Financial Harmonization and Financial Development: An Application of Europe's Financial Services Action Plan

Ozkok, Zeynep

St. Francis Xavier University

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Zeynep Ozkok[*]

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Abstract

The Financial Services Action Plan (FSAP) of the European Commission intends to create an open, secure, integrated financial market across EU member countries. Although recent research has shown a positive impact of the FSAP directives on cross-border lending and industrial growth, the effect on financial development remains to be examined. Using principal component analysis to construct financial, banking sector, bond and stock market development indices, we investigate the impact of financial harmonization policies of the FSAP on financial development in a panel of twenty five EU member states for the period of 1996 – 2007. Taking into account the timing perspective in implementing the FSAP directives across countries we find a positive link between financial harmonization and financial development. The results are shown to be robust to different approaches in constructing the harmonization index and the harmonization difference (relative timing of adoption) variable, and adding further controls and years to account for the recent period.

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[*] Corresponding author address: Department of Economics PO Box 5000, Antigonish, NS, B2G 2W5, Canada. Email: zozkok@stfx.ca. Telephone: + 1 (902) 867 5855

1. Introduction

Financial development is a potential engine for growth. It is the channel through which countries experience increasing levels of efficiency in financial markets and the overall financial system. It improves the quality of financial intermediaries, frameworks, and activities promoting both growth and welfare within countries. The argument regarding the role of financial development has grown even stronger in recent years. Countries with developed and integrated financial markets are more likely to experience enhanced growth rates. If economic growth is a chain of events, financial development together with legal and institutional development constitutes the first link of this process. Differences in banking sector, stock and bond markets across countries matter in terms of achieving higher growth rates. Financial harmonization thereby can be considered as an essential element in bringing together and accelerating further development of the financial markets.

The European Commission in hopes of harmonizing European countries has taken two important measures over the last two decades. The Euro, the first and well-known measure of integration, has not only grown to be a leading currency in the world's financial markets, but has also greatly contributed to unifying European financial markets since its establishment back in 1999. Following the success of the Euro in creating a unified financial system, the European Commission has introduced the second, less well-known measure, the Financial Services Action Plan (FSAP). The FSAP aims to harmonize European financial markets through the imposition and adoption of regulatory and legislative frameworks. With the strategic objectives of ensuring "a single EU market for wholesale financial services", creating "open and secure retail markets, and state-of-the-art prudential rules and supervision" and establishing "wider conditions for an optimal single financial market", the FSAP intends to harmonize and reduce the costs of cross-border financial intermediation and transactions. (Hartmann et al. 2003, 34; Kalemli-Ozcan et al. 2010 a).

Both the European Union and the European Commission have argued that financial harmonization, by reducing the cost of cross-border financial business, should increase economic growth leading to development of financial markets (FSA 2003; London Economics 2002). Ozkok (2012) has shown that taking into account the relative timing of adoption of the FSAP measures, there is a positive link between financial harmonization and industrial growth. In this paper, we hope to answer how effective given the initial goal of the FSAP of creating an open, secure, integrated financial market, the directives of the FSAP been for financial development across countries. Using principal component analysis to construct financial, banking sector, bond and stock market development indices from most frequently used measures of financial development, we study the effects of financial harmonization policies of the FSAP on financial development in a panel of twenty five EU member states for the period of 1996 – 2007.

Based on the view of the European Commission, we would anticipate harmonization to have a positive impact on financial development across countries controlling for the relative timing of adoption of the FSAP measures. As expected, when regressing financial development indices on financial harmonization, we find a positive and significant impact. A number of robustness checks are carried out to examine whether our main result --- harmonization having a positive effect on financial development and the

relative timing of adoption having a negative effect --- holds up. The results are robust to controlling for legal origins of countries, constructing new harmonization and relative timing of adoption measures, and including data for the most recent crisis period.

Our paper is related to different strands of the literature. First is the literature that has studied the effect of various types of integration on growth, volatility and development. Jayaratne and Strahan (1996, 1998) and Strahan (2002) study the impact of branching deregulation and interstate banking on growth. The results reveal that following state-level branching deregulation, real per-capita economic growth across the U.S. states increased significantly. Policy changes that allow for higher integration, better bank monitoring and screening across states are found to be a possible explanation. In a more recent study, De Avila (2003), examining the effects of financial deregulation in Europe, shows that the process of capital control lifting and the harmonization of banking laws have enhanced the growth rates of European economies. Harmonization is found to be beneficial for growth through the increase in the level and efficiency of financial intermediation, whereas the liberalization of capital controls increased growth through improvements in financial intermediation. Similarly in studying the effects of financial integration on financial development Chinn and Ito (2002) and (2006), Baltagi et al. (2007), Demetriades and Law (2006), Demetriades and Andrianova (2005) and Huang (2006) show that financial integration (capital account openness in most cases) contributes to financial development in equity and stock markets for both less developed and emerging market countries. More recently, Ozkok (2010) demonstrates that using index measures for financial openness and financial development in a panel study of developed and emerging market countries one can explain a large part of the variation in financial development across countries and over time. Principal component type indices provide better results in understanding the link between financial openness and financial development.

Second, a limited number of studies examine the role of the FSAP measures. Kalemli – Ozcan et al. (2010 a) analyze the link between financial integration and business cycle synchronization. The authors' analysis, using bilateral panel instrumental variables to link legislative harmonization policies to output synchronization, depicts a negative relationship for the country-pairs selected in the sample. In an attempt to examine the Euro's effect on financial integration Kalemli – Ozcan et al. (2010 b) reveal the legislative-regulatory harmonization policies in financial markets established under the FSAP to be a contributing factor for cross-border lending, despite these policies' inability to explain the Euro's impact on financial integration. Ozkok (2012) conveys that there is a positive relationship between financial harmonization induced by the FSAP directives and industrial growth rates across countries controlling for the relative timing of adoption of these directives.

Our current analysis contributes to the literature in three aspects. First, we provide evidence for the link between financial harmonization and financial development. Second, following the argument for the use of index measures in Ozkok (2010) we further study the importance of indexing in the harmonization context. Lastly we explicitly examine the potential effect of one of the biggest European harmonization projects, the FSAP, on the development of the financial sector.

The rest of the paper is structured as follows. In the next section we explain in detail our data. Section 3 provides a discussion of the empirical model. Section 4 depicts our results and some robustness checks. Section 5 concludes.

2. Data

The analysis is based on annual data for 25 European countries over a 12 year period of 1996 – 2007.[1]The data are obtained primarily from Beck, Demirguc-Kunt, and Levine's database on *Financial Development and Structure* (referred as *BDL* from onwards), the World Bank's *World Development Indicators (WDI)*, *Worldwide Governance Indicators,* and *Edstats* which extracts data from the UNESCO Institute for Statistics.

2.1 Financial Harmonization

The financial harmonization measure of our analysis is based on the directives of the Financial Services Action Plan. The Financial Services Action Plan (FSAP) was launched by the European Union and the European Commission at the end of 1998 as a major 5-year program with the goals of establishing "a single EU wholesale market for financial services, open and secure retail markets, and state-of-the-art prudential and supervisory regulations." (Kalemli – Ozcan et al. 2010 b, 79).

The European Commission through the establishment of the FSAP aimed to remove barriers to entry into the financial sector, increasing competition, and harmonizing information (Malcolm et al. 2009). However, like any legislative measure, the costs and benefits of the FSAP directives have become a topic of debate over the recent years. Boyfield et al. (2006) state that the benefits involve increasing investment opportunities in securities markets across borders, easing the framework for investment firms, augmenting internalization and stimulating competition between banks. This thereby induces a reduction in the cost of trading and the cost of capital, increases investor confidence, market liquidity, and free flow of capital, allows for more transparency, and greater competition. The costs on the other hand entail compliance costs due to complexity, possibility of creating barriers to entry for smaller firms, further costs that involve execution of the directives, and costs of implementation of these directives across countries. The goal of the European Commission through the FSAP is to form a unified financial market that can act as an essential element for growth, employment and improved competition in the overall European system (European Commission 2005). Financial Services Action Plan (FSAP) thereby should influence growth, and cross border lending across countries as shown in studies by Kalemli – Ozcan et al. (2010 b) and Ozkok (2012). Since the FSAP has been influential on financial activities across countries, it should have a positive impact on the banking sector, bond and stock market and overall level of financial development. The aim of this study thereby is to explore whether this is indeed the case.

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[1] The data are obtained primarily from Beck, Demirguc-Kunt, and Levine's database on *Financial Development and Structure* (referred as *BDL* from onwards), the World Bank's *World Development Indicators (WDI)*, *Worldwide Governance Indicators,* and *Edstats* which extracts data from the UNESCO Institute for Statistics.

The FSAP consists of 29 legislative acts, 27 directives and 2 regulations in corporate law, banking, payment systems and corporate governance (Kalemli – Ozcan et al. 2010 a). The most important of these measures are the 27 directives, which will be the focus of the remainder of our analysis. The directives amend previous laws, replace out-of-date proposals or offer new legislative measures for the EU member countries. Since the establishment of the FSAP in 1998, the European Commission has passed 21 out of the 27 directives by the end of 2003, with the remaining 6 directives being passed into legislation during the period of 2004 – 2006 (Kalemli – Ozcan et al. 2010 a).

Unlike the EU regulations that are enforceable across countries immediately after their announcement, the FSAP directives are enforceable only after the member states pass legislations that adopt the EU law domestically (Kalemli – Ozcan et al. 2010 a). The implementation stage of the FSAP directives involves the EU Commission's proposal on legislative directives and regulations, which then will have to be adopted by "co-decision" of the Council of Ministers of the Member States and the European Parliament (HM Treasury, The Financial Services Authority, and the Bank of England, 2003). The FSAP directives are incorporated into the national law of each EU member state either through introduction or through amendment of national laws within a time frame of 18 to 24 months of their date of original publication. The implementation process of the FSAP directives works through three stages; transposition of the EU legislation into national law, adjustment for necessary arrangements and ensuring that the newly adopted regulations are working effectively and efficiently. Due to differences across countries in modifying their existing internal institutional structures and frameworks to adopt the EU law (and due to the discretion in when to adopt these directives), the transposition of the FSAP directives may take several years, creating variation in terms of the dates of implementation of these directives in different countries.[2] For example, the 1998 Settlement Finality Directive (1998/26/EC) of the FSAP under the securities category was implemented into domestic law in Austria, Belgium, Finland, Germany, Ireland, the Netherlands, Spain and the U.K. within a year of its circulation. However, France, Italy and Luxembourg did not adopt this directive until 2001, while Cyprus, Czech Republic, Hungary, Latvia, Lithuania and Poland had not transposed the directive till the end of our sample period (Kalemli – Ozcan et al. 2010 a, b).[3] It is this cross-country variation in the timing of the adoption of different directives which will allow us to identify their effect on growth.

The harmonization indices for EU countries are created using adoption dates of directives in different countries from the European Commission's Financial Services Action Plan. Following the methodology by Kalemli – Ozcan et al. (2010 b), we construct country and time-variant and industry-invariant indices of harmonization that summarize the information provided by the 27 FSAP directives. In particular, for each of the 27 directives listed under the FSAP we define a dummy variable that takes on a value of one on and after the date that the country under examination has transposed the directive into national law and a

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[2] As explained in Ozkok (2012) the European Commission imposes sanctions on member states that do not comply with the rules and regulations set forward by the Commission. The Member States are therefore obliged to pay penalties for the days of non-compliance. For more information please refer to the European Commission's Application of the EU Law website, http://ec.europa.eu/eu_law/infringements/infringements_260_en.htm

[3] Please refer to Table 3 in the Appendix for further explanation of the directives in the Financial Services Action Plan.

value of zero otherwise. The sum of all 27 directives forms our next variable, $lex_{i,t}$ (Kalemli – Ozcan et al. 2010 a, b):

$$lex_{i,t} = \sum_{k=1}^{27} Directives_{i,t}^{k} \qquad (1)$$

where *k* represents all 27 directive dummies, *i* represents the countries, and *t* represents the years in the sample. Following Kalemli – Ozcan et al. (2010 b), we use the logarithmic transformation of the sum of the directives for countries in constructing the harmonization index given below.

$$Harmonization_{i,t} = \ln(1 + lex_{i,t}) \qquad (2)$$

Table 1 in the Appendix provides a time-line of adoption of the 27 directives for all countries in our sample, while Table 2 and 3 present detailed descriptions and categories for these directives.

