological and informational spillovers can have an immediate effect without the cost of development.

Empirical Analysis

This section is organized as a summary of the econometric approaches used in the literature that investigate the finance-to-growth discussion. Levine (2005) attributes the first empirical analysis to Goldsmith (1968). Goldsmith gathered data from thirty-five countries for the period 1860 to 1963 and correlated the size of financial intermediaries with the quality of the financial functions they provide. From this research, Goldsmith acknowledged a series of shortcomings that later studies should investigate – primarily further attribution to financial development, more countries, longer time series, additional controls, and focus on predictability. His list of shortcomings provides a framework to catalog the follow-up research. This section is divided into a) Case studies, b) Panel data, c) Time-series, and d) Principal component Analysis.

Case Studies

Case studies by Cameron et al. (1967) and McKinnon (1973) provide the first measured discussions of the relationship between financial development and growth. Though lacking statistical analysis, the cases are able to provide observations regarding the interactions of the political, regulatory, administrative, industrial and financial structures. These two studies document the relationship of financial intermediaries, markets, and government intervention during periods of industrialization: e.g. England 1750 -1844; France 1800 – 1870; Germany 1815 – 1870; and, Japan 1868 – 1914. From the country case studies, Cameron et al. (1967) concludes that banking plays a positive, growth causing role. Similarly, McKinnon (1973) deduces that developed financial systems stimulate economic growth.

Haber (1991) also uses the case study approach. His study uses firm-level data for Brazil, Mexico, and the United States and infers that the development of capital markets leads to both industrial composition and economic growth. Liberalization of policies and restrictions on Brazilian and Mexican financial markets in the late 19th century led to growth. Comparisons between Brazil and Mexico highlight that differences in financial development can have a significant impact on the rate of economic growth.

On a micro and firm level basis, other researchers like Guiso et al. (2002) find financial development enhances business start-ups and fosters industrial competition in Italy. Cull and Xu (2005) observes the advantage of private ownership over public in encouraging retaining earnings. Bertrand et al. (2007) examines the financial deregulation of the 1980s and the positive impact on competition in the credit markets.

These examples illustrate the theses developed for countries, sectors, and markets regarding financial development and describe certain observed behaviors. While these studies simplify aspects of the finance-to-growth notion, their conclusions may not be fairly generalized.

The next two sections are organized around econometric approaches that measure and examine the finance-to-growth relationship.

Panel Data

King and Levine (1993)

King and Levine (1993) takes Goldsmith's research and increases the number of countries to 77 for a thirty year period from 1960 to 1989. They also for the first time specified financial development with three independent variables that measure:

a) Size of the intermediaries;

b) Degrees to which bank credit is made available to all parties, public and private; and

c) Credit to private enterprises.

In the regression, they controlled for other factors associated with economic growth – income, education, exchange rates, trade, fiscal and monetary policy.   Their results are limited to illustrating the effects of changes in financial (primarily banking) development and long term growth and not the causes.

Levine and Zervos (1998)

As King and Levine (1993) expanded the banking channel measurements, Levine and Zervos (1998) attended to the construction of numerous measures of stock market development. To assess the relationship between stock market development and growth, they sample 42 countries over the period 1976 – 1993. Their results indicate that the level of market liquidity (turnover) with banking development (size of assets and deposits) are significantly correlated with economic growth. Similarly to King and Levine (1993), this research does not address the issue of causality.

Loayza and Ranciere (2002)

This paper attempts to reconcile the apparent `contradiction between the supply-leading and the demand-following hypotheses. Loayza and Ranciere (2002) use an empirical explanation of the apparently opposing effects of financial intermediation. Employing Pesaran's Pooled Mean Group Estimator (PMG), the analysis demonstrates a positive long-run relationship between finance and growth. There is also evidence that a negative short-run relationship exist. This analysis reflects the 'stages of growth' notion posited by Patrick (1966). The significant contribution to the literature is the identification of causality.

Rioja and Valev (2004)

The impact of financial development varies in the way it affects productivity and capital accumulation in developed, developing and less developed economies. Rioja and Valev (2004) test this using the Generalized Method of Moments regression (GMM) for 74 countries. Their results confirm the hypothesis – finance has a strong positive impact on productivity in developed countries while finance affects capital accumulation in less developed economies.

Beck and Levine (2004)

This research reviews the impact of two financial channels, markets, and banking, on economic growth. The study uses panel data for the period 1976-98, and like Rioja and Valev (2004), applies GMM techniques. The results indicate that markets and banks positively affect economic growth.

Time Series

Concurrent with the use of panel data is the substantial use of time-series. Time series studies frequently use Granger causality test and vector auto-regression (VAR) procedures to determine the direction of causality. Arestis and Demetriades (1997), Neusser and Kugler (1998), Xu (2000), and Christopoulos and Tsionas (2004) are the most notable studies utilizing time series.

Arestis and Demetriades (1997)

Arestis and Demetriades (1997) time-series focuses on measures of both markets and banking in their finance-to-growth investigation. The results indicate that the effects of the banking sector is larger than that of the markets. One additional important note, they determine that the direction of the causality runs both ways (bi-directional) particularly for developing economies.

Neusser and Kugler (1998)

Neusser and Kugler (1998*)* investigates the finance-to-growth nexus from a time series perspective for OECD countries. Granger and Lin indicate long-run causality. They offer one caution, because of a variety of results, a more complex picture is apparent from the cross-sectional evidence.

Xu (2000)

Xu (2000) introduces a more sophisticated econometric solutions by using vector auto-regression (VAR) in a broad study of 41 countries over the 1960–1993. This method allows for the identification of the long-term effects of finance-on-growth. The study concludes that financial development is important for long-term growth.

Christopoulos and Tsionas (2004)

This research combines cross-sectional and time series data to test the finance-to-growth debate. With this, the study introduces panel unit root tests and panel co-integration analyses. For the 10 developing countries in the study, the results demonstrate support for the hypothesis that there is a strong relation between financial depth and growth. They are further able to verify a unidirectional causality of finance-to-growth in the long run.

Principal Component Analysis (PCA)

PCA was first used by Pearson (1901) and later improved upon by Hotelling (1933). It is an orthogonal transformation procedure that resolves the issues of multicollinearity when increasing the number of similarly focused variables are specified in a model.   Because of the large number of independent variables and a significant issue with collinearity, the original data set is not directly used in regression. The aim of PCA is to reduce that large number of potentially interrelated data sets (dimensionality) by transforming them into a new set of variables (principal components.) and still preserve the relevant data (Hotelling, 1933).

Though this tool has been available for generations, it has only recently been utilized in the finance-to-growth discussion. Figure 2 below indicates the trend in adoption of this method.

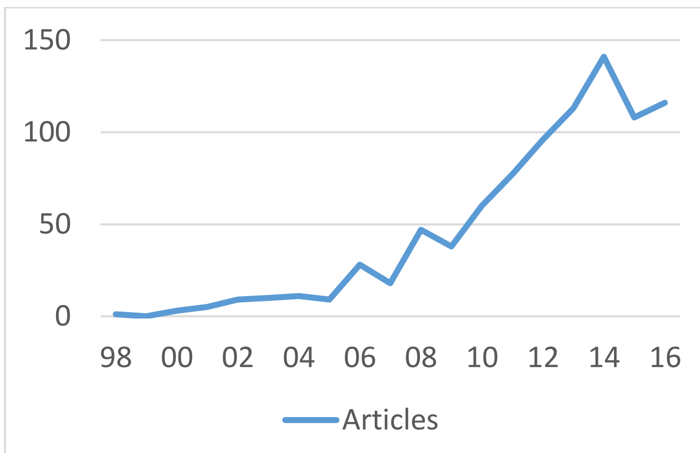

Figure 2. Journal Articles with Financial Development and PCA

This graph plots the number of journal articles that include both a financial development and PCA discussion.   The earliest appearance of a journal article for financial development and PCA is Levine and Zervos (1998). The trend in its use is dramatic.

Though the principal reason for PCA's adoption is to resolve the issue of multicollinearity, it has facilitated an opportunity to increase the number of explanatory variables. Unfortunately, few researchers have ventured beyond the same three to five proxies most used in the literature. One exception is Lipovina-Bozovic et al. (2016) where in his research the study utilized nine independent variables. As the description and measurement of financial development is broadened and deepened and the data collection for those measurements expands, PCA's contribution should not only be recognized in its solution for multicollinearity, but also in its greatest strength – uncovering important underlying structures in the data.

CHAPTER III - METHODOLOGY

The literature limits the investigation of the nexus between financial development and economic growth to either a large group of unrelated countries or individual economies. Figure 3 below illustrates the breadth of the studies. Studies not focusing on geographic regions are absent.

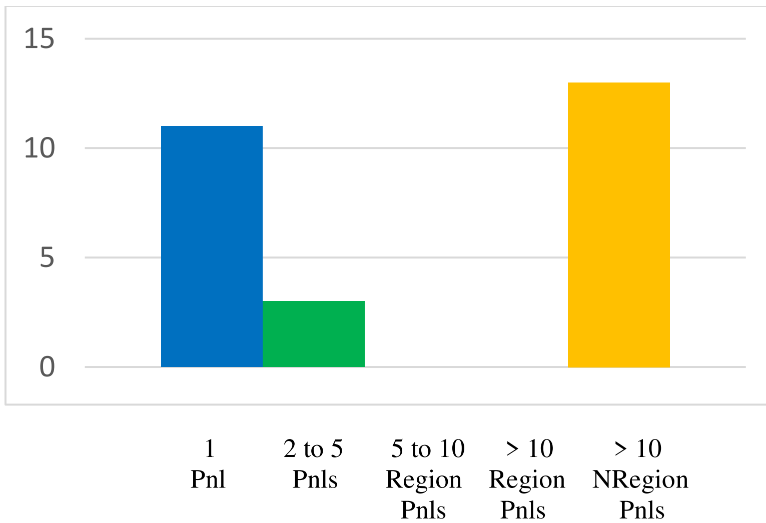

Figure 3. Number of Panels Investigated

This study investigates Europe and the multiple levels of economic development present in three regions on the continent.

Though financial development is typically expressed in five channels: a) markets, b) banking, c) insurance, d) FDI and e) mortgages – the literature concentrates its investigation primarily among the market/banking and markets channels. Figure 4 highlights the concentration of channels investigated, demonstrating strong bias towards combining markets and banking. The research this study pursues is more narrowly focused on the banking channel

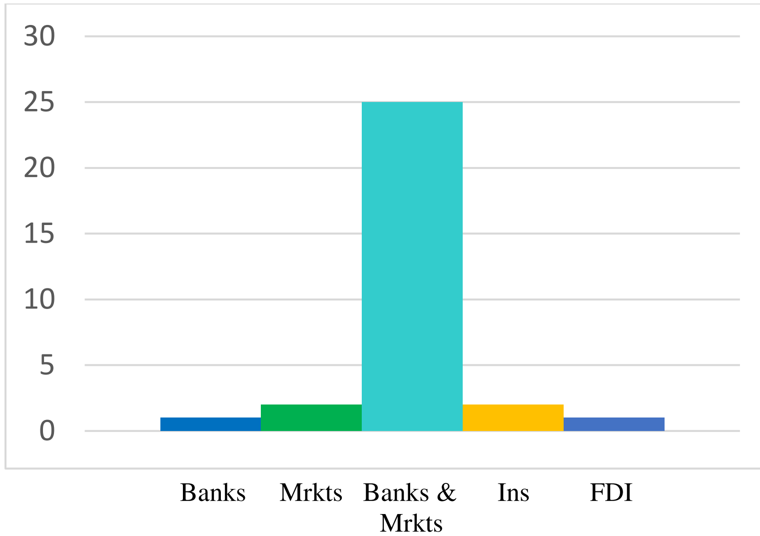

Figure 4. Researched Channels.

The literature is also limited in the choice of independent variables it utilizes to measure financial development, usually five to seven. As discussed earlier, the World Bank (2013) and International Monetary Fund (2014) express development in a more deliberate manner. They offer four dimensions that define development – access, depth, efficiency, and stability. This study adopts these dimensions and resources metrics that measure them.

If there is a correlation between a country's banking development and its economic growth, then a model or models should be derived to specify that relationship. This chapter is organized to discuss the data and statistical tools utilized to examine the relationship. The methodology will be applied to Europe as a whole and then to subregions of Eastern, Central, and Western Europe.

This chapter is divided into six sections:

a) Banking Development - defined with four descriptive dynamics;

b) Data - reasons for the selection and use in the statistical analysis;

c) Statistical test - normality, collinearity, and stationarity;

d) Principal Component Analysis;

e) Principal Component Regression; and,

f) Model specification.

Banking Development

Development is vague in both its description and measurement. The largest body of literature depends upon a few readily available metrics to represent financial development. The World Bank (2004) first introduce a concept of four dimensions to describe and measure financial development. These dimensions are access, depth, efficiency, and solvency. Access and depth provide an external connection between banking institutions and their customers. Efficiency and stability reflect the internalized structure and organization of the institutions themselves. This study utilizes the foundation of four dimensions in its qualification of banking development.

With each dimension, multiple metrics measuring banking attributes and functions are selected. These metrics provide overlapping explanations. This certainly can lead to collinearity, but this issue will be dealt with later in this chapter. With the problem of collinearity, a significantly larger database of metrics is available and thus improved specification of the models.

Data

The principal source of data for this study is the World Bank's Data Base 2015. The database contains as many as four hundred metrics on up to two hundred and six countries. There are currently seventy-eight financial metrics. This study is utilizing 21 independent variables, 4 control variables, and 1 dependent variable in the data set. The data set is structured as panel data for thirty-eight countries over a ten year period from 2004 to 2013.

Countries

Forty-one countries spanning the European continent are subdivided into three geographic and economic regions: Eastern Europe, Central Europe, and Western Europe. The geographic divisions largely overlap the levels of economic development. As presented earlier in this study, the countries' level of economic development increases as they range from east to west. The methodology begins with fifteen countries in Eastern Europe, seven countries in Central Europe, and nineteen countries of Western Europe. Table 1 below lists the countries in the studies data set.

Table 1

Listing of Countries in the Database

Eastern Europe		**Central Europe**	**Western Europe**	
Albania	Serbia	Czech Republic	Austria	Luxembourg
Armenia	Slovenia	Estonia	Belgium	Malta
Belarus	Turkey	Hungary	Cyprus	Netherlands
Bosnia	Ukraine	Latvia	Denmark	Norway
Bulgaria		Lithuania	Finland	Portugal
Croatia		Poland	France	Spain
Kosovo		Slovakia	Germany	Sweden
Macedonia			Greece	Switzerland
Moldova			Ireland	U K
Romania			Italy	

The following are maps (Figures 5 through 7) indicating the location of the countries in the dataset:

Figure 5. Eastern Europe.

The map indicating the location of the countries in the dataset are the work of Elizabeth Bee.

Figure 6. Central Europe.

The map indicating the location of the countries in the dataset are the work of Elizabeth Bee.

Figure 7. Western Europe.

The map indicating the location of the countries in the dataset are the work of Elizabeth Bee.

Economic Growth

Following the convention most utilized in the literature, this study adopts the rate of the change in growth of gross domestic product as its measurement for the dependent variable.

Banking Development Independent Variables

The richness of the World Bank and International Monetary Fund's Global Financial Development database allows for a large number of metrics to be utilized as independent variables. Thirty-one banking metrics are available, twenty-two are selected due to the number of countries participating and the depth of years reported. Each of these variables represents one of four dimensions – access (6), depth (6), efficiency (4), and stability (6).

Access. The degree to which individuals can and do use banking services.

- ATMs 100,000 adults
- ATMs per 1,000 KM^2
- 5 Bank asset concentration
- Bank branch per 100,000 adults
- Bank branch per 1,000 KM^2
- Bank concentration

Depth. The size of banking institutions' components.

- Bank deposits to GDP
- Domestic credit to private sector to GDP
- Deposit money bank assets to deposit money assets
- Deposit money banks' assets to GDP

- Liquid liabilities to GDP
- Private credit by deposit money banks to GDP

Efficiency. The measurement of the management of productivity and performance.

- Bank cost to income
- Noninterest income to total income
- Overhead costs to total assets
- Return on assets

Stability. The financial and capital stability of the banking industry.

- Capital to assets ratio
- Regulator capital to risk- weighted assets
- Credit to deposits
- Net interest margin
- Non-performing loans
- Return on Equity

Control Variables

In order to examine the effect of banking development on economic growth, this research utilizes four control variables most often utilized in the literature. These variables allow us to analyze the true impact of banking on growth as we control for possible influential effects. The control variables used in this paper include capital investment, human capital, openness, and government spending. The data is available from the World Bank.

Capital Investment. Apergis et al. (2007) suggests two points of value for investment – a) an increase in investment results in growth and b) spillover effects and economies of scale result in growth. Christopoulos and Tsionas (2004) found investment to have a positive effect and is statistically significant. The studies have focused on Gross Capital Investment as the singular proxy.

Human Capital. Lucas (1993) finds that higher levels of education creates an ability for a country to absorb new technologies and become innovative. Enjoying spillover and applying new information are better suited for more educated populations. Human capital influences the growth of total factor productivity and does so by attracting physical capital (Benhabib and Spiegel, 1994). The percent of population with secondary education is the most frequently used proxy.

Openness. Trade appears to raise income by spurring the accumulation of physical and human capital. (Barro and Sala-i-Martin, 2004 and Frankel and Romer, 1999). Trade creates interactions in exchange of ideas, specialization, and dissemination of knowledge – all resulting in greater growth. The literature utilizes Net Exports for the proxy for openness.

Government Spending. According to Barro and Sala-i-Martin (1995), government expenditures on education and infrastructure promotes growth. Similarly, Easterly and Rebelo (1993) review fiscal policy correlations and conclude that investment in transport and communication is robust with respect to growth. In lieu of deconstructed components, this study will use aggregate Expenditures.

Statistical Tests

The data is checked for normality, collinearity, and stationarity.

Normality

The assumption of normality for the sample distribution is tested. The three default test in Stata 12 are:

a) Doornick-Hansen, b) Shapiro-Wilk, and, c) SKtest.

The Doornik-Hansen test for multivariate normality is based on the skewness and kurtosis of multivariate data (Doornik and Hansen, 2008). Shapiro-Wilk and SKtest are two other general tests designed to detect departures from normality. All three tests are comparable in power.

Collinearity

In multiple regression, an event can arise when two or more independent variables are highly correlated. The collinear variables essentially share the same information about the dependent variable and are redundant. According to Wooldridge (2010), the principal danger of such data redundancy is the overfitting in regression models.

Stationarity

A time series is stationary if a shift in one time period to the next doesn't cause a change in the shape of the distribution. Since the data in this study is structured in time series, there is concern for non-stationarity. As a result, some stochastic processes (unit root) may cause a problem with statistical inference. Its presence can cause spurious regressions or errant predictions due to invalid assumptions (Granger and Newbold, 1974). A test is necessary to determine the presence of unit root. The Levin-Lin-Chu test (LLC) is utilized for the four control variables and twenty-two independent variables.

This study adopts Cihak et al. (2012) use of the World Bank dimensionalities. The PCA method provides components derived from variables measuring those four dimensions to characterize banking development. The result is a single model expressing all the component(s) without the burden of collinearity.

Principal Component Analysis

Because of the large number of independent variables and a significant issue with collinearity, the original data set is not directly used in regression. The aim of PCA is to reduce that large number of potentially interrelated data sets (dimensionality) by transforming them into a new set of variables (principal components.) and still preserve the relevant data (Hotelling, 1933). The method defines a set of principal components with the direction having the greatest variability in the data (Lavrenko, 2015). The value is that these principal components (PCs) are uncorrelated and retain most of the original group's variation.

The process deconstructs the data set into eigenvalues (magnitude), from which eigenvectors (direction) are constructed. The eigenvectors with the highest eigenvalues are the principal components. In this study, there are twelve independent variables measuring the four general aspects of financial development. It is the intention of this study to utilize PCA to re-expresses a data set into its most meaningful basis. This new basis has filtered out all the noise that disguises the relationships and exposes the underlying structure (Shlens, 2014).

Following Gries, Kraft, and Mejerrieks (2009), this study uses PCA to transform the independent variables into principal components. Qualified components are used in the regression sequence. To transform the data and select the appropriate components

Williams et al. (2010) provides a protocol for PCA. The illustration below outlines the five point process:

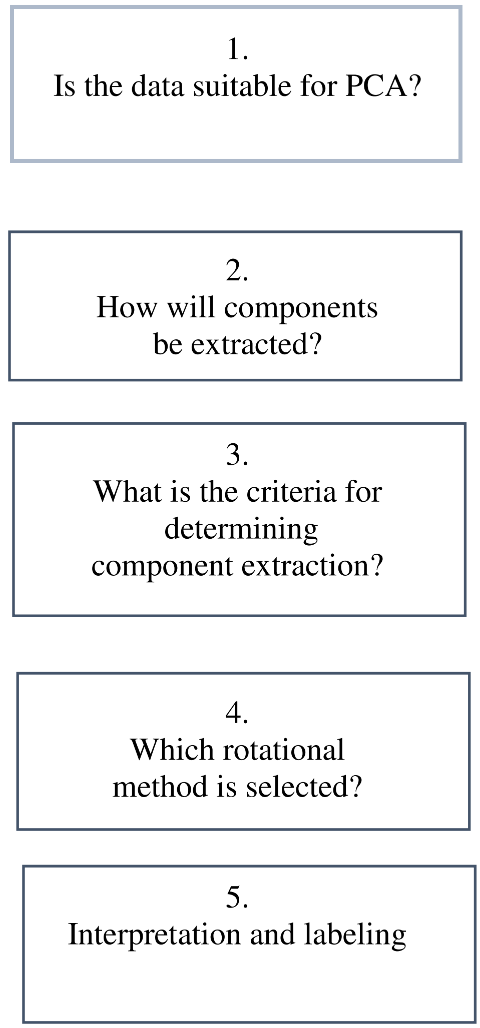

Figure 8. Five-Step PCA Protocol.

Step One: Is Data Suitable for PCA? Data for four models are developed for Europe as a whole and each of three distinct regions – Eastern Europe, Central Europe, and Western Europe. The countries in each of the three regions share similar economic growth rates. Eastern European countries (lesser developed) grow faster than Central Europe (see Table 7 below) and Central Europe countries (developing) grow faster than

Western Europe (developed.) PCA necessarily requires the data to be collinear. As a result, the data should to be tested for suitability. According to William et al. (2010) and Katchova (2013), the Kaiser-Meyer-Olkin (KMO) measure is the recommended test. The KMO test measures that suitability by providing the proportion of variance which might be caused by underlying factors

Step Two: How Components Will Be Extracted. Four sets of principal component are derived from the orthogonal transformation of twenty-two independent variables. Each set relates to the specific relationships within the European, Eastern, Central, and Western European economies.

Step Three: What is the Criteria for Determining Component Extraction? The goal is to reduce the twenty-two independent variables into a lesser number of components yet maintain a significant amount of the information in the variation. Several criteria are available to determine an optimal number. According to Williams et al. (2010), multiple approaches are preferable and two of the most often used are the Kaiser Rule and the Scree test.

