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Measuring complementarity in financial systems

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Abstract

The distinction between bank and market based economies has a long tradition in applied macroeconomics. The two types differ not only in the level of financial activity channeled through the stock market and private banking, but also in their institutional frameworks. We challenge this traditional distinction between the two types of financial architecture. We develop an index that accounts for complementarity between financial markets and banking systems that has been hypothesized by Sylla (1998) and Song and Thakor (2010). The theoretical foundation of our empirical approach is the general equilibrium framework by Freixas and Rochet (1997). We validate the proposed index and the underlying theory of complementary using a random coefficient and a Generalized estimating equations (GEE) models.

Il existe une longue tradition en macroéconomie appliquée sur la distinction entre les économies basées sur les banques et celles sur les marchés. Ces deux types d'économies ne diffèrent pas seulement sur leur niveau d'activité sur le marché financier et les banques mais aussi avec leurs différences institutionnelles. Nous remettons en question cette distinction entre les deux types d'architecture financière. Pour cela, nous utilisons un index qui prend en compte la complémentarité entre les marchés et les banques (hypothèse de Sylla et de Song (1998) et Thakor (2010)). Le modèle théorique de notre approche empirique est l'équilibre général de Freixas et Rochas (1997). Nous validons l'index proposé et la théorie sous jacente en utilisant les modèles économétriques appelés "random coefficient" et "Generalized estimating equations (GEE)".

JEL-Codes: E42, G20
Key Words: Bank-based, Market-based, Complementarity, Efficiency, Financial structure
Mots clefs: Structure financière, Complémentarité, Efficacité

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1 Introduction

The distinction between bank and market based economies has a long tradition in applied macroeconomics. Bank-based financial systems are prevalent in continental Europe (with Switzerland being a notable exception), while financial systems in the Anglo-Saxon countries are heavily market-based. The two types of financial systems differ not only in the level of financial activity channeled through the stock market and private banking, but also in their institutional and legal frameworks.

Allen and Gale (1999) stress the advantage of a financial market over bank based systems in aggregating and collecting information and in providing incentives for investment. Boot and Thakor (1997) show using a theoretical model that by coordinating the agents' actions, banks resolve asset substitution problems, whereas financial markets improve the real decision of a firm due to feed back from market prices. The conclusions of these studies suggest that bank and market based systems differ in their performance, and it is important to understand these differences. Levine (2002) challenged this conclusion and argued that the degree of financial development is more important than financial structure, particularly in explaining economic growth.

The fact that the existing literature is divided on the importance of financial architecture on providing funds for investment and growth suggests that it might not be the competition but rather the complementarity between different components of the financial architecture that plays a decisive role in improving the overall performance and efficiency. In this vein Sylla (1998) and Song and Thakor (2010) stress the possibility that the two systems are not mutually exclusive and competing entities but that they can complement each other and co-evolve. Sylla was among the first to describe a potential complementarity that may exist between securities markets and banks. To him, this interaction is responsible of what he called the "federalist financial revolution" in the US. It was a "jump starter" of US economic changes resulting in industrial and transportation revolution. Taking this theme further, Song and Thakor (2010) identify several dimensions in the interaction between banks and capital markets, competition, complementarity and co-evolution being the most prominent ones. Song and Thakor's argument is theoretical.

The aim of this paper is to test Song and Thakor's theory empirically. To this we use an index of complementarity between the banking sector and the stock market developed in

Saillard and Url (2011). A fundamental question is: *Are the complementary finance systems more efficient to transfer capital from savers to investors?* Can the channels suggested by Song and Thakor's be validated empirically? Briefly anticipating our results, we find that complementarity as formulated in Song and Thakor's theory and represented by our index and can explain the degree of the efficiency in the financial system. The higher the degree of complementarity, the more efficient the financial system.

In the following section we provide a short description of the financial structure index. Section 3 emphasizes the complementarity concept and sketches out a general equilibrium model that identifies efficiency in the banking sector and suggests its main determinant. In our empirical analysis we proxy the inefficiency of a banking system using an estimate of Financial Intermediation Services Indirectly Measured (FISIM). We used the fees and commission receivable divided by the stock market traded value as proxy of the market capital efficiency degree. The degree of inefficiency based on FISIM and Fees are the dependent variables in the subsequent empirical analysis. Section 4 discusses the data and estimation techniques. Section 5 presents the results, which are followed by the conclusion.