The harmonization index described above takes into account the time varying sum of the directives across countries. We do not believe that this causes a potential problem or bias as countries are provided with a time frame in which they have to implement each directive into their national law. Nevertheless, it is also important and interesting to examine the fraction of the directives transposed each year given the possible number of directives that can possibly have been implemented in that year. We thereby construct another harmonization index that takes into account the fraction of directives implemented per year across countries relative to the possible sum of directives available for that year.[4] The fractional harmonization index can then be constructed as a possible robustness check as follows:

$$Harmonization_{i,t}(fraction) = \frac{lex_{i,t}}{\sum_{t} Directives\ possible_{i,t}} \qquad (3)$$

where $Directives\ possible_{i,t}$ represents the number of directives that can be implemented at each possible year and $lex_{i,t}$ is the sum of directives implemented across time per country.[5]

2.2 Relative timing (speed) of adoption

The relative timing of adoption is an important determinant of the effect of the FSAP directives. As shown in Ozkok (2012) there exist significant differences across EU member countries in the timing of adoption of the FSAP directives and not controlling for this timing would introduce a bias. As expressed previously, the FSAP directives need to be transposed into national law before they become effective. Although this implementation process has to be completed within a specified period of time some countries implement directives earlier in comparison to others.[6] The delays in implementation are taken at the country-level and cannot directly affect decision making for other member countries. These differences in timing of

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[4] We would like to thank Irma Clots-Figueras for pointing out this possibility.

[5] We have also experimented using the logarithmic transformation in the numerator of the fractional harmonization index. The results are similar to those reported in Table 6 in the Appendix.

[6] As expressed in Kalemli-Ozcan et al. (2010 b) countries may choose to postpone implementation of certain directives due to parliamentary delays, delays in formation of new agencies, problems in removing existing laws that could counteract against the FSAP directives and possible other technical obstacles. Countries may also choose not to adopt a certain directive immediately as a way of protecting domestic firms from foreign competition and for other political considerations.

adoption, however, are highly influential on the overall level of harmonization across countries. For example, if Czech Republic adopts a directive, and no other country adopts the same directive, then we cannot talk about harmonization. In that case Czech Republic would simply bear the cost of adopting the directive, without attaining any benefits from it. With this in mind, we consider whether there is a disadvantage from adopting these directives earlier. In order to check for this possibility, we construct a new variable which we call the harmonization difference:

$$Harmonizationdif_{i,t} = Harmonization_{i,t} - Harmonizationave_t$$

where $Harmonization_{i,t}$ is the harmonization index of country *i* in year *t*, and $Harmonizationave_t$ is the average index of harmonization across countries in year *t*. The harmonization difference is a measure that depicts how many FSAP directives are adopted by each country relative to the average rate of adoption for all countries per year. Using this variable we can analyze the impact of being an early versus a late adopter on industrial growth.

2.3 Financial Development Indicators

Financial development indicators consist of banking system, stock market and bond market measures. Below we discuss each group of measures and the construction of indices in detail.

Banking sector development indicators:

Five indicators are used to measure the development of the banking sector. These variables are liquid liabilities (% of GDP), private credit by deposit money banks and other financial institutions (% of GDP), the ratio of deposit money bank assets to the sum of deposit money bank assets and central bank assets (in percentages), total bank assets (% of GDP), and domestic credit provided by the banking sector (% of GDP). The annual data is obtained from *the Financial Development and Structure Databas*e by BDL and the World Bank's *WDI*.

Liquid liabilities (% of GDP) equals the ratio of liquid liabilities of bank and nonbank financial intermediaries to GDP (Demirguc-Kunt and Levine 2001). This variable is commonly used as a measure of financial sector development and is a typical measure of financial depth.

Private credit by deposit money banks and other institutions (% of GDP) is an indicator for the overall development in private banking markets (Chinn and Ito 2006). This variable includes financial resources provided to the private sector by deposit money banks and other financial institutions. It measures the level of credit available for the private sector.

The ratio of deposit money bank assets to the sum of deposit money bank assets and central bank assets (in percentages) is used to demonstrate the weight of deposit money bank assets among total assets. It reflects the importance of private lending compared to total lending (Huang 2006).

Total bank assets (% of GDP) is used as a measure of financial depth. It is used to represent the overall size of the banking sector.

Domestic credit provided by the banking sector (% of GDP) includes credit extended to the private sector and general government, to the nonfinancial public sector in the form of investments in short- and long-term government securities, to banking and nonbank institutions and loans to state enterprises but excludes credit to the central government (World Bank 2012). It is a measure of banking sector depth and financial sector development in terms of size (World Bank 2012).

Stock market development indicators:

Three different variables are used to measure development in stock markets. These variables are *stock market capitalization (% of GDP), stock market turnover ratio (in percentages),* and *stock market total value traded (% of GDP)*. Annual data is obtained from the *Financial Development and Structure Database* of BDL.

Stock market capitalization (% of GDP) is equal to the value of listed shares divided by GDP. It is an indicator of the size of the stock market. *Stock market turnover ratio (in percentages)* is used as the efficiency indicator of stock markets (Demirguc-Kunt and Levine 2001). It is classified as the ratio of the value of total shares traded to stock market capitalization. *Stock market total value traded (% of GDP)* is equal to the total shares traded on the stock market exchange divided by GDP. This indicator measures the activity or liquidity of the stock markets (Demirguc-Kunt and Levine 2001).

Bond market development indicators:

Private bond market capitalization (% of GDP) and *public bond market capitalization (% of GDP)* are the two indicators used to measure bond market development. Data is reported annually from the *Financial Development and Structure database* of BDL.

Private bond market capitalization (% of GDP) is equal to the total amount of outstanding domestic debt securities issued by financial institutions and corporations as a share of GDP. *Public bond market capitalization (% of GDP)* is equal to the total amount of public domestic securities issued by governments as a share of GDP. Both of these indicators are used to determine the efficiency of bond markets.

The financial development literature does not use bond market development indicators as potential measures for financial development. Due to their short period of availability bond market indicators may reduce the number of estimations or may create problems in estimations due to their large variability. For these reasons, we also construct financial development indices that exclude the bond market development indicators.

2.4 Creating financial development indices

We argue for the use of indices for financial development for various reasons. First, the choice of indicators to be used is a topic of concern in the literature. Studies lack a comprehensive indicator that can bring together all features of financial development; the banking system, the stock and the bond markets. Second, with different measures used for financial development, the results obtained seem unconvincing. Constructing better financial development indices will help resolve problems associated

with particular choice of measures. By aggregating different measures of financial development into a single index we summarize the comprehensive nature of the financial markets and bring together different sectors that affect financial development.

The use of principal components and factors models in creating indices have become more common among the researchers particularly in examining the link between financial openness and financial development and growth. Principal components analysis in its simplest form involves a mathematical procedure that helps transform a number of possibly correlated variables into a smaller number of uncorrelated ones. Principal components has two main objectives; reducing the dimensionality of the data set, and identifying new meaningful variables.[7] Here we use the methodology of Bo and Woo (2008) and apply it to our context following Ozkok (2010). This index calculates weights taking into account the information from all components. According to this methodology the weights for each measure of the index are constructed as follows:

$$w_j = \frac{\sum_{i=1}^{i=p} \lambda_i \alpha_j^i}{\sum_{i=1}^{i=p} \lambda_i}$$

where λ_i *(i =1,…,p)* is the ith eigenvalue and α^i_{px1} *(i = 1, …, p)* is the ith eigenvector of the correlation matrix R_{pxp} respectively (Bo and Woo, 2008). The technique used by Bo and Woo (2008) is similar to that proposed by the United Nations Conference on Trade and Development (UNCTAD) for constructing the Trade and Development Index. Bo and Woo (2008/2010), Nagar and Basu (2002) and Klein and Ozmucur (2002/2003) provide different approaches in creating indices analogous to the Trade and Development Index (TDI) with minor alterations.

The index is then constructed taking into account the relative importance of all indicators:

$$Index = \frac{\sum_{i=1}^{i=p} \sum_{j=1}^{i=p} \lambda_i \alpha_j^i x_j}{\sum_{i=1}^{i=p} \lambda_i} = \sum_{j=1}^{j=p} w_j x_j$$

where x_j (j = 1, …, p) is the jth column of the matrix X and w_j is the final weight of the indicator *j*. All variables that constitute the jth column of the matrix X, x_j, are standardized. The sum of the weights expressed by the above formula above does not necessarily have to equal unity. This is due to the fact that the principal component analysis in its underlining structure normalizes the mode of each eigenvector to unity. The weights therefore could be very close to but not always equal to 1 (Bo and Woo 2008).

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[7] For a more in depth discussion of the principal component analysis please refer to Jackson (1991), Dunteman (1989) and Jolliffe (2002).

Following this methodology we construct indices with standardized individual measures for financial openness, banking sector, stock and bond market development, financial development.[8] This avoids any potential problem that could arise as a result of using different scales or units of measurement.

2.5 Control Variables

To further examine the relationship between financial harmonization and financial development we introduce a series of variables to control for legal and institutional differences, health care and education. Control variables described in detail below are country and time-variant for the period of 1996 – 2007. The data for the control variables are from the World Bank's *WDI* and the *Worldwide Governance Indicators*, and *Edstats.*

We employ a series of legal and institutional variables from the World Bank's *Worldwide Governance Indicators* dataset. We use three different measures to control for institutional, legal, political and economic factors that may affect the overall level of growth. The three indicators --- *government effectiveness*, *regulatory quality,* and *rule of law* --- are constructed using subjective and perceptions-based data that reflect views of a range of respondents, agencies and organizations. They are measured in a range from -2.5 to 2.5, where higher values correspond to better governance outcomes.[9]

Secondary school gross enrolment rate (% of population) is used as an indicator that controls for differences in educational attainment across countries. This measure is an important determinant of development. Following the examples of educational attainment indicators from the economic growth literature we use secondary school gross enrollment rate as a control for educational differences across countries.

Public health expenditure (% of government expenditure) is an indicator used for controlling funds provided for the health sector across countries. It consists of recurrent and capital spending from government (central and local) budgets, external borrowings and grants and social (or compulsory) health insurance funds (World Bank 2012).[10]

Control variables help in further explaining the effect of financial harmonization on financial development as well as banking sector, bond and stock market development. Countries may demonstrate higher levels of financial development relative to others as a result of differences in education, institutions and legal systems, and health systems. The ease in adopting FSAP directives into national law can be induced by the quality of regulatory and legislative institutions. Education could be a factor in establishing human capital which would facilitate faster and simpler implementation of legislative policies. Health expenditure could

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[8] This method makes use of all eigenvectors and proposes to use weights depending on the eigenvectors and eigenvalues.

[9] Please refer to the Worldwide Governance Indicators (WGI) dataset. 1996 – 2011. World Bank. http://info.worldbank.org/governance/wgi/index.aspx#home . The institutional quality variables used in our analysis do not fluctuate widely across time. Due to the relatively small fluctuation structure of these indicators, we take the averages of two consecutive years to replace the missing years' data for these three legal and institutional variables.

[10] The grants also include donations from international agencies and nongovernmental organizations. For further information please refer to http://data.worldbank.org/indicator/SH.XPD.PUBL.GX.ZS

be taken as an indicator of better functioning of countries. There may be different reasons behind financial development however given that we have a sample set of European economies which all have higher levels of economic development and growth in comparison to other world economies we try to capture and control for the main elements that we believe would have a potential influence in our analysis.[11]

3. Empirical Model

We measure the effect of financial harmonization on financial development through an empirical model using fixed effects estimation. We follow the literature (Jayaratne and Strahan (1996), (1998), Strahan (2002), Morgan et al. (2004), and Kalemli – Ozcan et al. (2010 a, b)) and use a model which controls for average differences across countries and time in harmonization policies. We estimate the below benchmark empirical model in our estimations:

$$FD_{i,t} = \lambda_i + \theta_t + \beta_1 Harmonization_{i,t} + \beta_2 Harmonizationdif_{i,t} + \sum_{p=1}^{5} \tau_p \, Controls_{i,t}^p + v_{i,t}$$

where the dependent variable in the above equation is the index of financial development[12], λ_i represents country fixed effects, θ_t represents time fixed effects, $Harmonization_{i,t}$ is the index measure created using the FSAP directives, $Harmonizationdif_{i,t}$ is the relative timing of adoption of the FSAP directives measuring the difference between how much a country implements these directives in response to the average rate of adoption, and $Controls_{i,t}$ are the three legal and institutional quality variables of government effectiveness, regulatory quality and rule of law, secondary school enrollment rate, and the health expenditure.

In the above equation our main focus is on the coefficient of the harmonization index. We would expect to find a positive and significant coefficient for harmonization which would imply a positive link between financial harmonization and financial development. We convey our main findings for both the empirical model and robustness checks in detail in the next section.

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[11] We also checked for the robustness of our results including an income variable to account for differences across our European countries. The inclusion of the logarithm of GDP per capita depicted insignificant coefficients and did not alter the magnitudes or the significances of our other explanatory variables. Similarly including a trade openness variable to account for the trade across European countries did not add to our regressions. We find its coefficient to be insignificant with no alterations on the signs and significances of other explanatory variables. These results are available upon request.