Step Four: Selection of Rotational Method. Rotation produces a more interpretable solution by maximizing high item loadings (correlations of the independent variables) and minimizing the low item loadings. Two methods are typically utilized: Varimax (orthogonal) and Promax (oblique). Varimax rotation first developed by Kaiser (1958) is the most common rotational technique. While this research uses both, interpretation is based on the Varimax rotations.

Step Five: Interpretation and Labeling. A singular loading or set of loadings may be identified as a result of the rotation as having a particular theme or weight. These themes drive the interpretation of the components and are significant in understanding the relationships between the components and the dependent variable.

Principal Component Regression

Principal component regression (PCR) is a regression approach utilizing principal components instead of independent variables Jolliffe (1982). Similar to the standard linear regression model, this method regresses the dependent variable (outcome) on a set of reduced number of principal components (covariates). Those components with the higher variances are selected. The determination is based upon the preceding discussion regarding the application of the Kaiser Rule and scree plot.

Model

The traditional model is exemplified by the following equation (Levine, 2005):

$$G = \beta 0 + \beta 1C + Y1F + \varepsilon \qquad (1)$$

where *G* is the growth indicator and is typically per capita GDP growth; *C* represents anywhere from two to four control variables, and *F* represents typically three to five independent variables.

This research will express its model(s) in the following manner:

(a) Control variables specified

$$\beta 1C = [\beta 1c + \beta 2hc + \beta 3o + \beta 4s] \qquad (2)$$

where: *c* is investment in capital; *hc* is human capital *o* is trade openness, and *s* is government spending.

(b) Banking development principal components specified:

$$Y1F = [Y1pc1 + Y2pc2 + \ldots Ynpcn] \qquad (3)$$

where: *pc1* through *pcn* are the principal components

(c) Aggregate model:

$$gdp = \beta_0 + \beta_1 c + \beta_2 hc + \beta_3 o + \beta_4 s +$$

$$Y_1 pc1 + Y_2 pc2 + \ldots Y_n pcn + \varepsilon \qquad (4)$$

where *C* are the control variables previously mentioned and pc1 through pcn are the derived components. The number of components (pc1 through pc*n*) are determined by the previously mention Kaiser Rule. It is anticipated that number of components may be five or less.

CHAPTER IV – ANALYSIS

Data

This study has not found any body of research that is as inclusive in characterizing banking development as the twenty-two explanatory variables suggested herein. Though researchers have increasingly used principal component analysis as a tool to reveal underlying structures in their data, the number of variables incorporated in the orthogonal transformation have been typically less than five. Furthermore, they focus on a broader category of financial sector variables and not the more narrow channel of banking. The data in his study specifically includes banking variables for the purpose of regressing economic growth on banking development in Europe, covering less developed, developing, and developed economies.

The field of data originally included forty-one countries, four control variables and twenty-two independent variables for a ten year period (2004 – 2013). The forty-one countries span the European continent and are further subdivided into Western Europe (19), Central Europe (7), and Eastern Europe (15). Those subdivisions may further reflect economies that are generally developed, developing, and less developed.

Due to insufficient data, three countries are deleted from the database – Kosovo, Georgia, and United Kingdom. The reasons for incomplete data vary. Kosovo and Georgia do not monitor or publish certain banking variables. The United Kingdom chooses to not make available those banking metrics to the World Bank. The deletion of these three countries is believed to not have a significant impact upon the methodology.

Twenty-two metrics are chosen to describe banking development. Each of the independent variables represents one of four dimensions of banking development– access

(6), depth (6), efficiency (4), and stability (6). The World Bank (2013) and International Monetary Fund (2014) use these dimensions as expressions of ways financial markets and banking are qualified as developed. This particular range of variables provides a more thorough measurement of development. Four to six metrics are chosen to provide different measurements for each of the four dimensions.

Each of the following metrics measure some attribute of one of the four dimensions:

Table 2

Proxies for Dimensions of Banking Development

ACCESS • ATMs 100,000 adults • ARMs per 1,000 KM^2 • 5 Bank asset concentration • Bank branch per 100,000 adults • Bank branch per 1,000 KM^2 • Bank concentration	**DEPTH** • Bank deposits to GDP • Domestic credit to private sector to GDP • Deposit money bank assets to deposit money assets • Deposit money banks' assets to GDP • Liquid liabilities to GDP • Private credit by deposit money banks to GDP
EFFICIENCY • Bank cost to income • Noninterest Income to total income • Overhead costs to total assets • Return on assets	**STABILITY** • Capital to assets ratio • Regulator capital to risk-weighted assets • Credit to deposits • Net interest margin • Non-performing loans • Return on Equity

Of the metrics listed above, the literature typically restricts its choice to:

a) deposit money bank assets,

b) total bank deposits,

c) liquid liabilities, and

d) private credit by deposit money banks.

These are aggregates of financial institutions balance sheet items and reflect one aspect of financial development – depth. In contrast, rescaling financial (banking) development with the World Banks's four dimensions provides an improved opportunity to measure and ultimately understanding of development.

The significant addition of independent variables normally raises the risk of multicollinearity. The collinearity tends to inflate the variance. Furthermore, a large number of independent variables tend to produce a model that is awkward. Principal component analysis (PCA) provides a solution. PCA produces components derived from orthogonally transformed independent variables. Collinearity is resolved and the resulting number of components should be significantly less than the original number of variables. Based upon Katchova (2013), the study expects the number of resulting components for a model to be well less than half of the starting twenty-two independent variables. Added to that, the strength of the dimensionalities that define development are determinable from the amount of information about the variance that is retained.

The data is checked for its balance, normality, collinearity, and stationarity.

Balance

A balance data set contains all observations in all the time series and panels. As the Tables 3 and 4 below demonstrate, time series and panel data variables are tested and determined balanced.

Table 3

Balanced Data Sets

Time Series	
tsset cc year, yearly	
panel variable:	cc (strongly balanced)
time variable:	year, 2004 to 2013
delta:	1 year

Table 4

Balanced Data Sets

Panel	
xtset cc year, yearly	
panel variable:	cc (strongly balanced)
time variable:	year, 2004 to 2013
delta:	1 year

Normality

The assumption of normality for the sample distributed is tested. The three tests applied are Doornick-Hansen, Shapiro-Wilk, and SKtest.

Table 5

Test for Multivariate Normality

Doornik-Hansen		
chi^2 (56)	=	28619.6
Prob > chi^2	=	0.0000

The Doornick-Hansen test resulted in a $p < 0.0000$, thus we can reject the null hypothesis.

The Shapiro-Wilk test illustrated below in Table 6 allows us to reject the null for all metrics we are testing.

Table 6

Shapiro—Wilk Test for Normality

Variable	Obs	W	V	z	Prob > z
c	380	0.9215	20.6320	7.1850	0.0000
cd1	342	0.9223	18.5960	6.9040	0.0000
hc	380	0.9513	12.8150	6.0550	0.0000
o	380	0.8303	44.6190	9.0160	0.0000
s	380	0.9420	15.2440	6.4670	0.0000
aatma	380	0.9468	13.9780	6.2610	0.0000
aatmg	380	0.6865	82.4300	10.4730	0.0000
abac	380	0.9335	17.4810	6.7920	0.0000
abba	380	0.8953	27.5220	7.8690	0.0000
abbg	380	0.5497	118.4120	11.3330	0.0000
abc	380	0.9657	9.0170	5.2200	0.0000
dbd	380	0.7217	73.1790	10.1900	0.0000
ddc	380	0.9162	22.0400	7.3420	0.0000
ddmba	380	0.6488	92.3530	10.7430	0.0000
ddmbagdp	380	0.9227	20.3250	7.1500	0.0000
dll	380	0.7501	65.7040	9.9350	0.0000
dpc	380	0.9161	22.0600	7.3440	0.0000
ebc	380	0.7017	78.4450	10.3550	0.0000
ebnin	380	0.9668	8.7360	5.1450	0.0000
eoc	380	0.6851	82.8150	10.4840	0.0000
eroa	380	0.5543	117.2000	11.3080	0.0000
sca	380	0.8791	31.7850	8.2110	0.0000
scrwa	380	0.8791	31.7830	8.2110	0.0000
sld	380	0.9134	22.7730	7.4190	0.0000
snim	380	0.8678	34.7690	8.4240	0.0000
sroe	380	0.7779	58.4110	9.6550	0.0000
g	380	0.1290	229.0410	12.8990	0.0000
gd	380	0.9606	10.3730	5.5530	0.0000

Each of the four control and the twenty-one independent variables have p = 0.0000, thus we reject the null hypothesis and conclude the data is normally distributed.

The SKtest measures the skewness and kurtosis of the distribution. Table 7 demonstrates the results of the test.

Table 7

Skewness/Kurtosis test for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	------- joint ------ adj $chi^2(2)$	Prob>chi^2
c	380	0	0.0001	53.02	0.0000
cd1	342	0	0	47.76	0.0000
hc	380	0	0	56.65	0.0000
o	380	0	0	.	0.0000
s	380	0	0	34.82	0.0000
aatma	380	0	0.0028	37.85	0.0000
aatmg	380	0	0	.	0.0000
abac	380	0	0.0005	29.53	0.0000
abba	380	0	0.0003	60.72	0.0000
abbg	380	0	0	.	0.0000
abc	380	0.2070	0	.	0.0000
dbd	380	0	0	.	0.0000
ddc	380	0	0.0137	43.78	0.0000
ddmba	380	0	0	.	0.0000
ddmbagdp	380	0	0.0058	43.49	0.0000
dll	380	0	0	.	0.0000
dpc	380	0	0.0158	42.99	0.0000
ebc	380	0	0	.	0.0000
ebnin	380	0	0.0012	30.86	0.0000
eoc	380	0	0	.	0.0000
eroa	380	0	0	.	0.0000
sca	380	0	0.0013	58.96	0.0000
scrwa	380	0	0	.	0.0000
sld	380	0	0	66.42	0.0000
snim	380	0	0	.	0.0000
sroe	380	0	0	.	0.0000
g	380	0	0	.	0.0000
gd	380	0	0	40.88	0.0000

From the results of the calculations in the far right column, all control and independent variables have p values less than 0.05, thus allowing a rejection of the null hypothesis that the data is normally distributed.

For the purposes of this study the normality assumption is unnecessary (Jolliffe, 1982). Following the PCA transformation, principal component regression is run. In multiple regression models, the estimator is consistent and efficient regardless of normality of the independent variables. As the sample sizes are not small (n = 380), the t and f statistics are not adversely affected (Wooldridge, 2010).

Collinearity

As indicated before, this study has an interest in incorporating a larger number of independent variables that measure banking development in numerous dimensions. Because of the large number, the regression of growth on these variables is expected to lead to multicollinearity. Because of this, standard errors will be large and the predictive power of the model could be inaccurate.

PCA is not negatively affected by collinearity. The test is just the reverse, to be an effective tool the independent variables need to show collinearity. Table 8 demonstrates that there are significant pairwise correlations of the independent variables.

Table 8

Europe Independent Variables PairWise Correlation

A.

Variable	*aatma*	*aatmg*	*abac*	*abba*	*abbg*	*abc*	*dbd*
aatma	1						
aatmg	0.3634	1					
abac	-0.1822	-0.0203	1				
abba	0.5525	0.315	-0.2826	1			
abbg	0.1656	0.9111	-0.0061	0.4172	1		
abc	-0.1214	0.0156	0.8909	-0.2403	0.0349	1	
dbd	0.4622	0.4919	-0.1478	0.6015	0.4969	-0.0630	1
ddc	0.5674	0.3788	-0.0738	0.4998	0.3151	0.0278	0.7040
ddmba	0.3626	0.169	-0.1453	0.2510	0.1058	-0.1196	0.1719
ddmbagdp	0.5875	0.4496	-0.0715	0.4798	0.3586	0.0277	0.7056
dll	0.4572	0.5021	-0.1416	0.6040	0.5109	-0.0577	0.9957
dpc	0.5819	0.4005	-0.0768	0.4818	0.3169	0.0254	0.6956
ebc	-0.0861	0.2522	0.0306	-0.0949	0.2486	0.0711	-0.0798
ebnin	-0.0223	-0.0028	-0.3601	0.0260	-0.0136	-0.3184	0.1195
eoc	-0.3335	-0.1623	-0.0239	-0.2418	-0.0823	-0.0677	-0.3150
eroa	-0.1438	-0.2025	0.0006	-0.1040	-0.1900	-0.0816	-0.1337
sca	-0.4634	-0.3608	0.0788	-0.3388	-0.2510	0.002	-0.4594
scrwa	-0.412	-0.1968	0.0440	-0.3185	-0.1471	-0.0448	-0.2221
sld	0.1343	-0.1883	-0.1202	-0.0433	-0.2145	0.0076	-0.2436
snim	-0.4478	-0.3608	0.0738	-0.3304	-0.2720	-0.0324	-0.4355
sroe	-0.1031	-0.2031	0.0374	0.0060	-0.1686	0.0081	-0.0332

B.

Variable	*ddc*	*ddmba*	*ddmbagdp*	*dll*	*dpc*	*ebc*	*ebnin*
ddc	1						
ddmba	0.2569	1					
ddmbagdp	0.9767	0.2449	1				
dll	0.7140	0.1651	0.7166	1			
dpc	0.9882	0.2753	0.9910	0.7063	1		
ebc	-0.0773	0.0275	-0.0508	-0.0811	-0.0674	1	
ebnin	0.0338	0.0227	0.0413	0.1053	0.0477	0.0988	1
eoc	-0.3321	-0.1811	-0.3356	-0.3217	-0.3357	0.4066	0.3830
eroa	-0.1771	-0.1002	-0.1947	-0.1371	-0.1865	-0.5060	0.0338

sca	-0.5869	-0.3158	-0.6094	-0.4723	-0.5937	0.0184	0.1374
scrwa	-0.4353	-0.3854	-0.4238	-0.2257	-0.4142	-0.0510	0.1893
sld	0.3528	0.2389	0.2926	-0.2299	0.3559	-0.0342	-0.0589
snim	-0.4699	-0.3887	-0.4841	-0.4449	-0.4859	-0.0915	0.0139
sroe	-0.1012	-0.0932	-0.1292	-0.0342	-0.1156	-0.4054	-0.0417

C.

Variable	*eoc*	*eroa*	*sca*	*scrwa*	*sld*	*snim*	*sroe*
eoc	1						
eroa	-0.0250	1					
sca	0.5160	0.2000	1				
scrwa	0.3746	0.2412	0.7452	1			
sld	-0.0526	-0.0844	-0.1720	-0.2756	1		
snim	0.5717	0.3441	0.6892	0.5750	-0.1395	1	
sroe	-0.0549	0.5372	0.0540	0.0474	-0.0584	0.1667	1

Stationarity

Since the data in this study is structured in time series, there is concern for non-stationarity. A stationary time series is one in which the probability distributions are stable over time and the preceding data point is not likely to influence the subsequent data point. Non-stationarity in a time series processes is measured by a unit root.

Twenty-six individual Levin-Lin-Chu (LLC) tests are utilized to determine the unit root for thirty-eight panels (one for each country in the data set) and nine periods (for the periods 2004 to 2013). An example of the results of the LLC test is demonstrated in Table 9.

Table 9

Test for Stationarity

Levin-Lin-Chu unit-root test for *c*				
Ho: Panels contain unit roots		Number of panels	=	38
Ha: Panels are stationary		Number of periods	=	9
	Statistic	p-value		
Unadjusted t	-0.129			
Adjusted t*	-0.129	.449		

To simplify, Table 10 summarizes the LLC tests on the control and independent variables.

Table 10

Test for Stationarity LLC Unit Root Summary

Lag(s)	0		1		2	
Variables	Stat	p-value	Stat	p-value	Stat	p-value
c	-0.129	0.449	-5.098	0.000	-14.600	0.000
hc	-10.787	0.000	1.483	0.931	-1.906	0.028
o	-5.867	0.000	-6.775	0.000	-10.503	0.000
s	-2.716	0.003	-3.564	0.000	-13.086	0.000
aatma	-3.407	0.000	-32.361	0.000	-82.118	0.000
aatmg	-3.078	0.001	-17.003	0.000	-3.262	0.001
abac	-8.992	0.000	-3.610	0.000	-8.239	0.000
abba	-2.844	0.002	-4.489	0.000	-14.839	0.000
abbg	-2.553	0.005	-4.652	0.000	-13.061	0.000
abc	-17.254	0.000	-7.449	0.000	-18.374	0.000
dbd	-3.781	0.000	-9.350	0.000	-9.227	0.000
ddc	-9.042	0.000	-8.860	0.000	-4.663	0.000
ddmba	-21.488	0.000	-290.000	0.000	-580.000	0.000
ddmbagdp	-6.497	0.000	-10.133	0.000	-7.162	0.000
dll	-4.664	0.000	-9.310	0.000	-9.888	0.000
dpc	-4.196	0.000	-9.821	0.000	-7.050	0.000
ebc	-6.857	0.000	-5.820	0.000	-10.678	0.000
ebnin	-7.819	0.000	-9.415	0.000	-9.595	0.000
eoc	-12.146	0.000	-4.347	0.000	-11.237	0.000
eroa	-8.003	0.000	-1.155	0.124	-11.324	0.000
sca	-3.634	0.000	-4.881	0.000	-12.536	0.000

scrwa	-2.248	0.012	-3.671	0.000	-8.294	0.000
sld	-25.964	0.000	-10.187	0.000	-6.761	0.000
snim	-11.581	0.000	-4.592	0.000	-16.810	0.000
snpl	14.664	1.000	-0.962	0.168	-3.466	0.000
sroe	-6.944	0.000	-1.553	0.060	-9.401	0.000
gd	-10.078	0.000	-7.821	0.000	-16.952	0.000

Determined from the test, a first difference is necessary for capital investments to become stationary. As a result, cd1 (capital investment first difference) replaces c as the control variable. Another metric, nonperforming loans, provides uninterpretable results and is deleted from the analysis. The data is now determined to be stationary for the next step - principal component transformation.

Models

Four models are developed for Europe and each of three distinct regions – Eastern Europe, Central Europe, and Western Europe. Gerschenkron (1952), Rostow, (1956, 1960), and Chirot, (1989) postulate variations of backwardness and catch up theory, particularly as it applies to Eastern and Central Europe. Stated, the more backward an economy is at the beginning of economic development, the more likely certain catalyst are necessary to stimulate growth. The models should suggests that financial development, banking, in particular, influences physical and human capital to growth. Each of the three regions' models should reflect differences in banking development and economic growth – e.g. Eastern Europe (lesser developed) stronger correlations of banking-to-growth.

Principal Component Analysis

The use of PCA allows this study to transform and reduce the twenty-one variables into a smaller number of components and yet retain a significant amount of information about the variances. The components themselves are correlated with the variables. Interpreting the components references back to those variables most strongly correlated. From those variables, we may label the component in a manner that describes its effect on the dependent variable.

The following are the steps in PCA:

a. Determine sampling adequacy
b. Transform variables into components;
c. Apply the Kaiser rule and scree plot to determine the number of components to retain;
d. Rotate the orthogonal relationships using Varimax and Promax
e. Review the greatest magnitudes of the eigenvector loadings (correlation coefficients);
f. Determine a descriptive label for each component based upon the concentration of variables with the greatest loadings;
g. Perform an initial principal component regression to test statistical significance
h. Specify the model with significant variables and components

Sampling Adequacy

As mentioned before, PCA necessarily requires the data to have a degree of collinearity to be suitable for transformation. The Kaiser-Meyer-Olkin (KMO) test measures the data's suitability by providing the proportion of variance which might be caused by underlying factors. KMO values range from 0 to 1. High values indicate usefulness. Both William et al. (2010) and Parinet et al. (2004) state the data is adequate when the value is greater than 0.5. Each model's test is available in the Appendix, but a summary of the values is provided below in Table 11.

Table 11

Summary Table of KMO Sampling Adequacy

	Europe	**Western Europe**	**Central Europe**	**Eastern Europe**
KMO Value	0.7198	0.5374	0.5956	0.6937

As the KMO values are all above 0.5, the data for the four models are found adequate in their collinearity.

Transformation

Table 12 provides the calculations of all the components, their eigenvalues, differences, proportions, and cumulative proportions.

Table 12

Europe PCA Eigenvalues and Proportions

Principal components/correlation	Number of obs	=	380
Rotation: unrotated	Number of comps	=	21
	Trace	=	21
	Rho	=	1

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	7.1659	4.8000	0.3412	0.3412
Comp2	2.3658	0.0544	0.1127	0.4539
Comp3	2.3115	0.2689	0.1101	0.5640
Comp4	2.0426	0.5901	0.0973	0.6612
Comp5	1.4525	0.4980	0.0692	0.7304
Comp6	0.9545	0.1052	0.0455	0.7758
Comp7	0.8494	0.0657	0.0404	0.8163
Comp8	0.7837	0.0838	0.0373	0.8536
Comp9	0.6999	0.1749	0.0333	0.8869
Comp10	0.5250	0.0666	0.0250	0.9119
Comp11	0.4584	0.0392	0.0218	0.9338
Comp12	0.4192	0.0918	0.0200	0.9537
Comp13	0.3273	0.1367	0.0156	0.9693
Comp14	0.1906	0.0089	0.0091	0.9784
Comp15	0.1817	0.0315	0.0087	0.9870
Comp16	0.1502	0.0772	0.0072	0.9942
Comp17	0.0731	0.0468	0.0035	0.9977
Comp18	0.0263	0.0107	0.0013	0.9989
Comp19	0.0156	0.0120	0.0007	0.9997
Comp20	0.0036	0.0004	0.0002	0.9998
Comp21	0.0033	.	0.0002	1.0000

Determination of the Number of Components to Retain

As there are as many components as there are variables, it is not practical to retain all of the components resulting from the orthogonal transformation. This study applies both the Kaiser rule and Cattel scree plot to determine which principal components to retain for regression. Both rules are generally accepted in the literature.

According to Costello and Osborne (2005), the Kaiser rule is the most commonly used method in selecting the number of components. Kaiser (1960) recommends that only eigenvalues equal to and greater than 1.0 are retained as 1.0 is the average size of the eigenvalues in a full decomposition.

Tables 13 through 15 are abbreviated and do not include, according to the Kaiser rule, eigenvalues less than 1.0.

