

**The Role of Banking Sector on Economic Growth in  
European Union and East Asia: Evidence from Panel  
Data Analysis**

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## ABSTRACT

This thesis empirically investigates the relationship between bank sector and economic growth whereas controlling for the effects of labour and physical capital factors in panel data estimation. Panel data which covers the period 2000 – 2010 by conducting a version of Solow Growth Model for both four European countries and four East Asia countries are used a sample in the thesis. The study mainly aims to determine whether the Bank sector and other relatively important factors stimulate the process of economic growth in the light of exogenous modelling framework by conducting the Panel Co-integration Technique. Estimated results suggest that economic growth in four European countries and four East Asia countries are in long-term equilibrium relationship; banking sector has long-term significant impact on economic growth and therefore economic growth converge to their long-term equilibrium levels through the channels of Capital and labor. However, East Asia countries have not long term and short term economic growth effect when labor and domestic credit are used whereas European countries have not long-term labor growth effect and short term money supply effect. This supports the reality that European countries are more successful in adapting banking system by using money supply as well as domestic credit than East Asia countries. However East Asia countries are more successful in adapting labor and capital policies in short-run than European countries. Therefore, authorities in East Asia countries need to adapt monetary policies effectively in order to increases efficiency through expansion in banking sectors.

**Keywords:** Economic growth, money supply, domestic credit, capital, labor, Solow growth model, panel unit root test, panel co-integration test.

## ÖZ

Bu tez, bankacılık sektör etkisi ile ekonomik büyüme arasındaki ilişkiyi capital (sermaye) ve (emek) işçi değişkenlerini kullanarak ölçer. 2000 ile 2010 yılları arasındaki Avrupa ve Uzakdoğu kıtalarında yer alan dört ülke seçilerek bankacılık sisteminin ölçümleri için panel verileri kullanılmıştır. Bu tezdeki ana amaç Solow Büyüme Modeli çerçevesinde panel birim kök ve panel eşbütünleme tekniklerini kullanıp ekonomik büyüme üzerindeki bankacılık sektörü etkilerini analiz etmektir. Ampirik bulgular hem Avrupa’da hemde Uzakdoğu ülkelerinde uzun dönemli ilişki olduğu ve bankacılık sektörünün ekonomik büyümeyi etkilediği gözlemlenmiştir. Uzakdoğu ülkelerinde yerel sermaye ile emek piyasasının ekonomik büyüme üzerinde uzun ve kısa dönemli etkiler saptanmamıştır. Bu bulgular Avrupa ülkelerinde daha başarılı bir bankacılık sektörünün olduğunu gösteriyor. Ayrıca, Uzakdoğu emek ve sermaye piyasalarında kısa dönem için Avrupa ülkelerinden daha başarılı olduğu bulunmuştur. Dolayısıyla, uzmanlar para ve sermaye politikalarını bankacılık sektöründeki verimliliği artırabilmesi bağlamında daha iyi uygulaması gerekir.

**Anahtar Kelimeler:** Ekonomik büyüme, para arzı, emek, sermaye, Solow Büyüme Modeli, birim kök, eşbütünleme.

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# **Chapter 1**

## **INTRODUCTION**

### **1.1 Aim of the Study**

This research empirically discovers the relationship between the banking sector and economic growth while controlling for the effects of labor and physical capital factors in panel data estimation. A sample panel data which covers the period 2000 – 2010 is used. This research mainly aims at determining whether the Bank sector and other relatively important factors stimulate the process of economic growth in the light of exogenous modeling framework.

### **1.2 Methodology and Data Collection**

The research used the panel unit root technique, co-integration technique and vector error correction technique to investigate the case. The data were collected from the World Bank which included the four Eastern Asian countries; Malaysia, Hong Kong, Singapore and Southern Korea and four Western European countries; Germany, France, Belgium and England.

### **1.3 Findings of this Thesis**

The findings of this thesis can be summarized as such there is a strong economic and statistical relationship between banking sector and economic growth in long-term in both European and Eastern Asian countries with its determinants which are capital, labor growth, and money supply or domestic credit. Thus banking sector affects economic

growth level through the channels of capital and labor growth in the economic long term. Furthermore, economic growth converges to their long-term path significantly through its determinants mentioned above.

#### **1.4 Structure of The Study**

This thesis is organized as follows: the second chapter reviews the related literature, the third chapter gives information about banking system in Europe and Eastern Asia, chapter four explains methodology, data and the method used in the thesis, chapter five presents and discusses results and chapter six concludes some important remarks by discussing policy implications as well as summarizing some important recommendations for further studies.

## **Chapter 2**

### **LITERATURE REVIEW**

#### **2.1 Literature Review**

In theoretical studies of the endogenous economic growth, the financial sector played such an important role that it lead to growth increase. Pagno (1993) has found three factors in financial efficiency that could increase economic growth which was increasing productivity of investment, reducing of transaction costs of intermediation and the ability to influence the share of saving in the economy.

Harrison et al. (1999) describe the existence of relationship between banking sector and economic growth in general. Their finding shows that in case of economic growth, the banking sector is the main factor and more cost effective, which consequently influences capital accumulation and final growth. Economic growth increases bank's activity and profits and therefore, brings more banks to the financial market. This reduces the distance between banks and borrowers and the cost of intermediation thus increases investment and economic growth.

In (Valerija Botrić & Sunčana Slijepčević , 2008) studies and model for financial efficiency estimation is used as indicators such as interest rate spread. The results indicate that there is positive relationship between increased banking sector efficiency

and economic growth for countries of Southeastern Europe during the period of 1995-2005 by using panel data model.

Also (Schumpeter, [1911] 1934; Mckinnon, 1973; and Shaw, 1973) have studied the relationship between financial development and economic growth. Now it is well recognized that financial development is very important for driving to economic growth.

Patrick (1966) studied causality between financial development and growth as the supply leader and demanded hypothesis. The supply leading assumes that a relationship between financial development and economic growth means financial institutions creation and market increases the supply of financial services, due to the economic growth.

One of the studies mentioned in the preceding paragraph by (Gupta K. L., 1984) was the first attempt on the issue of causality to overcome the shortage of data used for the industrial output to measure the extent of economic development which is available in a quarterly frequency. This quarter is managed to construct a large number of observations by using quarterly data. Using annual data of 19 developed and 37 developing countries and employing the Granger's causality testing framework, (Jung, 1986) the second important issue on causality resulted in that developing countries have a supply-leading causality pattern, which makes Patrick (1966) suggestion about the usefulness and importance of financial development in developing countries unacceptable. In contrast, Demetriades et al. (1996) confirmed in their study that (Jung, 1986)'s results based on asymptotic theory are rarely expected to hold. Also, Jung's proposition is in direct

contrast with the view of (Goldsmith, 1989) that the direction of causality is from economic to financial development irrespective of the stage of development. (Mckinnon, 1973; King & Levine, 1993a; King & Levine, 1993b; and Neusser & Kugler, 1998) and (Beck, Levine, & Loayza, 2000; and Rousseau & Watchel, 1998) all support the leading-supply hypothesis. On the other hand, the followed-demand posits a causal relationship between economic growth and an increasing demand for financial services. (Gurley & Shaw, 1967; Goldsmith, 1969; and Jung, 1986) also support this hypothesis. Jao (1976) used the two measures of financial development, growth of per capita real money balances and ratio of wide money stock or M2 to GDP, in order to measure their influences on economic growth by taking 67 developed and developing countries into consideration over the period of 1967-1972. According to Jao's findings both measures positively affected the economic growth as all the 67 countries are combined. Whereas only the growth rate of per capita real balances has effects on developing countries as the countries are separated. Moreover, utilizing time series data over 13 developing countries Wai (1980) found that the real value of domestic credit had considerable positive impacts on real GDP in almost all countries.

Another cross-country study covering 21 countries over the period of 1971-1980 was carried out by Layni & Saracoglu (1983) in which they stated that growth of real money stock, wide money or M2, had a significant positive effect on the growth rate of real GDP. Correspondingly, Gupta & Kahaya (1986) and Gelb (1989) also found that financial intermediation favorably affected economic growth. Demetriades et al. (1996) conducted one of the recent causality tests between financial development and real GDP by using time series techniques over 16 countries. Even though in quite a few countries they found

the evidence that the direction of causality run from economic growth to financial development, most of the overall evidence suggested that the association between financial development and economic growth is bi-directional. Some studies discussed that the degree of competition in the financial sector can affect the efficiency of the production of services, the quality of products, and the degree of innovation in that sector and therefore the economic growth (Allen, Franklin, & Douglas Gale, 2004; and Vives, 2001) They argued that the degree of competition in the financial sector can induce the access of firms to external financing. Furthermore, less competitive systems may lead to easier access to external financing as more market power banks have more tendencies to invest in information acquisition and relationships with borrowers.

## **2.2 Finance and Growth Nexus**

In the 1960 s early pioneers like Goldsmith (1969) and Gerschenkron (1962) used econometric methods and case studies to investigate the finance growth connection. They found a strong relationship between these two factors but did not provide a strong enough theoretical studies to answer the causality question.