[12] We also use indices of banking sector, bond and stock market developments as dependent variables to analyze the impact of harmonization on different financial sectors.

4. Results

4.1 Benchmark Model

We report our results using 25 EU member countries for the period of 1996 – 2007. In our regressions we use fixed effects estimations with country and time specific effects. The results from Table 5 illustrate the link between the harmonization index and financial development. Previous discussions had conveyed that through the Financial Services Action Plan, European economies would achieve an increase in the real GDP by 1.1% over a decade (FSA 2003; London Economics 2002). Although there is no clear explanation regarding how the FSAP would influence the level of financial development across countries, given its initial goal of creating a unified and integrated European financial market we would anticipate that it would be one of the primary determinants of an increase in financial development both across countries and over time. The results from Table 5 show that this is indeed the case. Controlling for the relative timing of adoption, the financial harmonization index is found to be positive and significant for all dependent variables of development with the exception of the bond market development index. Harmonization difference, or the relative timing of adoption, on the other hand takes on a negative effect implying that being an early adopter does not have a clear benefit in terms of financial development. The relative timing of adoption is shown to have a significantly disadvantageous effect on banking sector, stock market and financial development that excludes the bond market. The goal of unification of financial markets by the FSAP directives can only be mutually beneficial for countries when they all implement these directives.[13] Legal and institutional variables take on altering coefficients that are mostly insignificant. Health and education variables are generally positive and partly significant. This shows that health and educational attainment are contributing factors for financial development. In order to examine whether the inclusion of other control variables affect our results particularly for the banking sector we include further controls to our benchmark model. The results are reported below.

4.2 Robustness checks

As a first robustness check we examine our results with the harmonization index that takes into account the fraction of directives implemented. Constructing a harmonization index that depends on the fraction of the directives implemented we can observe whether countries adopt the FSAP directives in a timely manner. This index differs from our original measure by taking into account that not every year are newer FSAP directives proposed by the European Commission. As shown in equation (3), we expect this index to convey information regarding the adoption process of the directives rather than the quantity of directives implemented per year. Our results from Table 6 (columns 1 to 5) report no significant relationship between the fractional harmonization index and the banking sector, bond and stock market and overall financial development indices. In order to examine whether the inclusion of a harmonization difference variable using the fractional argument would alter our findings, we construct the relative timing of adoption measure taking into account the fractions of directives as follows:

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[13] With the inclusion of the harmonization difference measure, the harmonization index acts like an average harmonization indicator that generates the impact of harmonization across countries at the average level.

$$Harmondif(fra)_{i,t} = \frac{(lex_{i,t} - lex(ave)_{i,t})}{\sum_t Directives\ possible_{i,t}}$$

where $Directives\ possible_{i,t}$ represents the number of directives that can be implemented at each possible year, $lex_{i,t}$ is the sum of directives implemented across time per country and $lex(ave)_{i,t}$ is the mean of the country and time variant sum of directives.

The findings from columns (5) to (10) of Table 6 are mostly insignificant. The fractional harmonization index is insignificant for all dependent variables, whereas the harmonization difference measure is found to be positively significant for the financial development index that excludes the bond market. Nevertheless the fractional harmonization index should not be regarded as a substitute of the original harmonization index. The results portray that the effect of harmonization most probably does not work through a fractional argument. By using the fraction of directives implemented in the harmonization index we cannot find the positive and significant link that we examine when using the original logarithmic harmonization index.

Another potential concern may stem from the construction of the relative timing of adoption of the FSAP directives across countries. The 25 countries, although being a part of the most powerful economic and political union in the world, differ from each other in terms of growth rates. Taking into account the differences across economies of the 25 EU countries we can construct a variable for relative timing of adoption such that it depends on the overall structure of the economy across countries. The relative timing of adoption measure created depends on the GDP levels. The weights for this variable are calculated as follows:

$$weight_{i,t} = \frac{GDP_{i,t}}{\sum_i GDP_{i,t}} \qquad (4)$$

where $GDP_{i,t}$ is the gross domestic product of country *i* given in constant 2000 USD from the World Bank's *World Development Indicators*. Similarly the relative timing of adoption measure, or in other words, the harmonization difference can be constructed as:

$$Harmonizationdif_{i,t} = Harmonization_{i,t} - \left(\sum_i weight_{i,t} \times Harmonization_{i,t}\right) \quad (5)$$

where $Harmonization_{i,t}$ is the harmonization index of the FSAP directives that is country and time variant. Using the above methodology each country takes on a weight that depends on the performance of their economy relative to the overall performance of the EU 25.

The results from Table 7 agree with those of the benchmark model. Harmonization index is positively significant for all development indices with the exception of the bond market development index, while the weighted harmonization difference variable takes on a negatively significant coefficient for most development indices, indicating that being an early adopter has a disadvantageous effect on financial development. The control variables of legal and institutional quality, together with education and health measures report coefficients similar to those of Table 5. Different constructions of the harmonization difference measure in computing the effect of early versus late harmonization on financial development show that harmonization is beneficial when all countries implement the directives around the same time.

As a third robustness check we reexamine the results by constructing two different harmonization indices. These two indices include the initial twenty-one directives that were put into force by the European Commission before the official completion of the FSAP directives in 2006, and the seven directives that correspond to the banking initiatives of the FSAP (Kalemli – Ozcan et al. 2010 b). By doing so we hope to determine whether the effect of the harmonization process on financial development alters when we consider the initial 21 directives that were put into force long before the end of the FSAP and identify a possible significant link between the banking directives and financial development. The first alternative harmonization index includes twenty one directives excludes the directives implemented prior to 2004. It is constructed as:

$$lexro_{i,t} = \sum_{k=1}^{21} Directives_{i,t}^k \text{ and } Harmonization_{i,t}^* = \ln(1 + lexro_{i,t}) \qquad (6)$$

The second alternative to the harmonization index highlights the importance of the 7 banking directives of the FSAP. The banking harmonization index is then formed as:

$$banklex_{i,t} = \sum_{k=1}^{7} Directives_{i,t}^k \text{ and } Harmonization_{i,t}^{**} = \ln(1 + banklex_{i,t}) \qquad (7)$$

The results from Tables 8 and 9 show that harmonization indices with initial 21 directives, and 7 banking directives have a positive effect on most financial development indices. Harmonization difference has a negative impact implying that being an early adopter is not beneficial for development. This shows that the construction of the harmonization index is crucial, however, excluding some directives does not change the robustness of our benchmark model.

Additionally we check for the robustness of our results when accounting for legal origins. Legal origins refer to the differences across countries in legal systems that are structured according to families of law. Depending on the historical background and development of legal families, characteristics of the legal structures, and distinctive institutions, each country has a different legal tradition. As La Porta et al. present in their series of articles (1997, 1998, and 2008), the most popular legal traditions are the common law and the civil law from which several sub-traditions such as the French, German, socialist and Scandinavian legal origins arise.[14] Although for our purpose, there is not much difference between the French, German and British laws in terms of implementing the EU legislation proposed under the FSAP, the way these provisions will be carried out into domestic law, the manner that these directives will be monitored and enforced may show vast differences across member countries. This remains to be a factor too strong to forgo. Together with governmental and institutional factors, health and educational variables, differences in legal origins across countries may highly influence the link between financial harmonization and financial development. Our analysis with the addition of legal origins in Table 10 finds the effect of financial harmonization index to be positive and significant for all development indices with the exception of the bond market development index. Once again, the harmonization difference variable is shown to have a negative coefficient for most development indices. Although the legal origin dummies for the U.K., France, Germany, Socialist regimes, and Scandinavian countries appear to be negatively

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[14] Please refer to La Porta et al. (2008). Legal origins dummies are obtained from the original La Porta et al. (1998) study and they are created by assigning a value of 1 for countries that have a specified legal tradition such as civil or common law, and 0 otherwise.

significant in some regressions, the coefficients alter signs depending on the dependent variables selected. The results correspond to those of the benchmark model of Table 5, demonstrating the robustness of our initial findings.

Additionally, we examine the effects of the recent financial crisis on the link between financial harmonization and financial development. Starting from 2008, the financial crisis has had a wide-spread effect on most European countries. Greece, Portugal, Ireland, Italy, Spain and recently Cyprus have had to deal with increasing levels of unemployment, large declines in growth rates, and worst of all with growing levels of deficits and bankruptcy. The three strongest economies, Germany, France and the UK, have also experienced worsening of financial markets and a damaging slowdown of economic growth. In order to study the impact of the crisis on how the FSAP directives have been implemented across countries, we include the most recent years, for which data is available, in our analysis.[15]

The recent financial crisis has undermined the degree of integration across countries. As the fear of contagion of the detrimental outcomes of the crisis surges, harmonization and the relative timing of adoption of the FSAP directives could very well be negatively affected. The results from Table 11 show similarities to our benchmark model. Harmonization index is positive and significant for the financial development index that excludes the bond market, and for the banking sector development index.

In order to examine how harmonization has been affected by the recent financial crisis we include interaction terms of the explanatory variables in our model and analyze their behavior once the dataset is extended to include the crisis period. An indicator for the crisis period is initially constructed as a dummy variable that takes on a value of 1 on and after 2008, and a value of 0 otherwise. This term is then multiplied by the explanatory variables to construct interaction terms. The results reported in Table 12 convey a harmonization index that is positive and significant. The harmonization difference measure is similarly found to have a negative coefficient that is significant for most dependent variables. Examining the interaction terms, harmonization has a negative but insignificant coefficient. Figure 1 depicts the harmonization index and the harmonization variable. Similarly the graphs across countries do not convey a clear alteration of the rate of harmonization during $2008 - 2010$. The crisis period does not seem to have affected the pace of the harmonization process. This could be the result of the last directives being established in 2006. Although by the end of our sample period there were countries remaining to implement some of the directives under the FSAP, most countries had already transposed majority of the directives into national law. Hence the positive impact of harmonization on financial, banking sector and bond and stock market development indices continues when we control for relative timing of adoption across countries. We have thereby shown that the link between financial harmonization and financial development is positive and robust.

We lastly check to see if using indices for financial development as opposed to individual measures alters our results. Ozkok (2010) depicts that using index measures the link between financial openness and financial development is found to be more significant and positive than what the literature had previously conveyed. Here we employ individual banking, stock market and bond market development indicators to

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[15] The analysis includes additional data from 2008, 2009 and 2010.

examine whether we lose any information from using principal component style indices for financial development rather than individual measures. The results from Table 13 depict that the harmonization index is positive and mostly significant. The magnitudes of significances depend largely on the dependent variables selected. Comparing our findings to those from Table 5 we find that the index measures for banking sector, bond and stock market and overall financial development provide more significant and more robust (in terms of standard errors) results. We thereby can conclude that we do not lose from indexing financial development measures; quite the opposite; we gain more by doing so.

One final remark is the concern of endogeneity and causality when analyzing the link between financial harmonization and financial development. We have so far argued that our financial harmonization index that stems from the use of Financial Services Action Plan directives is exogenous. The implementation of these directives of the FSAP is originally determined at the level of the European Commission. Although countries do have control over their implementation dates, they have to follow the European Commission's deadlines of adoption for these FSAP directives. Therefore, any disobedience with the timing of the implementation of these financial harmonization policies may result in sanctions that are costly for the member countries. The decision taken at the country level on when to implement each directive depends mostly on the alterations or modifications made to the legal systems, institutions and current regulations rather than being determined by future prospects of growth or development. The expectation for future development is undeniable; the idea behind harmonization just like integration is to achieve overall growth and development as put forward by both the European Commission and the European Union. Nevertheless, given the exogenous source of variation of the FSAP directives at the Commission's level, we hereby argue financial harmonization is not adopted with the hope of achieving financial development.

5. Concluding Remarks

The Financial Services Action Plan (FSAP) was established with the initiative of building an integrated and harmonized financial market among its member states. After the implementation of the Euro, the FSAP directives have constituted a further step in bringing together European countries through legislative and regulatory terms in banking, insurance and securities markets.

The literature has shown a positive impact of financial harmonization (from the FSAP directives) on cross-border lending and industrial growth across countries. Given that the FSAP directives aim to create open and secure financial markets, we have assessed the effect of these directives on the development of financial markets. With a standard fixed effects estimation--- regressing financial, banking, bond and stock market development indices constructed using principal components analysis on harmonization and controlling for country and time fixed effects and the relative timing of adoption of the directives --- we find that there is a positive relationship between financial harmonization and financial development. The results are shown to be robust to different approaches in constructing the harmonization index and the harmonization difference variable, including other control variables such as dummies for legal origins, and extending the dataset to include the crisis period.