Table 13

Western Europe PCA Eigenvalues and Proportions

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.5525	1.2232	0.2168	0.2168
Comp2	3.3293	0.5438	0.1585	0.3753
Comp3	2.7854	0.6799	0.1326	0.5080
Comp4	2.1056	0.5691	0.1003	0.6082
Comp5	1.5365	0.2508	0.0732	0.6814
Comp6	1.2856	0.0682	0.0612	0.7426
Comp7	1.2174	0.2407	0.0580	0.8006

Table 14

Central Europe PCA Eigenvalues and Proportions

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	6.5283	2.8268	0.3109	0.3109
Comp2	3.7015	1.4736	0.1763	0.4871
Comp3	2.2279	0.3809	0.1061	0.5932
Comp4	1.8469	0.2050	0.0879	0.6812
Comp5	1.6419	0.3821	0.0782	0.7594
Comp6	1.2598	0.1716	0.0600	0.8193
Comp7	1.0882	0.2235	0.0518	0.8712

Table 15

Eastern Europe PCA Eigenvalues and Proportions

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	8.6864	4.8415	0.4136	0.4136
Comp2	3.8450	1.9738	0.1831	0.5967
Comp3	1.8711	0.2094	0.0891	0.6858
Comp4	1.6617	0.5038	0.0791	0.7650
Comp5	1.1579	0.1100	0.0551	0.8201
Comp6	1.0479	0.4202	0.0499	0.8700

Following the Kaiser Rule, we determine that Europe's model retains 5 components, Western Europe 7, Central Europe 7, and Eastern Europe with 6. Table 16 summarizes the number of components and cumulative proportions for the four models.

Table 16

Summary of Components Retained and Cumulative Properties

Model	**Components Retained**	**Cumulative Proportion**
Europe	5	0.7304
W Europe	7	0.8006
C Europe	7	0.8712
E Europe	6	0.8700

With 5 principal components Europe's model retains 73.04 percent of the information in the variance. These proportions are higher in the three regions. This means that for all the models the number of input variables can be reduced from 21 to less than 8 components and still retain at least 73% of the explanation of the variance.

Cattell Scree Plot. As indicated before, the scree plot is a second method of determining the number of components to retain. The scree plot is a graph of the magnitudes of the eigenvalues in descending order and the factors. The plot illustrates a point of inflection in the diminishing order of the eigenvalues. Often this point of inflection is referred to as an "elbow." Cattell (1966) recommends that only those components above the elbow be retained as they are a visual "significance test" for each of the eigenvalues.

Figure 9 through 12 plot the eigenvalues with the number of components. The elbow is noted with a circle. For comparison, a line is super imposed to show the application of the Kaiser rule.

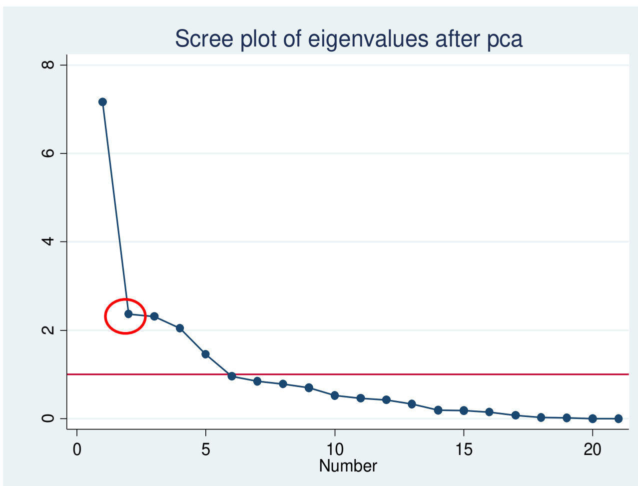

Figure 9. Europe PCA Scree Plot

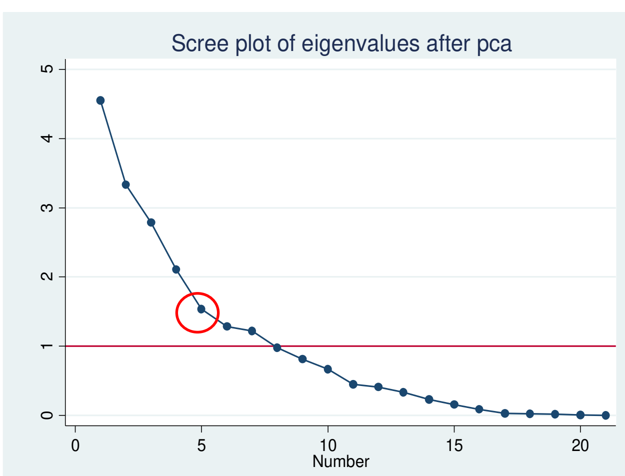

Figure 10. Western Europe PCA Scree Plot

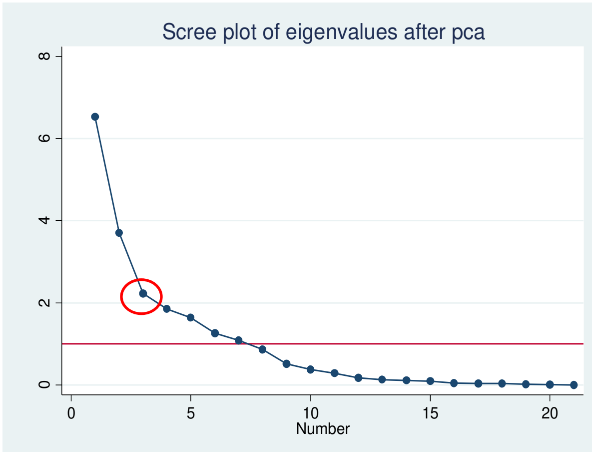

Figure 11. Central Europe PCA Scree Plot

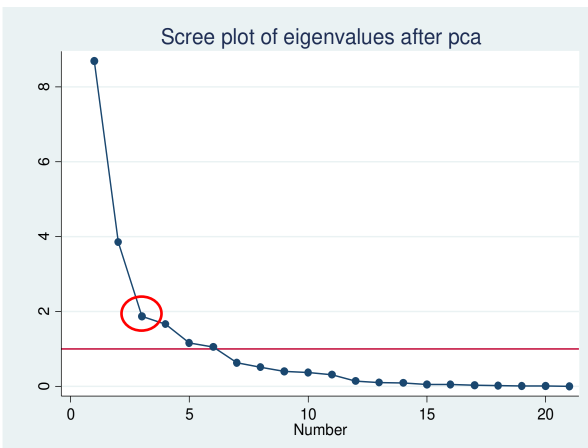

Figure 12. Eastern Europe PCA Scree Plot

As demonstrated, the visual "elbow" rule is not always consistent with the Kaiser rule. For the purposes of this study, the number of components will be determined by whichever method provides the highest cumulative proportions. For these four models, the Kaiser rule is applied.

Review the Eigenvector Loadings. The components are comprised of eigenvectors (loadings), similar to correlation coefficients. The load is information of the amount of the variance. The higher the calculated absolute value of the loading, the more important the variable is to the component. Table 17 presents the principal components deconstructed into to their respective variables' loadings.

Table 17

Europe Principal Component Eigenvectors

Variable	Comp1	Comp2	Comp3	Comp4	Comp5
aatma	0.2590	-0.0501	-0.1002	-0.0801	-0.0411
aatmg	0.2229	0.2771	0.2165	0.1506	-0.1731
abac	-0.0612	-0.2632	0.4349	0.3237	0.1681
abba	0.2445	0.1250	-0.1728	0.0632	-0.1155
abbg	0.1952	0.3219	0.2165	0.2030	-0.1684
abc	-0.0199	-0.2751	0.4519	0.2765	0.2156
dbd	0.3019	0.1761	-0.0802	0.2519	0.0572
ddc	0.3289	-0.0748	-0.0456	0.0031	0.3474
ddmba	0.1494	-0.0844	-0.0424	-0.2608	-0.1892
ddmbagdp	0.3335	-0.0478	-0.0215	0.0139	0.3216
dll	0.3050	0.1710	-0.0739	0.2536	0.0591
dpc	0.3305	-0.0698	-0.0399	-0.0068	0.3477
ebc	-0.0035	0.2961	0.3954	-0.2786	0.0274
ebnin	-0.0032	0.3397	-0.2212	-0.1464	0.2553
eoc	-0.1821	0.3307	0.0503	-0.1292	0.3478
eroa	-0.1062	-0.1383	-0.3640	0.3156	-0.0015
sca	-0.2807	0.1935	-0.0419	0.0922	0.1961
scrwa	-0.2183	0.2513	-0.0815	0.2192	0.2359
sld	0.0548	-0.3039	-0.0476	-0.4004	0.3326
snim	-0.2616	0.1189	-0.1051	0.1435	0.2647
sroe	0.0605	-0.1944	-0.3053	0.3093	-0.0513

The business of the numbers can be reduced by eliminating loadings below some predetermined level, leaving the higher loadings in place.   Tables 18 through 21 exhibit those loadings with less than 0.30 for the four models.

Table 18

Europe Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
aatma						0.4745
aatmg						0.2640
abac			0.4349	0.3237		0.1170
abba						0.4381
abbg		0.3219				0.2480
abc			0.4519			0.1225
dbd	0.3019					0.1243
ddc	0.3289				0.3474	0.0315
ddmba						0.6282
ddmbagdp	0.3335				0.3216	0.0458
dll	0.3050					0.1150
dpc	0.3305				0.3477	0.0264
ebc			0.3954			0.2715
ebnin		0.3397				0.4754
eoc		0.3307			0.3478	0.2880
eroa			-0.3640	0.3156		0.3641
sca						0.2693
scrwa						0.3150
sld		-0.3039		-0.4004	0.3326	0.2665
snim						0.3067
sroe			-0.3053	0.3093		0.4698

Table 19

Western Europe Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplained
aatma						-0.3514	-0.3650	0.4250
aatmg		0.3739					0.3682	0.1390
abac			0.3032	-0.4327				0.0851
abba	0.3237							0.2227
abbg		0.3991					0.3629	0.0958
abc				-0.4250				0.0533
dbd	0.4057							0.1255
ddc	0.3570		0.3609					0.0248
ddmba					-0.3179	-0.4658	0.3527	0.2766
ddmbagdp	0.3584		0.3409					0.0482
dll	0.4090							0.1137
dpc	0.3545		0.3509					0.0145
ebc		0.3419		0.3166				0.2216
ebnin						0.5178		0.3369
eoc				0.4572				0.2236
eroa							0.3420	0.2997
sca						0.3586		0.5025
scrwa					-0.3109	0.3421	0.3251	0.3079
sld			0.3343					0.1671
snim					0.4948			0.1694
sroe					0.3889			0.3345

Table 20

Central Europe Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplained
aatma	0.3565							0.0911
aatmg		0.3270						0.1429
abac					-0.4150			0.1148
abba			-0.3827				0.3212	0.1807
abbg	-0.3260						0.3126	0.0447
abc	0.3160				-0.3504			0.0955
dbd		0.4610						0.0926
ddc	0.3309							0.0681
ddmba			-0.3032			0.6389		0.2071
ddmbagdp	0.3366							0.0497
dll		0.4666						0.0844
dpc	0.3697							0.0187
ebc			0.3499		-0.3216			0.1393
ebnin			0.4966					0.1725
eoc			0.4910					0.1302
eroa				-0.3971	0.4216			0.1720
sca					-0.3281		0.5740	0.1124
scrwa							0.4410	0.2299
sld								0.0306
snim						0.4224		0.3812
sroe				-0.5648		-0.3370		0.1470

Table 21

Eastern European Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Unexplained
aatma							0.1030
aatmg							0.1299
abac		-0.3788			0.5069		0.0557
abba			0.5087				0.0864
abbg			0.4924				0.0748
abc		-0.3812			0.4744		0.0369
dbd						0.3063	0.0289
ddc	0.3034						0.0680
ddmba					0.3344		0.3434
ddmbagdp	0.3054						0.0401
dll							0.0602
dpc	0.3128						0.0399
ebc		0.3446		-0.3709			0.2453
ebnin		0.3492					0.1952
eoc		0.3190				0.4087	0.1397
eroa				0.3752		0.3134	0.0797
sca							0.2227
scrwa							0.3272
sld			-0.3232	0.4257			0.1084
snim						0.3486	0.2038
sroe				0.3288			0.1407

This process of eliminating eigenvectors of 0.30 and less provides a much clearer picture of particular dimensional influences, but loadings should be rotated to more accurately interpret the strongest relationships. This is performed by using one or more techniques – Varimax and Promax.

Varimax and Promax Rotations.

Rotations assist in interpretation of the components derived from the transformation of the variables. Rotations maximize high item loadings allowing for low items to be dropped. Two rotation techniques are commonly used: Varimax and Promax.

The Varimax rotation are orthogonal, preserving the perpendicularity of the axis, and produces components that are uncorrelated and independent (Kaiser, 1958.) It takes its name from the maximization of the sum of the variances of the squared correlations between variables and factors. In contrast, Promax rotations are oblique, interrelated and results in component structures that are correlated. The objective in using the two rotations is to provide easier and simpler interpretations. According to Finch (2006) the two approaches are equally able to identify the underlying structures.

The following tables, 22 through 25, show the Varimax rotations. Groupings of dimensions are circled. These groupings will aid in the interpretation and labeling of the components for the PC regression.

Table 22

Europe Varimax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
aatma						0.4745
aatmg			0.4294			0.2640
abac					0.6279	0.1170
abba						0.4381
abbg			0.4773			0.2480
abc					0.6302	0.1225
dbd			0.3167			0.1243
ddc	0.4756					0.0315
ddmba						0.6282
ddmbagdp	0.4603					0.0458
dll			0.3160			0.1150
dpc	0.4759					0.0265
ebc				-0.5572		0.2715
ebnin		0.3409			-0.3065	0.4754
eoc		0.4573				0.2880
eroa				0.5033		0.3641
sca		0.3955				0.2693
scrwa		0.4475				0.3150
sld			-0.5442			0.2665
snim		0.4066				0.3067
sroe				0.4812		0.4698

Table 23

Western Europe Varimax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplained
aatma							-0.5023	0.4250
aatmg		0.5952						0.1390
abac				0.6037				0.0851
abba							-0.4533	0.2227
abbg		0.6144						0.0958
abc				0.5936				0.0533
dbd								0.1255
ddc	0.5185							0.0248
ddmba						-0.6732		0.2766
ddmbagdp	0.5176							0.0482
dll								0.1137
dpc	0.5318							0.0145
ebc			-0.4932					0.2216
ebnin				-0.3871			0.3118	0.3369
eoc			-0.3849		0.3232			0.2236
eroa			0.5299					0.2997
sca						0.4077		0.5025
scrwa							0.5750	0.3079
sld					0.3790			0.1671
snim					0.5995			0.1694
sroe			0.5051					0.3345

Table 24

Central Europe Varimax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplained
aatma	0.3619							0.0911
aatmg		0.4610						0.1429
abac			0.6369					0.1148
abba			-0.4822					0.1807
abbg			-0.3352					0.0447
abc			0.3363					0.0955
dbd		0.5119						0.0925
ddc	0.4516							0.0681
ddmba							0.7190	0.2071
ddmbagdp	0.4102							0.0497
dll		0.4641						0.0844
dpc	0.4256							0.0187
ebc					-0.4367			0.1393
ebnin				0.5240				0.1725
eoc				0.6186				0.1302
eroa					0.5918			0.1720
sca						0.7247		0.1124
scrwa						0.4615		0.2299
sld	0.3438							0.0306
snim				0.3406			0.4288	0.3812
sroe					0.5946			0.1470

Table 25

Eastern Europe Varimax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Unexplained
aatma	0.4193						0.1030
aatmg	0.3813						0.1299
abac					0.6722		0.0557
abba				0. 6030			0.0864
abbg				0.5929			0.0748
abc					0.677		0.0369
dbd						0.4562	0.0290
ddc	0.3874						0.0680
ddmba				0.3837		-0.3053	0.3434
ddmbagdp	0.4327						0.0401
dll						0.4820	0.0602
dpc	0.3990						0.0399
ebc		0.3370	-0.4111				0.2453
ebnin		0.5048					0.1952
eoc		0.5700					0.1397
eroa			0.5878				0.0797
sca		0.3195					0.2227
scrwa							0.3272
sld						-0. 5967	0.1084
snim			0.3941				0.2038
sroe			0.5207				0.1407

Determine a Descriptive Label for each Component Based Upon the Concentration of Variables with the Greatest Loadings

As components are the transformation of the independent variables, they can share multiple aspects of various dimensions. That is to say, components express more than just one dimension or the other. Combinations may express internal (operational) aspects – how efficient banking is managed and the strength and solvency of the institutions. Combinations may also express external (diffusion) dynamics – how accessible is banking to the customer base and the depth of the kinds and number of banking services. When components are blended dimensions they create yet other descriptors of banking development. When a component shares efficiency and stability dimensions, this is an internal operations aspect, and when access and depth are predominant, there is an external aspect of diffusion. These will be used also in the following models.

Interpretation. Variables are Transformed into Components. Examining the combination of the highest loading variables lends insight into the interpretation of the structure of the component. The goal is to find a cluster of variables that define a component (Katchova, 2013.) As the components' structure is interpreted, a meaningful description or theme may be exposed. The components are typically labeled after the themes they express. This descriptive label is helpful in understanding the model following principal component regression.

Europe Summary of Results:

Comp 1-specifically centered on depth metrics, labeled *depth credit*;

Comp 2-mainly combined both efficiency and stability, labeled *operations costs*;

Comp 3-heavily concentrated with access but also includes stability, labeled *access branching*;

Comp 4-mostly combines efficiency and stability, labeled *operations cost*; and,

Comp 5-heavily concentrated with *access metrics, access credit*.

Overall, the highest loadings came from access credit and access concentration

Western Europe Summary of Results:

Comp 1-specifically centered on depth metrics, labeled *depth credit*;

Comp 2-specifically centered on access metrics, labeled *access branches*;

Comp 3-heavily concentrated with efficiency but also includes strong stability, labeled *operations*;

Comp 4-heavily loaded with access metrics, labeled *access concentration*;

Comp 5-heavily concentrated with stability metrics, labeled *depth assets*;

Comp 6-heavily concentrated with depth metrics, labeled *depth assets*; and,

Comp 7-strong concentration of both access and stability metrics, labeled *access atms.*

Overall, the highest loadings came from access and depth.

Central Europe Summary of Results:

Comp 1-mostly centered on depth metrics, labeled *depth credit*;

Comp 2-mostly centered on depth metrics, labeled *depth deposits*;

Comp 3-specifically concentrated with access metrics, labeled *access* *concentration*;

Comp 4-heavily loaded with efficiency metrics, labeled *efficiency costs*;

Comp 5-shares efficiency and stability metrics, labeled *operations return*;

Comp 6-specifically concentrated with stability metrics, labeled *stable capital*; and,

Comp 7-strong concentration of depth metrics, labeled *depth assets*

Overall, the highest loadings came from stable capital and depth assets

Eastern Europe Summary of Results:

Comp 1-shares access and depth metrics, labeled *diffusion assets*;

Comp 2- mostly centered on efficiency metrics, labeled *efficiency margin*;

Comp 3-shares efficiency and stability metrics, labeled *operations return*;

Comp 4-heavily loaded with access metrics, labeled *access branches*;

Comp 5-specifically loaded with access metrics, labeled *access credit*; and

Comp 6-shares depth and stability metrics, labeled *stability leverage*.

Overall, the highest loadings came from solvency capital and depth assets

Below is an example of an initial principal component regression performed to test statistical significance. Tables 26 and 27 illustrate the initial and secondary proposals. Variables in Table 26 that fail to be significant (circled) are deleted in the second regression.

Table 26

Europe 1st PC Regression

Source	SS	Df	MS
Model	3204.52	9	356.057
Residual	3376.95	332	10.1715
Total	6581.47	341	19.3005

Number of obs	=	342
F(9, 332)	=	35.01
Prob > F	=	0
R-squared	=	0.4869
Adj R-squared	=	0.4730
Root MSE	=	3.1893

gd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
cd1	0.9773	0.0723	13.5200	0.0000	0.8351	1.1196
hc	-0.0051	0.0202	-0.2500	0.7990	-0.0448	0.0345
o	0.0114	0.0044	2.5600	0.0110	0.0026	0.0201
s	0.0265	0.0197	1.3500	0.1790	-0.0122	0.0652
pc1	-0.3462	0.0892	-3.8800	0.0000	-0.5216	-0.1707
pc2	-0.0504	0.1270	-0.4000	0.6920	-0.3001	0.1994
pc3	-0.1409	0.1130	-1.2500	0.2130	-0.3633	0.0815
pc4	0.3434	0.1455	2.3600	0.0190	0.0571	0.6297
pc5	-0.2788	0.1512	-1.8400	0.0660	-0.5761	0.0186
_cons	-1.0487	3.3939	-0.3100	0.7580	-7.7250	5.6276

Table 27

Europe 2nd PC Regression

	SS	Df	MS
Model	3167.5	5	633.501
Residual	3413.96	336	10.1606
Total	6581.47	341	19.3005

Number of obs	=	342
F(5, 336)	=	62.35
Prob > F	=	0
R-squared	=	0.4813
Adj R-squared	=	0.4736
Root MSE	=	3.1876

gd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
cd1	0.9894	0.0711	13.9300	0.0000	0.8496	1.1292
o	0.0085	0.0039	2.2100	0.0280	0.0009	0.0161
pc1	-0.4225	0.0694	-6.0900	0.0000	-0.5591	-0.2859
pc4	0.4113	0.1344	3.0600	0.0020	0.1470	0.6756
pc5	-0.2783	0.1438	-1.9400	0.0540	-0.5612	0.0046

Tables for the first and second PC Regression can be found in the Appendix. Tables 28 and 29 summarize the First and Second PC regressions for the four models.

Table 28

Summary of First PC Regression

	Europe	Western Europe	Central Europe	Eastern Europe
Number of observations	342	162	63	117
F Statistic	(9, 332) 35.01	(11, 150) 9.37	(11, 51) 9.37	(10, 106) 10.86
Prob > F	0.000	0.000	0.000	0.000
Adj R-squared	0.4730	0.3638	0.8200	0.4594
Intercept	-1.0487	3.76613	-29.382	-0.8704
	(0.7580)	(0.4530)	(0.1070)	(0.9220)
cd1	0.9773	1.0789	1.301	0.6011
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
hc	-0.0051	-0.0160	0.0019	0.0520
	(0.7990)	(0.4300)	(0.9840)	(0.4470)
o	0.0114	0.0133	0.0872	0.0138
	(0.0110)	(0.0590)	(0.0050)	(0.3680)
s	0.0265	0-.0223	0.2084	-0.0145
	(0.1790)	(0.5940)	(0.0760)	(0.7270)
pc1	-0.3462	-0.1364	0-.6170	-0.6617
	(0.0000)	(0.2990)	(0.0120)	(0.0000)
pc2	-0.0504	-0.0723	-0.5463	-0.5468
	(0.6920)	(0.6080)	(0.1660)	(0.0080)
pc3	-0.1409	0.0580	-0.5217	0.6291
	(0.2130)	(0.6740)	(0.1050)	(0.0270)
pc4	0.3434	0.0922	-0.5383	0.1319
	(0.0190)	(0.5140)	(0.0950)	(0.6420)
pc5	-0.2788	0.3847	1.4816	0.3291
	(0.0660)	(0.0490)	(0.0060)	(0.3420)
pc6		-0.2468	0.4663	-0.3489
		(0.1890)	(0.1280)	(0.3160)
pc7		-0.0051	0.1456	
		(0.9780)	(0.6760)	

Europe Model 1

Cd1 (investment) and pc1 (depth) are both highly significant. *Pc5* (depth narrow) tests significant also. Added to the model is a marginally significant *pc3* (access) at 0.105.