According to Mckinnon and Shaw (1973), also known as M-S school of thought, the financial liberalization affects the growth in contrast to financial repression. They argued that the financial sector could increase the volume of savings as well as the quality and quantity of investment.

A majority of studies were concluded that finance induces growth in early stages of economic growth as well as advanced stages.

## 2.3 Finance and Endogenous Growth

In the 1990's studies on the relationship between financial development and long run growth was raised from the literature on endogenous growth. Thus they started to focus on the question that whether financial conditions could induce sustained growth in per capita GDP or not.

One of the studies referred to in the preceding paragraph is the work of (Greenwood & Jovanovic, 1990). They concluded that “growth and financial intermediation are inextricably linked”, because, “growth” provides means to develop financial structure. In turn, financial structure allows for a higher growth rate given that a higher rate of return on capital can be earned, enabling investment to be undertaken more efficiently. Likewise, developing an endogenous growth model with multiple assets, (Bencivenga & Smith, 1991) argued that the effects of introducing financial intermediation into the environment in which agents who face haphazard future liquidity needs build up capital and a liquid, but unproductive asset. They proposed the conditions under which the composition of savings shifts towards capital by means of intermediaries, causing intermediation to be growth promoting. The main argument is that finance creates an external effect on aggregate investment efficiency. Some other studies investigated the role of stock market and economic growth. The question ‘what is the relationship and causality between finance and economic growth and in which level of the development process does prevail?’ was asked by Patrick (1966). He found that in the initial stage of development process causality runs from financial to grow to a supply-leading relationship. Yet, in later stages increase in real economy demand meant increase in financial services which the causality is reversed with the demand-following



relationship. (Fritz, 1984) also reached the same conclusion by utilizing the “causality-testing framework”, proposed by Granger (1969) in the case of Philippines. The causality debate that began with Patrick (1966) is still unresolved after nearly three decades, especially in the empirical literature. This is partly due to the shortage of time-series data for a long-time period in developing countries. Demetriades et al. (1996) also applied causality tests between financial development and real GDP for 16 less developed countries by time series techniques. Their studies provide less support for the hypothesis that financial factors play an important role in the economic development process. There are sufficient supports for the reverse pattern (i.e. growth causing financial development). In addition to this, most of the studies prefer to use only the financial development variable, sometimes with an additional variable as the determinant of economic growth which ignores other growth-determining variables such as the share of investment in the GDP, labor force growth and export growth. Consequently, their findings cannot be free of doubt (Odedokun, 1996a).

## **2.4 Stock Market And Economic Growth**

Large number of studies has been written about the importance of stock markets for development. Atje & Javanovic (1993) for example, do not present an endogenous growth model but use the approach of Greenwood & Jovanovic (1990) and operate it to stock markets. Levine (1991) constructs an endogenous growth model in which a stock market facilitates growth by assuming two processes where it reduces liquidity risk and productivity risk.

Atje & Javanovic (1993) use a sample of 40 developing and developed countries for their empirical method. They used two indices of financial development; one is

measuring bank intermediation and second is stock market activity. They concluded that stock market induce long run growth in per capita GDP. In contrast, Harris (1997) concludes that the stock market activity is one of the weakest indicators for long run growth in per capita output. He used 49 countries that had official stock markets in 1991, in period of 1980-1991.

## **2.5 Banking Sector and Economic Growth**

There are few studies investigating the impact of banking system structure on growth. Whether more banking system competition positively affects a firm's ability to attract financing is a way to grow the external financially dependent sectors. This is because these sectors grow faster in greater competition countries. Based on the empirical methodology at (Rajan,Raghuram & Luigi Zingales, 1998), the cross sectional study of (Cetorelli, Nicola, & Gambera, 2001) documents that banking sector concentrates its efforts to have an effect on overall economic growth; as it promotes the growth of industries that depend on external finance. The same methodology that Deidda & Fattouh (2002) found that banking concentration is negatively joined per capita growth and industrial growth only in low income countries.

In this field, Dell ' Ariccia and Bonaccorsi di (Dell Ariccia & Bonaccorsi di Patti, 2004) used this approach and found that banking system's concentration has positive effect on firm's creation. Gerschenkron (1962) argued about the role of banking sector in economic growth and he used the term "economic backwardness" for the first time. According to his study a country's degree of economic growth at the beginning of industrialization process can determine the role of its banking sector. For instance, in England, the most advanced economy which is industrialization didn't need an active

financial sector. The reason is that investment was small scale and needed less capital and specialized entrepreneurship. But Germany which has moderately backward economy, entered industrialization when technology was more developed and investment had a large share. So, the banking sector provided both capital and entrepreneurship to run the industrialization process.

In France, the insufficiently developed banking system retarded rapid industrialization in the first half of the 19<sup>th</sup> century. The main reasons for retarded economic development are restrictions on credit volume, a small number of banks, insufficient variety and specialization of financial institutions. In the second half of the century some financial improvements were employed, but restrictions remained. In that time the Belgian financial system featured some major innovations. For example the creation of the first joint stock bank, this has promoted the process of industrial development.

In Germany before 1870 private banks were the most important financial institutions that provided capital for industrial development.

## Chapter 3

### THE BANKING SECTOR

#### 3.1 The Banking Sector

One of the all financial activities in an economy basic to the working of the economic system is the provision of payments, which is traditionally achieved by banks presenting a distribution network for the supply of money and realizing both domestic and international payments on behalf of their customers.

#### 3.2 United Kingdom

In the UK's financial system, the Bank of England chooses an appropriate means to apply and be responsible for putting into effect the financial policy formulated by the Treasury and this has a pivotal role. It exerts control over the conditions in financial markets and the behavior of financial institutions through its three basic functions (Howells & Bain, 1994).

- ❑ Supervision of all UK banks.
- ❑ Management of the National Debt.
- ❑ Banker function to the government and to commercial banks.

The bank of England has carried out its control of the banking system indirectly by way of closing associations with the clearing banks, discount houses and accepting houses for

a long time. Nevertheless, scandals of secondary banks in the early 1970s, the collapse of the Johnson Matthey Bank in 1984 and worries about the soundness of the major banks regarding capital sufficiency with emerging debt crisis of developing countries in the mid-1980s have caused the need for a change in the Bank of England's role through new Banking Acts in 1979 and 1987. The Bank exercised its supervision by licensing institutions to take deposits and requiring regular statistical returns from them. The 1987 Banking Act eliminated the separation between recognized banks and licensed deposit-taking institutions to set up in the 1979 Banking Act, establishing one type of "authorized institutions" governed by the same rules and regulations. Thus, The Bank of England is responsible for the supervision of all UK banks under the 1987 Banking Act. In addition, another change through the 1987 Banking Act is the usage of risk-asset ratio total bank capital compared to bank assets as a base for supervision rather than gearing ratio which is the relationship between bank's capital and its total liabilities. Also, through the 1986 Financial Services Act the Bank of England is in charge of regulating the UK wholesale markets in sterling, foreign exchange, and bullion. Managing the National Debt the Bank of England has the discretion about impinging on financial markets. Since the government has had expenses more than its revenue, the Bank is responsible for recovering this deficit. Issuing government securities, ( i.e. treasury bills maturing in ninety-one days and government bonds maturing at anything from five years from their date of issue to never), is one way of borrowing. The Bank has to bear the refinancing of new borrowing requirement of the National Debt, maturing each year, in mind due to this process might influence both the liquidity of financial markets and the structure of interest rates. Lastly, the Bank of England serves as banker to the government and to commercial banks through its banking department. Its liabilities

cover “public deposits”, those of Exchequer (the government’s central cash account), the Inland Revenue, the National Loans Fund and the National Debt Commissioners. The net flows of large sums being received and paid out as the public and private sectors make payments illustrate a change in the stock of public deposits. Different commercial banks use the Bank for different needs.

### **3.3 Belgium**

Belgium banking sector is one of the most concentrated in Europe with high degree of openness to investment, particularly with the rest of Europe. In spite of the high concentration, low overall net interest margins indicate that the system could still be competitive in some segments of the loan and deposit markets. There is a high competition between large numbers of small and medium-sized banks providing savings deposits and the mortgage market. Belgian banks have high ratings. Profitability, as measured by return on assets (ROA). However, Belgium banks’ ranks get higher when profitability is measured by return on equity (ROE). In fact, Belgian banks are more leveraged than in other European countries. The figure1 below shows the banking assets as a percentage of GDP in UK, France, Germany and Belgium that is separated into two periods: before and after Europe crises. Figure 2 indicates just Belgium banking asset (percent of GDP).

