International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 162 July, 2017
http://www.internationalresearchjournaloffinanceandeconomics.com

A Comparison using PLS-MGA between PIGS and V4 Countries' Financial Systems

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Abstract

The aim of this study is to investigate the financial system of the countries that are in the tail of the Eurozone (contemptuously named PIGS). They form part of the ESCB, are subject to the discipline of the ECB and the troika, and are more efficient than the systems of the countries which are at the top of the New Member States (NMS) and do not have the Euro currency. PIGS countries have financial markets and financial institutions which are more developed than NMS, including V4 countries, but the crisis mainly began there. The role of insurance companies, investment funds, and pension funds seemed to be well established and its involvement played an essential role in PIGS developed financial systems more than in V4. The reason why PIGS gained popularity is a serious concern within the EU, with regard to their national debts, especially in Greece. In the year 2010, it was clear that these countries were in need of corrective action in order to regain their former financial stability. In this paper we apply a PLS-SEM Multigroup Analysis to study if making a partition of data into separate groups for PIGS and V4 countries, we can gain knowledge about the differences in their financial systems, identifying observed heterogeneity, and checking if they are statistically significant. Eventually, we try to find out where the problem is. In our opinion, this study provides important and reliable information to the ECB, PIGS and V4 countries' policy makers.

Keywords: Banking System Quality, Financial System Efficiency, European Financial Integration, PLS-SEM Multigroup Analysis, PIGS, V4 countries
JEL Classification: E42, F36, G14

1. Introduction

The financial markets of most European Union (EU) Member States, especially after World War II, and until the 1980s were dominated by banks, which were mainly owned by states. That is why domestic banking were main players in the economy. In Western Europe the situation changed at the end of the 1970s, after the oil price shocks, which were connected with the downfall of the Bretton Woods' system and the beginning of European integration. In the Visegrád Group (Czech Republic, Hungary, Poland and Slovakia) the situation was different and this alliance of four countries was established in 1991.

The financial system in the V4 was highly concentrated and only state banks dominated which was characteristic for a central economy. During the 1990s all four countries began the process of privatization and the main role was played by foreign banks. As the Czech Republic, Hungary, Poland and Slovakia entered the EU, they had to liberalise their financial systems. These economies in the V4 needed capital to finance changes and to move from centrally planned economies to market-led ones in quite a brief time. A more detailed description and explanation about the V4 countries financial systems can be found in García-Machado and Jachowicz (2016). But, in short we can describe the financial sector in the Visegrád group as follows:

- The dominating role of banks, including foreign ones, as main financial intermediaries (in terms of asset size);
- The second largest type of financial institutions are insurance companies and after the financial crisis of 2008 their asset size became bigger as a result of conversions;
- The depth of the financial markets is still unrewarding as measured by total assets to GDP ratio;
- The role and size of the stock exchanges is still low as a source of capital.

The characteristic thing after the crisis is that the national banks, especially in Poland and Hungary, started to buy back shares from foreign banks –particularly from Italian banks–, who had problems caused by the last financial crisis. This meant that state banks started to become main players in the economy. In addition to this, one could see a limited role of the equity market and the crucial importance of public financing needs.

With regards to the PIGS countries, this term is an acronym used to refer to the economies of Portugal, Italy, Greece and Spain, four economies of the Southern Europe with problems after the financial and economic crisis, the burst of the real estate bubble, and the onset of the European sovereign-debt crisis. Ireland became associated with the term, either replacing Italy or as a second "I" (PIIGS). Sometimes a second "G" (PIGGS or PIIGGS), for Great Britain, was also added. Finally, another third "I" is added at times to include Iceland (PIIIGGS). The term is considered pejorative by affected countries and it is widely considered disparaging. The term was first used by the Financial Times and Barclays Capital in 2010 in comparison with the BRIC or BRICS countries (Brazil, Russia, India, China and South Africa), the G7 developed economies or another predominately economic-groupings of countries.

Nevertheless, the PIGS countries have financial markets and financial institutions more developed than NMS including V4 countries. The role of insurance companies, investments funds, and pension funds is well established and its participation is essential in their developed financial systems. From now on we will consider in this paper the first of the meanings. That is, we will include the countries of Portugal, Italy, Greece and Spain (PIGS) in comparison with Czech Republic, Hungary, Poland and Slovakia (V4 Group). On the other hand, as it is well-known, the financial crisis has motivated the PIGS countries Central banks' and Government interventions in several forms, including liquidity injections, direct public finance, publicly loan guarantee schemes and, even interest rates subsidization. However, the effectiveness of these interventions may be put in doubt.

The common points in the financial systems shared by the V4 and the PIGS group are as follows:

- In both groups a nationalized financial system dominates. In West Europe the changes began in the 1970s, whereas in Central Europe – in the 1990s;
- The main role played was still played by banks – initially by national banks but after that by foreign banks especially by German ones;
- Weak developed stock markets The best situation is in the Madrid Stock Exchange, where the Latin South American businesses are noticed and in Warsaw, which is the biggest market in this part of Europe;
- An unsatisfactory level of pension funds.

In Portugal the main problem was the use of foreign loans; in Spain – purchasing property; in Italy – the problems with inflation which influenced bank rates; and Greece – a country with big economic problems.