Western Europe Model 2

Control variables *hc, o,* and *s*, as well as principal components *pc1, pc2, pc3, pc4, pc6*, and *pc7* are deleted since they are not statistically significant.

Central Europe Model 3

Three components (*pc2, pc6*, and *pc7*) and one control variables (*hc*) are eliminated since they did not test significant.

Eastern Europe Model 4

Control variables *hc, o, s*, and principal components *pc2, pc4,* and *pc6* are deleted since they are not statistically significant. Following the elimination of the non-statistically significant variables, a second PC Regression is performed. Table 29 summarizes the four tables found in the Appendix.

Table 29

Summary of Second PC Regression

	Europe	**Western Europe**	**Central Europe**	**Eastern Europe**
Number of observations	342	162	63	117
F Statistic	(5, 336) 62.35	(3, 159) 42.49	(9, 53) 33.74	(9, 53) 25.62
Prob > F	0.000	0.000	0.000	0.000
Adj R^2	0.4736	0.4345	0.8262	0.4592
Intercept	1.495 (0.001)	No intercept	-26.661 (0.008)	3.5327 (0.000)
cd1	0.9894 (0.000)	1.110 (0.000)	1.3120 (0.000)	0.6526 (0.000)
Hc	0.0085 (0.028)			
O	0.0114 (0.000)	0.012 (0.000)	0.0853 (0.003)	
S	0.0265 (0.002)		0.1861 (0.062)	
pc1	-0.4225 (0.054)		-0.6033 (0.000)	-.5754 (0.000)
pc2			-0.5891 (0.111)	-.4548 (0.010)
pc3			-0.5254 (0.096)	.3875 (0.111)
pc4	0.4113 (0.002)		-0.5585 (0.038)	
pc5	-0.2783 (0.054)	0.359 (0.029)	1.4760 (0.006)	
pc6			0.4796 (0.108)	
pc7				

Table 30 summarizes the interpretations and labeling of the principal components following Varimax rotation. Next, you should determine a descriptive label for each component. Based upon the concentration of variables with the greatest loadings the components can be logically named.

Table 30

Summary of the Interpretation and Labeling of the Principal Components

	Europe	**Western Europe**	**Central Europe**	**Eastern Europe**
pc1	Depth		Depth	Depth/Access
pc2			Depth	Efficiency
pc3			Access	Efficiency /Stability
pc4	Efficiency		Efficiency	
pc5	Access	Stability	Efficiency/ Stability	
pc6			Stability	
pc7				

The variables are coded in such a way that the clusters can be more accurately determined. Variables that begin with “a” measure access, “d” measure depth, “e” measure efficiency, and “s” measure stability. In several cases, the clusters overlap and include two dimensions. When depth and access overlap, this study labels the component diffusion. Diffusion is the outward contact from banking institutions and customers – the availability of products and services as well as their number and kinds. In cases where efficiency and stability overlap, these dimensions combine to describe the strength of the banking institution’s inward operations. In several cases, components share the same general description derived from the dimensions. These are distinguished by referencing the most significant loading in the cluster:

a) Europe has three clusters – depth, efficiency, and access;

b) Western Europe has one cluster – stability;

c) Central Europe has six clusters – depth of credit, depth of deposits, access,

d) efficiency, operations, and stability; and,

e) Eastern Europe has three clusters – diffusion, efficiency, and operations.

The model should be specified with significant variables and components. From the principal component labels in Table 33 and the coefficients in Table 32 four models are specified:

Europe Model 1

$$gd_e = 1.495 + 0.9894\,capital + 0.0085\,technology + 0.0114\,openness + 0.0265\,government\ spending - 0.4225\,depth + 0.4113\,efficiency - 0.2783\,access + \varepsilon_e \quad (5)$$

Western Europe Model 2

$$gd_w = 1.110\,capital + 0.012\,openness + 0.359\,stability + \varepsilon_w \quad (6)$$

Central Europe Model 3

$$gd_c = -26.661 + 1.3120\,capital + 0.0853\,openness + 0.1861\,government\ spending - 0.6033\,depth\ credit - 0.5891\,depth\ \mathrm{deposits} - 0.5254\,access - 0.5585\,efficiency$$

$$+ \ 1.4760\textit{operations} \ + \ 0.4796\textit{stability} \ + \ \varepsilon_c \qquad (7)$$

Eastern Europe Model 4

$$gd_e \ = \ 3.5327 \ + \ 0.6551\textit{capital} \ - \ 0.5754\textit{diffusion} \ - \ 0.4548\textit{efficiency}$$

$$+ \ 0.3875\textit{operations} \ + \ \varepsilon_e \qquad (8)$$

CHAPTER V – CONCLUSIONS

This chapter summarizes the effects of banking development on economic growth in three regions of Europe. These effects have implications in additional research in growth theory and development policy. A discussion of the specific contributions to the literature provided by this study follows. Next, the limitations of this research are noted. Finally, recommendations for further research are offered.

Effects of Banking Development on Economic Growth

Correlation

Europe, as an aggregate, and three regions of Europe are examined. Each region is characterized by a different level of economic development and is tested for the supply-following hypothesis. The results demonstrate that banking development has a strong correlation with economic growth. Four OLS models test this correlation and find a general association, though the degree of the correlation varies from model to model. The Europe, Western Europe, and Eastern Europe models share similar Adj. R^2s (0.43 to 0.47), but there is a significant outlier with Central Europe (0.81). The p values for the F-statistics in all four models is < 0.000. We conclude the tests support the hypothesis that there is correlation between the independent variables and economic growth.

Control Variables

Based on the literature, OLS models utilize four control variables, though not always at the same time. They are investment, human capital, openness and government spending. This study introduces all four of the variables to the regression equation. The tests demonstrate that investment capital is the single most important contributor. All four regressions indicate this control variable is highly significant ($p < 0.000$). Another control variable, openness, tested well also. Its results are significant or highly significant in three models, Europe ($p < 0.028$), Western Europe ($p < 0.000$) and Central Europe ($p < 0.008$). Openness, as measured by total trade, is statistically significance in the more developed economies of Central and Western Europe, as well as Europe in the aggregate. Future research should include these two variables as controls.

The remaining control variables are determined to be inconsequential. Government spending proved to be significant in only one model, Central Europe. Human capital, as measured by percent of the population with secondary education, was found not to be statistically significant for any of the models.

Independent Variables/Components

The World Bank's guidance in broadening the definition of development led this study to increase the number of proxies for access, depth, efficiency, and solvency significantly. With twenty-one variables multicollinearity issues is of concern. Recent literature provides guidance in the use of principal components, an orthogonal transformation tool which overcomes the problems presented by multicollinearity. Through this method, twenty-one variables are transformed into five to seven components that retain at least 72% of the information of the variances.

As the components are deconstructed into their most significant eigenvectors, they reflect different variable weightings, and can more thoroughly describe the correlation than just the four generalized dimensions. Central and Eastern Europe's greatest association are from depth of products and services available to customers.

Eastern Europe also benefits from the access provided through location and proximity of those products and services. This study has deemed that combination as an externalization of banking, or "diffusion." Diffusion is how banking institution supply customers with banking products and services. The task could be accomplished through establishment of more branches or ATMs.

As the study observes the more developed economies, a greater correlation is evidenced from components reflecting efficiency and solvency. As these dimensions are internal aspects of an institution, combining these two dimensions reveals the significance of the dependency of growth on the "operational" aspects of banking. The models for Central and Western Europe demonstrate this operational correlation, though have weaker strength in their components. This is rational as focus on the strength and solvency of a banking system bears more weight in developed economies.

Summary of Regression Results

Table 31

Model Regression Comparisons

	Europe Model 1	Western Model 2	Central Model 3	Eastern Model 4
Obs	342	162	63	117
F	62.35	42.49	33.74	25.62
(k, N-k)	(5, 336)	(3, 159)	(9, 53)	(10, 106)
P	0.000	0.000	0.000	0.000
Adj R^2	0.4736	0.4345	0.8262	0.4592
B_0 *coef*	1.4954	Suppress	-26.661	3.5327
cd1 *coef (p)*	0.9894 (0.000)	1.100 (0.000)	1.3120 (0.000)	0.6526 (0.000)
Hco *coef (p)*	0.0085 (0.028)	0.0130 (0.000)	0.0853 (0.003)	
s *coef (p)*			0.1861 (0.062)	

pc1 coef (p)	-0.4225 (0.000)		-0.6033 (0.000)	-0.5754 (0.000)
Component	Depth		Depth	Diffusion
% Explains	0.3412		0.3109	0.4136
pc2 coef (p)				-0.4548 (0.010)
Component				Efficiency
% Explains				0.1831
pc3				
pc4 coef (p)	0.4113 (0.002)		-0.5585 (0.038)	
Component	Operations		Efficiency	
% Explains	0.0973		0.0879	
pc5 coef (p)	-0.2783 (0.054)	0.359 (0.023)	1.4760 (0.006)	
Component	Access	Operations	Operations	
% Explains	0.0692	0.0732	0.0782	
pc6				

Eastern Europe, Model 4, following determinations by t tests and re-specification of the model, is characterized by diffusion (access and depth) on growth. This is particularly true since it occurs in the first component which explains 0.4136 of the variance on it's on. This is consistent with the supply-leading hypothesis in the notion that banking development (particularly providing access and depth) correlates and even causes growth. The latter, though, is not the focus of this research.

Central Europe's model draws on the depth dimensionality, more particularly the specific input from amount of private loans provided. It too is the first component and explains 0.3109 of the variance. Depth, like access, is one of the external dynamics.

A first, second, third, or fourth component specification is not included in the Western Europe's Model 2. This lends speculation to the notion that banking development does not affect growth. The direction of causality might change to support the demand-following hypothesis. The remaining statistically significant component, pc5, only explains 0.073 of the variance. This component favors a combination of two dimensions – efficiency and solvency, though the central focus in on limiting costs.

Comparison

The four models vary in their number of qualified components, component loadings, and statistical significance. Table 32 demonstrates the summary of the number of principal components that are significant out of the original model's qualified components.

Table 32

Summary of Significant Principal Components

Model	Europe	Western Europe	Central Europe	Eastern Europe
Significant of Qualified	3 of 5	1 of 7	3 of 5	2 Of 5

One deduction from the analysis is that components have the strongest impact upon Central Europe first, then Eastern Europe, and finally Western Europe. This is consistent with the progressive thought that the less developed economies enjoy the greatest benefit from banking development than the more developed economies.

Theory

The supply-leading hypothesis, particularly as banking development provides banking products and services with increasing availability by number and proximity, fits rationally with this finding. Conversely, the lack of power of these components in developed economies provide less support for the supply-leading hypothesis and increases possibility for the demand- following hypothesis. This can be generalized as less developed economies have a greater dependence on banking development to stimulate growth and the developed economies create demand for more and newer banking products and services. This latter part is the subject of additional causality research.

Contributions to Literature

World Bank (2005) introduced four dimensions to describe financial/ banking development – access, depth, efficiency, and stability. Each of these reflect different aspects of banking and together provide a better description of development. This more thorough measurement has not been fully utilized in testing the supply-leading hypothesis in the literature. This study begins with those four dimensions and contributes three additional alternatives:

a) introduce a significant number of additional banking metrics representing each of the four dimensions:
b) orthogonal transformation of the metrics into principal components analysis; and,
c) use the components to redefine the merged dimensions and provide a newer reflection.

When the dimensions merge through PCA, new aspects surface. Two examples include:

1) The access and depth combination that results in an outward, ”diffusion” reflection; and,
2) The efficiency and stability merger that results in an internalized reflection termed “operations.”

The first example speaks to how well banking institutions diffuse themselves into the economy, reflected by the number of product and services offered and utilized as well as the proximity to the customer. The second speaks to the strength of the institution, its profitable nature, and capital foundation.

This study has contributed to the literature in five ways: understanding of banking development; addition of proxies; adoption of PCA; banking to growth models; and geographic region differences.

Utilized a More Thorough Understanding of "Banking Development;"

By an understanding from World Bank contributors, financial development has been pressed to be further defined with four dimensions. These dimensions – access, depth, efficiency, and solvency – provide a more thorough expression of the dynamics within development. It is expected that by incorporating this refined explanation into a model, a clearer correlation between specific metrics of development can be causality tested.

Incorporated a Significantly Larger Number of Proxies to Fulfill the Thoroughness of Model Specification;

This study has selected four to six different macro and micro metrics to quantify the four dimensions. While previous studies have typically used four or less independent variables, this study expanded the list to twenty-one. These proxies quantify the dynamics of development in a more thorough manner.

Adopted Principal Component Analysis in the Model Building Framework;

For the two reasons of multicollinearity and complexity, principal component analysis is used to create a series of indexes. The proxies are orthogonally transformed to create a potential predictor. Each of the components favor some weighted dimension or combination of dimensions that can further express dynamics.

Develop Models that are Banking to Growth Orientation

Banking development is posited to cause economic growth. The derived components reflected in this study are thought to demonstrate that relationship. The four models that are specified share similarities in the dynamics of the expressions. Though not tested, the differences are expected to be found in the association with growth. Different aspects of development have varying degrees of association. By dividing Europe into three sub-regions, these differences may be heightened and measured.

Focused on a Specific Geographical Region

The growth rates regressed on control variables and components to determine specifications for each of the four models – Europe, Western Europe, Central Europe, and Eastern Europe. Each model is specified with components having similar and or different expressions of underlying dimensions. This is expected as the different regions reflect different growth rates.

Limitations of This Study

There are four principal limitations in this study: depth of the data set, types of proxies, determination of causality, and explanation of negative coefficients.

Data Set is Limited

Accessibility, depth, efficiency and stability have a number of ways to be measured. Though the micro measurements for the banking industry has expanded significantly since 1992, the depth for each of those metrics has been inconsistent. There are variables that would better suit to express the associative relationship and the causal power, but the period for which the data has been recorded and the breath of countries reporting is limited.

Improve Types of Proxies

The number of banking metrics is continuing to expand by the World Bank, United States, and European Central Bank reporting requirements. As the institutions harmonize their information requirements and data sets, more specific asset and liability classes, as well as numerous kinds of banking services, can be captured. This adds to the thoroughness of measuring banking development.

Determination of Causality

Based upon the Adj. R^2, each of the four models indicates the associative power of banking development with economic growth. Different growth rates for the regions associated with varying dynamics. This study does not test for direction of causality. This is the greatest unresolved issue with this study.

Explanation of the Negative Coefficients

The goal of regression using the components is to provide a better understanding of the relationships of the underlying structures of the data and growth. These structures are formed from the loadings of the variables that go to form the components. If the coefficients and loadings for the components in the model have a meaningful interpretations, then the goal is achieved.

Interpretation of the principal components is based on the variables that are most strongly correlated with each component. Interpretations are clearer when the coefficients are positive. However, in each of this study's models, there are significant components with negative coefficients. As these coefficients reflect the signs of the loadings, interpretations are not always clear or may be counter-intuitive (Jolliffe, 1982).

Further Study and Research

There are three principal directions the research could proceed in investigating the supply-leading hypothesis: direction of causality, improvement in selection of proxies, and cross country effects.

Short and Long Run Direction of Causality

This study only reviews the correlation between banking development and economic growth. As a result, causality cannot be inferred. Incorporation of statistical tools like panel vector autoregression may provide this next step in the direction of the causality - even discriminating between lesser developed and developed economies.

Improved Depth and Selection of Proxies

The banking data sets will continue to deepen both by backfilling from secondary sources as well as the additions of years going forward. New metrics can refine the meaning of the four dimensions of development proffered by the World Bank - access, depth, efficiency, and stability. The richness of the description of development and the discovery of new causalities from the created proxies could open opportunities to establish effective policies.

Cross Country Effects

Commercial banking in evolved economies tend to seek opportunities outside of their domiciled countries. They are often the first to branch across borders to seek additional opportunities for their own growth. As a result, this could provide a stimulus to lesser developed economies. The network of Western European banks branching or merging with banks in Central and Eastern Europe is similar to a foreign direct investment. That dynamic has not been analyzed in the literature.

APPENDIX A – This Appendix Needs A Title – Ask me how to enter it

Table A1.

Europe Variable Summary

Variable	Obs	Mean	Std. Dev.	Min	Max
c	380	23.4087	4.9026	12.0216	39.7616
cd1	342	-0.3007	2.4932	-12.4118	10.5716
hc	380	100.5879	11.4840	75.6674	165.5813
o	380	107.9236	49.6603	45.5866	348.3930
s	380	103.2341	13.0495	66.3444	152.7845
aatma	380	67.5191	36.1586	3.0291	193.8656
aatmg	380	83.1035	102.2868	2.4900	670.6600
abac	380	79.1938	18.5587	30.7109	100.0000
abba	380	33.8735	22.6498	0.9124	110.9829
abbg	380	46.1524	72.1656	0.6200	456.0600
abc	380	68.8673	22.2882	20.2151	100.0000
dbd	380	75.2210	61.0226	8.6350	394.5970
ddc	380	91.7945	58.4315	6.9906	305.0869
ddmba	380	97.8564	3.4431	74.9437	100.0000
ddmbagdp	380	100.7347	61.2017	7.8809	349.9944
dll	380	83.5584	61.1170	13.6977	399.1144
dpc	380	88.4027	58.2493	5.8586	313.8509
ebc	380	62.7410	20.2184	22.8181	218.0870
ebnin	380	36.1670	13.9666	2.2750	84.5121
eoc	380	3.3120	3.0961	0.0969	25.0085
eroa	380	0.6544	2.2862	-28.0775	9.6546
sca	380	8.7925	4.3098	2.7000	23.6000
scrwa	380	15.5692	4.6580	6.6480	34.9000
sld	380	129.6799	54.3269	19.4593	313.3344
snim	380	3.5174	2.4092	0.1248	14.6361
sroe	380	7.7744	12.9929	-46.7819	102.4622
g	380	7.34E+12	4.77E+13	4.53E+09	6.49E+14
gd	380	2.3626	4.3609	-14.8142	13.8657

Table A2.

Test for Multivariate Normality

Doornik-Hansen		
chi^2 (56)	=	28619.6
Prob > chi^2	=	0.0000

Table A3.

Test that correlation matrix is compound symmetric

Lawley		
chi^2 (377)	=	12222.22
Prob > chi^2	=	0.0000

Table A4.

Skewness/Kurtosis Test for Normality

Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	------- joint ------ adj $chi^2(2)$	Prob>chi^2
c	380	0	0.0001	53.02	0.0000
cd1	342	0	0	47.76	0.0000
hc	380	0	0	56.65	0.0000
o	380	0	0	.	0.0000
s	380	0	0	34.82	0.0000
aatma	380	0	0.0028	37.85	0.0000
aatmg	380	0	0	.	0.0000
abac	380	0	0.0005	29.53	0.0000
abba	380	0	0.0003	60.72	0.0000
abbg	380	0	0	.	0.0000
abc	380	0.207	0	.	0.0000
dbd	380	0	0	.	0.0000
ddc	380	0	0.0137	43.78	0.0000
ddmba	380	0	0	.	0.0000
ddmbagdp	380	0	0.0058	43.49	0.0000
dll	380	0	0	.	0.0000

dpc	380	0	0.0158	42.99	0.0000
ebc	380	0	0	.	0.0000
ebnin	380	0	0.0012	30.86	0.0000
eoc	380	0	0	.	0.0000
eroa	380	0	0	.	0.0000
sca	380	0	0.0013	58.96	0.0000
scrwa	380	0	0	.	0.0000
sld	380	0	0	66.42	0.0000
snim	380	0	0	.	0.0000
sroe	380	0	0	.	0.0000
g	380	0	0	.	0.0000
gd	380	0	0	40.88	0.0000

Table A5.

Shapiro – Wilk Test for Normality

Variable	Obs	W	V	z	Prob > z
c	380	0.9215	20.6320	7.1850	0.0000
cd1	342	0.9223	18.5960	6.9040	0.0000
hc	380	0.9513	12.8150	6.0550	0.0000
o	380	0.8303	44.6190	9.0160	0.0000
s	380	0.9420	15.2440	6.4670	0.0000
aatma	380	0.9468	13.9780	6.2610	0.0000
aatmg	380	0.6865	82.4300	10.4730	0.0000
abac	380	0.9335	17.4810	6.7920	0.0000
abba	380	0.8953	27.5220	7.8690	0.0000
abbg	380	0.5497	118.4120	11.3330	0.0000
abc	380	0.9657	9.0170	5.2200	0.0000
dbd	380	0.7217	73.1790	10.1900	0.0000
ddc	380	0.9162	22.0400	7.3420	0.0000
ddmba	380	0.6488	92.3530	10.7430	0.0000
ddmbagdp	380	0.9227	20.3250	7.1500	0.0000
dll	380	0.7501	65.7040	9.9350	0.0000
dpc	380	0.9161	22.0600	7.3440	0.0000
ebc	380	0.7017	78.4450	10.3550	0.0000
ebnin	380	0.9668	8.7360	5.1450	0.0000
eoc	380	0.6851	82.8150	10.4840	0.0000
eroa	380	0.5543	117.2000	11.3080	0.0000

sca	380	0.8791	31.7850	8.2110	0.0000
scrwa	380	0.8791	31.7830	8.2110	0.0000
sld	380	0.9134	22.7730	7.4190	0.0000
snim	380	0.8678	34.7690	8.4240	0.0000
sroe	380	0.7779	58.4110	9.6550	0.0000
g	380	0.1290	229.0410	12.8990	0.0000
gd	380	0.9606	10.3730	5.5530	0.0000

Table A6.

Balanced Data Sets

Time Series	
tsset cc year, yearly	
panel variable:	cc (strongly balanced)
time variable:	year, 2004 to 2013
delta:	1 year

Table A7.

Balance Data Sets

Panel	
xtset cc year, yearly	
panel variable:	cc (strongly balanced)
time variable:	year, 2004 to 2013
delta:	1 year

Table A8.