2 A measure for complementary in financial markets

Currently in the literature, two indices represents two interactions between banks and markets: one represents the competition whereas the other represents the complementarity. The section is divided into two parts, one part giving details about the computation of an index. Our starting point would be the computation of the index representing competition suggested by Demirguc-Kunt and Levine (1999). Secondly, the computation of the complementarity index. Both are computed in Saillard and Url(2011).

The measure for financial market structure suggested by Demirguc-Kunt and Levine (1999) is a continuous number increasing in the extent of market-based finance of domestic firms. The index compares the level of financial activity channeled through the stock market to that facilitated by private banks. The index combines deposits at banks, DB, private credit by banks, PCB, overhead costs of banks, OCB, the stock market capitalization, SMC, and the stock market total traded value, SMT, into an index number. The first two components of the index are the ratio of the stock market capitalization to deposits at banks, A_{it}, and the ratio of the stock market total traded value to private credit by banks, B_{it}:

$$A_{it} = \frac{SMC_{it}}{DB_{it}} \qquad B_{it} = \frac{SMT_{it}}{PCB_{it}} \tag{2.1}$$

Both components are computed for each country i and year t. Furthermore, Demirguc-Kunt and Levine (1999) use the ratio of bank overhead costs to total assets of banks, TAB, and multiply it by the stock market total traded value to GDP ratio to compute the third component, C_{it}:

$$C_{it} = \frac{OCB_{it}}{TAB_{it}} \frac{SMT_{it}}{GDP_{it}} \tag{2.2}$$

Then all three components, A_{it}, B_{it}, and C_{it} are mean corrected by subtracting the mean over all countries and years, cf. in the case of the stock market capitalization to deposit at banks ratio we obtain:

$$a_{it} = (A_{it} - A..)$$

where $A_{..}$ represent the mean of A_{it} across countries and years. Finally, the index of financial market structure, IFMSit, is computed as the average of the three components:

$$IFMS_{it} = \frac{a_{it} + b_{it} + c_{it}}{3}$$

A higher value of this index clearly indicates a higher degree of market-based finance for country i. In order to obtain a measure of complementary financial markets we rearrange the first two components of the index by Demirgurc-Kunt and Levine such that those components increase if marked and bank-based characteristics within a country are balanced. Specifically, we compute products rather than ratios between marked- and bank-based variables and normalize all variables with respect to GDP to make numbers comparable across countries:

$$A^*_{it} = \frac{DB_{it}}{GDP_{it}} \frac{SMC_{it}}{GDP_{it}} \qquad B^*_{it} = \frac{PCB_{it}}{GDP_{it}} \frac{SMT_{it}}{GDP_{it}} \tag{2.3}$$

The modified ratios achieve a maximum value if market- and bank based finance are of equal size, reflecting the idea of complementary rather than competitive financial markets. This hump shape pattern is illustrated in Figure ICindex for stylized economies with either loan or equity finance. If the country is fully market-based, firms will be completely financed by equity and the country will show up on the origin of the horizontal axis. Fully bank-based economies, on the other hand, will show up at the right hand corner. The index of complementarity will consequently have low values at both extrema points and will have its maximum if market- and bank-based features are balanced. The third indicator, Cit, does not have a similar reinterpretation; we therefore take C_{it} as in Demirguc-Kunt and Levine. Again we subtract means across countries and years from the modified components, making the index of complementary finance, IC_{it}, increasing in the size of financial markets within country i relative to the sample average:

$$IC_{it} = \frac{a^*_{it} + b^*_{it} + c_{it}}{3}$$

The demeaning is indicated in Figure (1) by the dashed horizontal line. Countries above this mean have highly developed financial markets, in the sense that deposits, loans, and other means of finance are large in comparison to GDP. Countries with less developed financial markets will show up below the dashed line, as their indicators of financial intermediation are comparatively small. We use the current release of the World Bank dataset to compute our index of complementary financial markets.

The preceding framework is provided as a starting point to represent the complementarity in an empirical study. The next section is devoted to describe the different interactions existing between markets and banks, the solution of the general equilibrium models and the empirical models following it.