This paper has shown that by taking into account the timing perspective in implementing the FSAP directives across countries we can find a positive link between financial harmonization and financial development. The transposition of the FSAP directives has been shown to positively affect our financial development indices. This however does not imply that the FSAP directives have entirely been successful in realizing their initial objectives. There existed countries by the end of our sample period, by 2010, which had not implemented all the directives. Although the last FSAP directives had been established in 2006, some countries have taken a longer time frame in adopting them. This could be a result of the costs attached to the implementation of the directives. As the Financial Services Action Plan nears completion in terms of full adoption with the remaining countries implementing the directives, the cost and benefit debate is ongoing. Having shown that the relative timing of adoption is key to understanding the impact of harmonization policies on financial development, future research, as more data become available, would call for a cost and benefit analysis of the FSAP directives. Such an analysis will clear doubts on the implementation stage of the FSAP and on its timing, and thereby provide a full picture on the efficiency of these directives.

Acknowledgements

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APPENDIX

Table 1: Timing of the FSAP Directives for the EU Member Countries

Directives	AT	BE	CY	CZ	DK	EE	FI	FR	DE	GR	HU	IE	IT	LV
1998/26/EC	1999	1999	Not Yet	Not Yet	2000	2004	1999	2001	1999	2000	Not Yet	1999	2001	Not Yet
2000/46/EC	2002	2003	2004	2003	2005	2006	2003	2003	2002	2003	2004	2002	2002	2004
2000/64/EC	2003	2004	2002	2004	2004	2001	2004	2006	2002	2004	2002	Not Yet	Not Yet	2004
2001/17/EC	2003	2004	2004	2004	2006	2005	2004	2005	2003	Not Yet	2004	2003	2003	2004
2001/24/EC	2003	2004	2004	2005	2004	2005	2004	2004	2004	2006	2004	2004	2004	2004
2001/65/EC	*2004*	2005	2003	2004	2002	2004	2004	2004	2004	2006	2004	2004	2005	1993
2001/86/EC	2004	2004	2004	2004	2004	2005	2004	2005	2004	2006	2004	2006	2005	2005
2001/97/EC	2003	2004	2003	2004	2005	2004	2003	2004	2002	2005	2003	2003	2004	2004
2001/107/EC	2003	2004	2004	2004	2004	2004	2004	2003	2004	2004	2003	2003	2003	2005
2001/108/EC	2003	2004	2004	2004	2005	2004	2004	2003	2004	2004	2003	2003	2003	2004
2002/13/EC	2003	2004	2004	2004	2004	2005	2004	2004	2004	2005	2004	2005	2004	1998
2002/47/EC	2003	2005	2004	2005	2004	2004	2004	2005	2004	2004	2004	2004	2004	2005
2002/65/EC	2004	2006	2004	2004	2005	2004	2005	2005	2004	2005	2005	2004	2005	2004
2002/87/EC	2005	2005	2005	2005	2004	2005	2004	2004	2005	2006	2004	2005	2005	2005
2002/83/EC	2003	2004	2004	2004	2004	2005	2004	2004	2004	2005	2004	2005	2004	1998
2002/92/EC	2004	2005	2004	2005	2005	2005	2005	2005	Not Yet	2005	2005	2005	2006	2005
2003/6/EC	2005	2005	2005	2006	2005	2005	2005	2005	2004	2005	2005	2005	2005	2005
2003/41/EC	2005	2006	2006	2006	2005	2004	2006	2006	2005	2005	2005	2005	Not Yet	2005
2003/48/EC	2004	2005	2005	2004	2004	2004	2004	2003	2005	2005	2003	2003	2005	2005
2003/51/EC	2005	2006	2005	2004	2002	2005	2004	2004	2004	2006	2005	2005	Not Yet	1993
2003/71/EC	2005	2006	2005	2006	2005	2005	2005	2005	2005	2005	2005	2005	Not Yet	2005
2004/25/EC	2006	2007	2007	2006	2005	2007	2006	2006	2006	2006	Not Yet	2006	2007	2006
2004/109/EC	2007	2007	2009	2006	2007	2007	2007	2007	2007	2007	Not Yet	2007	2007	2007
2004/39/EC	2007	2008	2010	2006	2007	2007	2007	2007	2007	2007	Not Yet	2007	2007	2008
2005/56/EC	2007	2008	2007	Not Yet	2007	2008	2007	2008	2007	2009	Not Yet	2008	2008	2010
2006/48/EC	2007	2007	Not Yet	Not Yet	2007	2007	2007	2007	2006	2007	Not Yet	2007	2007	2010
2006/49/EC	2007	2007	Not Yet	2006	2007	2007	2007	2007	2006	2007	Not Yet	2007	2007	2010

Directives	LT	LU	MT	NL	PL	PT	SK	SI	ES	SE	UK
1998/26/EC	Not Yet	2001	2002	1999	Not Yet	2000	2006	2004	1999	2000	1999
2000/46/EC	2005	2002	2002	2002	2003	2002	2004	2006	2002	2002	2002
2000/64/EC	2004	2001	2002	2003	2004	2000	2006	2004	2002	2000	2003
2001/17/EC	2004	2004	2004	2004	2004	2003	2005	2004	2003	2006	2003
2001/24/EC	2005	2004	2004	2005	2004	2006	2005	2004	2005	2006	2004
2001/65/EC	2004	2006	2001	2005	1995	2004	2005	2004	2004	2004	2004
2001/86/EC	2005	2006	2004	2005	2005	2005	2004	2006	2006	2004	2004
2001/97/EC	2004	2004	2003	2001	2001	2004	2006	2002	2003	2005	2004
2001/107/EC	2003	2003	2004	2005	2004	2004	2004	2004	2004	2004	2004
2001/108/EC	2003	2003	2004	2005	2004	2004	2004	2004	2004	2004	2004
2002/13/EC	2004	2004	2004	2003	2004	2003	2004	2004	2004	2004	2004
2002/47/EC	2004	2005	2005	2004	2004	2004	2005	2003	2002	2005	2005
2002/65/EC	2004	Not Yet	2005	2006	2000	Not Yet	2005	Not Yet	Not Yet	2004	2004
2002/87/EC	2004	2006	2005	2007	2005	Not Yet	2006	2006	2005	2006	2004
2002/83/EC	2004	2004	2004	2003	2004	2003	2004	2004	2004	2004	2005
2002/92/EC	2004	2005	2006	2005	2004	2006	2005	2004	2006	2005	2005
2003/6/EC	2004	2006	2005	2005	2005	2006	2006	2004	2005	2005	2005
2003/41/EC	2006	2005	2004	2006	1999	2006	2005	2003	2005	2006	2005
2003/48/EC	2005	2005	2004	2004	2005	2005	2005	2006	2004	2005	2005
2003/51/EC	2003	2006	2002	2005	1995	2005	2005	Not Yet	2005	2006	2005
2003/71/EC	2005	2005	2005	2005	2005	2005	2005	2006	2005	2005	2005
2004/25/EC	2007	2006	2006	2007	2009	2006	2007	2006	2007	2006	2006
2004/109/EC	2007	2007	2007	Not Yet	Not Yet	2007	Not Yet	2007	2007	2007	2007
2004/39/EC	2008	2008	2007	2007	Not Yet	2007	2007	2007	2007	2007	2007
2005/56/EC	2012	2007	2007	2008	2008	Not Yet	Not Yet	2008	2009	2008	2007
2006/48/EC	2011	2007	2007	2007	2010	2007	Not Yet	2007	2008	2007	2007
2006/49/EC	2008	2008	2007	2007	2010	2007	2007	2007	2008	2007	2007

Sources: Kalemli – Ozcan, S., E. Papaioannou, and J. L. Peydro. (2010 b). What Lies Beneath the Euro's Effect of Financial Integration? Currency Risk, Legal Harmonization, or Trade? *Journal of International Economics*, 81 (1): 75 – 88, European Commission. 2010. Transposition of Financial Services Action Plan. http://ec.europa.eu/internal_market/finances/actionplan/transposition/database/austria_en.htm, and Europa, Access to European Union Law National Execution Measures, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:72006L0049:EN:NOT#FIELD_MT

Table 2: Directives of the Financial Services Action Plan (FSAP)

Directives	Directive Names	Deadline	Category
1998/26/EC	Settlement Finality Directive	1/06/2005	Securities
2000/46/EC	Directive on the taking up, pursuit and prudential supervision of the businesses of electronic money institutions (E-Money Directive)	27/04/2002	Banking
2000/64/EC	Directive amending the insurance directives and the ISD to permit information exchange with third countries	17/11/2002	Insurance
2001/17/EC	Directive on the reorganization and winding-up of insurance undertakings	20/04/2003	Insurance
2001/24/EC	Directive on the reorganization and winding-up of banks	5/05/2004	Banking
2001/65/EC	Directive amending the 4th and the 7th Company Law Directives to allow fair value accounting	9/10/2004	Securities
2001/86/EC	Directive supplementing the Statute for a European Company with regard to the involvement of employees	10/10/2004	Securities
2001/97/EC	Directive amending the money laundering directive (2nd Money Laundering Directive)	15/06/2003	Banking
2001/107/EC	1st Directive on UCITS (Undertakings for Collective Investments in Transferable Securities)	13/08/2003	Securities
2001/108/EC	2nd Directive on UCITS (Undertakings for Collective Investments in Transferable Securities)	13/08/2003	Securities
2002/13/EC	Directive amending the solvency margin requirements in the insurance directives	20/09/2003	Insurance
2002/47/EC	Directive on financial collateral arrangements	17/12/2003	Securities
2002/65/EC	Directive on the Distance of marketing of Financial Services	1/01/2004	Insurance
2002/87/EC	Directive on the supplementary supervision of credit institutions, insurance undertakings and investment firms in a financial conglomerate (Financial Conglomerates Directive)	11/08/2004	Banking
2002/83/EC	Directive amending the solvency margin requirements in the insurance directives	20/09/2003	Insurance
2002/92/EC	Directive on insurance mediation	15/01/2005	Insurance
2003/6/EC	Directive on insider dealing and market manipulation	12/10/2004	Securities
2003/41/EC	Directive on the prudential supervision of pension funds	23/09/2005	Insurance
2003/48/EC	Directive on the taxation of savings income in the form of interest payments (Savings Tax Directive)	1/01/2004	Banking

2003/51/EC	Directive modernizing the accounting provisions of the 4th and the 7th Company Law Directives	1/01/2005	Securities
2003/71/EC	Directive on prospectuses	1/07/2005	Securities
2004/25/EC	Directive on Take Over Bids	20/5/2006	Securities
2004/109/EC	Transparency directive	20/01/2007	Securities
2004/39/EC	Directive on Markets in Financial Instruments (update of ISD) - MiFID	20/01/2007	Securities
2005/56/EC	10th Company Law Directive on cross-border mergers of limited liability companies	15/12/2007	Securities
2006/48/EC	Directive on the relating to the taking up and pursuit of the business of credit institutions	31/12/2006	Banking
2006/49/EC	Directive on the capital adequacy of investment firms and credit institutions	31/12/2006	Banking

Sources: Kalemli – Ozcan, S. E. Papaioannou, and J. L. Peydro. (2010 b). What Lies Beneath the Euro's Effect of Financial Integration? Currency Risk, Legal Harmonization, or Trade? *Journal of International Economics*, 81 (1): 75 – 88 and Supplementary Appendix Table A, http://www.dartmouth.edu/~elias/jie_SAT-A.pdf, European Commission. 2010. Transposition of Financial Services Action Plan http://ec.europa.eu/internal_market/finances/actionplan/transposition/database/austria_en.htm

Table 3: Description of the Directives of the Financial Services Action Plan

Directive	Directive No.	Deadline
Settlement Finality Directive	1998/26/EC	01/06/2005

This directive is implemented to reduce systemic risk in payment and securities settlement systems, particularly aiming to reduce the risk of insolvency of a member country. Main objectives of this directive include protection of transfer orders, greater competition between settlement providers and the removal of barriers to post-trading.

| Directive on the taking up, pursuit and prudential supervision of the businesses of electronic money institutions (E-Money Directive) | 2000/46/EC | 27/04/2002 |

The E-Money directive defines electronic money and sets conditions for capital and authorization requirements of electronic money institutions. Main objectives of this directive are to implement appropriate prudential rules and encourage innovation and confidence so as to boost the number of passports used in the banking system as well as to increase the use of e-money.

| Directive amending the insurance directives and the ISD to permit information exchange with third countries | 2000/64/EC | 17/11/2002 |

This directive allows for the exchange of information between the third country authorities and authorities of the Member States. It allows for the conclusion of cooperation agreements by the Member States providing an environment for exchange of information with the authorities of third countries.

| Directive on the reorganization and winding-up of insurance undertakings | 2001/17/EC | 20/04/2003 |

This directive aims to ensure that mutual recognition is applied to the winding-up and reorganization of insurance undertakings within the EU. The main objectives of this directive include reducing regulatory requirements regarding bankruptcy and increasing consumer protection in order to create more cross-border business through branches and more direct cross-border insurance.

| Directive on the reorganization and winding-up of banks | 2001/24/EC | 05/05/2004 |

This directive ensures that the banks across the Member States can be wound up and reorganized as a single entity. The main objectives of this directive include reducing regulatory requirements regarding bankruptcy and increasing consumer protection.