Governments, mainly in the Eurozone, and affected by the last financial crisis, have developed special programs to save their financial systems and restore their economies to growth. However, this would have been impossible without the participation of the largest central banks that have used unconventional tools aimed at restoring balance in the markets. The Eurozone partly caused the crisis to spread more quickly, but governments moved to rescue the currency. Countries from the V4 are not members of the Eurozone and they are not financially integrated with the Euro, and perhaps that is why the crisis did not hit them as strongly as it did the PIGS group of countries.

In this study, we apply a PLS-SEM Multi-group Analysis to investigate whether making a partition of data into two separate groups for PIGS and V4 countries, we can gain knowledge about the differences in their financial systems, identifying observed heterogeneity, and checking if they are statistically significant. Eventually, we try to find out where the problem is.

The paper is organized as it follows. We start in Section 2 giving an overview about the historical background of financial systems in PIGS countries. In Section 3, we review the conceptual framework as theoretical background. Next, we describe the methodology in use in Section 4, as well as the sample, data collection, component and data analysis. Section 5 presents empirical results. Finally, a summary and conclusions are provided in Section 6.

2. Historical Background of Financial System in Pigs Group

The history of the PIGS financial system is similar. The development of this system took place after World War II. Portugal, like most Western countries, experienced a period of strong economic growth in the quarter century that followed the end of World War II. Economically, the war fostered the accumulation of financial and political capital amongst part of the local industrial bourgeoisie, tilting the balance of power against the rural interest. But the evolution of the Portuguese economy was further influenced by two major events that took place in the beginning of the 1960s: the participation of Portugal as a founding member of the European Free Trade Agreement (EFTA) and the beginning of the colonial war. During 1970's strong economic growth interrupted by the collapse of the international monetary system and rising oil prices imposed by OPEC. A US-led international loan was granted in 1977 under the condition of an agreement with the IMF, which was signed the next year. The associated stabilization program included as key elements: the adoption of a crawling-peg exchange rate regime (with regular and pre-announced devaluations of the currency), credit limits aiming to control aggregate demand and the external deficit, the direct control of credit growth, administrative restraints on interest rates, and the liberalization of foreign trade. Strong restrictions on the movement of the capital were in place since 1977.

While in other European countries, the private sector dominated the banking system, public banks were the norm in Portugal in the early 1980s. During these years, public banks typically financed the public sector at interest rates which were below market values, reducing banks' profits and capital. Banks' management was subject to political influence and competition was essentially absent from the sector –banks could not compete on price, quantity or location–. Since 1990, Portuguese economic policy has been committed to the nominal convergence strategy that was inherent to the process of monetary integration in the EU. At the end of 1992 all restrictions on the free movement of the capital were abolished. In the remaining years of the 1990s, the Portuguese economy benefitted from the improved performance of the international economy and from the sharp reduction in real interest rates. Banks have ensured the financing of the economy, borrowing money internationally and lending it internally. In sum, the participation of the Portuguese economy in the process leading to the European Monetary Union (EMU) increased significantly the availability of credit. Accordingly, public and

private (firms and household') investment increased at a fast pace during this period, feeding and being fed by economic growth.

At the beginning of the millennium, the Portuguese economy were in seemingly promising conditions –and the participation in the founding group of euro area was just another expression of the optimistic outlook (Abreu, 2006)–. By the early 2000s, the Portuguese economy was facing the consequences of the combination of structural weaknesses and international developments. Moreover, anticipating the EU's Eastern enlargement in 2004, many multinational firms (especially in the automotive and related industries) shifted their productive capacity to some of the new member states (taking advantage of lower wages, higher educational levels, and the geographical proximity to the main European markets). And when subsequent external shocks hit the international economy: increases in ECB's interest rates in 2005-2008, the appreciation of the euro against the dollar in 2007-2008, the peak in oil and commodity prices in 2008 and, finally, the Great Recession –Portugal was still characterized by low economic growth, rising unemployment rates and a steady rise in the public debt ratio (Andrade and Duarte, 2011)–. Then, a rapid increase in public debt after 2008 and, a high level of indebtedness of both firms and households, the Portuguese economy was particularly vulnerable to the speculative attacks against sovereign bonds in the Eurozone. Portugal submitted a request for financial help to the European Financial Stability Facility (EFSF) in April 2011. The Memorandum of Understanding between the Portuguese Government and the troika composed of the European Commission, the European Central Bank and the International Monetary Fund –which established the terms of the adjustment program that would accompany the EFSF's loan– fixed as main objectives the rebalancing of Portuguese public finances and the adoption of a number of measures to strengthen the competitiveness of the Portuguese economy (Freeman,2010).

When we look at Italy, we can see, that the 1950s was a time of sustained economic development in a context of monetary stability, what was connected with membership in the European Economic Community (1957). The 1960s ended in the midst of serious economic difficulties. The end of the Bretton woods System (1971), the switch to floating exchange rates and the sharp rise in oil prices ushered in a long period in which two evils previously considered antitheses coexisted: stagflation and inflation (Cornia, 2003). An important role was also played by the removal of the discipline of fixed exchange rates. During the 1960s and 1970s banks' assets did not significantly change. An exponential increase was recorded only after the beginning of the 1980s for loans. Securities increased with the government need to be supported. In December 1978, Italy joined the European Monetary System, negotiating a broad fluctuation band for lira, while the other participating countries had a narrower band, because Italy's inflation differential was still substantial. To meet the growing need for international supervisory cooperation, the Basel Agreement was signed in 1983.