3 Theoretical background and model specification

In the model of Song and Thakor, the borrower has several choices concerning its financing source: direct capital market, securitization and a relationship loan from a bank. However, two frictions limit the borrower to access a financing. "Certification", due to the heterogeneity among the borrowers and "Financing", which comes from the different evaluation of the surplus of a project by those providing financing versus those seeking financing. The different solution offered by banks and financial markets to these frictions lead Song and Thakor to stress that financial architecture exhibit three types of interactions:

1. **Competition**: is the key theoretical findings in the literature. Borrowers would consider a financing source *at the expenses of* the other. The index of Levine computed in Saillard and Url (2011) represented in Figure (2) shows one representation of the financial architecture

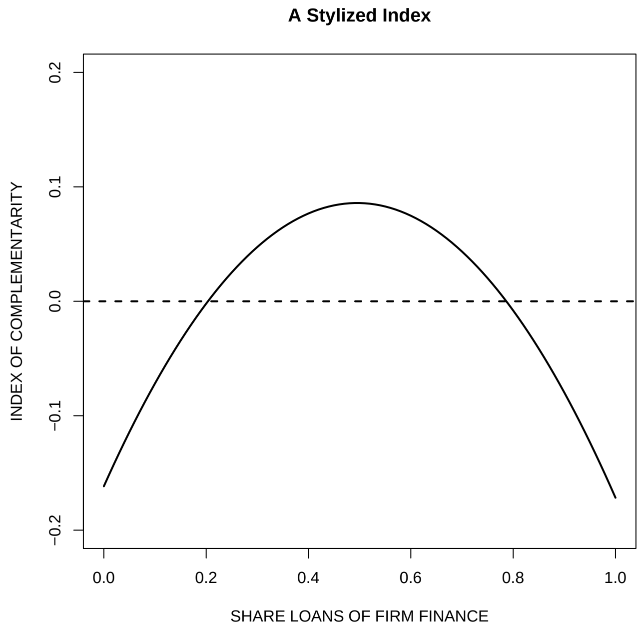

Figure 1: Complementarity Index

representing the so called "bank market" view. This representation considers that one market is large enough in comparison to the other, to describe a country. Typically, US as market-based system and Germany as bank-based system.

2. **Complementarity** (what we are interested here): works with two channels : securitization and bank capital connect banks and financial markets and, allow to say that both are acting together to answer the two frictions described above, "complementers". Typically, banks with their credit analysis ability can better than capital market decrease the Certification friction. For the Financing friction, the capital market is capable of lowering borrowing costs by providing a liquid market.

In the Figure (1), we represent the evolution of an index of complementarity (vertical axis) and the share loans of firm finance (horizontal axis). The maximum of the curve is reached when the share of external finance is 50 %. At this point, the firms used mixed financing from banks and financial markets. We consider such financial systems as exhibit complementarity. As illustrated, the Complementarity Index reached a maximum value at this point. As further illustration, we represent in the Figure (2), a ranking of the countries following the Competition (left side of the graph) and the Complementarity (right side of the graph)[1]. The index of

[1] Co evolution is the third interaction but we did not considered it in this paper, see Song and Thakor (2010)