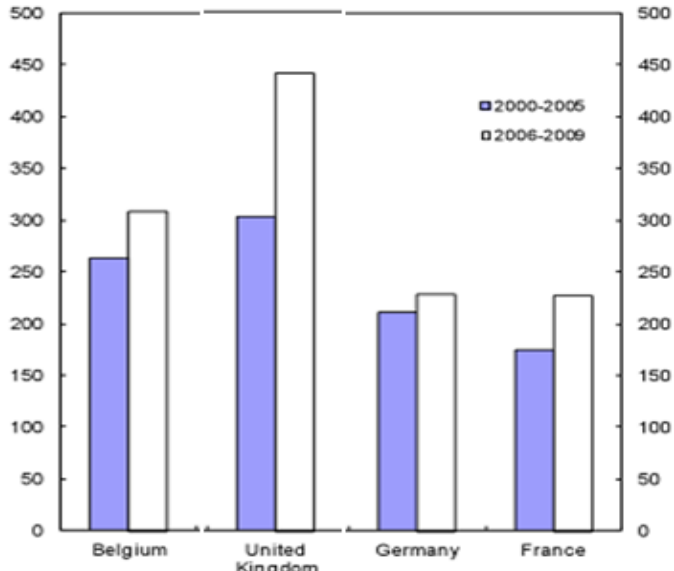


Figure 3.3.1. Banking Asset (Percent of GDP)

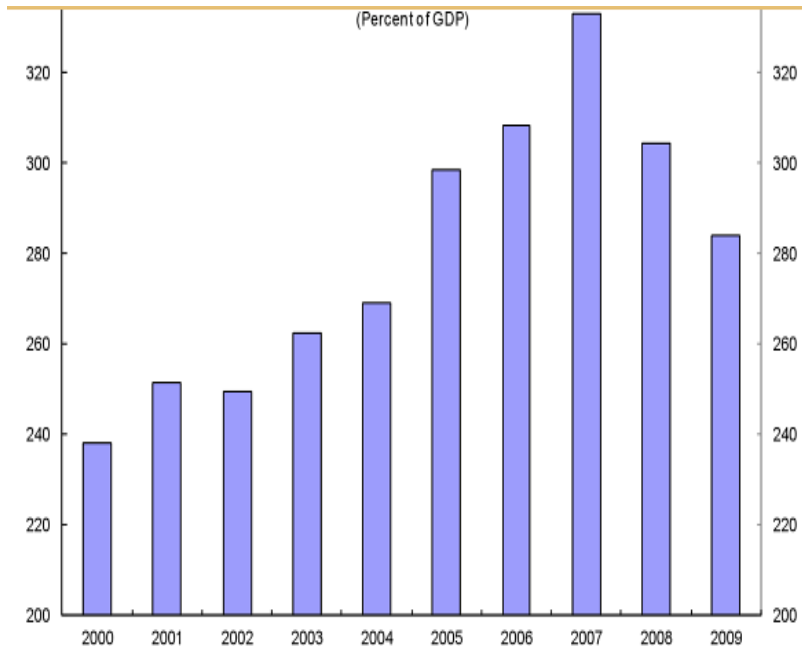


Figure 3.3.2. Annual Growth (GDP)

Belgium has two important banks: The Société Générale and National Bank of Belgium which was founded on May 5, 1850. The powerful Societe Generale was founded under the Dutch regime in the beginning of the century and attended to the collection of public revenues. It had done a large business both and industrial transactions at long maturity. The years 1837, 1838 and 1839 were disastrous for the Belgian banks. Belgium was historically dependent on the Netherlands and France which affected to its banking sector. In 1815, some countries gained independence from France and made up the United Kingdom of the Netherlands. However, the French speaking Catholics resented the Dutch rule, separated from the Netherlands in 1830 and established Belgium.

### **3.4 France**

Banking methods were invented in Italy and then arrived in France, manual exchange transactions and the bills of exchange usage to transfer funds. In France the first expansion of banking occurred in the eighteenth century. There was a need to create the organizations with diversified credit structure under Louis XVI in order for the economy to progress, particularly giant businesses and the need for borrowing money for the state. Some powerful banking houses were established in Bordeaux, Lyons, Saint Malo and Paris cities. Although they resulted in catholic bankers who originated from France, many foreign bankers, especially Swiss ones, for instance the Hottinguers of Zurich, were established in Geneva with multiple activities. They financed international trade, used international credit at the service of the sovereign and intervened in the stock market. In the first half of the nineteenth century the *haute banque* was created. In the capital city about 20 banking houses such as the Mallets, has settled in Paris since 1713. They had been in the profession since 1789. Some others,



like the Mirabauds, after the July monarchy (1830-48) were also settled there. In the nineteenth century the major part of capital were made from their personal capital, rich families and relatives whom entrusted them and the funds which they earned from numerous activities. Besides these powerful bankers, there were about 2000 local bankers, called discounters. Although the credit's structures for the state's demands and for trading were more or less sufficient, we posed to the scarce of money and high price in times of economic crisis. Although, the effects of a political revolution caused severe crisis in 1848 some bankers went bankrupt and others stopped granting credit. The banks posed critical situation and crisis by massive withdrawals at the time of the war in 1870 and crises broke out in the 'Great Depression' from 1873 to 1896. During the bankruptcies that occurred in 1930 and 1931, the number of banks was reduced by a quarter. Only one large bank, the *Banque Nationale de Cr dit* was established in 1913. The banks suffered from the collapse of the economy in the Second World War, too. The liberal regime (in which the banks in France had always functioned by the law of 13 June 1941 which regulated the banks and set up institutions) was stopped by the Vichy government. Overall, focusing on the banking sector has created quick progress in 1984. There were 1556 banks in France which added up to 50% decrease in the number of banking institutions operating at the turn of the century. In 1999, there were only 1000 left. Meanwhile, French banks, which were still ranked between 101<sup>st</sup> and 240<sup>th</sup> in the world profitability league tables in 1997, had made substantial progress by the end of the crisis.

### 3.5 Germany

The German financial system is a bank-based system although, in contrast to other developed capitalist countries, a significant part of the banking system has consisted of publically-owned and cooperative banks that are not driven primarily by the search for profits. In the 1980s, in Germany the big banks had a great effect on promoting the development of market securities by boosting their earnings from investment banking activities. There is a restriction on neither commercial nor investment banking activities in Germany. As a result, German banks are universal banks. The universal banks are divided into three main groups: private banks, which accounted for 38 per cent; a publically-owned savings bank sector with 29.4 per cent and a cooperative banking sector with 11.8 per cent of banking assets. In addition to the universal banks there are a small number of special purpose banks which accounted for 20.4 per cent of banking assets in 2012. Germany has a high number of banking compared with the other major European countries, with 1,988 institutions in 2012.

**Private Banks:** These include transnational banks, mega-national banks and branches of multinational banks. The Deutsche Bank which is the largest of these big banks plays a major and very important role in the size of Germany's economy. As of 2010, it remained the only major international player of Germany with total assets summing up to 1.9 trillion euro. The second largest big bank is Commerz bank with total assets summing up to 754 billion euro. There are also, two medium sized Bavarian banks which merged and became the Uni-Credit Bank in 1998 and ranked the third largest bank of 2010 with sum total assets of 372 billion euro. In order to develop investment banking, the Deutsche Bank purchased the London-based investment bank, Morgan

Grenfell, in 1990 and the New York-based Bankers Trust in 1998. Dresdner Bank, a London-based Kleinwort Benson was also bought for the same reason in 1995 and this led to greater activity in the international financial markets while Deutsche Bank actually established its investment banking activities in London. In the early 1980s, the share of net interest in big banks' total income declined from under 80% to under 60% in the year 2000, although it increased again to about 70% in 2008 and also in 2009.

**Savings Bank:** The savings bank sector consists of the primary savings banks, or Sparkassen which are owned by local city and country governments, namely, the regional Landesbanken, and the Deka Bank. They are required to serve the public interest in their domiciled communities and to avoid making a loss even though profit maximization is not their primary aim. One of the key factors attached to this development's success can be said to be due to the close relationship between Sparkassen and other small and medium enterprises which ensured that in Germany such enterprises have had greater access to credit than in many other developed capitalist countries. Sparkassen has also been more willing than private banks to continue providing credit when other companies are under stress.

**Cooperative banks:** The banks under this category compete with private banks for commercial and investment bank businesses. The cooperative banking sector can be subdivided into two levels; and they are primary cooperative banks and regional institutions. Notwithstanding, the number of primary cooperative banks has dropped drastically since the 1970s as a result of a process known as rationalization. It was intended to reduce operating expenses, but there were still about 1,121 at the start of year 2012. On the

other hand, the credit cooperatives are owned by their members, even though they also provide retail banking services to non-members. The cooperative sector also includes two regional institutions which act as central banks for the primary credit banks. The DZ Bank which was formed by a merger in 2001 has around 900 members while the WGZ Bank (Westdeutsche Genossenschafts-Zentrale) has some 210 members in the Rhineland and Westphalia.

**Specialised banks:** There are three groups of banks which have specialised functions in addition to the universal banks. One of them consists of mortgage banks, which provide loans to purchase property and raise money from long-term deposits and the issue out bonds. As in 1980, there were about 39 mortgage banks but the number has fallen steadily and by 2009 has dropped to 18. Another group of specialized function banks can be said to be made up of building and loan associations while the other group of specialized function banks provide funding to promote investment in specific sectors of the economy.