Unit Root Tests for Control and Independent Variables

Levin-Lin-Chu unit-root test for *cd1*			
Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	9
	Statistic	p-value	
Unadjusted t	-18.9366		
Adjusted t*	-14.1921	0.0000	

Levin-Lin-Chu unit-root test for *hc*			
Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-5.6825		
Adjusted t*	1.3554	0.9124	

Levin-Lin-Chu unit-root test for *o*			
Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-11.5156		
Adjusted t*	-6.8388	0.0000	

Levin-Lin-Chu unit-root test for *s*			
Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-7.7604		

Adjusted t*	-3.1507	0.0008

Levin-Lin-Chu unit-root test for *aatma*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-31.9657		
Adjusted t*	-34.0419	0.0000	

Levin-Lin-Chu unit-root test for *aatmg*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-15.3781		
Adjusted t*	-14.6710	0.0000	

Levin-Lin-Chu unit-root test for *abba*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-7.1944		
Adjusted t*	-4.0112	0.0000	

Levin-Lin-Chu unit-root test for *abbg*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	

Unadjusted t	-8.3145	
Adjusted t*	-4.8379	0.0000

Levin-Lin-Chu unit-root test for *abc*			
Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-13.3347		
Adjusted t*	-7.5286	0.0000	

Levin-Lin-Chu unit-root test for *dbd*			
Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-10.7771		
Adjusted t*	-8.7248	0.0000	

Levin-Lin-Chu unit-root test for *ddc*			
Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-12.2143		
Adjusted t*	-8.3568	0.0000	

Levin-Lin-Chu unit-root test for *ddmba*			
Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10

	Statistic	p-value
Unadjusted t	-2.6e+02	
Adjusted t*	-2.8e+02	0.0000

Levin-Lin-Chu unit-root test for *ddmbagdp*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-11.9844		
Adjusted t*	-9.7674	0.0000	

Levin-Lin-Chu unit-root test for *dll*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-10.7728		
Adjusted t*	-8.8401	0.0000	

Levin-Lin-Chu unit-root test for *dpc*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-11.7122		
Adjusted t*	-9.4764	0.0000	

Levin-Lin-Chu unit-root test for *ebc*

Ho: Panels contain unit roots Number of panels = 38

Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-10.5847		
Adjusted t*	-5.0224	0.0000	

Levin-Lin-Chu unit-root test for *ebnin*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-13.0732		
Adjusted t*	-9.3177	0.0000	

Levin-Lin-Chu unit-root test for *eoc*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-10.2600		
Adjusted t*	-3.8530	0.0001	

Levin-Lin-Chu unit-root test for *eroa*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-6.8535		
Adjusted t*	-0.7679	0.2213	

Levin-Lin-Chu unit-root test for *sca*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-10.2255		
Adjusted t*	-5.3124	0.0000	

Levin-Lin-Chu unit-root test for *scrwa*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-8.6615		
Adjusted t*	-3.4160	0.0003	

Levin-Lin-Chu unit-root test for *sld*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-14.1218		
Adjusted t*	-10.0117	0.0000	

Levin-Lin-Chu unit-root test for *snim*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-10.6524		
Adjusted t*	-4.1116	0.0000	

Levin-Lin-Chu unit-root test for *sroe*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-6.8469		
Adjusted t*	-1.1107	0.1334	

Levin-Lin-Chu unit-root test for *g*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-9.6081		
Adjusted t*	-7.6282	0.0000	

Levin-Lin-Chu unit-root test for *gd*

Ho: Panels contain unit roots		Number of panels =	38
Ha: Panels are stationary		Number of periods =	10
	Statistic	p-value	
Unadjusted t	-12.4864		
Adjusted t*	-7.4896	0.0000	

Table A9.

LLC Unit Root Summary

Lag(s)	0		1		2	
Variables	Stat	p-value	Stat	p-value	Stat	p-value
c	-0.129	0.449	-5.098	0.000	-14.600	0.000
hc	-10.787	0.000	1.483	0.931	-1.906	0.028
o	-5.867	0.000	-6.775	0.000	-10.503	0.000
s	-2.716	0.003	-3.564	0.000	-13.086	0.000
aatma	-3.407	0.000	-32.361	0.000	-82.118	0.000
aatmg	-3.078	0.001	-17.003	0.000	-3.262	0.001
abac	-8.992	0.000	-3.610	0.000	-8.239	0.000
abba	-2.844	0.002	-4.489	0.000	-14.839	0.000
abbg	-2.553	0.005	-4.652	0.000	-13.061	0.000
abc	-17.254	0.000	-7.449	0.000	-18.374	0.000
dbd	-3.781	0.000	-9.350	0.000	-9.227	0.000
ddc	-9.042	0.000	-8.860	0.000	-4.663	0.000
ddmba	-21.488	0.000	-290.000	0.000	-580.000	0.000
ddmbagdp	-6.497	0.000	-10.133	0.000	-7.162	0.000
dll	-4.664	0.000	-9.310	0.000	-9.888	0.000
dpc	-4.196	0.000	-9.821	0.000	-7.050	0.000
ebc	-6.857	0.000	-5.820	0.000	-10.678	0.000
ebnin	-7.819	0.000	-9.415	0.000	-9.595	0.000
eoc	-12.146	0.000	-4.347	0.000	-11.237	0.000
eroa	-8.003	0.000	-1.155	0.124	-11.324	0.000
sca	-3.634	0.000	-4.881	0.000	-12.536	0.000
scrwa	-2.248	0.012	-3.671	0.000	-8.294	0.000
sld	-25.964	0.000	-10.187	0.000	-6.761	0.000
snim	-11.581	0.000	-4.592	0.000	-16.810	0.000
snpl	14.664	1.000	-0.962	0.168	-3.466	0.000
sroe	-6.944	0.000	-1.553	0.060	-9.401	0.000
g	-6.025	0.000	-8.060	0.000	-9.847	0.000
gd	-10.078	0.000	-7.821	0.000	-16.952	0.000
gi	-5.796	0.000	-7.894	0.000	-10.165	0.000

Table A10.

Independent Variables Data Set: Summarized Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
aatma	380	67.5191	36.1586	3.0291	193.8656
aatmg	380	83.1035	102.2868	2.4900	670.6600
abac	380	79.1938	18.5587	30.7109	100.0000
abba	380	33.8735	22.6498	0.9124	110.9829
abbg	380	46.1524	72.1656	0.6200	456.0600
abc	380	68.8673	22.2882	20.2151	100.0000
dbd	380	75.2210	61.0226	8.6350	394.5970
ddc	380	91.7945	58.4315	6.9906	305.0869
ddmba	380	97.8564	3.4431	74.9437	100.0000
ddmbagdp	380	100.7347	61.2017	7.8809	349.9944
dll	380	83.5584	61.1170	13.6977	399.1144
dpc	380	88.4027	58.2493	5.8586	313.8509
ebc	380	62.7410	20.2184	22.8181	218.0870
ebnin	380	36.1670	13.9666	2.2750	84.5121
eoc	380	3.3120	3.0961	0.0969	25.0085
eroa	380	0.6544	2.2862	-28.0775	9.6546
sca	380	8.7925	4.3098	2.7000	23.6000
scrwa	380	15.5692	4.6580	6.6480	34.9000
sld	380	129.6799	54.3269	19.4593	313.3344
snim	380	3.5174	2.4092	0.1248	14.6361
sroe	380	7.7744	12.9929	-46.7819	102.4622

Table A11.

Western Europe Independent Variables Data Set: Summarized Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
aatma	180	87.6058	35.7644	35.7086	193.8656
aatmg	180	137.4182	126.8137	5.3200	670.6600
abac	180	75.9525	22.0714	32.3004	100.0000
abba	180	42.8390	25.2283	9.0608	110.9829
abbg	180	76.9547	95.1948	1.0200	456.0600
abc	180	67.2528	26.3020	21.6954	100.0000
dbd	180	112.9061	70.3289	39.4230	394.5970
ddc	180	138.7399	50.3008	64.9539	305.0869

ddmba	180	98.6595	1.8814	86.7760	99.9971
ddmbagdp	180	151.1292	50.8895	68.6325	349.9944
dll	180	121.4260	69.7569	42.9302	399.1144
dpc	180	135.8539	49.2488	64.4482	313.8509
ebc	180	64.2234	26.3932	22.8181	218.0870
ebnin	180	37.2922	13.3912	2.2750	79.2517
eoc	180	2.1370	2.1759	0.0969	25.0085
eroa	180	0.1444	2.6937	-28.0775	2.9755
sca	180	5.7754	1.5193	2.7000	13.7000
scrwa	180	13.5217	2.7392	6.6480	21.3000
sld	180	141.3073	58.5281	33.5964	313.3344
snim	180	2.1101	1.0876	0.1248	6.7613
sroe	180	6.1090	11.1513	-43.8604	57.7697

Table A12.

Central Europe Independent Variables Data Set: Summarize Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
aatma	70	53.3871	15.6994	25.3817	89.4657
aatmg	70	35.2974	14.4940	14.0700	61.7100
abac	70	83.2825	13.7834	52.5622	100.0000
abba	70	24.7702	5.7412	13.7258	36.0952
abbg	70	17.9083	9.3685	3.6700	35.8600
abc	70	77.9099	19.3187	37.6370	100.0000
dbd	70	45.3111	10.4133	23.8824	68.7442
ddc	70	57.8556	19.4816	28.0644	105.1089
ddmba	70	99.0430	1.3730	93.9271	99.9902
ddmbagdp	70	64.8979	16.4066	29.5956	112.6572
dll	70	55.1607	11.8101	31.6631	79.2776
dpc	70	55.4487	18.8491	24.6021	110.0047
ebc	70	60.4136	13.4178	30.3371	94.2771
ebnin	70	32.9582	15.2039	8.9888	84.5121
eoc	70	3.4407	3.3913	0.9072	19.4468
eroa	70	0.9701	1.7842	-6.2160	9.6546
sca	70	8.4207	1.5945	5.2000	12.6200
scrwa	70	14.0466	2.8322	10.1000	22.3210
sld	70	140.6233	62.2406	52.5643	278.4113
snim	70	3.2237	2.2438	1.3596	14.1955

sroe	70	12.7798	19.9773	-34.0630	102.4622

Table A13.

Eastern Europe Independent Variables Data Set: Summarized Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
aatma	130	47.31624	29.18673	3.02905	113.6555
aatmg	130	33.64031	22.12417	2.49	91.58
abac	130	81.48016	14.32957	30.71094	100
abba	130	26.36157	19.81019	0.9123738	90.60992
abbg	130	18.71131	12.79128	0.62	55.09
abc	130	66.23365	15.65014	20.21511	100
dbd	130	39.14689	15.51082	8.63496	74.3785
ddc	130	45.06794	20.41150	6.990648	92.28816
ddmba	130	96.10555	4.914932	74.94372	99.99996
ddmbagdp	130	50.25458	21.41585	7.880902	103.2874
dll	130	46.41737	17.85836	13.69774	84.561
dpc	130	40.44542	19.08216	5.858646	91.77833
ebc	130	61.94148	11.46536	27.66987	95.46233
ebnin	130	36.33692	13.90119	12.09701	80.69168
eoc	130	4.869558	3.325854	1.394175	20.36304
eroa	130	1.190482	1.696409	-4.081799	8.51485
sca	130	13.17033	4.232842	4.800000	23.6
scrwa	130	19.22411	5.3361	10.50000	34.9
sld	130	107.6876	33.23847	19.45933	205.3811
snim	130	5.624199	2.331181	1.603556	14.63614
sroe	130	7.385164	9.609165	-46.78189	29.05024

Table A14.

Europe Independent Variables PairWise Correlation

A.

Variable	*aatma*	*aatmg*	*abac*	*abba*	*abbg*	*abc*	*dbd*
aatma	1						
aatmg	0.3634	1					
abac	-0.1822	-0.0203	1				
abba	0.5525	0.315	-0.2826	1			
abbg	0.1656	0.9111	-0.0061	0.4172	1		
abc	-0.1214	0.0156	0.8909	-0.2403	0.0349	1	
dbd	0.4622	0.4919	-0.1478	0.6015	0.4969	-0.063	1
ddc	0.5674	0.3788	-0.0738	0.4998	0.3151	0.0278	0.704
ddmba	0.3626	0.169	-0.1453	0.251	0.1058	-0.1196	0.1719
ddmbagdp	0.5875	0.4496	-0.0715	0.4798	0.3586	0.0277	0.7056
dll	0.4572	0.5021	-0.1416	0.604	0.5109	-0.0577	0.9957
dpc	0.5819	0.4005	-0.0768	0.4818	0.3169	0.0254	0.6956
ebc	-0.0861	0.2522	0.0306	-0.0949	0.2486	0.0711	-0.0798
ebnin	-0.0223	-0.0028	-0.3601	0.026	-0.0136	-0.3184	0.1195
eoc	-0.3335	-0.1623	-0.0239	-0.2418	-0.0823	-0.0677	-0.315
eroa	-0.1438	-0.2025	0.0006	-0.104	-0.19	-0.0816	-0.1337
sca	-0.4634	-0.3608	0.0788	-0.3388	-0.251	0.002	-0.4594
scrwa	-0.412	-0.1968	0.044	-0.3185	-0.1471	-0.0448	-0.2221
sld	0.1343	-0.1883	-0.1202	-0.0433	-0.2145	0.0076	-0.2436
snim	-0.4478	-0.3608	0.0738	-0.3304	-0.272	-0.0324	-0.4355
sroe	-0.1031	-0.2031	0.0374	0.006	-0.1686	0.0081	-0.0332

B.

Variable	*ddc*	*ddmba*	*ddmbagdp*	*dll*	*dpc*	*ebc*
ddc	1					
ddmba	0.2569	1				
ddmbagdp	0.9767	0.2449	1			
dll	0.714	0.1651	0.7166	1		
dpc	0.9882	0.2753	0.991	0.7063	1	
ebc	-0.0773	0.0275	-0.0508	-0.0811	-0.0674	1
ebnin	0.0338	0.0227	0.0413	0.1053	0.0477	0.0988
eoc	-0.3321	-0.1811	-0.3356	-0.3217	-0.3357	0.4066

eroa	-0.1771	-0.1002	-0.1947	-0.1371	-0.1865	-0.506
sca	-0.5869	-0.3158	-0.6094	-0.4723	-0.5937	0.0184
scrwa	-0.4353	-0.3854	-0.4238	-0.2257	-0.4142	-0.051
sld	0.3528	0.2389	0.2926	-0.2299	0.3559	-0.0342
snim	-0.4699	-0.3887	-0.4841	-0.4449	-0.4859	-0.0915
sroe	-0.1012	-0.0932	-0.1292	-0.0342	-0.1156	-0.4054

C.

Variable	*eoc*	*eroa*	*sca*	*scrwa*	*sld*	*snim*	*sroe*
eoc	1						
eroa	-0.025	1					
sca	0.516	0.2	1				
scrwa	0.3746	0.2412	0.7452	1			
sld	-0.0526	-0.0844	-0.172	-0.2756	1		
snim	0.5717	0.3441	0.6892	0.575	-0.1395	1	
sroe	-0.0549	0.5372	0.054	0.0474	-0.0584	0.1667	1

Table A15.

Western Europe Independent Variables PairWise Correlation

A.

Variable	*aatma*	*aatmg*	*abac*	*abba*	*abbg*	*abc*	*dbd*
aatma	1						
aatmg	0.0747	1					
abac	-0.2086	0.0891	1				
abba	0.5048	0.1583	-0.263	1			
abbg	-0.1015	0.9039	0.1011	0.3047	1		
abc	-0.2564	0.0872	0.9561	-0.2666	0.1198	1	
dbd	0.1944	0.2682	-0.0926	0.581	0.349	-0.0459	1
ddc	0.1394	-0.0492	0.1033	0.3845	0.0048	0.0887	0.5026
ddmba	0.2008	0.0421	-0.1257	-0.0871	-0.0737	-0.2305	0.0294
ddmbagdp	0.1788	0.069	0.0911	0.3605	0.0727	0.0826	0.4803
dll	0.1872	0.2868	-0.0941	0.581	0.3702	-0.0484	0.997
dpc	0.1699	-0.0166	0.091	0.3465	-0.0003	0.0762	0.4752
ebc	-0.1988	0.2822	0.1255	-0.216	0.2662	0.1653	-0.1637
ebnin	0.0979	-0.0427	-0.3917	0.0533	-0.0719	-0.3407	0.2255
eoc	-0.1652	0.1243	-0.0104	-0.0918	0.1904	-0.0027	-0.1522

eroa	0.0649	-0.104	-0.1538	0.0515	-0.1238	-0.2014	0.0203
sca	-0.0364	0.0368	0.322	-0.0136	0.194	0.3821	-0.0242
scrwa	-0.0486	0.1926	-0.0379	-0.1032	0.1466	-0.066	0.254
sld	-0.2261	-0.4637	-0.0799	-0.262	-0.4189	-0.1434	-0.5845
snim	-0.129	-0.141	-0.0554	0.0096	-0.0578	-0.0995	-0.2081
sroe	0.1021	-0.2232	-0.1385	0.1736	-0.2055	-0.1866	0.1185

B.

Variable	*ddc*	*ddmba*	*ddmbagdp*	*dll*	*dpc*	*ebc*	*ebnin*
ddc	1						
ddmba	-0.0186	1					
ddmbagdp	0.9559	-0.0323	1				
dll	0.5191	0.0199	0.5003	1			
dpc	0.9752	0.0438	0.9844	0.492	1		
ebc	-0.2329	-0.1095	-0.201	-0.1576	-0.2238	1	
ebnin	0.0834	-0.092	0.0888	0.2278	0.0941	-0.0716	1
eoc	-0.0527	-0.1812	-0.0609	-0.136	-0.0783	0.7031	-0.0643
eroa	0.0511	0.1729	0.0197	0.0137	0.0347	-0.514	0.1202
sca	-0.0571	-0.2359	-0.0691	-0.0067	-0.0855	0.0487	-0.0768
scrwa	-0.0605	0.1841	-0.0032	0.2675	-0.0005	-0.0454	0.2001
sld	0.1937	0.1121	0.1403	-0.5727	0.2147	-0.0657	-0.0867
snim	0.1636	-0.242	0.1528	-0.1828	0.119	-0.0371	-0.2012
sroe	0.0907	0.1358	0.0067	0.1046	0.0296	-0.5224	0.0732

C.

Variable	*eoc*	*eroa*	*sca*	*scrwa*	*sld*	*snim*	*Sroe*
eoc	1						
eroa	-0.451	1					
sca	0.071	-0.0452	1				
scrwa	-0.184	0.0765	0.2422	1			
sld	0.1249	0.0474	-0.0759	-0.2071	1		
snim	0.3993	0.096	0.1243	-0.3143	0.3436	1	
sroe	-0.2875	0.5106	-0.0738	-0.077	-0.0404	0.2427	1

Table A16.

Central Europe Independent Variables Pair Wise Correlation

A.

Variable	*aatma*	*aatmg*	*abac*	*abba*	*abbg*	*abc*	*dbd*
aatma	*1*						
aatmg	-0.287	1					
abac	0.4021	-0.0334	1				
abba	-0.1393	-0.1533	-0.4994	1			
abbg	-0.6276	0.7622	-0.4112	0.3162	1		
abc	0.6466	-0.5072	0.5749	-0.1454	-0.7914	1	
dbd	0.0234	0.6661	0.2064	-0.3064	0.4503	-0.2106	1
ddc	0.8314	-0.3841	0.1427	0.0458	-0.6415	0.5708	-0.1095
ddmba	0.072	-0.0496	0.0398	0.2865	0.2256	-0.1929	0.1334
ddmbagdp	0.8395	-0.1069	0.3132	-0.2198	-0.5367	0.59	0.1784
dll	0.2872	0.5293	0.3805	-0.4708	0.1808	-0.0088	0.8634
dpc	0.8967	-0.3451	0.2776	-0.1374	-0.6908	0.6623	-0.0172
ebc	-0.3233	0.0065	0.0595	0.0794	0.0184	0.0819	-0.3187
ebnin	-0.2816	0.2398	-0.2885	-0.2241	0.1585	-0.2211	-0.0316
eoc	0.2427	0.0595	0.1582	-0.3917	-0.2026	0.0595	-0.0029
eroa	0.2596	-0.0795	0.218	-0.2912	-0.1436	-0.0599	0.0658
sca	0.43	-0.2033	0.3292	-0.0018	-0.3426	0.571	-0.2465
scrwa	0.5531	-0.0223	0.2928	-0.259	-0.2151	0.347	0.3678
sld	0.6202	-0.6352	-0.0609	0.2505	-0.7184	0.6324	-0.5494
snim	0.3181	-0.0778	0.1061	-0.3389	-0.1802	0.0315	0.0922
sroe	-0.0256	-0.1881	0.1938	-0.0717	-0.1141	0.0928	-0.1128

B.

Variable	*ddc*	*ddmba*	*ddmbagdp*	*dll*	*dpc*	*ebc*	*ebnin*
ddc	1						
ddmba	-0.0615	1					
ddmbagdp	0.8251	-0.1838	1				
dll	0.0724	0.0941	0.3094	1			
dpc	0.9128	-0.1282	0.9565	0.1656	1		
ebc	-0.2625	-0.1441	-0.2285	-0.4483	-0.2843	1	
ebnin	-0.2365	-0.2717	-0.1012	-0.1346	-0.1928	0.4111	1
eoc	0.2538	-0.034	0.3352	0.0236	0.285	0.2372	0.5674

eroa	0.1275	0.07	0.1487	0.2183	0.1734	-0.4233	-0.0839
sca	0.1394	-0.0946	0.3052	-0.1022	0.3411	0.1326	-0.1084
scrwa	0.2806	0.042	0.5615	0.3948	0.5184	-0.3203	-0.1956
sld	0.767	-0.2141	0.6099	-0.3785	0.7572	-0.049	-0.118
snim	0.2115	0.0835	0.287	0.0843	0.2827	-0.1216	-0.075
sroe	-0.1087	-0.2525	-0.0897	-0.0461	-0.0119	-0.2257	-0.0433

C.

Variable	*eroa*	*sca*	*scrwa*	*sld*	*snim*	*sroe*
eroa	1					
sca	0.0102	1				
scrwa	0.2329	0.4356	1			
sld	-0.0929	0.3806	0.1311	1		
snim	0.2935	0.1183	0.4159	-0.0403	1	
sroe	0.5048	0.2664	0.1068	0.0264	-0.0135	1

Table A17.

Eastern Europe Independent Variables Pair Wise Correlation

A.

Variable	*aatma*	*aatmg*	*abac*	*abba*	*abbg*	*abc*	*dbd*
aatma	1						
aatmg	0.9572	1					
abac	-0.02	0.0311	1				
abba	0.3977	0.3617	-0.1643	1			
abbg	0.4274	0.4515	-0.1371	0.9723	1		
abc	0.0071	0.0072	0.9335	-0.185	-0.196	1	
dbd	0.653	0.6307	0.0535	0.422	0.4423	0.1018	1
ddc	0.8576	0.8354	-0.0665	0.3832	0.3982	-0.0723	0.6388
ddmba	0.4462	0.4058	-0.2188	0.458	0.4655	-0.2217	0.1715
ddmbagdp	0.8601	0.8446	0.0171	0.3147	0.3536	0.0392	0.8226
dll	0.4924	0.4938	0.0621	0.4513	0.4722	0.0693	0.9525
dpc	0.87	0.8618	-0.079	0.4202	0.4506	-0.0927	0.7035
ebc	0.1085	0.0331	-0.3649	0.143	0.1015	-0.3553	0.0632
ebnin	-0.283	-0.323	-0.3486	-0.069	-0.1009	-0.3274	-0.4545
eoc	-0.3415	-0.4092	-0.3457	-0.1762	-0.2295	-0.2831	-0.4259
eroa	-0.4012	-0.4049	0.2326	-0.2109	-0.2397	0.2792	-0.3548

sca	-0.3588	-0.3996	-0.3832	-0.3265	-0.3784	-0.3529	-0.5701
scrwa	-0.5797	-0.5927	-0.0794	-0.386	-0.4327	-0.0559	-0.5237
sld	0.4307	0.4289	-0.2225	0.1129	0.1209	-0.3061	-0.1495
snim	-0.4932	-0.5585	-0.0235	-0.4092	-0.4813	0.0541	-0.5906
sroe	-0.4187	-0.4201	0.1999	-0.0819	-0.1044	0.2283	-0.2626

B.