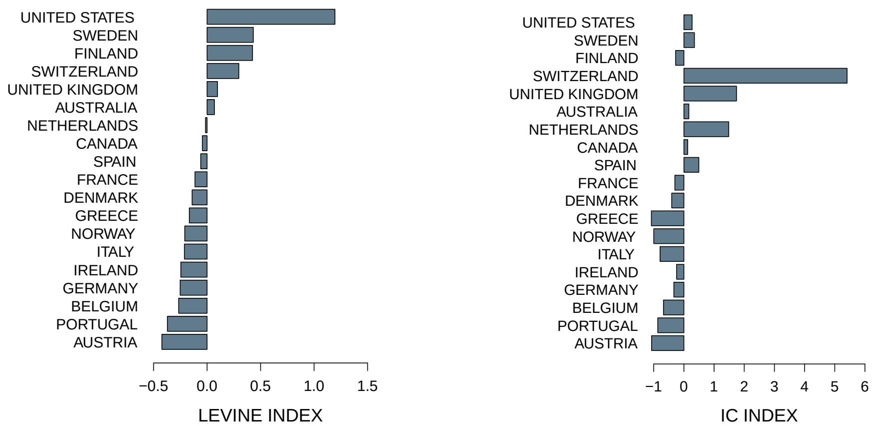

Figure 2: Classification of countries following the 2 indexes

complementarity exacerbates a new financial architecture classification. Switzerland, United-Kingdom and Netherlands are heavily complementary systems. By following the competition theory, they are market based systems for Switzerland and United Kingdom and bank based systems for Netherlands. In general, most of the market based systems stress complementarity, with Finland as notable exception. Surprisingly, Canada and Spain are not following this rule: although they are bank based systems, they are shifting "complementary systems".

3.1 The Theoretical Foundations

The general equilibrium framework by Freixas and Rochet (1997) serves as a theoretical foundation of our empirical models. Notice that this choice is motivated by the fact that it gives theoretical indication concerning interest rates in the general equilibrium, including the banking sector. Furthermore, savers (banks and financial markets) and investors (firm) are represented in this theoretical model. For these reasons, we consider the model appropriate to guide our empirical models.

The following equation gives the solution of optimization problems for each agent: consumer, firm and bank.

Consumer's Problem.

The representative consumer's optimization problem is written as follows:

$$\mathcal{P}h \quad \begin{aligned} &\max u(C_1, C_2) \\ &C_1 + B_h + D^+ = \omega_1 \qquad (3.4) \\ &C_2 = \pi_f + \pi_b + (1+r)B_h + (1+r_D)D^+. \qquad (3.5) \end{aligned}$$

Here S represents the allocation of his savings between banks deposits D^+ and securities B_h. The representative consumer chooses between a consumption profile (C_1, C_2), so as to maximize his utility function u under the two budget constraints (3.4)-(3.5). The profits of the firm π_f and the profits of the banks π_b are distributed to the consumer at $t = 2$. Finally, r and r_D denote the interest rates paid by securities and deposits. Securities and deposits are considered as perfect substitutes.

For $t = 1, 2$, the consumer's utility function is given by:

$$C_1 + \frac{1}{(1+r)}C_2 = \omega_1 - B_h - D^+ + \frac{1}{(1+r)}\Big[\pi_f + \pi_b + (1+r)B_h + (1+r_D)D^+\Big]. \qquad (3.6)$$

We solve it with the method of Lagrange multipliers:

$$L = u(C_1, C_2) + \lambda\Big[C_1 + \frac{1}{(1+r)}C_2 - \omega_1 + B_h + D^+ - \frac{\pi_f}{(1+r)} - \frac{\pi_b}{(1+r)} - B_h - \frac{(1+r_D)}{(1+r)}D^+\Big]$$

with the following first-order conditions:

$$\begin{aligned} \frac{\partial \mathcal{L}}{\partial C_1} &= \frac{\partial u}{\partial c_1} + \lambda = 0, &(3.7) \\ \frac{\partial \mathcal{L}}{\partial C_2} &= \frac{\partial u}{\partial c_2} + \frac{\lambda}{1+r} = 0, &(3.8) \\ \frac{\partial \mathcal{L}}{\partial B_h} &= \lambda - \lambda = 0, &(3.9) \\ \frac{\partial \mathcal{L}}{\partial D^+} &= \lambda - \frac{\lambda(1+r_d)}{1+r} = 0. &(3.10) \end{aligned}$$

The last first-order condition (3.10) yields

$$\begin{aligned} &\lambda = \frac{\lambda(1+r_d)}{1+r} = 0, \qquad (3.11) \\ &r = r_D. \end{aligned}$$

Firm's Problem. The firm maximizes its profit with the following program:

$$\max u(\pi_f)$$

$$\mathcal{P}h \quad C_1 + B_h + D^+ = \omega_1 \tag{3.12}$$

$$I = B_f + L^- \tag{3.13}$$

where f represents the production function of the representative firm and r_L, the interest rate on bank loans. The firm chooses its investment level I, its level of bank debt L^-, and issuance of securities B_f.