### **3.6 Malaysia**

The Malaysian economy continued to grow strongly in the first three quarters of 2012. Malaysia has also become a global leader in Islamic finance and participant banking. Thus, the first commercial bank was mercantile bank which was a branch of a British exchange bank in 1859 in Penang. Domestic demand has been the main driver of growth. Also the first domestic bank was the Kwong Yik in Kuala Lumpur in July 1913. The currency board was established in 1907 for issuing currency and protecting its value. The central bank of Malaya was called bank Negara Malaysia in 1959. At the formation of the Central Bank, the currency issuing powers remained vested in the

currency board until June 1967 when the currency issuing authority was handed over to bank Negara Malaysia. Under the Financial Sector Master Plan (FSMP), the finance goes through a consolidation process. The number of domestic commercial banking groups has been reduced from 22 in 1986 to 8. Commercial banks are merging with their finance companies. It makes financial institutions one stop financial centers and be more competitive and better prepared for the impending liberalization of the financial service sector which is expected to come on board as of 2007. On the other hand, other mergers are expected between ten anchor banks.

### **3.7 Hong Kong**

Hong Kong banking sector (deposit-taking) is divided into three categories; licensed banks, restricted license banks and deposit-taking companies. They are all known as authorized institutions (AIs) under banking authority. AIs might operate in Hong Kong both locally consolidated companies and of foreign banks branches but licensed banks operate current accounts. Restricted license banks are involved in merchant banking and capital market activities. These companies are impeded to keeping deposits of HK\$100,000 or above with at least three months term to maturity. In addition, the Deposit Protection Scheme protects the depositors in Hong Kong. The license banks and deposit-taking companies were restricted by the authorization criteria for licensed banks as a reason of looking for guarantee that only public deposits are entrusted by proper institutions. Overseas banks are not required to keep capital in Hong Kong as they operate in branch form. The legal structure of banking supervision in Hong Kong is according to international standards such as the Basel Committee's Core Principles for impressive Banking Supervision. The supervisory process includes risk-based approach

which stresses on the quality assessment of AIs internal risk management systems related to the current and emerging risks they encounter.

### **3.8 Singapore**

Singapore is the third largest economy in Asia after Japan and Hong Kong. Moreover, the banking sector plays a key role in the country's financial market segment. The factors such as economic and political environment, favorable for legal and tax policies, good integration economy and strict obligations against corruption and money laundering made Singapore's economy stronger. There are 117 foreign banks and 6 local banks that prevail banking industry. MAS (Monetary Authority of Singapore) started a five year liberalization programs to empower the banking system and enlargement of Singapore's international financial center in May 1999. The second part of liberalization was started in June 2001 during which the restricted banks were re-classified as wholesale banks to improve competitiveness in retail banking. A big jump in the local banking sector was the consolidation of the 6 local banking groups into the present 3 main local banks (DBS, OCBC and UOB). This result in strengthening the banks' capabilities, building their management teams and impact on activities efficiency. The banking in Singapore categorize in two types of clients: individuals, corporations or government agencies. These banks provide commercial banking, retail banking and private banking services. The banks are classified into two groups: **1) local banks** and **2) foreign banks**. This is subdivided into:

**-Full Banks:** prepare the whole range of banking activities approved under the Banking Act. For instances: HSBC, Citibank, Standard Chartered, May bank, ABN AMRO and BNP Paribas. These foreign banks are operating in Singapore.

-**Wholesale Banks:** involve in the same range banking activities as full banks, except dollar retail banking operation of Singapore. For examples: ING bank, National Australia Bank, Barclays Bank, Deutsche Bank etc.

-**Offshore Banks:** involve in same activities as full and wholesale banks for businesses transacted through their Asian currency units (is an accounting unit that are used to book foreign currency transactions done in the Asian Dollar Market).for Examples: Korea Development Bank, Bank of Taiwan, Bank of New Zealand, Canadian Imperial Bank of Commerce etc.

-**Merchant Banks:** prepare corporate finance, underwriting of share and bond issues, merges and acquisitions and portfolio investment management. These are including: Credit Suisse Singapore Ltd, Barclays Merchant Bank Singapore Ltd, ANZ Singapore Ltd, Axis Bank Ltd etc. main local banks are include:

**1. DBS** (Development Bank of Singapore) which was established in 1968 and is large bank in Singapore and Southeast Asia regarding its assets.

**2. OCBC** (Oversea Chinese Banking Corporation) established in 1912, is one of the largest financial institutions in the Singapore-Malaysia market with total assets of S\$184 billion.

**3. UOB** (United Overseas Bank) founded in 1935, which is a leading bank. The UOB had total assets of S\$175.0 billion at 31 December 2007.

### **3.9 South Korea**

In 1961 Park Chung Hee became president of South Korea and he organized a centralized government with capability of direct economy. He nationalized all banks, took control of foreign borrowing and merged agricultural banks with agricultural cooperative movement. In the mid-1980s government liberalized the banking system by denationalizing some banks. Thus the government took a strong control over these banks. In the late 1980s South Korea financial sector included a mix of commercial banking system, a wide range of secondary financial institutions and a securities market. On June 12 of 1950 the bank of Korea was founded as a central bank. The main operations were issuance of all currency, the conduct of the main part of foreign exchange control business, the implementation and making monetary and credit policies, the studding, collecting and calculating of statistics on many dimensions of South Korea's financial system. In December of 1988 the key element of financial liberalization was established, with removing barriers of interest rates of banks and non-bank financial industry in 1989, three new commercial banks were founded. In 1989 a number of securities investment trust companies were set up. Five major commercial banks of South Korea include: Chohung, Commercial, First, Hanil, and Seoul, which were privately held. All commercial banking operations are organized by the Bank of Korea. Commercial banks got their money by deposits from general public, international loan sand fund borrowed from the bank of Korea. There are three other financial development institutions which supplied credit for business and government's projects, which are: the Export-Import Bank of Korea, the Korea Development Bank and the Korea Long-term Credit Bank.



### 3.10 East Asian Currency Crisis

Important case investigations are 1997–1998 banking disasters that affected Eastern Asia. All the East Asian countries that suffered a severe decline of their currency (a currency crisis) during that chaos also experienced systemic banking sector catastrophe. A recent research of the growth of the East Asian disaster was accompanied by extensive banking problems.<sup>1</sup> The suggestion made here that the decline in domination power may play the most significant role in the appearance of a financial crisis after liberalization. For instance, the study found that during the East Asian disaster, foreign-owned banks were less probable to get into a liquidity crisis and none of the foreign-owned financial organizations were closed. Moreover, the institutions that were connected with industrial groups or powerful families were more likely to be troubled during the crisis. Some evidences showing that foreign-owned banks tend to have higher profit margins and more meaningfully, that foreign presence is associated with lower profit margins for natively owned banks in developing countries.<sup>2</sup> Many liberalizing actions happened in the five East Asian countries which were affected most brutally by the disaster; namely, Indonesia, Korea, Malaysia, the Philippines and Thailand. Apparently, the sequence of liberalizations was different in each of these countries and that no single liberalizing act can be clearly related to the crisis. When the crisis generated it renewed interest in the banking sector issues. The World Bank started a

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<sup>1</sup> Bongini, P., S. Claessens, and G. Ferri. 2001. “The Political Economy of Distress in East Asian Financial Institutions.” *Journal of Financial Services Research* 19(1): 5–25.

<sup>2</sup> Claessens, S., A. Demirgüç-Kunt, and H. Huizinga. 2001. “How Does Foreign Entry Affect Domestic Banking Markets?” *Journal of Banking and Finance* 25: 891–911. More research on these issues is found in a 2004 special issue of the *Journal of Money Credit and Banking* 36(3), which is devoted to a discussion of banking concentration and competition.

biannual investigation of banking supervision practices universally, in 1999. Two rounds of this survey are now accessible that enable initial conclusions about developments for the five countries which were affected mostly by the crisis. Three observations are remarkable. First, banking sectors in the East Asian countries are now usually more concentrated, more foreign-owned and face more limitations on their areas of operations. Second, the legal powers given to auditors have increased. Third, the amount of non-performing loans, as a percent of total assets has declined in these countries. In reporting the results of a recent survey, the International Monetary Fund noted that [Asian] Banks have increased provisioning and write-offs to strengthen their balance sheets to varying degree. However, noteworthy vulnerabilities remain in the banking systems in a number of countries faced with high levels of distressed assets, under provisioned bad loans, and significant exposure to interest rate increases.<sup>3</sup>

Between 1997–1998 banking crises that swept through East Asia set off drastic declines in the affected countries and imposed heavy costs on the national taxpayers. Fear of more crises encouraged studies for causes and early warning signs. It soon became clear that liberalization of the local financial sectors of the countries in crises contributed to the birth of these crises but policymakers, supervisors and economists disagree about this. Initial inspection fell on unregulated universal capital flows, but an inclusive investigation suggests that liberalization can lead to financial instability either because of inadequate regulation of the financial sector or because of omission of previously

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<sup>3</sup> International Monetary Fund. 2005. *Global Financial Stability Report: Market Developments and Issues*, p. 58.

settled dominations of existing banks. These likelihoods suggest varying policy implications for the existing state of domestic economic systems in Eastern Asia. An analysis of the banking system has obtained a great interest in the last few years, especially after the international financial crisis of 2007-08. Studies such as (Kindleberger & Aliber, 2005; Reinhart & Rogoff, 2009 and Gorton, 2010) have used historical evidence to show that the banking system seldom escapes any crisis.<sup>4</sup> In most cases, the banking system has usually exaggerated and intensified the crisis and finally suffered itself from it.