Variable	*ddc*	*ddmba*	*ddmbagdp*	*dll*	*dpc*	*ebc*	*ebnin*
ddc	1						
ddmba	0.4186	1					
ddmbagdp	0.8848	0.3389	1				
dll	0.556	0.0903	0.7163	1			
dpc	0.9687	0.4453	0.9309	0.6216	1		
ebc	0.0849	0.2309	0.1085	0.0108	0.1398	1	
ebnin	-0.2972	0.1545	-0.3347	-0.4862	-0.2493	0.4142	1
eoc	-0.365	-0.0352	-0.3242	-0.4768	-0.3245	0.4411	0.8092
eroa	-0.4921	-0.2772	-0.4639	-0.3443	-0.5306	-0.5501	-0.0156
sca	-0.3884	-0.0662	-0.4579	-0.6074	-0.369	0.2015	0.5304
scrwa	-0.6112	-0.3752	-0.5953	-0.4746	-0.588	0.0361	0.4105
sld	0.5985	0.3983	0.3114	-0.1994	0.5325	0.0639	0.0592
snim	-0.5408	-0.3003	-0.5342	-0.6174	-0.5805	-0.203	0.2513
sroe	-0.4631	-0.308	-0.4705	-0.2122	-0.5247	-0.5241	-0.1421

C.

Variable	*eoc*	*eroa*	*sca*	*scrwa*	*sld*	*snim*	*sroe*
eoc	1						
eroa	0.0282	1					
sca	0.578	0.2203	1				
scrwa	0.4453	0.3273	0.7284	1			
sld	-0.0188	-0.3081	0.135	-0.2702	1		
snim	0.5377	0.6221	0.5304	0.5483	-0.1254	1	
sroe	-0.0679	0.8678	0.0442	0.1807	-0.3549	0.4432	1

Table A18.

Europe PCA Eigenvalues and Proportions

Principal components/correlation	Number of obs	=	380
Rotation: unrotated	Number of comps	=	21
	Trace	=	21
	Rho	=	1

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	7.1659	4.8000	0.3412	0.3412
Comp2	2.3658	0.0544	0.1127	0.4539
Comp3	2.3115	0.2689	0.1101	0.5640
Comp4	2.0426	0.5901	0.0973	0.6612
Comp5	1.4525	0.4980	0.0692	0.7304
Comp6	0.9545	0.1052	0.0455	0.7758
Comp7	0.8494	0.0657	0.0404	0.8163
Comp8	0.7837	0.0838	0.0373	0.8536
Comp9	0.6999	0.1749	0.0333	0.8869
Comp10	0.5250	0.0666	0.0250	0.9119
Comp11	0.4584	0.0392	0.0218	0.9338
Comp12	0.4192	0.0918	0.0200	0.9537
Comp13	0.3273	0.1367	0.0156	0.9693
Comp14	0.1906	0.0089	0.0091	0.9784
Comp15	0.1817	0.0315	0.0087	0.9870
Comp16	0.1502	0.0772	0.0072	0.9942
Comp17	0.0731	0.0468	0.0035	0.9977
Comp18	0.0263	0.0107	0.0013	0.9989
Comp19	0.0156	0.0120	0.0007	0.9997
Comp20	0.0036	0.0004	0.0002	0.9998
Comp21	0.0033	.	0.0002	1.0000

Table A19.

Western Europe PCA Eigenvalues and Proportions

Principal components/correlation	Number of obs	=	180
Rotation: unrotated	Number of comps	=	21
	Trace	=	21
	Rho	=	1

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.5525	1.2232	0.2168	0.2168
Comp2	3.3293	0.5438	0.1585	0.3753
Comp3	2.7854	0.6799	0.1326	0.5080
Comp4	2.1056	0.5691	0.1003	0.6082
Comp5	1.5365	0.2508	0.0732	0.6814
Comp6	1.2856	0.0682	0.0612	0.7426
Comp7	1.2174	0.2407	0.0580	0.8006
Comp8	0.9768	0.1649	0.0465	0.8471
Comp9	0.8119	0.1435	0.0387	0.8858
Comp10	0.6684	0.2190	0.0318	0.9176
Comp11	0.4494	0.0388	0.0214	0.9390
Comp12	0.4106	0.0799	0.0196	0.9585
Comp13	0.3307	0.1021	0.0157	0.9743
Comp14	0.2285	0.0757	0.0109	0.9852
Comp15	0.1529	0.0683	0.0073	0.9924
Comp16	0.0845	0.0535	0.0040	0.9965
Comp17	0.0310	0.0107	0.0015	0.9979
Comp18	0.0203	0.0026	0.0010	0.9989
Comp19	0.0177	0.0142	0.0008	0.9998
Comp20	0.0034	0.0017	0.0002	0.9999
Comp21	0.0018	.	0.0001	1.0000

Table A20.

Central Europe PCA Eigenvalues and Proportions

Principal components/correlation	Number of obs	=	180
Rotation: unrotated	Number of comps	=	21
	Trace	=	21
	Rho	=	1

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	6.5283	2.8268	0.3109	0.3109
Comp2	3.7015	1.4736	0.1763	0.4871
Comp3	2.2279	0.3809	0.1061	0.5932
Comp4	1.8469	0.2050	0.0879	0.6812
Comp5	1.6419	0.3821	0.0782	0.7594
Comp6	1.2598	0.1716	0.0600	0.8193
Comp7	1.0882	0.2235	0.0518	0.8712
Comp8	0.8647	0.3455	0.0412	0.9123
Comp9	0.5191	0.1390	0.0247	0.9371
Comp10	0.3801	0.0964	0.0181	0.9552
Comp11	0.2837	0.1048	0.0135	0.9687
Comp12	0.1789	0.0519	0.0085	0.9772
Comp13	0.1270	0.0207	0.0060	0.9832
Comp14	0.1062	0.0136	0.0051	0.9883
Comp15	0.0926	0.0424	0.0044	0.9927
Comp16	0.0502	0.0103	0.0024	0.9951
Comp17	0.0399	0.0077	0.0019	0.9970
Comp18	0.0321	0.0105	0.0015	0.9985
Comp19	0.0216	0.0142	0.0010	0.9996
Comp20	0.0074	0.0055	0.0004	0.9999
Comp21	0.0019	.	0.0001	1.0000

Table A21.

Eastern Europe PCA Eigenvalues and Proportions

Principal components/correlation	Number of obs	=	130
Rotation: unrotated	Number of comps	=	21
	Trace	=	21
	Rho	=	1

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	8.6864	4.8415	0.4136	0.4136
Comp2	3.8450	1.9738	0.1831	0.5967
Comp3	1.8711	0.2094	0.0891	0.6858
Comp4	1.6617	0.5038	0.0791	0.7650
Comp	1.1579	0.1100	0.0551	0.8201
Comp6	1.0479	0.4202	0.0499	0.8700
Comp7	0.6277	0.1142	0.0299	0.8999
Comp8	0.5135	0.1122	0.0245	0.9243
Comp9	0.4013	0.0351	0.0191	0.9435
Comp10	0.3662	0.0528	0.0174	0.9609
Comp11	0.3134	0.1711	0.0149	0.9758
Comp12	0.1423	0.0400	0.0068	0.9826
Comp13	0.1022	0.0131	0.0049	0.9875
Comp14	0.0891	0.0392	0.0042	0.9917
Comp15	0.0500	0.0045	0.0024	0.9941
Comp16	0.0455	0.0145	0.0022	0.9962
Comp17	0.0310	0.0089	0.0015	0.9977
Comp18	0.0221	0.0080	0.0011	0.9988
Comp19	0.0140	0.0037	0.0007	0.9994
Comp20	0.0103	0.0090	0.0005	0.9999
Comp21	0.0014	.	0.0001	1.0000

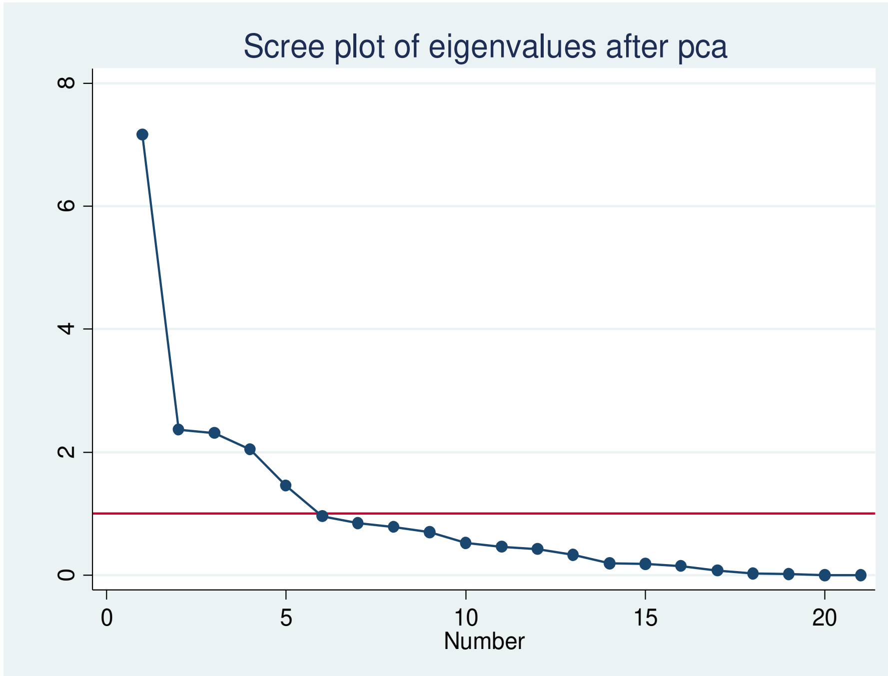

Figure A1. Europe PCA Scree Plot

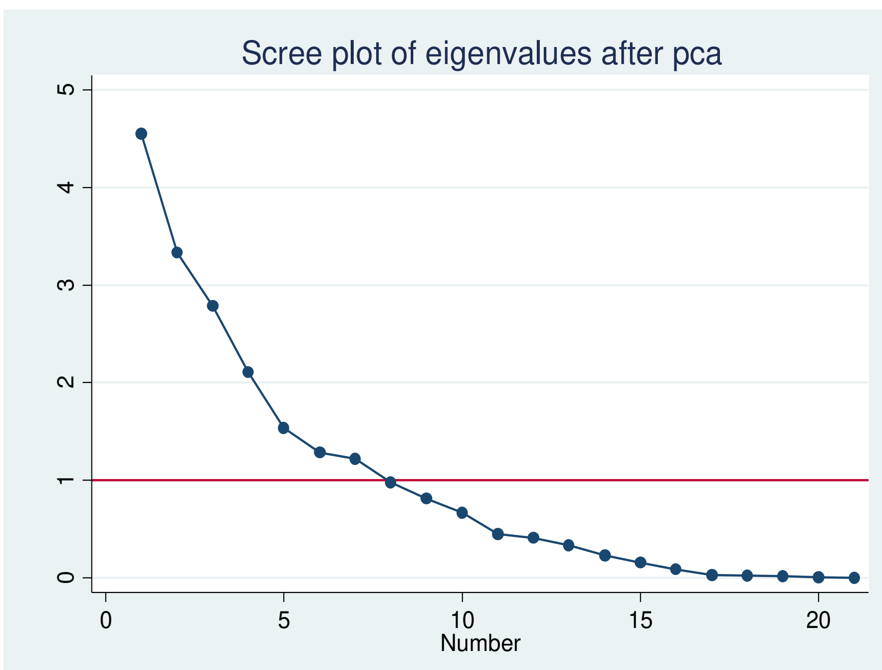

Figure A2. Western Europe PCA Scree Plot

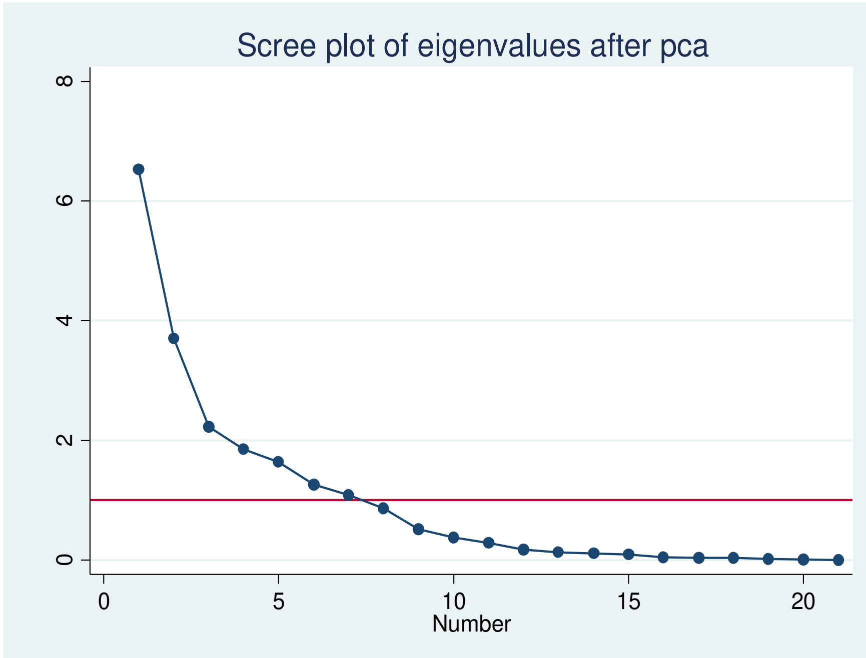

Figure A3. Central Europe PCA Scree Plot

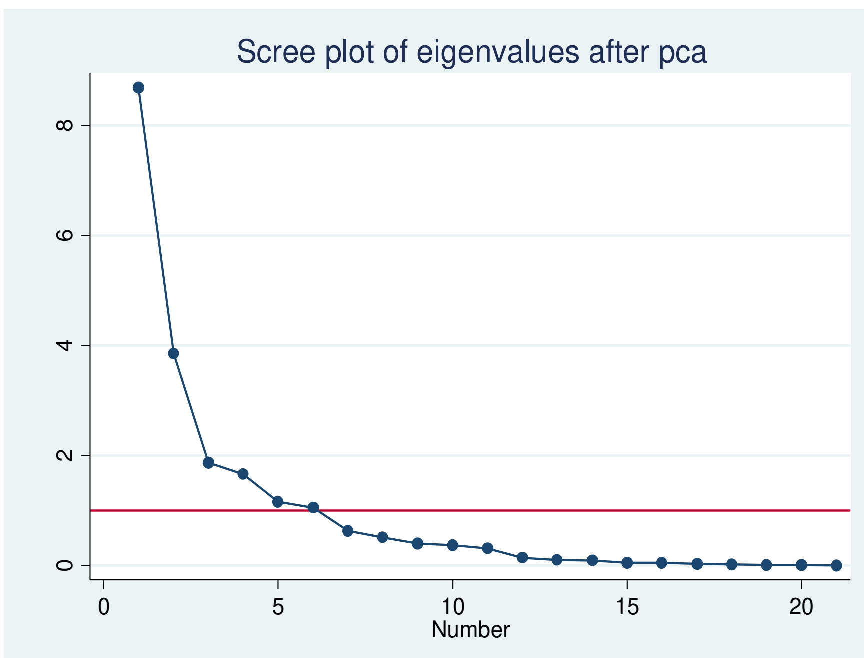

Figure A4. Eastern Europe PCA Scree Plot

Table A22.

Europe Principal Component Eigenvectors

A.

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7
aatma	0.2590	-0.0501	-0.1002	-0.0801	-0.0411	0.0102	-0.1223
aatmg	0.2229	0.2771	0.2165	0.1506	-0.1731	0.3769	-0.1736
abac	-0.0612	-0.2632	0.4349	0.3237	0.1681	0.0524	0.1707
abba	0.2445	0.1250	-0.1728	0.0632	-0.1155	0.0003	-0.1564
abbg	0.1952	0.3219	0.2165	0.2030	-0.1684	0.3841	-0.1995
abc	-0.0199	-0.2751	0.4519	0.2765	0.2156	0.0463	0.2022
dbd	0.3019	0.1761	-0.0802	0.2519	0.0572	-0.2057	0.1386
ddc	0.3289	-0.0748	-0.0456	0.0031	0.3474	0.0118	-0.0679
ddmba	0.1494	-0.0844	-0.0424	-0.2608	-0.1892	0.3876	0.2451
ddmbagdp	0.3335	-0.0478	-0.0215	0.0139	0.3216	0.0142	-0.0693
dll	0.3050	0.1710	-0.0739	0.2536	0.0591	-0.1988	0.1225
dpc	0.3305	-0.0698	-0.0399	-0.0068	0.3477	0.0193	-0.0639
ebc	-0.0035	0.2961	0.3954	-0.2786	0.0274	0.0949	0.1381
ebnin	-0.0032	0.3397	-0.2212	-0.1464	0.2553	0.0299	0.5955
eoc	-0.1821	0.3307	0.0503	-0.1292	0.3478	0.2695	0.1478
eroa	-0.1062	-0.1383	-0.3640	0.3156	-0.0015	0.3825	0.0424
sca	-0.2807	0.1935	-0.0419	0.0922	0.1961	0.0110	-0.1952
scrwa	-0.2183	0.2513	-0.0815	0.2192	0.2359	-0.1244	-0.1954
sld	0.0548	-0.3039	-0.0476	-0.4004	0.3326	0.2937	-0.262
snim	-0.2616	0.1189	-0.1051	0.1435	0.2647	0.14	-0.3067
sroe	0.0605	-0.1944	-0.3053	0.3093	-0.0513	0.3497	0.2765

B.

Variable	Comp8	Comp9	Comp 10	Comp 11	Comp 12	Comp 13	Comp 14
aatma	0.4314	0.0844	-0.6884	-0.0716	0.3321	-0.1049	0.1753
aatmg	-0.1676	-0.2043	-0.2147	-0.0121	0.1005	-0.1885	-0.0208
abac	0.2089	-0.0214	-0.0955	0.0182	-0.1038	0.0172	-0.1810
abba	0.3777	0.4101	0.0187	0.4323	-0.3611	0.3060	-0.1903
abbg	-0.1624	-0.0753	0.0726	0.1983	-0.1867	-0.0653	0.0502
abc	0.1521	-0.0155	-0.0723	0.1723	-0.0912	0.0301	0.1902
dbd	0.0637	0.0195	0.2281	-0.1009	0.0488	0.0094	0.3169
ddc	-0.0605	0.0102	0.0683	-0.0639	0.0126	0.0285	-0.1668

ddmba	0.5621	-0.3343	0.4109	-0.1644	0.0498	-0.0885	-0.1142
ddmbagdp	-0.0870	-0.0259	-0.0113	-0.1168	0.0532	-0.0155	-0.2609
dll	0.0432	0.0197	0.2359	-0.0880	0.0434	0.0137	0.3208
dpc	-0.0591	-0.0393	0.0406	-0.0659	0.0637	0.0154	-0.2002
ebc	-0.0569	0.2896	0.0579	-0.1080	0.4002	0.5380	-0.1864
ebnin	-0.0953	-0.2459	-0.3122	0.2689	-0.2306	-0.0672	-0.1973
eoc	0.1262	0.3485	-0.0096	-0.2019	-0.1098	-0.1528	0.4201
eroa	-0.0727	-0.1684	-0.1796	-0.3101	-0.1331	0.6205	0.1365
sca	0.3174	-0.1277	0.0810	0.2910	0.1221	0.0376	0.0149
scrwa	0.1286	-0.3809	0.0748	0.1905	0.4049	0.1318	-0.0367
sld	-0.1451	-0.0648	0.1091	0.3443	-0.0143	0.0709	0.3652
snim	0.1387	0.2008	0.0571	-0.3694	-0.1850	-0.2557	-0.3019
sroe	-0.1494	0.4021	0.1288	0.2732	0.4745	-0.2313	-0.1182

C.

	Comp 16	Comp 17	Comp 18	Comp 19	Comp 20	Comp 21	Unexplained
aatma	0.1034	0.0684	-0.2313	0.0171	0.0062	-0.0076	0
aatmg	0.0089	0.0003	0.6478	-0.1390	0.0180	0.0140	0
abac	-0.1477	0.6479	0.0206	0.0603	-0.0095	0.0257	0
abba	0.0438	-0.0588	0.2100	-0.0098	-0.0010	0.0121	0
abbg	-0.0050	0.0271	-0.6503	0.0984	-0.0300	-0.0343	0
abc	0.2801	-0.5942	0.0212	-0.0503	0.0106	-0.0141	0
dbd	0.1653	0.1658	0.0823	0.0224	-0.6986	0.0416	0
ddc	-0.1578	-0.0106	-0.1609	-0.7822	0.0331	0.2261	0
ddmba	0.0406	-0.0587	-0.0166	-0.0044	0.0090	0.0196	0
ddmbagdp	-0.1919	-0.2063	0.0221	0.5575	-0.0093	0.5411	0
dll	0.1496	0.1729	0.0479	0.0813	0.7121	-0.0017	0
dpc	-0.1493	-0.0876	0.0226	0.1565	-0.0345	-0.8041	0
ebc	0.1867	0.0622	-0.0231	0.0128	0.0063	0.0038	0
ebnin	0.1986	0.0848	-0.0202	0.0031	0.0109	0.0060	0
eoc	-0.3398	-0.0880	0.0373	-0.0127	-0.0080	-0.0035	0
eroa	-0.0529	-0.0204	0.0032	0.0100	0.0003	-0.0015	0
sca	-0.4110	0.0201	0.0734	0.0362	0.0154	0.0006	0
scrwa	0.1706	-0.0705	-0.0634	-0.0418	-0.0125	0.0314	0
sld	0.2881	0.2802	0.0990	0.0809	-0.0091	0.0610	0
snim	0.5272	0.062	-0.0025	0.0123	0.0126	-0.0116	0
sroe	0.0092	0.0042	-0.0172	0.0044	-0.0008	0.0048	0

Table A23.

Western Europe Principal Component Eigenvectors

A.