Here again the Lagrange multipliers are used to solve the firm program:

$$L = f(I) - (1+r)B_f - (1+r_L)L^- + \lambda(I - B_f - L^-)$$

$$\frac{\partial \mathcal{L}}{\partial B_f} = -(1+r) - \lambda = 0, \tag{3.14}$$

$$\frac{\partial \mathcal{L}}{\partial L^-} = -(1+r_L) - \lambda = 0, \tag{3.15}$$

As noted by Freixas and Rochet (1997), (3.14)-(3.15)) has an interior solution

$$r = r_L$$

Bank's Problem. The objective of the bank is to maximize its profit:

$$\max u(\pi_b)$$

$$\mathcal{P}b \quad \pi_b = r_L^+ - rB_b - r_D D^- \tag{3.16}$$

$$L^+ = B_b + D^-, \tag{3.17}$$

where L^+ and D^- represent, respectively, the supply of loans and the demand for deposits.

The first-order conditions:

$$\begin{aligned} L &= \pi_b - r_L L^+ + rB_b + r_D D^- + \lambda(L^+ - B_b - D^-) \\ \frac{\partial \mathcal{L}}{\partial B_b} &= r - \lambda = 0, \quad (3.18) \\ \frac{\partial \mathcal{L}}{\partial D^-} &= r_D - \lambda = 0, \quad (3.19) \\ \frac{\partial \mathcal{L}}{\partial L^+} &= \lambda - \lambda = 0 \quad (3.20) \end{aligned}$$

give the solution of the bank profit maximization:

$$r = r_D = r_L \tag{3.21}$$

Moreover, the equality of interest rates appears as the only possible solution of the general equilibrium (Freixas and Rochet (1997)).

In this section, we touched upon a few central aspects of complementarity theory. Furthermore, we identify a definition of efficiency by using the general equilibrium including the banking sector. The objective of the next section is to show how we integrate these concepts in our empirical models.

4 Data and Estimation

The goal of this paper is to demonstrate if there is a link between efficiency and the level of complementarity of financial systems and, generally, to offer an empirical test of the Song and Thakor theory. The general equilibrium model suggests 3.21 as a theoretical solution. The discrepancy in this equation reflects the degree of inefficiency in financial markets.

The discrepancy in equality 3.21 can be measured using the Financial Intermediation Services Indirectly Measured (FISIM) data from the National Accounts. Since these data are not available for the whole sample period from 1990 to 2010, we propose a proxy measure for FISIM as the difference between the Interest Income and the Interest Expenses. To get a relative measure that would be readily comparable between countries, we normalize this difference by the stock of loans:

$$\frac{\text{Interest Income - Interest Expenses}}{\text{Loan}} * 100 \tag{4.22}$$

Another possible measure of the discrepancy stated above in the equation 3.21 can be measured using a ratio of market capital inefficiency computed as follow:

$$\frac{\text{Fees and commissions receivable}}{\text{stock market value traded}} \tag{4.23}$$

The two channels stressed by Song and Thakor are accounted for in our empirical models by: 1). Issuance (to represent securitization), and 2). Own capital and Bonds to represent the capital market financing.

4.1 Random Coefficient Model

Let us now shift to the specification of the empirical models that we use. Firstly, the random coefficient models.

General specification of the panel linear data regression problem inspired from Hsiao 2004. Each individual has their own coefficients and there are specific to each time period.

$$y_{it} = \beta\prime_{ki} x_{kit} + u_{it} \tag{4.24}$$

$$= \beta_{1it} x_{1it} + ... + \beta_{kit} x_{kit} + u_{it} \tag{4.25}$$

In our sample, we have $i = 16$ and $t = 19$. In order to respect some structure imposed by the parameters β_{kit}, we run a test described by Hsiao (1986), whether or not the slopes and intercepts simultaneously are homogeneous among different individuals at different times.

We test the equality of intercepts and slopes among countries cf Hsiao, cf Stata. The results are the rejection of null hypothesis stated we use the random coefficients models (see Hsiao (1986)):

$$y_{it} = \sum_{k=1}^{K} \beta_{ki} x_{kit} + u_{it} \quad (4.26)$$

$$= \sum_{k=1}^{K} (\beta_k + \alpha_{ki}) x_{kit} + u_{it} \quad (4.27)$$

$\beta = (\beta_1, ..., \beta_K)'$: common-mean coefficient vector and

$\alpha_{\mathbf{i}} = (\alpha_{1i}, ..., \alpha_{Ki})'$: individual deviation from the common mean, β

As we are interested by the performance of group of countries and we have no reasons to believe that random coefficients are correlated with explanatory variables, we are considering, α_{ki} as random variables with 0 mean and constant covariances and variances. In other words, we are using a random coefficient model, with $\beta_i = \beta + \alpha_i$ and treated as random.