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<sup>4</sup> With growing financialization in the economy, economic crises have increasingly concentrated on the banking system (Cook, 2008).

## Chapter 4

### DATA, METHODOLOGY AND EMPIRICAL MODEL

#### 4.1 Data: Types and Sources

Data set used in this thesis is based on annual figures consisting of 2000-2010 of eight countries, four Western Europe such as: Germany, France, Belgium, United Kingdom and four Far Eastern Asia countries: Malaysia, Hong Kong, Singapore, South Korea base on panel data method. The variables are measured as follows; output is measured by real **GDP** per number of worker, **GDPW**, **KGDP** gross capital per **GDP**; **L** labor and **VBS** vector banking sector or **M2** or **DC** which is total Domestic Credit (us \$). Data are derived from the **WORLDBANK** website<sup>5</sup>.

#### 4.2 Methodology

##### 4.2.1 Panel Unit Root Test

Some researchers who have used cross-sectional and time series analysis in empirical work have argued that when the main motivation of the study is to investigate the variables if they are stationary or not. Many approaches exist to analyse unit roots such as Im, Pesaran and Shin W-stat, ADF - Fisher Chi-square, PP - Fisher Chi-square, Levin, Lin & Chu and Breitung t-stat for the benefit of variables.

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<sup>5</sup> See [www.worldbank.com](http://www.worldbank.com) for more detail.

#### **4.2.2 Panel Co-integration Test**

Having applied panel unit root test, the panel cointegration tests are conducted for the sake of the non-stationary series. Here this test is employed to investigate whether long-term relationship exists between the variables or not. These tests are Pedroni (Engle-Granger based), Kao (Engel-Granger based) and Fisher (Johansen combined).

#### **4.2.3 Panel Error Correction Model Test**

After the detection of panel unit root as well as cointegration tests, error correction model test applied to find out long-term coefficients, short-term coefficients, error term to show how fast such disequilibrium would be corrected after a quarter by using the empirical equation.

### **4.3 Theoretical and Empirical Model**

Following (Fethi & Katircioğlu, 2007) the models are constructed in this study for both long –run and short run periods as follow:

Recently, many studies have provided new impetus to empirical research on the link between financial development and growth from both the endogenous and the exogenous growth modelling points of view.<sup>6</sup> It is worth emphasising that a number of existing empirical studies on the role of financial development have no framework with standard theoretical underpinnings.<sup>7</sup> Recent attention has centered on the relationship between financial development (i.e. banking sector) and economic growth in developing countries [See Schumpeter (1911), Goldsmith (1969), McKinnon (1973), Shaw (1973),

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<sup>6</sup> See King and Levine (1992), Murinde (1996), Odedokun (1996b), Berthelemy and Varoudakis (1996) and others.

<sup>7</sup> See Odedokun (1996b) for more detail.

King and Levine (1992), Odedokun (1996 a,b), Demetriades and Hussein (1996) and Levine (1996; 1997)].

In this thesis, we adopt the frameworks introduced by Mankiw et al. (1992), Ghura and Hadjimicheal (1996) and Arestis et al. (2001) to investigate the role of banking sector development and economic growth.

Let us consider the following Cobb-Douglas production function:

$$Y_t = K_t^\alpha (A_t L_t)^{1-\alpha} \quad 0 < \alpha < 1 \quad (4.3.1)$$

Where  $Y$  is output,  $K$  is capital,  $L$  is labour and  $A$  is a measure of the level of technology. The subscript  $t$  indicates time.  $L$  and  $A$  are assumed to grow exogenously at rates  $n$  and  $g$ :

We assume that  $\alpha + \beta < 1$ , so there are constant returns to factor inputs jointly and decreasing returns separately. Raw labour and labour-augmenting technology are assumed to grow according to the following functions:

$$L_t = L_0 e^{nt} \quad (4.3.2)$$

$$A_t = A_0 e^{gt + BDS\theta} \quad (4.3.3)$$

Where  $n$  is the exogenous rate of growth of the labor force,  $g$  is the exogenous rate of technological progress,  $BDS$  is a vector of banking sector development policy and the other factors that can affect the level of technology and efficiency in the economy, and  $\theta$  is a vector of coefficients related to this policy and other variables.

Furthermore, in the steady state, output per worker grows at the constant rate  $g$  (the exogenous component of the growth rate of the efficiency variable  $A$ ). This outcome can be obtained directly from the definition of output per effective worker as follows:

$$\frac{Y_t}{A_t L_t} = (k_t)^\alpha$$

$$\frac{Y_t}{L_t} = A_t (k_t)^\alpha \quad (4.3.4)$$

Let  $y_t^* = \left( \frac{Y_t}{L_t} \right)^*$

Taking logs both sides of Equation (4.3.4), we get Equation (4.3.5):

$$\ln \left( \frac{Y}{L} \right)^* = \ln A + \alpha \ln k^* \quad (t \text{ is omitted})$$

Where  $A_t = A_0 e^{(gt + BSD\theta)}$

$$\ln \left( \frac{Y}{L} \right)^* = \ln A_0 + gt + \theta \ln BSD + \frac{\alpha}{1 - \alpha - \beta} \ln s^\kappa - \frac{\alpha + \beta}{1 - \alpha - \beta} \ln(n + g + \delta) \quad (4.3.5)$$

Equation (4.3.5) indicates steady state output per worker or labour productivity where a vector of financial policy proxies and the other variables exist.

The transitional dynamics by using a log-linearization around the steady-state give the following growth Equation:

$$\ln y - \ln y(0) = g + (1 - e^{-\lambda t}) \left[ \ln A_0 + gt + \theta \ln BSD + \frac{\alpha}{1 - \alpha - \beta} \ln s^\kappa - \frac{\alpha + \beta}{1 - \alpha - \beta} \ln(n + g + \delta) - \ln y(0) \right] \quad (4.3.6)$$

Where  $BSD$  is a vector of financial development policy and the other factors that can affect the level of technology and efficiency in the economy, and  $\theta$  is a vector of coefficients related to this policy and other variables.

Having rearranged Equation (4.3-6), we have the following equation, which indicates steady-state output per worker, or labour productivity evolving around the steady-state path.

$$\ln y_{t+1} - \ln y_t = g + (1 - e^{-\lambda_t}) \left[ \ln A_0 + gt + \theta \ln BSD + \frac{\alpha}{1 - \alpha - \beta} \ln s_t^K - \frac{\alpha + \beta}{1 - \alpha - \beta} \ln(n_t + g + \delta) - \ln y_t \right] \quad (4.3.7)$$

Where  $\lambda_t = (n_t + g + \delta)(1 - \alpha - \beta)$

Equation (4.3-7) can be expressed as follows, omitting the log notation:

$$\begin{aligned} \Delta y_t &= c + \mu \left[ y - A_0 - A_1 BSD - A_2 T - A_3 s^K - A_4 (n + g + \delta) \right]_{t-1} \\ \Delta y_t &= c + \mu \left[ y - y^* \right]_{t-1} \end{aligned} \quad (4.3.8)$$

Equation (4.3.8) leads an error correction mechanism as follows:

$$\Delta \ln y_t = c_0 + \mu e_{t-1} + \sum_{i=0}^m \phi_i \Delta \ln s_{t-i}^K + \sum_{j=0}^n \phi_j \Delta \ln BSD + \sum_{k=0}^r \pi_k \Delta \ln (n_{t-k} + g + \delta) + \varepsilon_t \quad (4.3.9)$$

Where  $\Sigma$  BSD is a vector, which contains two different proxies for banking sector development indicators. In turn, *BSD1*: Money supply and *BSD2*: Domestic credit and the rests are explained earlier in this section. It is important to mention that there might be some missing exogenous variables in our model that do not capture other important factors for the current crisis (i.e. 2008) such as the efficiency of supervision, the monetary policies of central banks, full and complete financial disclosure of positions, inefficient corporate governance practices and so on. However these factors are really difficult to be modelled within this framework under inspection.