To find out the macroeconomic policy in Italy, the period from 1980 to the financial crisis can be divided in two phases: the first can be called the pre-euro time, from 1980 to 1998 and the second – the euro time from 1999 to nowadays–. In 1979, the European Exchange Rate Mechanism (ERM) was introduced. The purpose was to initiate a stable monetary area within the European Community, with a final goal to reach an economic and financial integration. Italy was forced to follow an economic model aimed at stabilizing financial and social frictions. The increasing economic integration and the expected currency stability, even though within a corridor, enforced an equilibrium among real and monetary fundamentals of European partners. Therefore, Italian economic weaknesses became more clear, affecting both the public budget and the monetary policy. On the 3rd of May 1998, the European Union Council took decision to allow Italy within the first group of euro countries. Interest rates, particularly those paid by long term bonds, were closed the average of the best European countries. The monetary policy was focused on the inflation stability. The inevitable trade-off with growth and employment was an obstacle to the made in Italy competitiveness and consequently, to wages. The last financial crisis found a weak economy, essentially depending on banking credit and on foreign markets. Even though the financial system appeared to be less sensitive to the risk factors originating the crisis (real estate and financial exposure), the impact was remarkable once the credit crunch

became effective, with a collapse of the GDP, particularly the component generated by small and business firms (Dorodnykh, 2012).

In Greece –next country in PIGS group–, the last three decades constitute a period of fundamental restructuring in the national economy. Greek capitalism has undergone a finance-led transformation due to financialization, neo-liberalism and financial globalization. The current sovereign debt crisis provides evidence that this transformation is likely to have been a root source of the failure of the Greek capitalist model to operate efficiently and at high employment and growth levels, as well as that financialization is a fragile process that causes recurrent episodes of banking, financial and fiscal instability and crises.

Like in another PIGS countries, Greek economy were considerably influenced by developments that took place after the end of the World-War II. The efforts made to stabilize the monetary and banking system proved ineffective and, in January 1946, the Greek authorities turned to the British government for financial and technical assistance. The consequence was Greece to have to establish a Monetary Committee to control the issuance of new money and the money supply process, as well as to safeguard the exchange rate stability. The formation of the Monetary Committee signaled the era of a highly protective and over-regulated banking system, which lasted through the early 1980s. The Committee comprised the Minister of National Economy as chairman, four other Ministers and the Governor of the Bank of Greece. The position of the Bank of Greece was prominent, because it had the responsibility for designing and proposing policy measures which were, as a rule, adopted by the Committee (Halikias, 1978). The stability of the financial system was elusive and it was obvious for the economic policy-makers that the Greek economy needed more stringent monetary and credit measures and a more effective restructuring of the banking sector. To 1973, the Greek economy grew rapidly with the average growth rates for the period 1961-1973 reaching the unprecedented rate of 7.9%, the second highest rate among OECD countries, and the highest comparing to the other two Mediterranean countries. The disintegration of the Bretton Woods system and the 1973 oil crisis had significant effects on the Greek economy. Heavy inflationary pressures and growing imbalances in the external sector left no choice to the Bank of Greece, but to pursue a managed exchange rate depreciation, posing certain quantitative limits on the money supply and loans given to the public sector. Meanwhile, Greece applied for full membership in the European Economic Community (EEC) in order to stabilize and modernize its political and economic institutions and to benefit from the advantages of economic unification with the developed European countries. The banking sector's portfolio had accumulated non-performing loans from a number of shipping and industrial enterprises, which had been abundantly financed. These enterprises had been proved insolvent, creating a huge network of "problematical" corporations, generating "black holes" to the banks' assets. Since the 1980s, but especially in the 1990s and 2000s, financialization has induced a large scale expansion of the financial sector and of borrowing from households, non-financial and financial corporations, as well as the Greek public sector. There is much evidence that financialization has been the root source for the development of a credit-consumption driven-growth model, which collapsed after the global financial crisis, and especially after the sovereign debt crisis that deleverage all economic sectors with detrimental macroeconomic, financial and social effects.

Significant changes have taken place in the structure of the banking system as a consequence of the role of foreign banks and the internationalization of Greek banks in the South-Eastern Europe (Hein, 2009). The global financial crisis in 2007-2009 and the sovereign debt crisis, have induced Greece to move through a process of deleverage, which has triggered negative demand and growth effects, reducing country's credibility and solvency in the private bond markets in 2009-2010. Furthermore, Greece has been enforced by the bailout agreements with troika to implement a policy mix that focuses attention to "sustainable" and "convincing" fiscal adjustment process and structural reforms that will, hypothetically, improve national competitiveness, as well as the efficient functioning of the product market and especially of the labour market. International money and capital markets dried up for the Greek banking sector, and the Greek economy experienced severe liquidity stress and a

solvency crisis. The debt crisis has caused considerable negative pressures on the stability, solvency and liquidity of the financial and especially the banking system, especially after the "haircut" of Greece's public debt (Kotios et al., 2011).