Directive amending the 4th and the 7th Company Law Directives to allow fair value accounting	2001/65/EC	09/10/2004

This directive highlights the existing EU Accounting Directives for companies, banks and other financial institutions and concentrates on the valuation of assets. It aims to achieve a single set of financial statements for listed companies across Member States. The directive is intended to establish greater transparency, increased investment and information disclosure.

Directive supplementing the Statute for a European Company with regard to the involvement of employees	2001/86/EC	10/10/2004

This directive provides provisions for the creation of a Statute for a European company particularly for employee involvement.

Directive amending the money laundering directive (2nd Money Laundering Directive)	2001/97/EC	15/06/2003

This directive highlights the importance of the scope of predicate offences and the reporting of suspicious activity in banking. It is established in order to cut funding for organized crime and terrorism. Its main objectives include increasing market confidence, reducing money laundering, and decreasing the risk of banking crises.

1st Directive on UCITS (Undertakings for Collective Investments in Transferable Securities)	2001/107/EC	13/08/2003

This directive aims to regulate management companies and provide simplified prospectuses for investment purposes. It promotes the consolidation of EU funds and generation of economies of scale. By providing greater flexibility for fund managers, this directive hopes to increase cross border trade in UCITS.

2nd Directive on UCITS (Undertakings for Collective Investments in Transferable Securities)	2001/108/EC	13/08/2003

This directive has the objectives of harmonizing information to investors, expanding investment options, providing a larger number of passports to ease cross border trade, and increasing the use of eligible assets so as to allow for quicker diffusion of products.

Directive amending the solvency margin requirements in the insurance directives	2002/13/EC	20/09/2003

This directive was implemented in order to improve prudential regulation of insurance companies. It addresses the reduction in the amount of regulatory capital an insurance undertaking is obliged to hold against unforeseen conditions, as well as aiming to simplify regulation and increase consumer protection.

Directive on financial collateral arrangements	2002/47/EC	17/12/2003

This directive creates greater enforceability for collateral backing transactions across the Member States. It aims to reduce systemic risk in securities settlement and the cost of capital, provide a harmonized legal treatment of financial collateral, and increase cross-border trading.

| Directive on the Distance of marketing of Financial Services | 2002/65/EC | 01/01/2004 |

This directive helps in protecting retail consumers of financial products sold at a distance. It aims to remove barriers to cross-border provision and expects to achieve higher cross-border consolidation in insurance through M&A activity. This directive provides higher protection for retail consumers and helps increase the levels of competition between suppliers throughout Member States.

| Directive on the supplementary supervision of credit institutions, insurance undertakings and investment firms in a financial conglomerate (Financial Conglomerates Directive) | 2002/87/EC | 11/08/2004 |

This directive provides a settlement on how the lead supervisor of a financial conglomerate should be decided and how supervisory arrangements should be fulfilled. It aims to ensure soundness of financial institutions through better prudential regulation such as risk reflective capital levels, improved risk management, and harmonization of cross-border and cross-sector supervision.

| Directive amending the solvency margin requirements in the insurance directives (Solvency 1 directive for life insurance) | 2002/83/EC | 20/09/2003 |

This directive aims to increase consumer protection and lower the costs for the insurance sector. It helps merge national markets so as to achieve a highly integrated single market in terms of life insurance.

| Directive on insurance mediation | 2002/92/EC | 15/01/2005 |

This directive is proposed to remove barriers to insurance intermediaries, enhance consumer protection and encourage retail insurance across borders of Member States. It brings together the issues regarding authorization, capitalization and regulation of intermediaries and brokers who sell insurance products under a single framework. It aims to provide higher quality advice and products in the insurance sector as well as to increase cross-border consolidation in insurance.

| Directive on insider dealing and market manipulation (Market Abuse Directive) | 2003/6/EC | 12/10/2004 |

This directive is aimed to terminate market abuse and insider trading. It is established to improve market transparency and confidence, and increase investment. Through this directive the markets are assumed to be more effectively protected against abuse due to the new changes that relate to mandatory suspicious transaction reporting.

| Directive on the prudential supervision of pension funds | 2003/41/EC | 23/09/2005 |

This directive brings new regulation to the operation of employment-related pension schemes across Member States. It aims to create an internal market that will allow for occupational retirement provision organized in a European scale.

| Directive on the taxation of savings income in the form of interest payments (Savings Tax Directive) | 2003/48/EC | 01/01/2004 |

This directive is implemented to prevent cross-border tax evasion by individuals within the EU. Through this directive, the Member States will be able to exchange information on interest income paid to non-residents or to tax that particular income.

Directive modernizing the accounting provisions of the 4th and the 7th Company Law Directives	2003/51/EC	01/01/2005

This directive hopes to improve transparency in standards of corporate reporting. It aims to enhance investor confidence and to increase competition in the investment market and information quality.

Directive on prospectuses	2003/71/EC	01/07/2005

This directive is established to increase transparency and investor confidence in the securities markets across Member States. It proposes passporting of prospectuses that are to be published for securities trade to the public across the EU borders so as to achieve a more competitive market for issuers and investors. This directive provides a single passport for issuers of equity and debt securities easing the transactions of securities across the EU borders. It aims to harmonize information, promote a more competitive EU market in securities, and reduce the cost of capital.

Directive on Take Over Bids	2004/25/EC	20/05/2006

This directive is implemented to promote free market in corporate control and enhance competition in securities markets. It aims to implement a minimum framework to the national approval of takeovers in applicable law, protection of shareholders and disclosure. Its main objective includes insurance of an efficient market for M&A activity through which merger related costs and increase cross-border activity in M&A will be reduced.

Transparency directive	2004/109/EC	20/01/2007

This directive aims to increase the quality of information available to investors in the securities market and promote a more competitive investment market. It proposes an obligation on issuers of securities to meet continuing disclosure requirements after the issue.

Directive on markets in Financial Instruments (update of ISD) – MiFID	2004/39/EC	20/01/2007

This directive aims to create an integrated single European market of financial instruments. It promotes banks to internalize trading across Europe and compete with exchanges. Through greater internalization across banks, this directive hopes to increase competition, reduce the cost of capital and enhance fair competition between exchanges and banks. This directive is expected to create appropriate investor protection, single passport for securities trade, remove barriers to entry for exchanges and increase competition between trading venues.

10th Company Law Directive on cross-border mergers of limited liability companies	2005/56/EC	15/12/2007

This directive is created to allow companies to conduct cross-border mergers. It ensures efficient market for M&A activity. It aims to decrease merger related costs and increase cross-border M&A activity. It provides a more secure and transparent environment for cross-border restructuring.

Directive on the relating to the taking up and pursuit of the business of credit institutions	2006/48/EC	31/12/2006

This directive is established to coordinate credit institutions in order to protect savings and to create equal conditions of competition between institutions.

Directive on the capital adequacy of investment firms and credit institutions	2006/49/EC	31/12/2006

This directive establishes the capital adequacy requirements for investment firms and credit institutions, setting the rules for their prudential supervision. Its main objectives include harmonization of capital adequacy of investment firms and credit institutions, enhancement of effective risk management for banks, and the creation of a safer environment that would decrease possibility for banking crises.

Source: The definitions for the directives are collected from the following: Kalemli – Ozcan, S., E. Papaioannou, and J. L. Peydro. (2010 b). What Lies Beneath the Euro's Effect of Financial Integration? Currency Risk, Legal Harmonization, or Trade? *Journal of International Economics*, 81 (1): 75 – 88 and Supplementary Appendix Table A, http://www.dartmouth.edu/~elias/jie_SAT-A.pdf, European Commission. 2010. Transposition of Financial Services Action Plan http://ec.europa.eu/internal_market/finances/actionplan/transposition/database/austria_en.htm, Boyfield, K., H. Robinson, and L. Mullally. (2006). Selling the City Short? A Review of the EU's Financial Services Action Plan. *Open Europe*, 1 – 119, (http://www.openeurope.org.uk/Content/Documents/PDFs/fsap.pdf), Malcolm, K., M. Tilden, and T. Wilsdon. (2009). Evaluation of the economic impacts of the Financial Services Action Plan. *European Commission Internal Market and Services Final Report*, 1 – 243

Table 4: Summary Statistics

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Financial development	145	0.38678	0.8669	-1.5686	2.4907
Financial development*	202	0.08187	1.2056	-2.6924	4.0789
Banking sector development	205	0.05424	1.3383	-3.0448	3.2115
Bond market development	214	0.01414	0.7352	-0.8746	2.9753
Stock market development	297	0.00330	1.1153	-1.3210	4.3889
Harmonization	300	1.34614	1.2694	0	3.3322
Harmonization difference	300	0.00003	0.3694	-1.5349	1.5011
Government effectiveness	300	1.28349	0.5706	0.0782	2.3379
Regulatory quality	300	1.26356	0.3753	0.4393	2.0578
Rule of Law	300	1.19809	0.5241	0.1039	2.0142
Health	300	12.7227	2.5069	4.8078	18.3899
Education	290	103.988	14.609	81.322	162.349

Note: Financial development, banking sector development, stock and bond market development indices are constructed using the principal components analysis. Financial development* is a principal components index that excludes the bond market development indicators. Harmonization is the harmonization index constructed using the directives of the Financial Services Action Plan. Harmonization difference is the difference between a country's harmonization index and average harmonization for that particular year. Government effectiveness, Regulatory quality and Rule of law are legal and institutional variables taken from the Worldwide Governance Indicators. Health is the percentage of government expenditure that is devoted to public health, and Education is the gross percentage of secondary school enrollment rate.

Table 5: Financial development, financial harmonization and relative timing of adoption

VARIABLES	(1) Financial development	(2) Financial development*	(3) Banking sector development	(4) Bond market development	(5) Stock market development
	Dependent Variables				
Harmonization	0.305***	0.549***	0.360***	0.0296	0.453***
	(3.801)	(5.762)	(4.319)	(0.505)	(6.450)
	[0.0801]	[0.0953]	[0.0834]	[0.0586]	[0.0702]
Harmonizationdif	-0.116	-0.497***	-0.407**	-0.0649	-0.321***
	(-0.838)	(-3.682)	(-2.777)	(-0.631)	(-3.558)
	[0.138]	[0.135]	[0.146]	[0.103]	[0.0901]
Government effectiveness	-0.253	-0.272	-0.149	-0.00626	-0.324**
	(-1.209)	(-1.679)	(-0.694)	(-0.0350)	(-2.121)
	[0.209]	[0.162]	[0.215]	[0.179]	[0.153]
Regulatory quality	-0.479*	-0.378	-0.262	-0.301	0.242
	(-1.929)	(-0.959)	(-0.582)	(-1.139)	(0.713)
	[0.248]	[0.394]	[0.450]	[0.264]	[0.339]
Rule of law	0.904*	0.0529	0.714	0.723	-0.553**
	(1.856)	(0.124)	(1.454)	(1.032)	(-2.068)
	[0.487]	[0.427]	[0.491]	[0.701]	[0.267]
Health	0.155**	0.0869	0.111	0.131**	-0.0118
	(2.540)	(1.254)	(1.465)	(2.723)	(-0.339)
	[0.0610]	[0.0694]	[0.0760]	[0.0480]	[0.0348]
Education	0.0116*	0.00297	0.00891	0.00900	-0.00621*
	(1.986)	(0.494)	(1.511)	(1.593)	(-1.977)
	[0.00583]	[0.00600]	[0.00590]	[0.00565]	[0.00314]
Observations	141	194	196	209	288
R-squared	0.721	0.728	0.629	0.339	0.517
Number of countries	20	25	25	22	25

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Note: t-statistics are in parentheses (*** p<0.01, ** p<0.05, * p<0.1) and standard errors are in brackets. *Financial development*, *Financial development**, *Banking sector development*, *Bond market development* and *Stock market development* are all indices calculated using principal components analysis. Harmonization$_{i,t}$ = ln (1 + lex$_{i,t}$) where lex$_{i,t}$ represents the sum of all 27 directives which take on a value of 1 on and after the date that the directive under consideration goes into effect in that particular country, and a value of 0 otherwise. $Harmonization dif_{i,t} = Harmonization_{i,t} - Harmonization ave_t$ where $Harmonization ave_t$ is the average harmonization across countries per year. *Government effectiveness*, *Regulatory quality* and *Rule of law* are legal and institutional variables taken from the *Worldwide Governance Indicators*, *Health* is the percentage of government expenditure that is devoted to public health, and *Education* is the gross percentage of secondary school enrollment rate. The regressions are estimated over 25 countries and 12 years. The 25 European Union countries included are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Poland, Slovakia, Slovenia, Spain, Sweden and the UK. The estimation period in our regressions is 1996 – 2007. The above estimations include country and time effects that are not reported here. t – statistics reported in the tables are based on country-specific (clustered) heteroskedasticity and autocorrelation.