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6
aatma	0.1821	-0.0970	-0.1431	0.0726	0.0479	-0.3514
aatmg	0.1075	0.3739	-0.1807	0.0621	0.1034	-0.2201
abac	-0.0667	0.2565	0.3032	-0.4327	0.0038	-0.1240
abba	0.3237	0.0064	-0.0830	0.1589	0.2902	-0.1483
abbg	0.1237	0.3991	-0.1324	0.0717	0.2179	-0.0937
abc	-0.0647	0.2898	0.2950	-0.4250	0.0067	-0.0383
dbd	0.4057	0.1386	-0.1153	-0.0205	-0.0013	0.1064
ddc	0.3570	-0.0516	0.3609	0.0435	-0.0977	0.0110
ddmba	0.0347	-0.1355	-0.1515	-0.0586	-0.3179	-0.4658
ddmbagdp	0.3584	-0.0152	0.3409	0.0591	-0.1240	-0.0103
dll	0.4090	0.1459	-0.1054	-0.0102	0.0026	0.1192
dpc	0.3545	-0.0509	0.3509	0.0452	-0.1738	-0.0201
ebc	-0.1749	0.3419	0.0428	0.3166	-0.1474	-0.0054
ebnin	0.1200	-0.0991	-0.1857	0.1466	-0.2158	0.5178
eoc	-0.1312	0.2174	0.1615	0.4572	0.0976	0.0870
eroa	0.0829	-0.2906	-0.1179	-0.2458	0.2239	0.0444
sca	-0.0390	0.1842	0.0812	-0.2306	0.2310	0.3586
scrwa	0.0816	0.0942	-0.2173	-0.1862	-0.3109	0.3421
sld	-0.1493	-0.2768	0.3343	0.1514	-0.1583	-0.0082
snim	-0.0462	-0.1088	0.2807	0.2213	0.4948	0.1153
sroe	0.1011	-0.2961	-0.076	-0.1744	0.3889	0.0246

B.

Variable	Comp7	Comp8	Comp9	Comp10	Comp11	Comp12
aatma	-0.3650	0.5319	-0.0864	0.3638	-0.3150	-0.0149
aatmg	0.3682	-0.0058	-0.3231	0.1542	-0.1511	-0.1974
abac	-0.0676	-0.0486	0.0409	0.2237	-0.0219	-0.0265
abba	-0.2398	0.1776	-0.0679	-0.2243	0.3134	0.1197
abbg	0.3629	-0.0216	-0.2574	-0.0639	0.2219	-0.1239
abc	-0.1385	-0.0883	0.0057	0.1896	0.0500	0.0055
dbd	-0.0842	-0.1678	0.2842	-0.0922	0.0623	0.1029
ddc	0.0606	-0.0067	-0.0200	0.0418	0.0370	0.0196

ddmba	0.3527	0.1595	0.4197	0.1822	0.3285	-0.0579
ddmbagdp	0.0961	0.0325	-0.1223	0.0508	-0.1507	-0.0286
dll	-0.0604	-0.1491	0.2726	-0.0982	0.0475	0.0898
dpc	0.0935	0.0384	-0.0583	0.0472	-0.0371	-0.006
ebc	-0.0173	-0.0189	0.1759	0.2626	0.0602	0.3616
ebnin	-0.0773	-0.0691	-0.2812	0.5498	0.2232	-0.2023
eoc	0.0542	0.0428	0.3421	0.2606	-0.0002	0.105
eroa	0.342	-0.0492	-0.178	0.2502	-0.0274	0.7437
sca	0.0048	0.6383	0.0701	-0.0161	0.3628	0.0167
scrwa	0.3251	0.3366	0.2046	-0.1649	-0.4222	-0.0465
sld	0.2535	0.1789	-0.1578	-0.1477	0.3145	-0.0524
snim	0.2322	0.0651	0.1777	0.0115	-0.3386	-0.0958
sroe	0.1067	-0.1737	0.322	0.3072	0.1015	-0.3963

C.

Variable	Comp13	Comp14	Comp15	Comp16	Comp17	Comp18
aatma	-0.0136	0.0133	-0.0709	0.2989	-0.0259	0.0623
aatmg	-0.0250	-0.1018	-0.0210	0.1669	0.1345	-0.0498
abac	0.1284	0.3676	0.0522	0.0471	-0.4364	-0.4748
abba	0.4188	0.3727	0.2085	-0.2862	0.1027	0.0083
abbg	0.0363	0.0571	-0.0598	-0.0049	-0.1647	0.1034
abc	0.0300	0.1603	0.0207	0.0382	0.5366	0.5029
dbd	-0.1591	0.0556	-0.022	0.3480	0.0742	-0.1092
ddc	0.0451	-0.1350	-0.0633	-0.0024	-0.5693	0.5502
ddmba	-0.2743	0.1555	0.1252	-0.2108	0.0319	0.0513
ddmbagdp	-0.0066	-0.1943	0.0277	-0.2989	0.2742	-0.3673
dll	-0.1704	0.0612	-0.0128	0.3329	0.0369	-0.0695
dpc	0.0240	-0.1259	-0.0087	-0.1057	0.1684	-0.1067
ebc	0.2698	-0.3219	0.5471	0.1170	-0.0317	-0.0122
ebnin	-0.1055	0.2928	0.1461	-0.0619	-0.0055	0.0080
eoc	0.1173	0.1907	-0.6395	-0.1226	0.0683	-0.0262
eroa	0.0203	0.0395	-0.1094	0.0069	0.0260	-0.0106
sca	-0.2335	-0.3136	-0.0299	-0.0411	-0.0191	-0.0935
scrwa	0.4073	0.1935	0.0457	-0.0431	0.0096	0.1073
sld	0.2143	0.1807	-0.0201	0.6150	0.1444	-0.0835
snim	-0.3314	0.2998	0.4221	0.0154	0.0090	0.0826
sroe	0.4457	-0.3132	0.0037	0.0750	0.0431	-0.0324

D.

Variable	Comp19	Comp20	Comp21	Unexplained
aatma	0.2244	0.0277	0.0009	0
aatmg	-0.6049	-0.0392	0.0020	0
abac	-0.0459	-0.0291	-0.0078	0
abba	-0.2234	-0.0069	-0.0038	0
abbg	0.6581	0.0098	0.0147	0
abc	0.0534	0.0705	0.0018	0
dbd	0.0009	-0.0286	0.6956	0
ddc	-0.2090	0.1527	0.0485	0
ddmba	-0.0280	0.0395	0.0041	0
ddmbagdp	0.1284	0.5726	0.0484	0
dll	-0.0032	0.1086	-0.7100	0
dpc	0.1079	-0.7833	-0.0783	0
ebc	0.0563	0.0041	-0.0040	0
ebnin	-0.0098	0.0053	0.0055	0
eoc	-0.0549	0.0068	-0.0018	0
eroa	0.0034	0.0035	-0.0054	0
sca	-0.1162	-0.0174	0.0051	0
scrwa	0.0347	0.0107	0.0159	0
sld	-0.0051	0.1078	0.0036	0
snim	0.0205	-0.0264	0.0190	0
sroe	0.0409	0.0052	-0.0109	0

Table A24.

Central Europe Principal Component Eigenvectors

A.

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6
aatma	0.3565	0.0924	-0.1004	0.0843	0.0418	0.0725
aatmg	-0.1963	0.3270	0.0446	0.2401	-0.1261	-0.1486
abac	0.1726	0.1860	0.1194	-0.2460	-0.4150	0.2053
abba	-0.0830	-0.2843	-0.3827	0.0856	0.1173	0.0143
abbg	-0.3260	0.1604	-0.1271	0.1035	0.0444	-0.0272
abc	0.3160	-0.1009	0.0351	-0.0498	-0.3504	0.0119
dbd	-0.0572	0.4610	-0.1107	0.1472	-0.1170	-0.0862
ddc	0.3309	-0.0337	-0.1170	0.2341	0.1878	-0.0726

ddmba	-0.0504	0.0713	-0.3032	-0.0312	0.1474	0.6389
ddmbagdp	0.3366	0.1268	-0.0019	0.2609	0.0198	-0.1182
dll	0.0390	0.4666	-0.1043	0.0591	-0.1349	-0.1307
dpc	0.3697	0.0360	-0.0485	0.1738	0.0857	-0.0898
ebc	-0.0894	-0.2256	0.3499	0.1914	-0.3216	0.2880
ebnin	-0.1028	-0.0256	0.4966	0.2789	0.1051	-0.1199
eoc	0.1028	0.1014	0.4910	0.1515	0.2918	0.1848
eroa	0.0951	0.1987	0.1299	-0.3971	0.4216	-0.0180
sca	0.1922	-0.0760	0.0587	-0.1965	-0.3281	0.0922
scrwa	0.2133	0.2486	-0.0656	-0.0601	-0.0651	0.0866
sld	0.2942	-0.2885	-0.0721	0.1320	0.0818	-0.1722
snim	0.1250	0.1647	0.1320	-0.0357	0.2631	0.4224
sroe	0.0437	0.0082	0.1458	-0.5648	0.0991	-0.3370

B.

Variable	Comp7	Comp8	Comp9	Comp10	Comp11	Comp12
aatma	0.0468	0.1365	0.0135	-0.2328	0.0676	0.1241
aatmg	0.2036	0.1431	0.3439	-0.3018	-0.0013	-0.2661
abac	-0.2765	0.2327	0.2239	0.0609	-0.0066	-0.2922
abba	0.3212	0.3304	0.2385	0.2831	-0.0156	0.2471
abbg	0.3126	0.1447	0.1857	0.0151	0.0133	-0.0475
abc	-0.0742	0.0732	-0.0701	0.1595	0.1049	0.3138
dbd	0.0138	0.0436	-0.0514	0.3679	0.1078	0.2192
ddc	-0.1230	0.1032	0.2066	0.0631	0.0886	0.0920
ddmba	-0.0302	0.3836	-0.3250	-0.0120	0.1998	-0.1646
ddmbagdp	0.0802	0.0412	0.1235	0.0540	-0.1074	-0.1669
dll	-0.1273	0.0946	-0.1176	-0.0710	0.1742	0.3897
dpc	0.0283	0.0304	0.0438	0.0428	0.0045	-0.1563
ebc	0.0707	0.1258	0.2743	0.2564	-0.2530	0.2544
ebnin	0.1562	0.1386	-0.4631	-0.0063	0.2029	0.1544
eoc	0.0179	0.3140	0.0488	0.1048	0.0289	-0.1778
eroa	-0.0380	0.2316	0.1097	-0.2119	-0.4973	0.3692
sca	0.5740	0.0749	-0.0482	-0.4656	0.1377	0.1249
scrwa	0.4410	-0.2160	-0.3458	0.3421	-0.4771	-0.2005
sld	0.0628	0.0490	-0.0556	-0.0555	0.0610	-0.1352
snim	0.1837	-0.5648	0.3391	0.0659	0.3524	0.1562
sroe	0.2022	0.1978	0.0949	0.3648	0.3937	-0.1547

C.

Variable	Comp13	Comp14	Comp15	Comp16	Comp17	Comp18
aatma	-0.0412	-0.5338	0.3047	0.0797	-0.1404	-0.5324
aatmg	0.1790	-0.1112	-0.1003	0.2888	0.3255	-0.0891
abac	0.2362	-0.0836	0.3455	-0.2272	-0.1465	0.2176
abba	0.2397	-0.1039	0.1019	-0.1167	-0.3017	0.1320
abbg	0.1295	0.0053	0.0208	0.0888	-0.0445	0.1496
abc	0.5466	0.0807	-0.3463	0.3680	0.1368	-0.0505
dbd	-0.0453	0.3396	0.0078	-0.2736	0.0313	-0.5005
ddc	-0.0474	-0.2021	-0.1518	-0.4243	0.5813	0.2445
ddmba	-0.0953	0.1682	0.0248	0.2025	0.2506	0.0245
ddmbagdp	-0.0193	0.4460	0.2198	0.1452	-0.1673	0.1242
dll	-0.3419	-0.1910	-0.1103	0.2045	-0.2451	0.4784
dpc	-0.1038	0.2399	0.1283	0.0052	0.0167	0.0664
ebc	-0.4601	-0.0218	0.1291	0.1939	0.1867	-0.0381
ebnin	0.2661	-0.0390	0.4364	-0.0642	0.1302	0.1616
eoc	-0.0011	-0.0845	-0.5346	-0.1240	-0.3701	-0.0756
eroa	0.1005	0.1982	0.1010	0.0920	0.1245	0.0017
sca	-0.1415	0.2237	-0.1450	-0.3425	-0.0114	0.0285
scrwa	0.0304	-0.3026	-0.0702	0.0159	0.0960	0.1195
sld	-0.1469	0.0684	-0.0036	0.3480	-0.0953	-0.0090
snim	0.1207	0.0206	0.1146	0.1157	-0.0248	0.0932
sroe	-0.2153	-0.0768	0.0640	0.1590	0.1666	-0.0479

D.

Variable	Comp20	Comp21	Unexplained
aatma	0.1294	-0.0383	0
aatmg	-0.3750	-0.0152	0
abac	0.0797	0.0523	0
abba	-0.3536	-0.0196	0
abbg	0.7537	0.2033	0
abc	0.0886	0.0458	0
dbd	0.0366	0.0235	0
ddc	0.1630	-0.1404	0
ddmba	-0.0513	-0.0583	0
ddmbagdp	0.0272	-0.5621	0
dll	-0.0855	0.0129	0
dpc	-0.1861	0.7756	0

ebc	0.0226	0.0367	0
ebnin	-0.0386	0.0087	0
eoc	0.0025	0.0045	0
eroa	0.0194	0.0464	0
sca	0.0039	-0.0207	0
scrwa	-0.0251	-0.0176	0
sld	0.2378	0.0272	0
snim	-0.0350	0.0072	0
sroe	-0.0370	-0.0728	0

Table A25.

Eastern Europe Principal Component Eigenvectors

A.

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6
aatma	0.2942	0.0406	-0.1639	0.145	-0.0003	0.2258
aatmg	0.2959	0.0138	-0.1696	0.145	-0.0051	0.1375
abac	-0.0024	-0.3788	-0.2091	-0.0642	0.5069	0.0787
abba	0.1892	0.0622	0.5087	0.1817	0.1956	0.0659
abbg	0.2049	0.0489	0.4924	0.1824	0.1905	0.0186
abc	-0.0103	-0.3812	-0.2123	-0.0839	0.4744	0.2112
dbd	0.2751	-0.1207	0.1166	-0.2316	-0.1963	0.3063
ddc	0.3034	0.0621	-0.1940	0.1404	-0.0774	0.0829
ddmba	0.1571	0.2050	0.1035	0.2802	0.3344	-0.0262
ddmbagdp	0.3054	0.0012	-0.1645	-0.0392	-0.1036	0.2833
dll	0.2549	-0.1481	0.1997	-0.2676	-0.2303	0.1859
dpc	0.3128	0.0812	-0.1554	0.0793	-0.0631	0.1528
ebc	0.0422	0.3446	0.0588	-0.3709	0.1919	0.0680
ebnin	-0.1386	0.3492	0.0539	-0.0319	0.2926	0.2448
eoc	-0.1704	0.3190	0.0045	-0.0891	0.1566	0.4087
eroa	-0.1962	-0.2391	0.0974	0.3752	-0.0986	0.3134
sca	-0.2042	0.2763	-0.1205	0.1131	-0.1554	0.2079
scrwa	-0.2508	0.0900	-0.0330	-0.1083	-0.1065	0.2407
sld	0.1180	0.2345	-0.3232	0.4257	0.0351	-0.2418
snim	-0.2543	0.0060	-0.1029	0.219	-0.0815	0.3486
sroe	-0.1666	-0.2739	0.2341	0.3288	-0.1391	0.1554

B.

Variable	Comp7	Comp8	Comp9	Comp10	Comp11	Comp12
aatma	0.0303	-0.0729	0.2050	-0.2831	-0.3219	0.0552
aatmg	0.0808	-0.0498	0.0838	-0.3854	-0.4064	-0.0268
abac	0.1803	0.0814	-0.0055	0.0147	0.1305	-0.0939
abba	0.2348	0.2512	0.0969	0.1191	-0.0087	-0.0080
abbg	0.2312	0.2236	0.0189	-0.0002	-0.1371	-0.0724
abc	0.0968	0.0048	0.0460	0.0685	0.0691	-0.0910
dbd	-0.0442	-0.1212	-0.0460	0.0882	0.0679	-0.1489
ddc	0.0047	0.1398	-0.0542	0.0703	0.2781	0.2136
ddmba	-0.1318	-0.7452	-0.0415	0.3388	0.0391	0.0697
ddmbagdp	-0.0933	-0.0038	-0.0513	0.0763	0.0470	0.0085
dll	0.0276	-0.0268	-0.1713	0.2005	0.2271	-0.0525
dpc	0.0484	0.0815	-0.1142	0.0638	0.2026	0.0710
ebc	-0.0647	-0.0433	0.6683	-0.2031	0.3513	0.2051
ebnin	-0.1484	0.0298	-0.5550	-0.3305	0.0580	0.1481
eoc	-0.3042	0.2801	-0.0724	0.1024	-0.0542	-0.2480
eroa	-0.0849	-0.1418	0.0330	-0.1984	0.1531	0.1343
sca	0.4402	-0.2090	0.1000	-0.0236	0.1478	-0.6655
scrwa	0.6516	-0.0938	-0.1188	0.0475	0.0013	0.5218
sld	0.0864	0.3001	-0.0135	0.0981	0.3412	-0.0142
snim	-0.1611	0.1769	0.2976	0.5181	-0.2714	0.1858
sroe	-0.1825	-0.0171	0.1158	-0.3057	0.3836	-0.0030

C.

Variable	Comp13	Comp14	Comp15	Comp16	Comp17	Comp18
aatma	0.0712	-0.3138	0.3632	-0.0180	0.1943	-0.3509
aatmg	0.1486	0.2876	-0.0162	0.1377	-0.2482	0.3490
abac	0.0520	0.4058	0.0707	0.3638	0.1311	-0.3841
abba	-0.1320	-0.2572	0.0531	-0.0947	0.0936	-0.2471
abbg	0.0191	0.2353	-0.1795	0.0220	-0.0357	0.2493
abc	-0.0337	-0.4287	-0.0324	-0.3104	-0.1223	0.4378
dbd	0.0144	-0.0652	0.2910	-0.0057	0.0439	0.1017
ddc	-0.0140	-0.3195	-0.2256	0.2799	-0.4059	-0.2024
ddmba	0.1727	0.0533	0.0134	0.0051	-0.0474	-0.0122
ddmbagdp	-0.0464	0.2228	-0.4182	-0.4093	0.5317	-0.0739
dll	0.0173	0.1639	0.3989	0.1478	-0.0813	0.1351
dpc	-0.0896	0.0337	-0.3152	0.1592	-0.0891	0.0668

ebc	-0.1127	0.1134	0.0191	0.0280	0.0005	0.1028
ebnin	-0.2433	-0.1119	0.1078	0.2386	0.2576	0.1746
eoc	0.4038	0.120	0.0174	-0.2441	-0.3545	-0.2259
eroa	-0.5054	0.2668	0.1076	-0.2828	-0.3096	-0.1425
sca	-0.1465	-0.0886	-0.0962	0.1513	0.0463	0.0008
scrwa	0.3055	0.0526	0.0206	-0.1550	-0.0192	-0.0180
sld	0.0833	0.1576	0.4577	-0.2347	0.1218	0.2039
snim	-0.1293	0.0053	0.0513	0.3522	0.1867	0.2159
sroe	0.5308	-0.1246	-0.1094	0.1616	0.2283	0.1098

D.

Variable	Comp19	Comp20	Comp21	Unexplained
aatma	-0.2068	0.0165	-0.3717	0
aatmg	0.0300	0.0957	0.4417	0
abac	0.0905	-0.0444	0.0265	0
abba	-0.0833	-0.0358	0.5573	0
abbg	0.1509	0.0602	-0.5807	0
abc	-0.0893	0.0707	-0.0397	0
dbd	0.5794	-0.4682	0.0220	0
ddc	0.3558	0.3417	-0.0527	0
ddmba	-0.0092	0.0145	0.0186	0
ddmbagdp	0.0829	0.2719	0.0664	0
dll	-0.4156	0.4276	-0.0103	0
dpc	-0.5000	-0.6049	-0.0595	0
ebc	0.0023	0.0147	-0.0031	0
ebnin	0.0543	0.0579	0.0239	0
eoc	-0.0598	-0.0293	-0.0114	0
eroa	0.0083	-0.0193	-0.0459	0
sca	-0.0007	0.1047	-0.0107	0
scrwa	0.0380	-0.0473	0.0014	0
sld	0.0882	-0.0338	0.0111	0
snim	0.0179	0.0267	0.0151	0
sroe	-0.0432	-0.005	0.0421	0

Table A26.

Europe Component Proportions

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	7.1659	4.8000	0.3412	0.3412
Comp2	2.3658	0.0544	0.1127	0.4539
Comp3	2.3115	0.2689	0.1101	0.5640
Comp4	2.0426	0.5901	0.0973	0.6612
Comp5	1.4525	0.4980	0.0692	0.7304
Comp6	0.9545	0.1052	0.0455	0.7758
Comp7	0.8494	0.0657	0.0404	0.8163
Comp8	0.7837	0.0838	0.0373	0.8536
Comp9	0.6999	0.1749	0.0333	0.8869
Comp10	0.5250	0.0666	0.0250	0.9119
Comp11	0.4584	0.0392	0.0218	0.9338
Comp12	0.4192	0.0918	0.0200	0.9537
Comp13	0.3273	0.1367	0.0156	0.9693
Comp14	0.1906	0.0089	0.0091	0.9784
Comp15	0.1817	0.0315	0.0087	0.9870
Comp16	0.1502	0.0772	0.0072	0.9942
Comp17	0.0731	0.0468	0.0035	0.9977
Comp18	0.0263	0.0107	0.0013	0.9989
Comp19	0.0156	0.0120	0.0007	0.9997
Comp20	0.0036	0.0004	0.0002	0.9998
Comp21	0.0033	.	0.0002	1.0000

Table A27.

Western Europe Component Proportions

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	4.5525	1.2232	0.2168	0.2168
Comp2	3.3293	0.5438	0.1585	0.3753
Comp3	2.7854	0.6799	0.1326	0.5080
Comp4	2.1056	0.5691	0.1003	0.6082
Comp5	1.5365	0.2508	0.0732	0.6814
Comp6	1.2856	0.0682	0.0612	0.7426
Comp7	1.2174	0.2407	0.0580	0.8006
Comp8	0.9768	0.1649	0.0465	0.8471

Comp9	0.8119	0.1435	0.0387	0.8858
Comp10	0.6684	0.2190	0.0318	0.9176
Comp11	0.4494	0.0388	0.0214	0.9390
Comp12	0.4106	0.0799	0.0196	0.9585
Comp13	0.3307	0.1021	0.0157	0.9743
Comp14	0.2285	0.0757	0.0109	0.9852
Comp15	0.1529	0.0683	0.0073	0.9924
Comp16	0.0845	0.0535	0.0040	0.9965
Comp17	0.0310	0.0107	0.0015	0.9979
Comp18	0.0203	0.0026	0.0010	0.9989
Comp19	0.0177	0.0142	0.0008	0.9998
Comp20	0.0034	0.0017	0.0002	0.9999
Comp21	0.0018	.	0.0001	1.0000

Table A28.