At the end Spain, which the history of financial system is the result of a complex historical process fed by financial crises, regulatory changes emanating from economic doctrine and the experience gained from crises, guidelines for financial policy emanating from political authority, commitments to liberalizing the financial system and, of course, pressure from financial agents who sought to maintain their privileged positions (Lloyd et al., 1994). The 1962 Parent Act, nationalized the Banco de España, although the regulatory activity carried out by credit institutions was initially subject to different regulators. Regulation of the Spanish financial system at this time was not so different from what could be seen in other countries on the continent such as France and Italy (Lozano-Vivas, et al., 2002). 56 banks in total were affected by this crisis along the period 1977-1985, holding a 27percent share of deposits in private banking. Parallel to the resolution of the crisis, a reform process got underway that aimed at changing the financial model inherited from the dictatorship. The purpose was to uncouple the banking sector from industry via a regulatory change that was geared to liberalizing the financial system as a whole. In 1988, it was enacted the Securities Market. Nonetheless, the Spanish banking system continues to hold a key position within the financial system, despite greater development of financial markets. A new circular issued by the Banco de España in 1984, induced by growing Spanish banking activity in Latin America, also introduced the obligation to make bad-debt provision for the risk-country. The 1977-1985 crisis had a major impact both on prudential and accounting regulations and on the mechanisms and procedures in place for dealing with deposit-taking institutions (Maudos, 2012).

To sum up, the history of PIGS' financial system can be divided into five periods: beginning of international economic integration (1945-1974), international crises and adjustment (1974-1985), accession to the EEC and preparing to EMU (1986-1999), loss of competitiveness within the EMU (2000-2008) and crises and trials to get better of it (from 2008 until now). All these countries had nationalized financial system after World War II and the integration was an answer for breakdown of Bretton Woods system.

3. Conceptual Framework

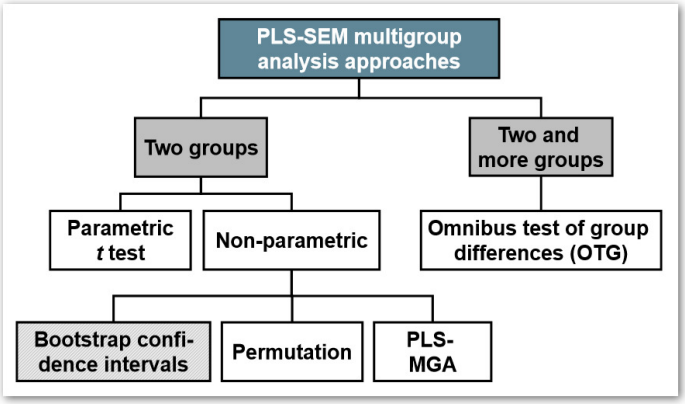
According to García-Machado and Jachowicz (2016), there is a large literature that attempts to analyze the transformation of the financial system and its efficiency as well as many interesting methods for assessing banking sectors in order to improve it and predict its development as well as the financial system as a whole. For instance, Berger and Humphrey (1992) analyzed some of the problems in defining and measuring bank output, Schmidt et al., (1999) investigated whether there were common tendencies towards disintermediation and securitization of the financial system in France, Germany and United Kingdom, Demirgüç-Kunt et al., (2006) studied what happens to the banking system following a banking crisis, Fiordelisi et al., (2010) analyzed the impact of efficiency on bank risk, or Borgioli et al. (2013) used the Consolidated Banking Data (CBD), a key component of the ECB statistical toolbox for financial stability analysis in order to assess banking sector and identify periods of stress, and their extent and severity, in the EU financial system. Finally, Hanisz (2013) presents the instruments implemented, mainly monetary, to overcome the negative effects of the economic and financial crisis on the global economic and Doudou (2014) analyses the root cause of the American financial crisis in 2007.

To perform our study, a partial least squares structural equation modeling (PLS-SEM) is used. This is a technique based on an iterative approach that maximizes the explained variance of endogenous constructs. As Henseler et al. (2014) point out, PLS-SEM is a very useful statistical tool for business, management and organizational research, and also in finance.

Applications of PLS-SEM usually analyze the full set of data, implicitly assuming that the used data stem from a single homogeneous population. This assumption of relatively homogeneous data characteristics is often unrealistic. Individuals (e.g. in their behaviour) or corporations (e.g. in their structure) are different, and pooling data across observations is likely to produce misleading results (Hair et al. 2017). Failure to consider such heterogeneity can be a threat to the validity of PLS-SEM results, and it can lead to incorrect conclusions (Becker et al., 2013 and Hair et al. 2012). More important, when heterogeneity is present, significantly negative and positive group-specific effects can cancel each other out when analyzed on the aggregate data level and suggest the absence of a significant relationship. Heterogeneity can come in two forms. First, it can be observed in that differences between two or more groups of data relate to observable characteristics, such as gender, age, or country of origin. Researchers can use these observable characteristics to partition the data into separate groups of observations and carry out group-specific PLS analysis. The path coefficient estimates for separate group models are almost always numerically different, but that does not mean that these differences are statistically significant. To answer this question, researchers can carry out a multigroup analysis. Second, heterogeneity can be unobserved in that it does not depend on an a priori known observable characteristic or combinations of several characteristics. To identify and treat unobserved heterogeneity, research has proposed a multitude of approaches commonly referred to as latent class techniques (Hair et al. 2017).

Figure 1: shows several approaches to multigroup analysis proposed by researchers (Sarstedt et al. 2011)

Figure 1: Approaches to Multigroup Analysis



Source: Ringle (2016), p. 51.