Table 6: Financial development and financial harmonization constructed using fractions

VARIABLES	(1) Financial dev.	(2) Financial dev.*	(3) Banking sector dev.	(4) Bond market dev.	(5) Stock market dev.	(6) Financial dev.	(7) Financial dev.*	(8) Banking sector dev.	(9) Bond market dev.	(10) Stock market dev.
					Dependent Variables					
Harmonization (Fractional)	0.247	0.00154	-0.165	-0.0242	0.201	-0.172	-0.128	-0.311	0.0911	0.0922
	(1.156)	(0.00683)	(-0.696)	(-0.258)	(1.601)	(-0.690)	(-0.565)	(-1.272)	(0.755)	(0.667)
	[0.214]	[0.225]	[0.237]	[0.0940]	[0.126]	[0.249]	[0.226]	[0.244]	[0.121]	[0.138]
Harmonizationdif (Fractional)						0.248*	0.0180	0.0772	-0.0999	-0.0194
						(1.873)	(0.296)	(1.094)	(-1.331)	(-0.435)
						[0.133]	[0.0609]	[0.0705]	[0.0750]	[0.0447]
Government effectiveness	-0.222	-0.273	-0.156	-0.00599	-0.344**	-0.0808	-0.303*	-0.126	-0.0189	-0.370***
	(-1.086)	(-1.674)	(-0.724)	(-0.0337)	(-2.203)	(-0.447)	(-1.813)	(-0.743)	(-0.123)	(-2.917)
	[0.204]	[0.163]	[0.215]	[0.178]	[0.156]	[0.181]	[0.167]	[0.170]	[0.154]	[0.127]
Regulatory quality	-0.499*	-0.369	-0.226	-0.294	0.214	-0.370	-0.372	-0.367	-0.312	0.0951
	(-1.950)	(-0.929)	(-0.501)	(-1.100)	(0.632)	(-1.240)	(-0.830)	(-0.886)	(-1.088)	(0.425)
	[0.256]	[0.397]	[0.451]	[0.267]	[0.339]	[0.298]	[0.448]	[0.414]	[0.286]	[0.224]
Rule of law	0.848*	0.0366	0.705	0.714	-0.532*	0.573	0.283	0.659	0.762	-0.217
	(1.758)	(0.0886)	(1.454)	(1.009)	(-2.016)	(1.070)	(0.590)	(1.321)	(0.965)	(-1.059)
	[0.482]	[0.414]	[0.485]	[0.708]	[0.264]	[0.536]	[0.480]	[0.499]	[0.790]	[0.205]
Health	0.149**	0.0863	0.114	0.131**	-0.0149	0.107*	0.0807	0.117	0.124**	-0.0188
	(2.426)	(1.239)	(1.531)	(2.711)	(-0.420)	(1.841)	(1.123)	(1.475)	(2.552)	(-0.520)
	[0.0616]	[0.0696]	[0.0745]	[0.0482]	[0.0355]	[0.0581]	0.0718	[0.0790]	[0.0484]	[0.0362]
Education	0.0110*	0.00273	0.00884	0.00907	-0.00634**	0.0131***	0.00156	0.00908*	0.0105*	-0.00618**
	(2.035)	(0.459)	(1.506)	(1.584)	(-2.086)	(4.573)	(0.304)	(1.873)	(1.789)	(-2.404)
	[0.00543]	[0.00595]	[0.00587]	[0.00572]	[0.00304]	[0.00286]	[0.00511]	[0.00485]	[0.00585]	[0.00257]
Observations	141	194	196	209	288	115	157	157	178	246
R-squared	0.718	0.727	0.630	0.338	0.517	0.720	0.658	0.606	0.358	0.458
Number of countries	20	25	25	22	25	18	22	22	21	25

Note: t-statistics are in parentheses (*** p<0.01, ** p<0.05, * p<0.1) and standard errors are in brackets. *Financial development*, *Financial development**, *Banking sector development*, *Bond market development* and *Stock market development* are all indices calculated using principal components analysis. $Harmonization_{i,t}(fraction) = \frac{lex_{i,t}}{\sum_t Directives\ possible_{i,t}}$ where lex$_{i,t}$ represents the sum of all 27 directives which take on a value of 1 on and after the date that the directive under consideration goes into effect in that particular country, and a value of 0 otherwise. Similarly the relative timing of adoption measure is constructed as $Harmondif(fra)_{i,t} = \frac{(lex_{i,t} - lex(ave)_{i,t})}{\sum_t Directives\ possible_{i,t}}$ where lex(ave)$_{i,t}$ is the average of the sum of all 27 directives adopter per country across time. *Government effectiveness*, *Regulatory quality* and *Rule of law* are legal and institutional variables taken from the *Worldwide Governance Indicators*, *Health* is the percentage of government expenditure that is devoted to public health, and *Education* is the gross percentage of secondary school enrollment rate. The regressions are estimated over 25 countries and 12 years. The 25 European Union countries included are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Poland, Slovakia, Slovenia, Spain, Sweden and the UK. The estimation period in our regressions is 1996 – 2007. The above estimations include country and time effects that are not reported here. t – statistics reported in the tables are based on country-specific (clustered) heteroskedasticity and autocorrelation.

Table 7: Financial development, financial harmonization, with a different relative timing of adoption measure

VARIABLES	(1) Financial development	(2) Financial development*	(3) Banking sector development	(4) Bond market development	(5) Stock market development
	Dependent Variables				
Harmonization	0.301***	0.535***	0.348***	0.0277	0.443***
	(3.878)	(5.712)	(4.283)	(0.491)	(6.428)
	[0.0777]	[0.0936]	[0.0813]	[0.0563]	[0.0690]
Harmonizationdif (Weighted)	-0.112	-0.483***	-0.395**	-0.0629	-0.311***
	(-0.838)	(-3.682)	(-2.777)	(-0.631)	(-3.558)
	[0.134]	[0.131]	[0.142]	[0.0998]	[0.0875]
Government effectiveness	-0.253	-0.272	-0.149	-0.00626	-0.324**
	(-1.209)	(-1.679)	(-0.694)	(-0.0350)	(-2.121)
	[0.209]	[0.162]	[0.215]	[0.179]	[0.153]
Regulatory quality	-0.479*	-0.378	-0.262	-0.301	0.242
	(-1.929)	(-0.959)	(-0.582)	(-1.139)	(0.713)
	[0.248]	[0.394]	[0.450]	[0.264]	[0.339]
Rule of law	0.904*	0.0529	0.714	0.723	-0.553**
	(1.856)	(0.124)	(1.454)	(1.032)	(-2.068)
	[0.487]	[0.427]	[0.491]	[0.701]	[0.267]
Health	0.155**	0.0869	0.111	0.131**	-0.0118
	(2.540)	(1.254)	(1.465)	(2.723)	(-0.339)
	[0.0610]	[0.0694]	[0.0760]	[0.0480]	[0.0348]
Education	0.0116*	0.00297	0.00891	0.00900	-0.00621*
	(1.986)	(0.494)	(1.511)	(1.593)	(-1.977)
	[0.00583]	[0.00600]	[0.00590]	[0.00565]	[0.00314]
Observations	141	194	196	209	288
R-squared	0.721	0.728	0.629	0.339	0.517
Number of countries	20	25	25	22	25

Note: t-statistics are in parentheses (*** p<0.01, ** p<0.05, * p<0.1) and standard errors are in brackets. *Financial development*, *Financial development**, *Banking sector development*, *Bond market development* and *Stock market development* are all indices calculated using principal components analysis. Harmonization$_{i,t}$ = ln (1 + lex$_{i,t}$) where lex$_{i,t}$ represents the sum of all 27 directives which take on a value of 1 on and after the date that the directive under consideration goes into effect in that particular country, and a value of 0 otherwise. $Harmonization dif_{i,t} = Harmon_{i,t} - \left(\sum_i weight \times Harmon_{i,t}\right)$ where $weight = \frac{GDP_{i,t}}{\sum_i GDP_{i,t}}$. *Government effectiveness*, *Regulatory quality* and *Rule of law* are legal and institutional variables taken from the Worldwide Governance Indicators, *Health* is the percentage of government expenditure that is devoted to public health, and *Education* is the gross percentage of secondary school enrollment rate. The regressions are estimated over 25 countries and 12 years. The 25 European Union countries included are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Poland, Slovakia, Slovenia, Spain, Sweden and the UK. The estimation period in our regressions is 1996 – 2007. The above estimations include country and time effects that are not reported here. t – statistics reported in the tables are based on country-specific (clustered) heteroskedasticity and autocorrelation.

Table 8: Financial development and financial harmonization; using a harmonization index of 21 directives

VARIABLES	(1) Financial development	(2) Financial development*	(3) Banking sector development	(4) Bond market development	(5) Stock market development
	Dependent Variables				
Harmonization (21 directives)	0.324***	0.582***	0.382***	0.0310	0.480***
	(3.830)	(5.761)	(4.304)	(0.499)	(6.432)
	[0.0846]	[0.101]	[0.0887]	[0.0620]	[0.0747]
Harmonizationdif (21 directives)	-0.123	-0.531***	-0.407**	-0.0612	-0.366***
	(-0.862)	(-3.786)	(-2.725)	(-0.561)	(-3.872)
	[0.143]	[0.140]	[0.149]	[0.109]	[0.0945]
Government effectiveness	-0.252	-0.272	-0.149	-0.00692	-0.324**
	(-1.203)	(-1.673)	(-0.689)	(-0.0386)	(-2.124)
	[0.209]	[0.162]	[0.216]	[0.179]	[0.153]
Regulatory quality	-0.478*	-0.379	-0.266	-0.300	0.240
	(-1.915)	(-0.964)	(-0.592)	(-1.133)	(0.705)
	[0.249]	[0.393]	[0.450]	[0.265]	[0.340]
Rule of law	0.913*	0.0538	0.721	0.719	-0.550*
	(1.878)	(0.126)	(1.460)	(1.027)	(-2.057)
	[0.486]	[0.426]	[0.494]	[0.700]	[0.267]
Health	0.155**	0.0872	0.111	0.131**	-0.0120
	(2.535)	(1.260)	(1.458)	(2.722)	(-0.343)
	[0.0612]	[0.0692]	[0.0763]	[0.0480]	[0.0349]
Education	0.0117*	0.00297	0.00901	0.00901	-0.00626*
	(1.992)	(0.494)	(1.525)	(1.593)	(-2.000)
	[0.00587]	[0.00602]	[0.00590]	[0.00565]	[0.00313]
Observations	141	194	196	209	288
R-squared	0.721	0.728	0.628	0.339	0.516
Number of countries	20	25	25	22	25

Note: t-statistics are in parentheses (*** p<0.01, ** p<0.05, * p<0.1) and standard errors are in brackets. *Financial development*, *Financial development**, *Banking sector development*, *Bond market development* and *Stock market development* are all indices calculated using principal components analysis. Harmonization$_{i,t}$ = ln (1 + lex$_{i,t}$) where lex$_{i,t}$ represents the sum of all 21 directives, which take on a value of 1 on and after the date that the directive under consideration goes into effect in that particular country, and a value of 0 otherwise. This sum excludes the 6 directives implemented after 2003. $Harmonizationdif_{i,t} = Harmonization_{i,t} - Harmonizationave_t$ where $Harmonizationave_t$ is the average harmonization across countries per year. *Government effectiveness*, *Regulatory quality* and *Rule of law* are legal and institutional variables taken from the *Worldwide Governance Indicators*, *Health* is the percentage of government expenditure that is devoted to public health, and *Education* is the gross percentage of secondary school enrollment rate. The regressions are estimated over 25 countries and 12 years. The 25 European Union countries included are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Poland, Slovakia, Slovenia, Spain, Sweden and the UK. The estimation period in our regressions is 1996 – 2007. The above estimations include country and time effects that are not reported here. t – statistics reported in the tables are based on country-specific (clustered) heteroskedasticity and autocorrelation.