## Chapter 5

### EMPIRICAL ANALYSIS

#### 5.1 Unit Root Tests of Panel Data Analyses

This method is conducted to determine whether the variables used in the case are stationary or not. Based on the methodology employed as such Im, Pesaran and Shin W-stat, ADF - Fisher Chi-square, PP - Fisher Chi-square, Levin, Lin & Chu and Breitung tstat of econometric approaches applied for level and for first difference form for the European countries and Far-East countries. According to the panel data for European countries and Far-East countries, Breitung LLC, IPS, ADF- M W, and PP tests are suggested to reject null hypothesis, which in intercept and without trend model. Therefore real GDP per number of worker, GDPW, KGDP gross capital per GDP; L labor and VBS vector banking sector or M2 (money supply) or DC which is total Domestic Credit become non-stationary. Unit root test results in level and in first difference for the European countries are illustrated at table 5.1.1.

Table 5.1.1. Unit root tests for European countries

Variable	Europe		
	Method	Statistic	Prob
LNREGDP	Levin, lin & chu	-0.10030	0.4601
	Breitung t-stat	1.25871	0.8959
	Null: unit root (assumes individual unit root process)		
	Im, pesaran and shin w-stat	1.02013	0.8462
	ADF-Fisher Chi-square	2.22446	0.9733
	PP-Fisher Chi-square	0.08874	1.0000
	LNKGDP	Levin, lin & chu	-2.46078
Breitung t-stat		-1.74755	0.0403
Null: unit root (assumes individual unit root process)			
Im, pesaran and shin w-stat		-0.81382	0.2079
ADF-Fisher Chi-square		13.0086	0.1116
PP-Fisher Chi-square		9.92820	0.2701
LNLABOR		Levin, lin & chu	-2.73711
	Breitung t-stat	-0.39231	0.3474
	Null: unit root (assumes individual unit root process)		
	Im, pesaran and shin w-stat	-0.76824	0.2212
	ADF-Fisher Chi-square	12.5580	0.1280
	PP-Fisher Chi-square	12.1695	0.1438
	LNDCGDP	Levin, lin & chu	-1.23369
Breitung t-stat		1.09288	0.8628
Null: unit root (assumes individual unit root process)			
Im, pesaran and shin w-stat		0.94127	0.8267
ADF-Fisher Chi-square		2.14322	0.9763
PP-Fisher Chi-square		0.08193	1.0000
LNM2GDP		Levin, lin & chu	-2.18737
	Breitung t-stat	0.12793	0.5509
	Null: unit root (assumes individual unit root process)		
	Im, pesaran and shin w-stat	-0.44465	0.3283
	ADF-Fisher Chi-square	9.65799	0.2899
	PP-Fisher Chi-square	6.55382	0.5854
	Exogenous variables: none		
D(LNREGDP)	Levin, lin & chu	-3.36505	0.0004
	Null: unit root (assumes individual unit root process)		
	ADF-Fisher Chi-square	17.9982	0.0212
	PP-Fisher Chi-square	16.7317	0.0330
D(LNKGDP)	Levin, lin & chu	-6.13988	0.0000
	Null: unit root (assumes individual unit root process)		
	ADF-Fisher Chi-square	37.4865	0.0000
	PP-Fisher Chi-square	42.3899	0.0000
D(LNLABOR)	Levin, lin & chu	-2.04986	0.0202
	Null: unit root (assumes individual unit root process)		
	ADF-Fisher Chi-square	18.4891	0.0178
	PP-Fisher Chi-square	39.0598	0.0000
D(LNDCGDP)	Levin, lin & chu	-20.0959	0.0000
	Breitung t-stat	-2.28565	0.0111

Table 5.1.1. (continued)

	Null: unit root (assumes individual unit root process)		
	Im, Pesaran and Shin W-stat	-4.29719	0.0000
	ADF-Fisher Chi-square	47.9607	0.0000
	PP-Fisher Chi-square	27.2390	0.0006
	Exogenous variables: Individual effects		
	Levin, lin & chu	-5.22285	0.0000
	Null: unit root (assumes individual unit root process)		
D(LNM2GDP)	Im, Pesaran and Shin W-stat	-2.16930	0.0150
	ADF-Fisher Chi-square	19.9853	0.0104
	PP-Fisher Chi-square	11.0898	0.1967

Unit root test results in both level and first difference for the Fareast countries are illustrated at table 5.1.2. Breingtung LLC, IPS, ADF- M W, and PP tests are suggested to reject null hypothesis, which in intercept and without trend model. Therefore real GDP per number of worker, GDPW, KGDP gross capital per GDP; L labor and VBS vector banking sector or M2 (money supply) or DC which is total Domestic Credit become stationary in difference.

Table 5.1.2. Unit Root tests for Fareast countries

Fareast Countries :Individual Effects, individual linear trends			
	Method	Statistic	Prob
LNREGDP	Levin, lin & chu	-3.80115	0.0001
	Breitung t-stat	-0.88189	0.1889
	Null: unit root (assumes individual unit root process)		
	Im, pesaran and shin w-stat	-0.97452	0.1649
	ADF-Fisher Chi-square	13.4752	0.0965
	PP-Fisher Chi-square	17.9918	0.0213
	Exogenous variable: None _Null: Unit root (assumes individual unit root process)		
LNKGDP	Levin, lin & chu	-0.85541	0.1962
	Null: unit root (assumes individual unit root process)		
	ADF-Fisher Chi-square	7.94145	0.4392
	PP-Fisher Chi-square	7.90056	0.4432
Exogenous variables: Individual effects, individual linear trend			
LNLABOR	Levin, lin & chu	-2.51263	0.1221
	Breitung t-stat	-3.63368	0.0001
	Null: unit root (assumes individual unit root process)		
	Im, pesaran and shin w-stat	0.36800	0.6436
	ADF-Fisher Chi-square	7.19714	0.5155
	PP-Fisher Chi-square	5.90811	0.6575
Exogenous variable: None			
LNM2GDP	Levin, lin & chu	2.52680	0.9942
	Null: unit root (assumes individual unit root process)		
	ADF-Fisher Chi-square	1.16808	0.9969
	PP-Fisher Chi-square	0.49761	0.9999
Exogenous variables: Individual effects, individual linear trends			
LNDGDP	Levin, lin & chu	-0.87268	0.1914
	Breitung t-stat	-1.99503	0.0230
	Null: unit root (assumes individual unit root process)		
	Im, pesaran and shin w-stat	-0.46577	0.3207
	ADF-Fisher Chi-square	10.3882	0.2388
	PP-Fisher Chi-square	7.24178	0.5108
Null: Unit root (assumes common unit root process)			
D(LNREGDP)	Levin, lin & chu	-2.72336	0.0032
	Null: unit root (assumes individual unit root process)		
	Im, pesaran and shin w-stat	-0.99928	0.1588
	ADF-Fisher Chi-square	12.0838	0.1475
	PP-Fisher Chi-square	21.0201	0.0071
Null: Unit root (assumes common unit root process)			
D(LNKGDP)	Levin, lin & chu	-3.88611	0.0001
	Null: unit root (assumes individual unit root process)		
	ADF-Fisher Chi-square	25.1173	0.0015
	PP-Fisher Chi-square	52.1279	0.0000
Null: Unit root (assumes common unit root process)			
D(LNLABOR)	Levin, lin & chu	1.78572	0.9629
	Null: unit root (assumes individual unit root process)		
	ADF-Fisher Chi-square	9.98065	0.2664

Table 5.1.2. (continued)

	PP-Fisher Chi-square	17.3554	0.0266
Null: Unit root (assumes common unit root process)			
D(LNM2GDP)	Levin, lin & chu	0.35225	0.6377
	Null: unit root (assumes individual unit root process)		
	Im, pesaran and shin w-stat	-1.87322	0.0305
	ADF-Fisher Chi-square	18.2141	0.0197
	PP-Fisher Chi-square	54.9213	0.0000
Null: Unit root (assumes common unit root process)			
D(LNDCGDP)	Levin, lin & chu	-3.55919	0.0002
	Null: unit root (assumes individual unit root process)		
	ADF-Fisher Chi-square	20.6102	0.0083
	PP-Fisher Chi-square	36.4329	0.0000

## 5.2 Co-integration Tests of Panel Data Analyses

In this part of the thesis co-integration test are conducted to investigate long run relationship between variables that is formulated in equation (4.3.5). Pedroni (Engel-Granger based), Kao (Engel-Granger based), and Fisher (combined Johansen based) tests are usually applied as co-integration tests. Engle – Granger based Pedroni co-integration test is preferably employed with three different scenarios as such without trend, trend and intercept.

Table 5.2.1 illustrates co-integration test results of European countries. Engle-Granger based Pedroni test assumes that an autoregressive coefficient which is within dimensions rejected only null hypothesis of no integration where no intercept is included according to 10 % alpha level of v-statistics and PP-statistics as well as ADF-statistics provides co-integration relationship at 1 % alpha based on the banking sector proxy M2.