In our study, we applied the PLS-MGA, included in the set of methods to compare two groups of data within non-parametric alternatives to multigroup analysis. PLS-MGA (Henseler et al., 2009; Ringle, 2016 and Hair et al., 2017) approach compares each bootstrap estimate of one group with all other bootstrap estimates of the same parameter in the other group. By counting the number of occurrences where the bootstrap estimate of the first group is larger than those of the second group, the approach derives a probability value for a one-tailed test. PLS-MGA involves a great number of comparisons of bootstrap estimates (e.g. in a case of 5,000 bootstrap samples, there are 25,000,000 comparisons for each parameter) and reliably tests for group differences. At the same time, the test is geared toward one-sided hypothesis testing.

4. Methodology

Following the former study for economic stability and welfare in V4 countries carried out by García-Machado and Jachowicz (2016), and based on their results, we have selected some of indicators and chosen the same latent variables or constructs which are shown in table 1.

The inclusion of constructs and its relationships in the model was based in previous knowledge and relevant researches and studies on banking and financial systems. It is assumed that it is a function of banking system quality, financial system efficiency, environmental conditions identified in the macroeconomic framework, stock market performance and investors behaviour. Nevertheless, due to the complexity of the process of financial efficiency and its influence in the economic stability and welfare, it is assumed that not all the factors and relations were included, which could be seen as a limitation.

Table 1: Indicators and latent variables or constructs

Latent variables	Indicators
Banking System Quality (BANK_QUAL)	*Bank_capital/assets*, *Deposits/Assets*, and *Net_Int_Margin*
Economic Welfare (ECON_WELF)	*Deposits/GDP* and *GDPpc_US$*
Financial System Efficiency (FIN_EFFIC)	*Credit_Private_Sector* and *Domestic_credit*
Investors Behaviour (INVEST_BEHAV)	*Gross_Savings*
Macroeconomic Framework (MACRO_FRMW)	*GDP_Growth* and *Inflation*
Stock Market Performance (STOCK_PERF)	*Capitalisation*, *Listed_companies*, *Stocks Traded value*, and *Stocks_turnover*

Source: García-Machado and Jachowicz (2016), pp. 50-51.

In addition to the indicators for measurement models, and in order to a better assessment of the *Economic Welfare* construct, we initially have taken into consideration two new manifest variables or indicators: *Human development index (HDI) value* and the *Average happiness*. The *Human Development Index (HDI)* is a summary measure of human development. It measures the average achievements in a country in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. The HDI is the geometric mean of normalized indices measuring achievements in each dimension (see technical note 1 at http://hdr.undp.org). The *Average Happines* (Veenhoven, 2017) shows how much people enjoy their life-as-a-whole on scale 0 to 10. Life-satisfaction is assessed by means of surveys in general population samples. The scores are based on responses to a question about satisfaction with life. The answers to which are rated on a numerical scale ranging from "dissatisfied" to "satisfied", and measured with the following question: "How satisfied are you with the life you lead? - very satisfied - fairly satisfied - not very satisfied - not at all satisfied and very = 4 ..... not at all = 1". This is coded as Question type 4-step verbal LifeSatisfaction (code 121C). Finally, the original range is turned in a range from 0 to 10 (see technical notes at http://worlddatabaseofhappiness.eur.nl).

In this study, we used the SmartPLS 3 software (v. 3.2.6) developed by Ringle et al. (2015) and subject to subscription and authorization of its authors. Since SmartPLS is an estimation model and SEM analysis, the estimation process used in two steps evaluating the outer model and the inner model (Hair et al., 2014). This sequence ensures that we have adequate indicators of constructs before attempting to reach conclusions concerning the relationships included in the inner model (Roldán and Sánchez-Franco, 2012).