Table 9: Financial development and financial harmonization; using a harmonization index of 7 banking directives

VARIABLES	(1) Financial development	(2) Financial development*	(3) Banking sector development	(4) Bond market development	(5) Stock market development
			Dependent Variables		
Harmonization (Banking directives)	0.494***	0.865***	0.568***	0.0457	0.715***
	(3.838)	(5.729)	(4.320)	(0.501)	(6.487)
	[0.129]	[0.151]	[0.131]	[0.0912]	[0.110]
Harmonizationdif (Banking directives)	-0.476**	-0.747***	-0.662***	-0.111	-0.538***
	(-2.285)	(-3.778)	(-3.811)	(-1.110)	(-4.127)
	[0.208]	[0.198]	[0.174]	[0.0998]	[0.130]
Government effectiveness	-0.222	-0.277	-0.146	-0.00129	-0.326**
	(-0.977)	(-1.702)	(-0.676)	(-0.00704)	(-2.232)
	[0.227]	[0.163]	[0.215]	0.182	[0.146]
Regulatory quality	-0.481*	-0.374	-0.265	-0.308	0.274
	(-1.959)	(-0.939)	(-0.596)	(-1.172)	(0.801)
	[0.246]	[0.399]	[0.445]	[0.263]	[0.342]
Rule of law	0.898*	0.0665	0.705	0.705	-0.543*
	(1.818)	(0.153)	(1.467)	(1.030)	(-2.017)
	[0.494]	[0.436]	[0.481]	[0.685]	[0.269]
Health	0.151**	0.0880	0.111	0.131**	-0.0130
	(2.549)	(1.278)	(1.459)	(2.681)	(-0.385)
	[0.0591]	[0.0689]	[0.0759]	[0.0489]	[0.0337]
Education	0.0108*	0.00311	0.00883	0.00906	-0.00656*
	(1.973)	(0.528)	(1.551)	(1.604)	(-2.051)
	[0.00547]	[0.00588]	[0.00569]	[0.00564]	[0.00320]
Observations	141	194	196	209	288
R-squared	0.714	0.729	0.629	0.340	0.516
Number of countries	20	25	25	22	25

Note: t-statistics are in parentheses (*** p<0.01, ** p<0.05, * p<0.1) and standard errors are in brackets. *Financial development*, *Financial development**, *Banking sector development*, *Bond market development* and *Stock market development* are all indices calculated using principal components analysis. Harmonization$_{i,t}$ = ln (1 + lex$_{i,t}$) where lex$_{i,t}$ represents the sum of all 7 banking directives, which take on a value of 1 on and after the date that the directive under consideration goes into effect in that particular country, and a value of 0 otherwise. $Harmonizationdif_{i,t} = Harmonization_{i,t} - Harmonizationave_t$ where $Harmonizationave_t$ is the average harmonization across countries per year. *Government effectiveness*, *Regulatory quality* and *Rule of law* are legal and institutional variables taken from the *Worldwide Governance Indicators*, *Health* is the percentage of government expenditure that is devoted to public health, and *Education* is the gross percentage of secondary school enrollment rate. The regressions are estimated over 25 countries and 12 years. The 25 European Union countries included are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Poland, Slovakia, Slovenia, Spain, Sweden and the UK. The estimation period in our regressions is 1996 – 2007. The above estimations include country and time effects that are not reported here. t – statistics reported in the tables are based on country-specific (clustered) heteroskedasticity and autocorrelation.

Table 10: Financial development, financial harmonization with legal origin dummies

	Dependent Variables				
	(1)	(2)	(3)	(4)	(5)
VARIABLES	Financial development	Financial development*	Banking sector development	Bond market development	Stock market development
Harmonization	0.364***	0.500***	0.435***	0.0152	0.374***
	(4.620)	(5.300)	(4.640)	(0.263)	(4.786)
	[0.0788]	[0.0943]	[0.0938]	[0.0581]	[0.0781]
Harmonizationdif	-0.0692	-0.355**	-0.525***	0.0767	-0.187
	(-0.495)	(-2.393)	(-3.789)	(0.654)	(-1.562)
	[0.140]	[0.149]	[0.139]	[0.117]	[0.119]
Gov. effectiveness	0.0735	0.280	0.320	0.0736	0.271
	(0.282)	(1.101)	(1.189)	(0.393)	(1.129)
	[0.261]	[0.254]	[0.269]	[0.187]	[0.240]
Regulatory quality	1.086***	0.792***	0.253	0.449***	1.030***
	(5.042)	(2.767)	(0.989)	(2.611)	(4.696)
	[0.215]	[0.286]	[0.256]	[0.172]	[0.219]
Rule of law	-0.434*	-0.235	0.283	-0.522**	-0.387
	(-1.668)	(-0.931)	(1.055)	(-2.304)	(-1.569)
	[0.260]	[0.252]	[0.268]	[0.227]	[0.246]
Health	0.0352	0.0327	-0.105***	0.113***	0.0566**
	(1.088)	(1.128)	(-3.961)	(5.183)	(2.338)
	[0.0323]	[0.0290]	[0.0266]	[0.0218]	[0.0242]
Education	0.00695*	0.00448	-0.00351	0.0119***	0.00462
	(1.905)	(0.903)	(-0.746)	(3.676)	(0.964)
	[0.00365]	[0.00496]	[0.00471]	[0.00324]	[0.00479]
Legal origin UK	-2.264***	-1.736***	1.201**	-3.044***	-2.726***
	(-3.825)	(-2.986)	(2.129)	(-6.600)	(-5.158)
	[0.592]	[0.581]	[0.564]	[0.461]	[0.529]
Legal origin French	-2.124***	-2.134***	0.432	-2.688***	-2.586***
	(-3.896)	(-3.809)	(0.773)	(-5.638)	(-4.764)

	[0.545]	[0.560]	[0.559]	[0.477]	[0.543]
Legal origin Socialist	-3.537***	-3.492***	-1.132**	-3.279***	-3.561***
	(-6.887)	(-6.272)	(-2.084)	(-7.552)	(-6.781)
	[0.514]	[0.557]	[0.543]	[0.434]	[0.525]
Legal origin German	-2.427***	-2.540***	0.759	-2.585***	-3.610***
	(-3.885)	(-4.055)	(1.286)	(-5.226)	(-6.340)
	[0.625]	[0.626]	[0.590]	[0.495]	[0.569]
Legal origin Scandinavian	-2.287***	-2.639***	-0.220	-2.001***	-2.324***
	(-3.792)	(-3.917)	(-0.331)	(-3.911)	(-3.569)
	[0.603]	[0.674]	[0.664]	[0.512]	[0.651]
Observations	141	194	196	209	288
R-squared	0.784	0.739	0.770	0.526	0.598

Note: t-statistics are in parentheses (*** p<0.01, ** p<0.05, * p<0.1) and standard errors are in brackets. *Financial development*, *Financial development**, *Banking sector development*, *Bond market development* and *Stock market development* are all indices calculated using principal components analysis. Harmonization$_{i,t}$ = ln (1 + lex$_{i,t}$) where lex$_{i,t}$ represents the sum of all 27 directives which take on a value of 1 on and after the date that the directive under consideration goes into effect in that particular country, and a value of 0 otherwise. $Harmonizationdif_{i,t} = Harmonization_{i,t} - Harmonizationave_t$ where $Harmonizationave_t$ is the average harmonization across countries per year. *Government effectiveness*, *Regulatory quality* and *Rule of law* are legal and institutional variables taken from the Worldwide Governance Indicators, *Health* is the percentage of government expenditure that is devoted to public health, and *Education* is the gross percentage of secondary school enrollment rate. Legal origin dummy variables provide the legal origins of the U.K., France, Socialist countries, Germany and Scandinavian countries respectively. The data for legal origins comes from La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1999). The regressions are estimated over 25 countries and 12 years. The 25 European Union countries included are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Poland, Slovakia, Slovenia, Spain, Sweden and the UK. The estimation period in our regressions is 1996 – 2007. The above estimations include time fixed effects that are not reported here. t – statistics reported in the tables are robust to heteroskedasticity and autocorrelation.

Table 11: Financial development, financial harmonization with crisis period data

VARIABLES	(1) Financial development	(2) Financial development*	(3) Banking sector development	(4) Bond market development	(5) Stock market development
			Dependent Variables		
Harmonization	0.360***	0.367***	0.529***	0.142	0.173***
	(4.933)	(6.301)	(6.148)	(1.586)	(4.159)
	[0.0730]	[0.0583]	[0.0860]	[0.0895]	[0.0417]
Harmonizationdif	-0.131	-0.310**	-0.538***	-0.135	-0.0869
	(-1.209)	(-2.599)	(-3.516)	(-0.966)	(-1.139)
	[0.109]	[0.119]	[0.153]	[0.140]	[0.0763]
Gov. effectiveness	-0.222	-0.354**	-0.373	-0.108	-0.297**
	(-1.079)	(-2.466)	(-1.316)	(-0.363)	(-2.130)
	[0.206]	[0.144]	[0.283]	[0.298]	[0.140]
Regulatory quality	-0.608***	-0.286	-0.335	-0.363	0.171
	(-2.927)	(-0.814)	(-0.827)	(-1.279)	(0.553)
	[0.208]	[0.352]	[0.405]	[0.284]	[0.310]
Rule of law	0.365	0.210	0.886*	0.631	-0.476**
	(1.200)	(0.665)	(1.846)	(0.776)	(-2.267)
	[0.304]	[0.317]	[0.480]	[0.812]	[0.210]
Health	0.00969	0.0197	0.0422	0.0368	-0.0181
	(0.221)	(0.467)	(0.750)	(0.776)	(-0.529)
	[0.0438]	[0.0422]	[0.0564]	[0.0474]	[0.0343]
Education	0.00907***	0.00443	0.0141**	0.00876	-0.00523
	(3.140)	(1.167)	(2.180)	(1.665)	(-1.660)
	[0.00289]	[0.00379]	[0.00645]	[0.00526]	[0.00315]
Observations	180	234	236	270	360
R-squared	0.786	0.747	0.688	0.347	0.485
Number of countries	21	25	25	22	25

Note: t-statistics are in parentheses (*** p<0.01, ** p<0.05, * p<0.1) and standard errors are in brackets. *Financial development*, *Financial development**, *Banking sector development*, *Bond market development* and *Stock market development* are all indices calculated using principal components analysis. Harmonization$_{i,t}$ = ln (1 + lex$_{i,t}$) where lex$_{i,t}$ represents the sum of all 27 directives which take on a value of 1 on and after the date that the directive under consideration goes into effect in that particular country, and a value of 0 otherwise. $Harmonization dif_{i,t} = Harmonization_{i,t} - Harmonization ave_t$ where $Harmonization ave_t$ is the average harmonization across countries per year. *Government effectiveness*, *Regulatory quality* and *Rule of law* are legal and institutional variables taken from the Worldwide Governance Indicators, *Health* is the percentage of government expenditure that is devoted to public health, and *Education* is the gross percentage of secondary school enrollment rate. The regressions are estimated over 25 countries and 15 years. The 25 European Union countries included are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Poland, Slovakia, Slovenia, Spain, Sweden and the UK. The estimation period in our regressions is 1996 – 2010. The above estimations include country and time effects that are not reported here. t – statistics reported in the tables are based on country-specific (clustered) heteroskedasticity and autocorrelation.

**Table 12: Financial development, financial harmonization with crisis period data, interaction terms**

VARIABLES	(1) Financial development	(2) Financial development*	(3) Banking sector development	(4) Bond market development	(5) Stock market development
	Dependent Variables				
Harmonization	0.458***	0.529***	0.382***	0.102	0.440***
	(5.837)	(6.827)	(4.607)	(1.353)	(6.220)
	[0.0784]	[0.0775]	[0.0828]	[0.0752]	[0.0707]
Harmonizationdif	-0.244**	-0.485***	-0.420***	-0.100	-0.351***
	(-2.407)	(-4.325)	(-3.283)	(-0.984)	(-4.050)
	[0.101]	[0.112]	[0.128]	[0.102]	[0.0866]
Gov. effectiveness	-0.182	-0.289*	-0.104	0.119	-0.317**
	(-1.000)	(-2.058)	(-0.496)	(0.555)	(-2.231)
	[0.182]	[0.140]	[0.210]	[0.215]	[0.142]
Regulatory quality	-0.627**	-0.435	-0.686	-0.364	0.189
	(-2.694)	(-1.056)	(-1.561)	(-1.342)	(0.556)
	[0.233]	[0.412]	[0.439]	[0.271]	[0.339]
Rule of law	0.257	0.0590	0.615	0.521	-0.456**
	(0.920)	(0.183)	(1.420)	(0.823)	(-2.240)
	[0.279]	[0.322]	[0.433]	[0.633]	[0.204]
Health	0.0675	0.0491	0.0817	0.0330	-0.0176
	(1.524)	(0.923)	(1.258)	(1.021)	(-0.567)
	[0.0443]	[0.0532]	[0.0650]	[0.0323]	[0.0311]
Education	0.00879**	0.00377	0.0120**	0.00697	-0.00501**
	(2.658)	(0.956)	(2.309)	(1.405)	(-2.081)
	[0.00331]	[0.00394]	[0.00521]	[0.00496]	[0.00241]
Crisis	26.14	23.49	17.03	-2.425	19.86
	(1.087)	(1.124)	(0.812)	(-0.176)	(1.426)
	[24.05]	[20.89]	[20.98]	[13.77]	[13.93]
$(Harmonization \times crisis)$	-7.751	-7.199	-5.877	-0.149	-5.949
	(-1.058)	(-1.127)	(-0.913)	(-0.0349)	(-1.383)