Table 5.2.1. Pedroni Residual Cointegration Test for Europe

Europe Model: LNRGDP, LNKGDP, LNLABOR, LNM2GDP				
Alternative hypothesis: common AR coefs. (within-dimension)				
Method	Statistic	Prob	Statistic (weighted)	Prob
Panel v-Statistic	1.386156	0.0828	0.428587	0.3341
Panel rho- Statistic	0.503570	0.6927	1.054837	0.8543
Panel PP- Statistic	-4.287272	0.0000	-3.111661	0.0009
Panel ADF- Statistic	-2.172730	0.0149	-4.478374	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
Group rho- Statistic	1.643508		0.9499	
Group PP- Statistic	-6.246760		0.0000	
Group ADF- Statistic	-5.463641		0.0000	

Table 5.2.2. Pedroni Residual Cointegration Test for Europe with DC

Europe Model: LNRGDP, LNKGDP, LNLABOR, LNDCGDP				
Alternative hypothesis: common AR coefs. (within-dimension)				
Method	Statistic	Prob	Statistic (weighted)	Prob
Panel v-Statistic	2.954252	0.0016	0.631014	0.2640
Panel rho- Statistic	2.441196	0.9927	2.200760	0.9861
Panel PP- Statistic	-0.246462	0.4027	-3.252527	0.0006
Panel ADF- Statistic	-2.277313	0.0114	-2.589823	0.0048
Alternative hypothesis: individual AR coefs. (between-dimension)				
Group rho- Statistic	2.815633		0.9976	
Group PP- Statistic	-2.616538		0.0044	
Group ADF- Statistic	-3.069941		0.0011	

Additionally Table 5.2.2 explains that the co-integration test (i.e. Engle-Granger based Pedroni test ) also rejects the null hypothesis of no integration test with the other banking sector proxy called Domestic credit (DC) The test rejects the null hypothesis of no co-integration with 1% alpha level of both of v-statistics and ADF-statistics.

Therefore, all co-integration test approaches confirmed co-integration relation in functional relationship between variables. Economic growth has a long-run equilibrium relationship between capital, labor, and money supply as well as domestic credit in

European countries.

Table 5.2.3 Pedroni Residual Co-integration Test for Fareast Asian

East Asian Model: LNRGDP, LNKGDP, LNLABOR, LNM2GDP				
Alternative hypothesis: common AR coefs. (within-dimension)				
Method	Statistic	Prob	Statistic (weighted)	Prob
Panel v-Statistic	-0.681936	0.7524	-0.495119	0.6898
Panel rho- Statistic	1.127513	0.8702	1.087882	0.8617
Panel PP- Statistic	-1.775947	0.0379	-2.088950	0.0184
Panel ADF- Statistic	-1.817031	0.0346	-2.243613	0.0124
Alternative hypothesis: individual AR coefs. (between-dimension)				
Group rho- Statistic	1.883365		0.9702	
Group PP- Statistic	-2.315868		0.0103	
Group ADF- Statistic	-3.011079		0.0013	

Table 5.2.3 illustrates co-integration test results of Fareast countries. Engle-Granger based Pedroni test assumes that an autoregressive coefficient which is within dimensions rejected only null hypothesis of no integration where intercept and trend are included according to 1 % alpha level of ADF-statistics and PP-statistics based on the banking sector proxy M2.

Table 5.2.4 also explains that the co-integration tests (i.e. Engle-Granger based Pedroni test ) also rejects the null hypothesis of no integration test with the other banking sector proxy called Domestic credit (DC) The test rejects the null hypothesis of no co-integration with 1% alpha level of both of PP-statistics and ADF-statistics.

Therefore, all co-integration test approaches confirmed co-integration relation in functional relationship between variables. Economic growth has a long-run equilibrium

relationship between capital, labor, and money supply as well as domestic credit in Fareast countries.

Table 5.2.4. Pedroni Residual Co-integration Test for Fareast Asian with DC

East Asian Model: LNREGDP, LNKGDP, LNLABOR, LNDCGDP				
Alternative hypothesis: common AR coefs. (within-dimension)				
Method	Statistic	Prob	Statistic (weighted)	Prob
Panel v-Statistic	-0.963126	0.8323	-0.595235	0.7242
Panel rho- Statistic	0.944500	0.8275	1.070578	0.8578
Panel PP- Statistic	-7.157732	0.0000	-7.653930	0.0000
Panel ADF- Statistic	-4.721549	0.0000	-4.141895	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)				
Group rho- Statistic	1.964196		0.9752	
Group PP- Statistic	-10.47507		0.0000	
Group ADF- Statistic	-2.555943		0.0053	

### 5.3 Error Correction Models of Panel Data Analyses

In this section long-run and short-run coefficients will be determined by level estimation that is formulated in equation (4.3.5) and also error correction term to investigate how fast disequilibrium will be eliminated between long-run and short-run coefficients of economic growth that is formulated in equation (4.3.9).

Both level equation and error correction term for European countries in long run and short run are illustrated in Table 5.3.1 and 5.3.2 respectively as follows: **Adding M2**



Table 5.3.1. Vector Error Correction Estimates for Europe with M2 in Long Run

Cointegration eq:	Cointeq1
LNRGDP(-1)	1.000000
LNKGDP(-1)	-2.873767 (3.05745) [-0.93992]
LNLABOR(-1)	-2.065911 (0.38113) [-5.42054]
LNLM2GDP(-1)	-4.650729 (1.40912) [-3.30044]
C	-25.55399
R-Square	0.897984
Adj. R-Square	0.803255
F-Statistic	9.479505
Durbin-Watson statistic	1.853697

See (Wojciech W. & Derek F., 1992, 1997)

Table 5.3.2. Vector Error Correction Estimates for Europe with M2 in Short Run

Error correction:	D(LNRGDP)
CointEq1	-0.283320 (0.07960) [-3.56034]
D(LNRGDP(-1))	-0.011027 (0.29480) [-0.037411]
D(LNRGDP(-2))	-0.218230 (0.03831) [-5.69639]
D(LNRGDP(-3))	0.466811 (0.24489) [1.90620]
D(LNKGDP(-1))	0.216375 (0.23325) [0.92765]
D(LNKGDP(-2))	-0.223170 (0.28681) [-0.77810]
D(LNKGDP(-3))	0.444480 (0.25981) [1.71082]
D(LNLABOR(-1))	-0.037892

Table 5.3.2. (continued)

	(0.02049) [-1.84925]
D(LNLABOR(-2))	-0.046228 (0.02153) [-2.14690]
D(LNLABOR(-3))	-0.022600 (0.02751) [-0.82138]
D(LNM2GDP(-1))	-0.154265 (0.34604) [-0.44580]
D(LNM2GDP(-2))	0.315947 (0.11575) [2.72955]
D(LNM2GDP(-3))	0.059982 (0.03731) [1.59645]
C	0.204056 (0.06191) [ 3.29579]

In level equation, money supply is statistically significant and has positive impacts on economic growth in the long-run. Labor growth is also significant but has negative effect. One percent change in labor growth leads to 2.06 % decrease in Economic growth and finally one per cent change in money supply leads to 4.65 % increase in economic growth but capital is insignificant.

In error correction model, error correction term is statistically significant (-0.28) and as it is expected it is negative but low. ECT suggests that 28% of difference between long-term and short-term equilibrium is eliminated at the end of each year. Therefore disequilibrium in economic growth converge equilibrium at low levels.

Lastly, short-term coefficients of capital are statistically significant at lag 3 at 10%. Also it indicates positive short-term movements. Whenever capital increases by one per cent, economic growth increases by 0.444 % at lag 3. Also coefficients of labor at lag 1 and lag 2 are statistically significant at 10%.

Table 5.3.3. Vector Error Correction Estimates for Europe with DC in Long Run

Cointegration eq:	Cointeq1
LNRGDP(-1)	1.000000
LNRGDP(-1)	-0.703790 (0.08174) [-8.60924]
LNLABOR(-1)	-0.969252 (0.06948) [-13.9506]
LNDCGDP(-1)	-0.700210 (0.12564) [-5.57304]
C	-26.41624
R-Square	0.718453
Adj. R-Square	0.603274
F-Statistic	7.434327
Durbin-Watson statistic	1.951592

See (Wojciech W. & Derek F., 1992, 1997)

While labor growth decreases by one per cent, economic growth decreases by 0.037% and 0.046% at lags 1 and 2 respectively. Money supply also become statistically significant as a short-term coefficient and is statistically significant at lag 2 (2.72). So it indicates positive short-term movements. When money supply increases by one percent, economic growth will increase by 0.31 % at lag 2.

Table 5.3.4. Vector Error Correction Estimates for Europe with DC in Short Run

CointEq1	-0.503076 (0.24068) [-2.09017]
D(LNRGDP(-1))	0.534067 (1.00438) [ 0.53174]
D(LNRGDP(-2))	3.305380 (0.77351) [4.27322]
D(LNKGDP(-1))	4.858043 (1.38733) [ 3.50171]
D(LNKGDP(-2))	0.068940 (0.34044) [ 0.20250]
D(LNLABOR(-1))	-0.033713 (0.02514) [-1.34083]
D(LNLABOR(-2))	-0.017227 (0.02713) [-0.63498]
D(LNDCGDP(-1))	0.156487 (0.50189) [ 0.31180]
D(LNDCGDP(-2))	1.108872 (0.36550) [3.03387]
C	0.231581 (0.05965) [ 3.88240]

Both level equation and error correction term for European countries in Long Run and Short Run are illustrated in Table 5.3.3 and 5.3.4 respectively as follows: **Adding DC**

In level equation, Capital, labor and Domestic credit are statistically significant and have positive impacts on Economic growth, but in the long-run Labor growth has negative influence. One per cent change in capital leads to 0.70% increase in economic growth.