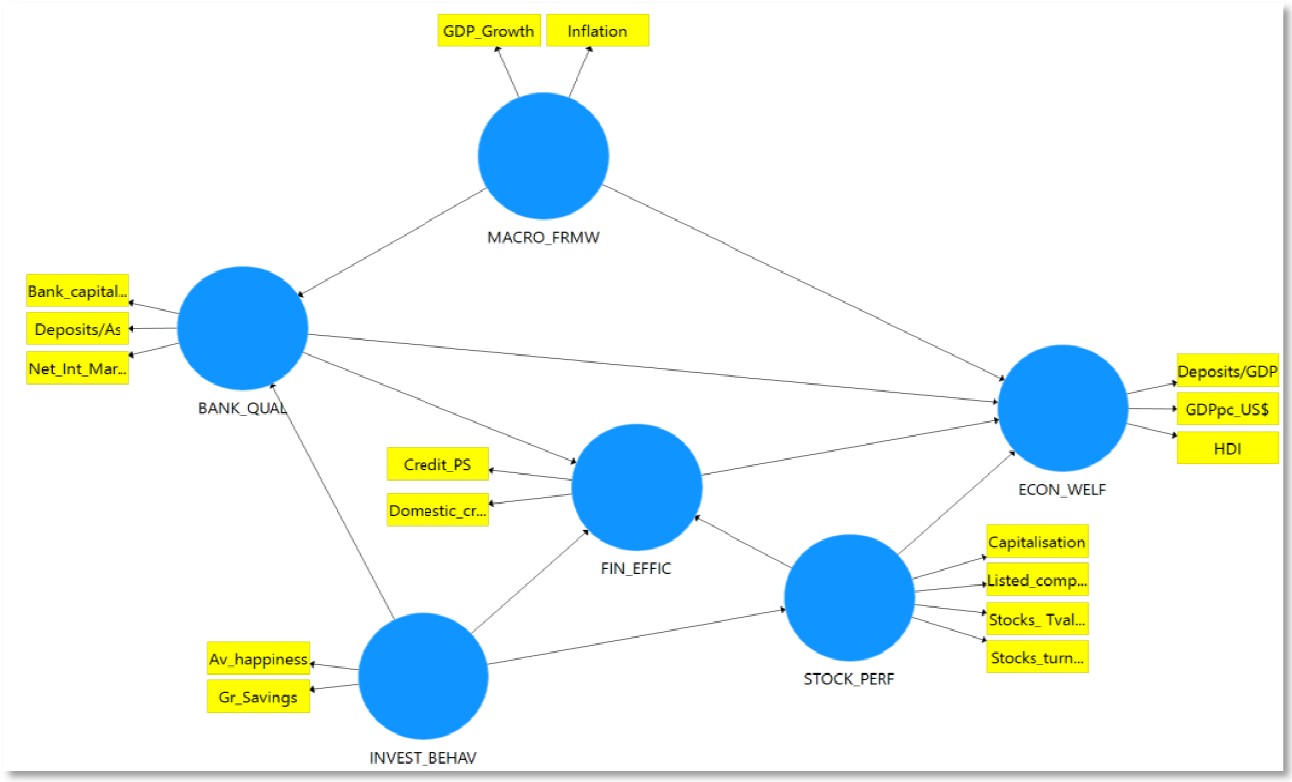
The proposed model for economic stability and welfare is framed with respect to latent constructs as given in the diagrammatic design in figure 2

4.1 Sample

Our analysis covers a sample of 836 financial institutions from PIGS and V4 countries' financial systems: Czech Republic (25), Greece (12), Hungary (28), Italy (552), Poland (41), Portugal (31), Slovakia (13), Spain (134). The study period is 2000 - 2015. The empirical bank-level data was obtained from a sample of financial institutions that include commercial banks, savings banks, cooperative banks, real estate and mortgage banks, investment banks and securities firms. Most of

these data were obtained from Bankscope International Bank Database[1]. Macroeconomic-level aggregate and financial data for each country were collected from FMI's "International Financial Statistics" and "World Economic Outlook Database", World Bank's "World Development Indicators", and Country economy website[2]. Stock exchange data was collected from PIGS and V4 stock markets (Athens Stock Exchange, Bratislava Stock Exchange, Madrid Stock Exchange, Milan Stock Exchange, Oporto Stock Exchanges, Prague Stock Exchange, Budapest Stock Exchange, Warsaw Stock Exchange and) in a daily basis and then annualized.

Figure 2: Initial Theoretical Path Model



Source: Authors' own research

4.2 Data Collection

Data collection was performed from December 2016 to March of 2017.We built a very complete data set, which initially included 44 indicators or manifest variables and a sample size of 112 observations (for PIGS and V4 countries and 15 years). They total 4.928 data. Indicators include manifest variables at macroeconomic, banks and other financial intermediaries and stock markets levels, financial sector structural indicators and indicators for development and happiness.

After debugging data set, finally, our sample includes 112 observations, with 37 indicators and 4.144 data. It includes less than a 5% of missing values.

All indicators and data are compute in an Excel work file, and then translated into CSV format to run SmartPLS software to apply the SEM-PLS path modeling and PLS-MGA analysis.

[1] The Bankscope International Database is a detailed database provided by Bankscope which contains information on over 30.000 international banks for a period up to 16 years of detailed accounts for each bank.