	[7.324]	[6.389]	[6.438]	[4.263]	[4.303]
$(Harmonizationdif \times crisis)$	11.06	9.120	5.253	0.707	5.872
	(1.365)	(1.222)	(0.681)	(0.158)	(1.282)
	[8.099]	[7.464]	[7.717]	[4.476]	[4.582]
$(Gov.effectiveness \times crisis)$	-0.637*	-0.430	-0.666	-0.160	-0.225
	(-1.844)	(-1.052)	(-1.282)	(-0.396)	(-0.530)
	[0.345]	[0.409]	[0.519]	[0.404]	[0.424]
$(Reg.quality \times crisis)$	0.662	0.694	1.515**	0.472	-0.328
	(1.145)	(0.887)	(2.190)	(1.091)	(-0.690)
	[0.578]	[0.782]	[0.692]	[0.432]	[0.476]
$(Rule\ of\ law \times crisis)$	0.0599	-0.0685	-0.494	-0.325	0.507
	(0.126)	(-0.132)	(-0.866)	(-0.878)	(1.171)
	[0.474]	[0.519]	[0.570]	[0.371]	[0.433]
$(Health \times crisis)$	-0.0977***	-0.0771**	-0.134**	-0.0321	0.0256
	(-3.349)	(-2.606)	(-2.721)	(-0.702)	(1.377)
	[0.0292]	[0.0296]	[0.0493]	[0.0458]	[0.0186]
$(Education \times crisis)$	6.64e-05	0.00283	0.0378**	0.0334***	-0.0145
	(0.00643)	(0.173)	(2.197)	(3.170)	(-1.492)
	[0.0103]	[0.0164]	[0.0172]	[0.0105]	[0.00973]
Observations	180	234	236	270	360
R-squared	0.816	0.766	0.769	0.468	0.497
Number of countries	21	25	25	22	25

Note: t-statistics are in parentheses (*** p<0.01, ** p<0.05, * p<0.1) and standard errors are in brackets. *Financial development*, *Financial development**, *Banking sector development*, *Bond market development* and *Stock market development* are all indices calculated using principal components analysis. Harmonization$_{i,t}$ = ln (1 + lex$_{i,t}$) where lex$_{i,t}$ represents the sum of all 27 directives which take on a value of 1 on and after the date that the directive under consideration goes into effect in that particular country, and a value of 0 otherwise. $Harmonizationdif_{i,t} = Harmonization_{i,t} - Harmonizationave_t$ where $Harmonizationave_t$ is the average harmonization across countries per year. *Government effectiveness*, *Regulatory quality* and *Rule of law* are legal and institutional variables taken from the Worldwide Governance Indicators, *Health* is the percentage of government expenditure that is devoted to public health, and *Education* is the gross percentage of secondary school enrollment rate. *Crisis* is an indicator that takes on a value of 1 on and after 2008 and a value of 0 otherwise. The regressions are estimated over 25 countries and 15 years. The 25 European Union countries included are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Poland,

Slovakia, Slovenia, Spain, Sweden and the UK. The estimation period in our regressions is $1996 - 2010$. The above estimations include country and time effects that are not reported here. t – statistics reported in the tables are based on country-specific (clustered) heteroskedasticity and autocorrelation.

Figure 1: Evolution of Financial Harmonization Policies across European Countries

Graphs by labelcountry
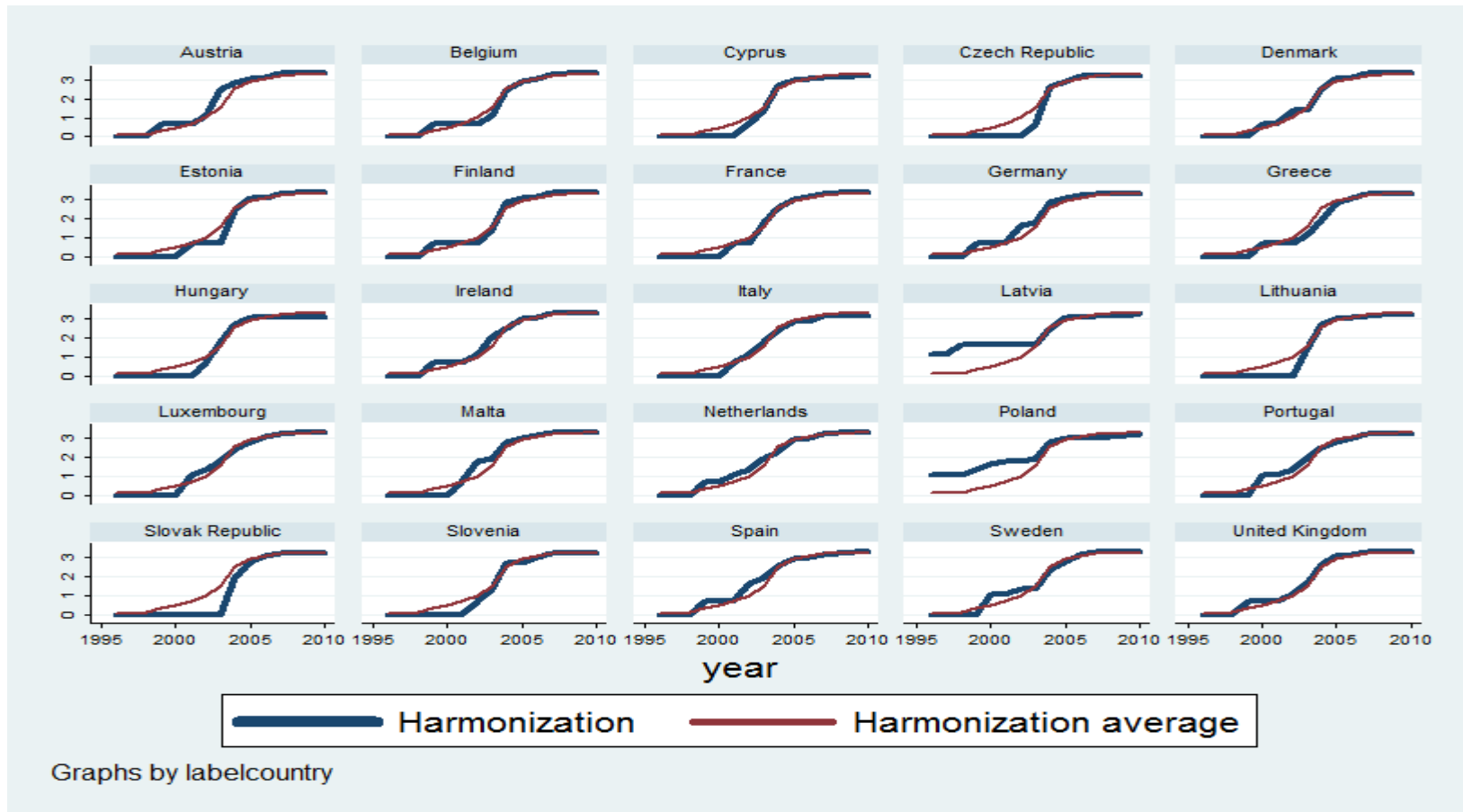
The figure above is generated in Stata and depicts the graphs for the harmonization index that is constructed using 27 directives of the Financial Services Action Plan and the harmonization average indicator which is the mean value of the harmonization index of 25 European countries per each year in our sample size.

Table 13: Financial development, financial harmonization, individual measures

					Dependent Variables					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
VARIABLES	Liquid liabilities	Deposit bank assets	Private credit	Total bank asset	Domestic credit	Private bond market capitalization	Public bond market capitalization	Stock market capitalization	Turnover ratio	Total value traded
Harmonization	7.372***	1.900	12.62***	9.245***	12.18***	0.868	0.896	13.93***	18.90***	17.90***
	(4.463)	(1.664)	(4.807)	(3.593)	(5.037)	(0.353)	(0.762)	(6.775)	(3.506)	(4.030)
	[1.652]	[1.142]	[2.625]	[2.573]	[2.418]	[2.458]	[1.176]	[2.056]	[5.392]	[4.442]
Harmonizationdif	-9.272***	-1.874**	-11.69***	-6.153	-13.50***	-1.922	-3.227	-10.58**	-14.82**	-10.37**
	(-4.683)	(-2.577)	(-2.929)	(-1.058)	(-2.798)	(-0.457)	(-1.319)	(-2.370)	(-2.320)	(-2.337)
	[1.980]	[0.727]	[3.992]	[5.817]	[4.825]	[4.202]	[2.447]	[4.464]	[6.389]	[4.437]
Government effectiveness	-11.34***	-1.638	-7.395	-2.030	-7.348	0.323	-2.913	0.608	-23.16*	-20.71**
	(-3.193)	(-0.707)	(-0.882)	(-0.242)	(-0.913)	(0.0432)	(-0.765)	(0.121)	(-1.755)	(-2.298)
	[3.553]	[2.316]	[8.386]	[8.393]	[8.045]	[7.482]	[3.808]	[5.030]	[13.19]	[9.012]
Regulatory quality	-23.90***	12.92	-44.51**	-34.87***	-53.49***	-12.78	13.44*	40.16**	-32.58	-3.807
	(-2.892)	(1.340)	(-2.747)	(-2.905)	(-4.214)	(-1.334)	(1.732)	(2.092)	(-1.304)	(-0.210)
	[8.262]	[9.644]	[16.20]	[12.00]	[12.69]	[9.574]	[7.761]	[19.20]	[24.98]	[18.09]
Rule of law	15.92*	0.172	29.94*	34.89*	39.65**	28.97	4.889	-24.21*	-27.46	-10.92
	(1.888)	(0.0553)	(2.051)	(1.729)	(2.390)	(1.016)	(0.497)	(-1.751)	(-0.909)	(-0.820)
	[8.431]	[3.107]	[14.59]	[20.18]	[16.59]	[28.51]	[9.832]	[13.82]	[30.21]	[13.31]
Health	1.040	-0.647	4.668*	5.147	4.472*	6.272***	-3.655***	-1.128	0.469	-0.00354
	(0.862)	(-0.751)	(1.782)	(1.655)	(1.966)	(3.138)	(-3.228)	(-0.815)	(0.143)	(-0.00180)
	[1.206]	[0.862]	[2.620]	[3.110]	[2.274]	[1.998]	[1.132]	[1.384]	[3.285]	[1.969]
Education	0.0672	0.123*	0.0692	0.315	0.170	0.330	0.184*	0.189	-0.590**	-0.534***
	(0.723)	(1.798)	(0.457)	(0.969)	(0.772)	(1.522)	(1.807)	(1.103)	(-2.252)	(-2.873)
	[0.0930]	[0.0683]	[0.151]	[0.325]	[0.221]	[0.217]	[0.102]	[0.171]	[0.262]	[0.186]
Observations	259	215	273	213	285	209	234	289	289	288
R-squared	0.469	0.276	0.552	0.458	0.503	0.378	0.382	0.418	0.347	0.418
Number of countries	25	25	25	25	25	22	22	25	25	25

Note: t-statistics are in parentheses (*** p<0.01, ** p<0.05, * p<0.1) and standard errors are in brackets. Harmonization$_{i,t}$ = ln (1 + lex$_{i,t}$) where lex$_{i,t}$ represents the sum of all 27 directives which take on a value of 1 on and after the date that the directive under consideration goes into effect in that particular country, and a value of 0 otherwise. $Harmonization dif_{i,t} = Harmonization_{i,t} - Harmonization ave_t$ where $Harmonization ave_t$ is the average harmonization across countries per year. The dependent variables used are as follows: Liquid liabilities (% of GDP), Deposit money bank assets to the sum of deposit money bank assets and central bank assets (in percentages), Private credit by deposit money banks and other institutions (% of GDP), Total bank assets (% of GDP), Domestic credit provided by the banking sector (% of GDP), Private bond market capitalization (% of GDP), Public bond market capitalization (% of GDP), Stock market capitalization (% of GDP), Stock market turnover ratio (in percentages), Stock market value traded (% of GDP). Government effectiveness, Regulatory quality and Rule of law are legal and institutional variables taken from the Worldwide Governance Indicators, Health is the percentage of government expenditure that is devoted to public health, and Education is the gross percentage of secondary school enrollment rate. The regressions are estimated over 25 countries and 12 years. The 25 European Union countries included are: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Poland, Slovakia, Slovenia, Spain, Sweden and the UK. The estimation period in our regressions is 1996 – 2007. The above estimations include country and time effects that are not reported here. t – statistics reported in the tables are based on country-specific (clustered) heteroskedasticity and autocorrelation.