One percent change in labor leads to 0.96 % increase in Economic growth and finally one per cent change in Domestic credit leads to 1.70 % increase in Economic growth.

In error correction model, error correction term is statistically significant (-2.09) and as it is expected it is negative but low. ECT suggests that 0.50 % of difference between long-term and short-term equilibrium is eliminated at the end of each year. Therefore disequilibrium in economic growth converge equilibrium at low levels.

Lastly, short-term coefficients of capital and DC both are statistically significant. Capital in at lag 1 at 1%. Also it indicates positive short-term movements. Whenever Capital increases by one percent, economic growth increases by 4.85 % at lag 1. DC in lag 2 at 1% is significant. It also shows that if one percent increases in DC 1.10 percent will increase in economic growth.

Labor growth is found as insignificant on economic growth. So it indicates that it has no impact on economic growth in short-run.

Both level equation and error correction term for East Asian countries in Long Run and Short Run are illustrated in Table 5.3.5 and 5.3.6 as follows: **Adding M2**

Table 5.3.5. Vector Error Correction Estimates for East Asia with M2 in Long Run

Cointegration eq:	Cointeq1
LNRGDP(-1)	1.000000
LNKGDP(-1)	-1.549538 (0.37505) [-4.13159]
LNLABOR(-1)	-0.123735 (0.04943) [-2.50333]
LNLM2GDP(-1)	-0.983669 (0.12329) [-7.97836]
C	-24.33120
R-Square	0.469324
Adj. R-Square	0.231243
F-Statistic	6.236311
Durbin-Watson statistic	1.828832

See (Wojciech W. & Derek F., 1992, 1997)

Table 5.3.6 Vector Error Correction Estimates for East Asia with M2 in Short Run

Error correction:	D(LNRGDP)
CointEq1	-0.193476 (0.02947) [-6.56620]
D(LNRGDP(-1))	0.368545 (0.39308) [ 0.93758]
D(LNRGDP(-2))	-0.103858 (0.05016) [-2.07040]
D(LNRGDP(-3))	0.444737 (0.62710) [0.70920]
D(LNKGDP(-1))	1.047473 (0.53429) [1.96050]
D(LNKGDP(-2))	0.158537 (0.34208) [0.46344]
D(LNKGDP(-3))	0.105019 (0.29871) [0.35157]
D(LNLABOR(-1))	-0.115102

Table 5.3.6. (continued)

	(2.94119) [-0.03913]
D(LNLABOR(-2))	-4.095572 (0.99123) [-4.13183]
D(LNLABOR(-3))	-1.515137 (2.76367) [-0.54823]
D(LNM2GDP(-1))	1.032771 (0.64900) [1.59133]
D(LNM2GDP(-2))	0.227039 (0.64543) [0.35177]
D(LNM2GDP(-3))	0.286082 (0.31425) [0.91038]
C	0.144808 (0.09212) [ 1.57203]

In level equation, capital, labor and money supply are statistically significant. All of them have positive impact on economic growth. But in long run labor growth has negative effect on economic growth. One per cent change in capital leads to 1.54% increase in economic growth. One percent change in labor leads to 0.12% increase in economic growth and finally one per cent change in money supply leads to 0.98% increase in economic growth.

In error correction model, error correction term is statistically significant at 10% (-1.74) and it is negative and has reasonable score. ECT suggests that 19.34% of difference between long-term and short-term equilibrium is eliminated at the end of each year. Therefore disequilibrium in Economic growth converge equilibrium at normal levels.

Lastly, short-term coefficients of capital are significant at lag 1 at 10%. Also labor growth is significant at lag 2 at 1%. But, money supply is not statistically significant at any lag 3. They do not indicate any short-term movements. It shows that 1% increase in capital 1.04% will increase in economic growth. If 1% increase in labor growth 4.09% will increase in economic growth.

Table 5.3.7. Vector Error Correction Estimates for East Asia with DC in Long Run

Cointegration eq:	Cointeq1
LNRGDP(-1)	1.000000
LNKGDP(-1)	-1.308970 (1.25206) [-1.04546]
LNLABOR(-1)	-1.336073 (0.13794) [-9.68575]
LNDCGDP(-1)	-4.053384 (0.70645) [-5.73765]
C	-8.203452
R-Square	0.745392
Adj. R-Square	0.508971
F-Statistic	6.681277
Durbin-Watson statistic	1.900431

See (Wojciech W. & Derek F., 1992, 1997)



Table 5.3.8. Vector Error Correction Estimates for East Asia with DC in Short Run

Error correction:	D(LNRGDP)
CointEq1	-0.639245 (0.307211) [-2.08884]
D(LNRGDP(-1))	0.423001 (0.25701) [1.64585]
D(LNRGDP(-2))	-1.276422 (1.48607) [-0.85892]
D(LNRGDP(-3))	0.068817 (1.58603) [0.04339]
D(LNKGDP(-1))	0.400986 (0.41224) [0.97271]
D(LNKGDP(-2))	0.225606 (0.35556) [0.63452]
D(LNKGDP(-3))	0.301582 (0.40612) [0.74259]
D(LNLABOR(-1))	-0.012576 (0.05399) [-0.23292]
D(LNLABOR(-2))	-1.411187 (0.59518) [-2.37103]
D(LNLABOR(-3))	0.027005 (0.05036) [0.53628]
D(LNDCGDP(-1))	0.295423 (0.54257) [0.54449]
D(LNDCGDP(-2))	0.156027 (0.72702) [0.21461]
D(LNDCGDP(-3))	0.420361 (0.71421) [0.58857]
C	0.016750 (0.13647) [0.12274]

Both level equation and error correction term for Eastern Asia countries in long run and short run are illustrated in Table 5.3.7 and 5.3.8 as follows: **Adding DC**

In level equation, domestic credit and labor are statistically significant. DC and labor both have positive impact on economic growth. But in the long-run labor growth has negative impact on economic growth. 1% change in capital leads to 1.30 % increase in economic growth. 1% change in labor leads to 1.33 % increase in economic growth and finally one per cent change in Domestic Credit leads to 4.05 % increase in economic growth.

In error correction model, error correction term is statistically significant at 5% (-2.08) and it is negative and has low score. ECT suggests that 63 % of difference between long-term and short-term equilibrium is eliminated at the end of each year. Therefore disequilibrium in economic growth converge equilibrium at normal levels.

Lastly, short-term coefficients of Capital and domestic credit are not statistically significant at any lag. They do not indicate any short-term movements. On the other hand, the coefficient of labor growth is significant at lag 2 at 5%. It means if 1% increases in labor growth, economic growth will decrease by 1.41%.

## Chapter 6

### CONCLUSION AND RECOMMENDATION

#### 6.1 Summary of Major Findings

This thesis aimed to investigate the nexus of economic growth, capital, labor and money supply or domestic credit for the four European countries and the four East Asia countries. The fundamental question of this study is that does banking sector development trigger economic growth? Initially all of countries listed in World Bank database were selected. However, many countries have been eliminated either due to insufficient number of observations or stationary problem of series under consideration.

This thesis has employed panel data analyses to compare if results would be robust. The panel data approaches prove that economic growth in both European and East Asia countries are in long-term economic and statistical relationship with its determinants which are capital, labor, and money supply or domestic credit. These determinants apply statistically significant impacts on economic growth both in the long-term and short-term periods. Furthermore capital and labor are more efficient in the existence of domestic credit in European countries. Additionally, banking sector affects economic growth level through the channels of capital and labor in the economic long term. Furthermore, economic growth converges to their long-term path significantly through its determinants mentioned above.

It is important to mention that banking sector are really affected by capital and labor in both long-term and short-term for European countries. The main conclusion of this thesis is: 1) banking sector in Eastern Asia better contributes to economic growth. 2) In both regions, it is domestic credit (DC) that makes capital (K) and labor (L) more efficient and effective for economy than money supply (M2).

## **6.2 Policy Implications and Further Research**

Major results of this thesis suggest that in particular countries banking sector development is a major factor to prosperity of economic with scanning the labor circumstances. Moreover, following the econometric result of this thesis reflect the reality of long-run relationship between banking sector and economic growth and banking sector are affected by capital and labour in both European and East Asian countries. The policy makers in each country should take into the account the existence of domestic credit in light of labor and capital can drive economy growth more efficiently. Also they can always monitoring the banking and financial system and structure. The banking sector plays a significant role in every country according to literature in this thesis. In the further research more rigorous panel data techniques such as causality techniques can be applied on the same subject for further studies in order to get more accurate results. The model employed in this study can be developed using the concept of second generation structural break co-integration models could be conducted to reap more benefit.

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