[2] www.countryeconomy.com

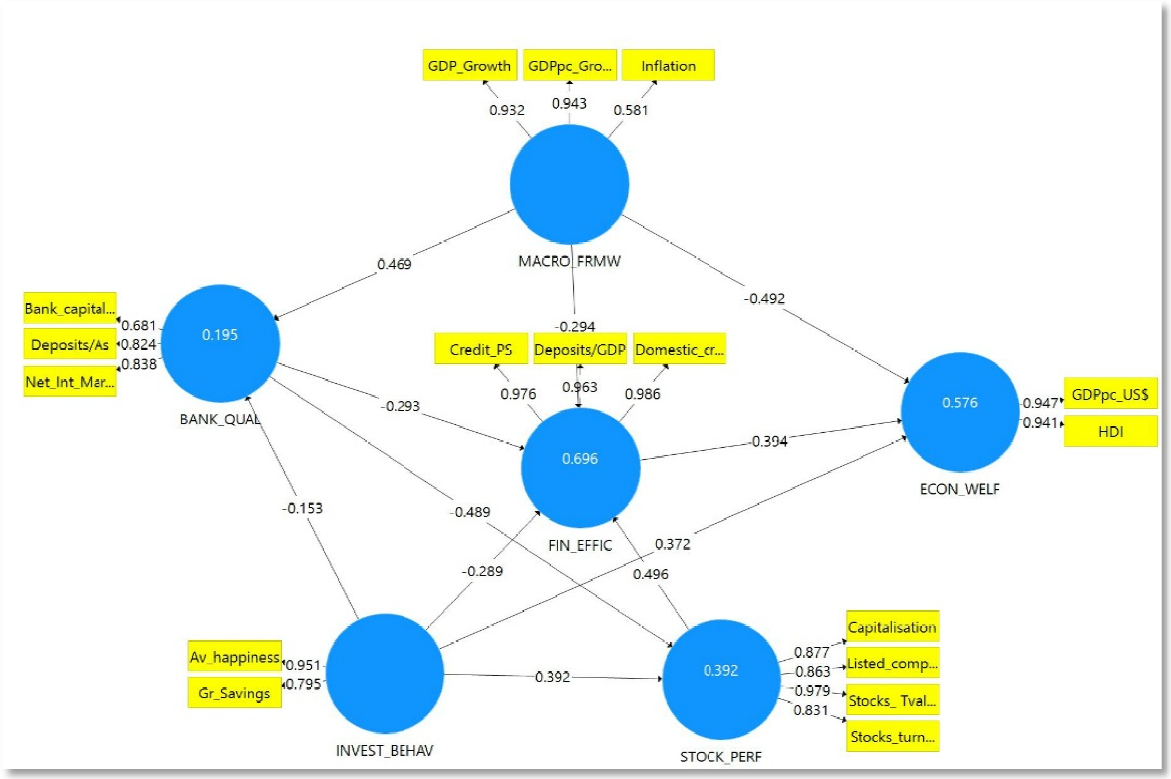
4.3 Components and Data Analysis

We use our data set with 112 observations for our empirical PLS-SEM and PLS-MGA analyses. The data set is from research that attempts to predict financial efficiency and, ultimately, economic welfare. Following Cohen's (1992) recommendations for multiple OLS regression analysis, we would need 92 or 113 observations to detect R2 values around 0.10, assuming a significance level of 10% or 5%, respectively, and a statistical power of 80%.

5. Results

After running several times the PLS algorithm for the estimation of the model, we can provide three key results: outer loadings for reflective measurement models and outer weights for formative measurement models, the path coefficients for the structural model relationships, and the R2 values of the latent endogenous variables. The resulting model estimates are showed in figure 3.

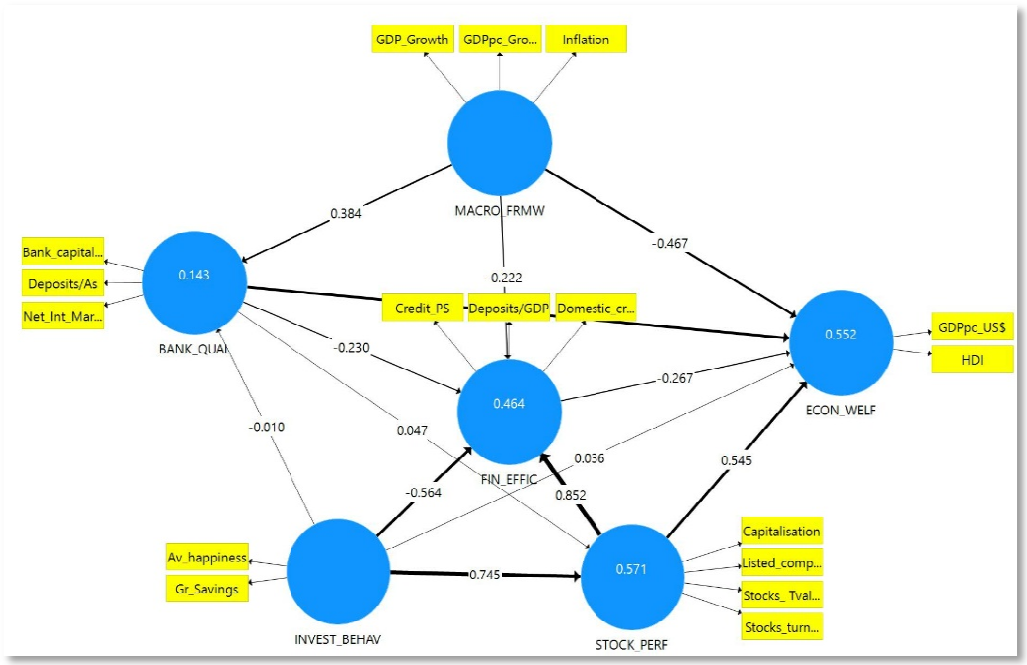
Figure 3: Final estimation results for all countries



Source: Authors' own research.