Central Europe Component Proportions

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	6.52828	2.82679	0.3109	0.3109
Comp2	3.70149	1.47362	0.1763	0.4871
Comp3	2.22787	0.380936	0.1061	0.5932
Comp4	1.84694	0.205025	0.0879	0.6812
Comp5	1.64191	0.382093	0.0782	0.7594
Comp6	1.25982	0.171638	0.06	0.8193
Comp7	1.08818	0.22352	0.0518	0.8712
Comp8	0.864661	0.345534	0.0412	0.9123
Comp9	0.519128	0.138994	0.0247	0.9371
Comp10	0.380134	0.0964485	0.0181	0.9552
Comp11	0.283685	0.10483	0.0135	0.9687
Comp12	0.178855	0.0519028	0.0085	0.9772
Comp13	0.126952	0.0207094	0.006	0.9832
Comp14	0.106243	0.0135968	0.0051	0.9883
Comp15	0.0926459	0.0424174	0.0044	0.9927
Comp16	0.0502285	0.0103425	0.0024	0.9951
Comp17	0.039886	0.0077466	0.0019	0.997
Comp18	0.0321394	0.0105106	0.0015	0.9985
Comp19	0.0216288	0.0142009	0.001	0.9996
Comp20	0.007428	0.0055396	0.0004	0.9999

Comp21	0.0018884	.	0.0001	1

Table A29.

Eastern Europe Component Proportions

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	8.6864	4.8415	0.4136	0.4136
Comp2	3.8450	1.9738	0.1831	0.5967
Comp3	1.8711	0.2094	0.0891	0.6858
Comp4	1.6617	0.5038	0.0791	0.7650
Comp5	1.1579	0.1100	0.0551	0.8201
Comp6	1.0479	0.4202	0.0499	0.8700
Comp7	0.6277	0.1142	0.0299	0.8999
Comp8	0.5135	0.1122	0.0245	0.9243
Comp9	0.4013	0.0351	0.0191	0.9435
Comp10	0.3662	0.0528	0.0174	0.9609
Comp11	0.3134	0.1711	0.0149	0.9758
Comp12	0.1423	0.0400	0.0068	0.9826
Comp13	0.1022	0.0131	0.0049	0.9875
Comp14	0.0891	0.0392	0.0042	0.9917
Comp15	0.0500	0.0045	0.0024	0.9941
Comp16	0.0455	0.0145	0.0022	0.9962
Comp17	0.0310	0.0089	0.0015	0.9977
Comp18	0.0221	0.0080	0.0011	0.9988
Comp19	0.0140	0.0037	0.0007	0.9994
Comp20	0.0103	0.0090	0.0005	0.9999
Comp21	0.0014	.	0.0001	1.0000

Table A30.

Europe Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
aatma						0.4745
aatmg						0.264
abac			0.4349	0.3237		0.117
abba						0.4381
abbg		0.3219				0.248
abc			0.4519			0.1225
dbd	0.3019					0.1243
ddc	0.3289				0.3474	0.03154
ddmba						0.6282
ddmbagdp	0.3335				0.3216	0.04581
dll	0.305					0.115
dpc	0.3305				0.3477	0.02646
ebc			0.3954			0.2715
ebnin		0.3397				0.4754
eoc		0.3307			0.3478	0.288
eroa			-0.364	0.3156		0.3641
sca						0.2693
scrwa						0.315
sld		-0.3039		-0.4004	0.3326	0.2665
snim						0.3067
sroe			-0.3053	0.3093		0.4698

Table A31.

Western Europe Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplain
aatma						-0.3514	-0.3650	0.4250
aatmg		0.3739					0.3682	0.1390
abac			0.3032	-0.4327				0.0851
abba	0.3237							0.2227
abbg		0.3991					0.3629	0.0958
abc				-0.425				0.0533
dbd	0.4057							0.1255
ddc	0.357		0.3609					0.02481

ddmba					-0.3179	-0.4658	0.3527	0.2766
ddmbagdp	0.3584		0.3409					0.04824
dll	0.409							0.1137
dpc	0.3545		0.3509					0.01452
ebc		0.3419		0.3166				0.2216
ebnin						0.5178		0.3369
eoc				0.4572				0.2236
eroa							0.342	0.2997
sca						0.3586		0.5025
scrwa					-0.3109	0.3421	0.3251	0.3079
sld			0.3343					0.1671
snim					0.4948			0.1694
sroe					0.3889			0.3345

Table A32.

Central Europe Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplain
aatma	0.3565							0.09111
aatmg		0.327						0.1429
abac					-0.415			0.1148
abba			-0.3827				0.3212	0.1807
abbg	-0.326						0.3126	0.04472
abc	0.316				-0.3504			0.09546
dbd		0.461						0.09255
ddc	0.3309							0.06809
ddmba			-0.3032			0.6389		0.2071
ddmbagdp	0.3366							0.0497
dll		0.4666						0.08438
dpc	0.3697							0.01869
ebc			0.3499		-0.3216			0.1393
ebnin			0.4966					0.1725
eoc			0.491					0.1302
eroa				-0.3971	0.4216			0.172
sca					-0.3281		0.574	0.1124
scrwa							0.441	0.2299
sld								0.0306
snim						0.4224		0.3812
sroe				-0.5648		-0.337		0.147

Table A33.

Eastern Europe Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Unexplained
aatma							0.103
aatmg							0.1299
abac		-0.3788			0.5069		0.05565
abba			0.5087				0.08636
abbg			0.4924				0.07483
abc		-0.3812			0.4744		0.03693
dbd						0.3063	0.02896
ddc	0.3034						0.068
ddmba					0.3344		0.3434
ddmbagdp	0.3054						0.04012
dll							0.06019
dpc	0.3128						0.03986
ebc		0.3446		-0.3709			0.2453
ebnin		0.3492					0.1952
eoc		0.319				0.4087	0.1397
eroa				0.3752		0.3134	0.07971
sca							0.2227
scrwa							0.3272
sld			-0.3232	0.4257			0.1084
snim						0.3486	0.2038
sroe				0.3288			0.1407

Table A34.

Europe Varimax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
aatma						0.4745
aatmg			0.4294			0.2640
abac					0.6279	0.1170
abba						0.4381
abbg			0.4773			0.2480
abc					0.6302	0.1225
dbd			0.3167			0.1243
ddc	0.4756					0.0315

ddmba						0.6282
ddmbagdp	0.4603					0.0458
dll			0.316			0.1150
dpc	0.4759					0.02646
ebc				-0.5572		0.2715
ebnin		0.3409			-0.3065	0.4754
eoc		0.4573				0.2880
eroa				0.5033		0.3641
sca		0.3955				0.2693
scrwa		0.4475				0.3150
sld			-0.5442			0.2665
snim		0.4066				0.3067
sroe				0.4812		0.4698

Table A35.

Western Europe Varimax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplain
aatma							-0.5023	0.4250
aatmg		0.5952						0.139
abac				0.6037				0.08508
abba							-0.4533	0.2227
abbg		0.6144						0.09583
abc				0.5936				0.0533
dbd								0.1255
ddc	0.5185							0.02481
ddmba						-0.6732		0.2766
ddmbagdp	0.5176							0.04824
dll								0.1137
dpc	0.5318							0.01452
ebc			-0.4932					0.2216
ebnin				-0.3871			0.3118	0.3369
eoc			-0.3849		0.3232			0.2236
eroa			0.5299					0.2997
sca						0.4077		0.5025
scrwa							0.575	0.3079
sld					0.379			0.1671
snim					0.5995			0.1694
sroe			0.5051					0.3345

Table A36.

Central Europe Varimax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplained
aatma	0.3619							0.0911
aatmg		0.461						0.1429
abac			0.6369					0.1148
abba			-0.4822					0.1807
abbg			-0.3352					0.0447
abc			0.3363					0.0955
dbd		0.5119						0.0926
ddc	0.4516							0.0681
ddmba							0.719	0.2071
ddmbagdp	0.4102							0.0497
dll		0.4641						0.0843
dpc	0.4256							0.0187
ebc					-0.4367			0.1393
ebnin				0.524				0.1725
eoc				0.6186				0.1302
eroa					0.5918			0.1720
sca						0.7247		0.1124
scrwa						0.4615		0.2299
sld	0.3438							0.0306
snim				0.3406			0.4288	0.3812
sroe					0.5946			0.1470

Table A37.

Eastern Europe Varimax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Unexplained
aatma	0.4193						0.1030
aatmg	0.3813						0.1299
abac					0.6722		0.0557
abba				0.603			0.0864
abbg				0.5929			0.0748
abc					0.677		0.0369
dbd						0.4562	0.0290
ddc	0.3874						0.0680
ddmba				0.3837		-0.3053	0.3434
ddmbagdp	0.4327						0.0401
dll						0.482	0.0602
dpc	0.399						0.0399
ebc		0.3370	-0.4111				0.2453
ebnin		0.5048					0.1952
eoc		0.5700					0.1397
eroa			0.5878				0.0797
sca		0.3195					0.2227
scrwa							0.3272
sld						-0.5967	0.1084
snim			0.3941				0.2038
sroe			0.5207				0.1407

Table A38.

Europe Promax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Unexplained
aatma						0.4745
aatmg			0.4392			0.2640
abac					0.6344	0.1170
abba						0.4381
abbg			0.4887			0.2480
abc					0.6395	0.1225
dbd						0.1243

ddc	0.4943					0.0315
ddmba						0.6282
ddmbagdp	0.4753					0.0458
dll						0.1150
dpc	0.4942					0.0265
ebc				0.5659		0.2715
ebnin		0.363			-0.3077	0.4754
eoc		0.4744				0.2880
eroa				-0.5028		0.3641
sca		0.3933				0.2693
scrwa		0.4445				0.3150
sld			-0.5639			0.2665
snim		0.4001				0.3067
sroe				-0.4827		0.4698

Table A39.

Western Europe Promax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplain
aatma							-0.4995	0.4250
aatmg				0.6449				0.1390
abac			0.6257					0.0851
abba							-0.4407	0.2227
abbg				0.6497				0.0958
abc			0.6215					0.0533
dbd								0.1255
ddc	0.5389							0.0248
ddmba						-0.7607		0.2766
ddmbagdp	0.538							0.0482
dll								0.1137
dpc	0.5551							0.0145
ebc		-0.5053						0.2216
ebnin			-0.3786				0.3245	0.3369
eoc		-0.3873			0.361			0.2236
eroa		0.5556						0.2997
sca						0.4479		0.5025
scrwa							0.6031	0.3079
sld					0.3538			0.1671

snim		0.7067	0.1694
sroe	0.5195		0.3345

Table A40.

Central Europe Promax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplained
aatma	0.3528							0.09111
aatmg		0.4715						0.1429
abac			0.6462					0.1148
abba			-0.4874					0.1807
abbg			-0.3178					0.04472
abc			0.3339					0.09546
dbd		0.5225						0.09255
ddc	0.4611							0.06809
ddmba							0.7466	0.2071
ddmbagdp	0.427							0.0497
dll		0.481						0.08438
dpc	0.4342							0.01869
ebc					-0.4257			0.1393
ebnin				0.5322				0.1725
eoc				0.6235				0.1302
eroa					0.5881			0.172
sca						0.728		0.1124
scrwa						0.4662		0.2299
sld	0.3655							0.0306
snim				0.3283			0.4174	0.3812
sroe					0.6501		-0.3219	0.147

Table A41.

Eastern Europe Promax Rotated Component Eigenvectors > .30

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Unexplained
aatma	0.4205						0.103
aatmg	0.381						0.1299
abac					0.6749		0.05565
abba				0.6181			0.08636
abbg				0.6047			0.07483
abc					0.6839		0.03693
dbd						0.4592	0.02896
ddc	0.3845						0.068
ddmba				0.3805			0.3434
ddmbagdp	0.4367						0.04012
dll						0.4815	0.06019
dpc	0.3983						0.03986
ebc		0.3622	-0.4231				0.2453
ebnin		0.5177					0.1952
eoc		0.5753					0.1397
eroa			0.5966				0.07971
sca		0.3013					0.2227
scrwa							0.3272
sld						-0.6009	0.1084
snim			0.3785				0.2038
sroe			0.5378				0.1407

Table A42.

Europe 1st PC Regression

Source	SS	df	MS
Model	3204.52	9	356.057
Residual	3376.95	332	10.1715
Total	6581.47	341	19.3005

Number of obs	=	342
F (9, 332)	=	35.01
Prob > F	=	0.000
R^2	=	0.4869
Adj R^2	=	0.4730
Root MSE	=	3.1893

gd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
cd1	0.9773	0.0723	13.5200	0.0000	0.8351	1.1196
hc	-0.0051	0.0202	-0.2500	0.7990	-0.0448	0.0345
o	0.0114	0.0044	2.5600	0.0110	0.0026	0.0201
s	0.0265	0.0197	1.3500	0.1790	-0.0122	0.0652
pc1	-0.3462	0.0892	-3.8800	0.0000	-0.5216	-0.1707
pc2	-0.0504	0.1270	-0.4000	0.6920	-0.3001	0.1994
pc3	-0.1409	0.1130	-1.2500	0.2130	-0.3633	0.0815
pc4	0.3434	0.1455	2.3600	0.0190	0.0571	0.6297
pc5	-0.2788	0.1512	-1.8400	0.0660	-0.5761	0.0186
_cons	-1.0487	3.3939	-0.3100	0.7580	-7.7250	5.6276

Table A43.

Europe 2nd PC Regression

Source	SS	df	MS
Model	3167.5	5	633.501
Residual	3413.96	336	10.1606
Total	6581.47	341	19.3005

Number of obs	=	342
F (5, 336)	=	62.35
Prob > F	=	0.000
R^2	=	0.4813
Adj R^2	=	0.4736
Root MSE	=	3.1876

gd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
cd1	0.9894	0.0711	13.9300	0.0000	0.8496	1.1292
o	0.0085	0.0039	2.2100	0.0280	0.0009	0.0161
pc1	-0.4225	0.0694	-6.0900	0.0000	-0.5591	-0.2859

pc4	0.4113	0.1344	3.0600	0.0020	0.1470	0.6756
pc5	-0.2783	0.1438	-1.9400	0.0540	-0.5612	0.0046
_cons	1.4954	0.4562	3.2800	0.0010	0.5981	2.3928

Table A44.

Western Europe 1st PC Regression

Source	SS	df	MS
Model	1738.15	11	158.014
Residual	302.1	51	5.92353
Total	2040.25	62	32.9073

Number of obs	=	63
F (11, 51)	=	26.68
Prob > F	=	0.000
R^2	=	0.8519
Adj R^2	=	0.8200
Root MSE	=	2.4338

gd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
cd1	1.3010	0.1448	8.9800	0.0000	1.0103	1.5918
hc	0.0019	0.0979	0.0200	0.9840	-0.1947	0.1985
o	0.0872	0.0295	2.9500	0.0050	0.0279	0.1464
s	0.2084	0.1153	1.8100	0.0760	-0.0230	0.4398
pc1	-0.6170	0.2356	-2.6200	0.0120	-1.0900	-0.1440
pc2	-0.5463	0.3884	-1.4100	0.1660	-1.3260	0.2333
pc3	-0.5217	0.3156	-1.6500	0.1050	-1.1554	0.1120
pc4	-0.5383	0.3165	-1.7000	0.0950	-1.1737	0.0971
pc5	1.4816	0.5204	2.8500	0.0060	0.4369	2.5263
pc6	0.4663	0.3013	1.5500	0.1280	-0.1387	1.0712
pc7	0.1456	0.3463	0.4200	0.6760	-0.5496	0.8407
_cons	-29.382	17.9069	-1.6400	0.1070	-65.3318	6.5673

Table A45.

Western Europe 2^{nd} PC Regression

Source	SS	df	MS
Model	726.747	3	242.249
Residual	906.433	159	5.7008
Total	1633.18	162	10.0814

Number of obs	=	162
F (3, 159)	=	42.49
Prob > F	=	0.000
R^2	=	0.445
Adj R^2	=	0.4345
Root MSE	=	2.3876

gd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
cd1	1.110	0.126	8.800	0.000	0.861	1.360
o	0.012	0.002	8.100	0.000	0.009	0.015
pc5	0.359	0.156	2.300	0.023	0.051	0.666

Table A46.

Central Europe 1^{st} PC Regression

Source	SS	df	MS
Model	1738.15	11	158.014
Residual	302.1	51	5.92353
Total	2040.25	62	32.9073

Number of obs	=	63
F (11, 51)	=	9.37
Prob > F	=	0.000
R^2	=	0.8519
Adj R^2	=	0.82
Root MSE	=	2.4338

gd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
cd1	1.3010	0.1448	8.9800	0.0000	1.0103	1.5918
hc	0.0019	0.0979	0.0200	0.9840	-0.1947	0.1985
o	0.0872	0.0295	2.9500	0.0050	0.0279	0.1464
s	0.2084	0.1153	1.8100	0.0760	-0.0230	0.4398
pc1	-0.6170	0.2356	-2.6200	0.0120	-1.0900	-0.1440
pc2	-0.5463	0.3884	-1.4100	0.1660	-1.3260	0.2333
pc3	-0.5217	0.3156	-1.6500	0.1050	-1.1554	0.1120
pc4	-0.5383	0.3165	-1.7000	0.0950	-1.1737	0.0971
pc5	1.4816	0.5204	2.8500	0.0060	0.4369	2.5263
pc6	0.4663	0.3013	1.5500	0.1280	-0.1387	1.0712

pc7	0.1456	0.3463	0.4200	0.6760	-0.5496	0.8407
_cons	-29.382	17.9069	-1.6400	0.1070	-65.3318	6.5673

Table A47.

Central Europe 2nd PC Regression

Source	SS	df	MS			
				Number of obs	=	63
				F (9, 53)	=	33.74
Model	1737.09	9	193.011	Prob > F	=	0.000
Residual	303.158	53	5.71997	R^2	=	0.8514
				Adj R^2	=	0.8262
Total	2040.25	62	32.9073	Root MSE	=	2.3916

gd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
cd1	1.3120	0.1383	9.4800	0.0000	1.0345	1.5895
o	0.0853	0.0272	3.1300	0.0030	0.0307	0.1398
s	0.1861	0.0977	1.9000	0.0620	-0.0099	0.3821
pc1	-0.6033	0.1579	-3.8200	0.0000	-0.9199	-0.2866
pc2	-0.5891	0.3638	-1.6200	0.1110	-1.3187	0.1405
pc3	-0.5254	0.3098	-1.7000	0.0960	-1.1468	0.0959
pc4	-0.5585	0.2619	-2.1300	0.0380	-1.0838	-0.0331
pc5	1.4760	0.5101	2.8900	0.0060	0.4529	2.4991
pc6	0.4796	0.2931	1.6400	0.1080	-0.1084	1.0675
_cons	-26.661	9.6460	-2.7600	0.0080	-46.0089	-7.3142

Table A48.

Eastern Europe 1st PC Regression

Source	SS	df	MS
Model	1344.99	10	134.499
Residual	1313.18	106	12.3885
Total	2658.17	116	22.9152

Number of obs	=	117
F (10, 106)	=	10.86
Prob > F	=	0.000
R^2	=	0.506
Adj R^2	=	0.4594
Root MSE	=	3.5197

gd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
cd1	0.6011	0.1077	5.5800	0.0000	0.3875	0.8147
hc	0.0520	0.0680	0.7600	0.4470	-0.0829	0.1868
o	0.0138	0.0153	0.9000	0.3680	-0.0165	0.0442
s	-0.0145	0.0415	-0.3500	0.7270	-0.0969	0.0678
pc1	-0.6617	0.1472	-4.5000	0.0000	-0.9536	-0.3699
pc2	-0.5468	0.2034	-2.6900	0.0080	-0.9501	-0.1435
pc3	0.6291	0.2808	2.2400	0.0270	0.0724	1.1859
pc4	0.1319	0.2824	0.4700	0.6420	-0.4280	0.6917
pc5	0.3291	0.3445	0.9600	0.3420	-0.3539	1.0121
pc6	-0.3489	0.3466	-1.0100	0.3160	-1.0360	0.3382
_cons	-0.8704	8.8793	-0.1000	0.9220	-18.4745	16.7337

Table A49.

Eastern Europe 2nd PC Regression

Source	SS	df	MS
Model	1270.19	4	317.548
Residual	1387.98	112	12.3927
Total	2658.17	116	22.9152

Number of obs	=	117
F (9, 53)	=	25.62
Prob > F	=	0.000
R^2	=	0.4778
Adj R^2	=	0.4592
Root MSE	=	3.5203

gd	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
cd1	0.6526	0.1030	6.3300	0.0000	0.4485	0.8567
pc1	-0.5754	0.1198	-4.8000	0.0000	-0.8128	-0.3380
pc2	-0.4548	0.1740	-2.6100	0.0100	-0.7997	-0.1099
pc3	0.3875	0.2412	1.6100	0.1110	-0.0904	0.8654
_cons	3.5327	0.3277	10.7800	0.0000	2.8833	4.1821

Table A50.

Europe KMO Sampling Adequacy

Variable	KMO
aatma	0.6710
aatmg	0.5824
abac	0.5019
abba	0.6774
abbg	0.5328
abc	0.5029
dbd	0.7962
ddc	0.8942
ddmba	0.7582
ddmbagdp	0.8081
dll	0.8011
dpc	0.7578
ebc	0.6034
ebnin	0.4666
eoc	0.6768
eroa	0.7405

sca	0.8644
scrwa	0.7529
sld	0.4406
snim	0.8196
sroe	0.6972
Overall	0.7198

Table A51.

Western Europe KMO Sampling Adequacy

Variable	KMO
aatma	0.2437
aatmg	0.3964
abac	0.5191
abba	0.5080
abbg	0.4042
abc	0.4849
dbd	0.7089
ddc	0.7798
ddmba	0.2863
ddmbagdp	0.6311
dll	0.7036
dpc	0.5912
ebc	0.6695
ebnin	0.5978
eoc	0.5514
eroa	0.7886
sca	0.2237
scrwa	0.3307
sld	0.6105
snim	0.4070
sroe	0.6149
Overall	0.5374

Table A52.

Central Europe KMO Sampling Adequacy

Variable	KMO
aatma	0.7889
aatmg	0.5741
abac	0.4684
abba	0.4039
abbg	0.6010
abc	0.7850
dbd	0.6842
ddc	0.7195
ddmba	0.1807
ddmbagdp	0.5990
dll	0.6641
dpc	0.6517
ebc	0.5467
ebnin	0.4945
eoc	0.4960
eroa	0.3824
sca	0.6449
scrwa	0.7644
sld	0.7602
snim	0.4456
sroe	0.1810
Overall	0.5956

Table A53.

Eastern Europe KMO Sampling Adequacy

Variable	KMO
aatma	0.6425
aatmg	0.6330
abac	0.5811
abba	0.4552
abbg	0.4866
abc	0.5475
dbd	0.8157
ddc	0.8667
ddmba	0.7528
ddmbagdp	0.8513
dll	0.8072
dpc	0.8546
ebc	0.7501
ebnin	0.5545
eoc	0.6071
eroa	0.6123
sca	0.7721
scrwa	0.8341
sld	0.7038
snim	0.7119
sroe	0.6081
Overall	0.6937

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