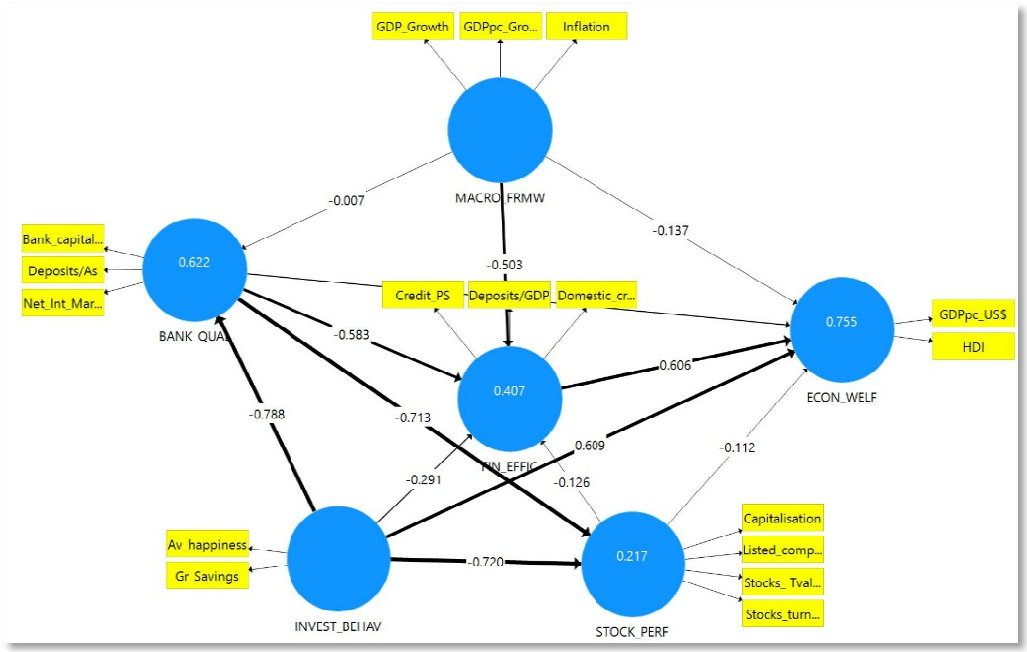
Figures 4 and 5 show the results for PIGS and V4 group countries after running PLS-MGA approach to carry out a multigroup analysis included in SmartPLS 3 software. We have made a partition of the data into two groups and then we generate two set of data for each group of countries (Group_1-PIGS and Group_2-V4). Thereafter, we run again the PLS-MGA approach. Thick arrows indicate the size and importance of path relationships between constructs. The Multi-group analysis allows to test if pre-defined data groups have significant differences in their group specific parameter estimates.

Figure 4: Final estimation results for PIGS countries



Source: Authors' own research.

Figure 5: Final estimation results for V4 countries



Source: Authors' own research.

Table 2 summarizes SmartPLS outcomes based on bootstrapping results for every group. Yellow color highlights significant differences relationships between every group of countries, applying a two tailed test. Differences are significant if the p-value is 0.05 or less and 0.95 or higher.

Table 2: Multi-Group Analysis (PLS-MGA) Bootstrapping Results PIGS vs V4 Countries

	Path Coefficients-diff (|GROUP_Group(1.0) - GROUP_Group(2.0)|)	**p-Value(GROUP_Group(1.0) vs GROUP_Group(2.0))**
BANK_QUAL -> FIN_EFFIC	0.230	0.237
BANK_QUAL -> STOCK_PERF	0.884	0.189
FIN_EFFIC -> ECON_WELF	0.522	0.991
INVEST_BEHAV -> BANK_QUAL	0.440	0.091
INVEST_BEHAV -> ECON_WELF	0.009	0.482
INVEST_BEHAV -> FIN_EFFIC	0.441	0.902
INVEST_BEHAV -> STOCK_PERF	1.514	0.000
MACRO_FRMW -> BANK_QUAL	0.485	0.083
MACRO_FRMW -> ECON_WELF	0.442	0.996
MACRO_FRMW -> FIN_EFFIC	0.294	0.054
STOCK_PERF -> FIN_EFFIC	1.056	0.000

Source: Authors' own research.

6. Discussion, Conclusion, and Implications

Our study has implemented a PLS-SEM Multi-group Analysis to investigate whether making a partition of data into two separate groups for PIGS and V4 countries, we can gain knowledge about the differences in their financial systems and economic welfare provide by them, identifying observed heterogeneity, and checking if they are statistically significant.

In PIGS group of countries, the five latent constructs explain 55.2% of the variance of the endogenous construct ECON_WELF. BANK_QUAL and INVEST_BEHAV also jointly explain 57.1% of the variance of STOCK_PERF (R^2=0.571) and the four constructs BANK_QUAL, INVEST_BEHAV, MACRO_FRMW and STOCK_PERF explain jointly the 46.4% of the variance of FIN_EFFIC (R^2=0.464). MACRO_FRMW explain 14.3% of BANK_QUAL (R^2=0.143). STOCK_PERF have significant influence in ECON_WELF.

In V4 group of countries, the five latent constructs explain 75.5% of the variance of the endogenous construct ECON_WELF. BANK_QUAL and INVEST_BEHAV also jointly explain 21.7% of the variance of STOCK_PERF (R^2=0.217) and the four constructs BANK_QUAL, INVEST_BEHAV, MACRO_FRMW and STOCK_PERF explain jointly the 40.7% of the variance of FIN_EFFIC (R^2=0.407). Relationships MACRO_FRMW to BANK_QUAL and STOCK_PERF to ECON_WELF are not significant in V4 countries.

With regard to the Multi-Group Analysis (PLS-MGA), bootstrapping results for PIGS vs V4 countries applying two tailed test, we find four significant differences between the following path relationships: FIN_EFFIC -> ECON_WELF, INVEST_BEHAV -> STOCK_PERF, MACRO_FRMW -> ECON_WELF and STOCK_PERF -> FIN_EFFIC.

Finally, in future studies it would be interesting to relate the legitimacy scores we have obtained with a results variable, evaluating the hypotheses that establish a link between business legitimacy and survival and growth capabilities. This type of analysis provides important and reliable information to the ECB, PIGS and V4 countries' policy makers which would allow them make better decisions.

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