4.2 Gamma GEE

The above random coefficient models does not account for the non-negativity of the dependent variable as defined by the equation 4.22. A glance at the empirical distribution in the left panel of Figure 3 (diamonds) and the corresponding histogram reveals a noticeable positive skew in the dependent variable. Both observation together suggest modeling the conditional mean of the dependent variable as a mean of a gamma distributed random variable[2]. A Maximum Likelihood estimate of a two parameter Gamma density with parameters $\alpha = 7.47$ and $\beta = 0.46$ shows a sufficiently close fit (solid line).

In view of the empirical distribution of the dependent variable, we estimate a Generalized Estimating Equation (GEE) with a Gamma distribution and a canonical link function. The GEE is an extension of the Generalized Linear Model developed in McCullagh and Nelder (1989) to longitudinal data analysis, with possibly non independent (clustered) error structures. The GEE framework has been developed in Liang and Zeger (1986) and Zeger and Liang (1986).

The basic specification of a Gamma GEE is as follows:

$$Y_{it} \sim \Gamma(\alpha, \beta) \text{ where } \alpha, \beta > 0 \qquad \mu_{it} = \mathsf{E}Y_{it}$$

$$g(\mu_{it}) = \sum_{k=1}^{K} \beta_{ki} x_{kit} \qquad g(z) = z^{-1}$$

[2]This distribution is also founded by Berger (1993).

The sum is a linear predictor, which is related to the mean of a gamma distributed random variable Y_{it} via a link function g. We chose the canonical link function appropriate for the mean of a Gamma distributed dependent variable (for details, see, McCullagh and Nelder (1989)). The goodness of fit can be judges by a plot of the quantiles of Pearson residuals again quantiles of a zero-mean normally distributed random variable having the same variance. This plot is provided in the right panel of Figure 3. We see some departure from normality in the left tail of the distribution and a remarkably good agreement in the center of the distribution.

5 Results

We want to test the hypothesis whether the complementary finance systems are more efficient to transfer capital from savers to investors. For this purpose we run a series of regressions based on equation 3.10- 3.20 employing the random coefficient model estimations and generalizing estimating equations. As explained in the Section 3, two channels are recognize by Song and Thakor to link banks and markets by limiting the friction to obtain financing. If the theory of Song and Thakor is demonstrated in this paper, the complementarity index would be negatively correlated with FISIM and the market capital inefficiency ratio (1) and these two channels should follow directly or indirectly the same direction.(2) The correlation matrix showed in Table 2 gives a first intuition concerning the relation between the Complementarity Index and the two channels: Issuance and Bond are positively correlated with the complementarity index. This correlation is at 1% level significant.

First of all, let us describe the results of the random coefficient estimation presented in the Table 3. In the Model 1, we examine the link between the Complementarity Index as explanatory variables of FISIM, excluding the channels of transmission. The complementarity index is negatively correlated with FISIM and significant at 1%.

Adding the other channel of transmission in the regression (see model 3 and 4) decreases the level of statistical significance at 5% but does not change the negative sign of the index. By doing it, we get less observations. Finally, the model 2, considers only the transmission channels without the complementarity index in the set of explanatory variables. Surprisingly, the three variables are not positively correlated with FISIM. This result does not support the Song and Thakor concerning the relevance of these transmission channels. It does not support the preliminary result presented in the Table 2.

Secondly, few words must be said about the Table 4. In this table, we want to study the efficiency in the stock markets. We compute it by using the variable fees and commission divided by the value of stock market traded. In line with the Table 3, we find that the complementarity index is negatively correlated with our measure of Market Capital Inefficiency. This results is respectively significant for the models 3 and 4, at 10% and 5%. Concerning the channels of transmission, none of their coefficients are found significant.

To summarize, there is a substantial evidence that the complementarity index, and furthermore the complementer systems, are negatively correlated with FISIM and Market Capital Efficiency. The second main interpretation stressed by these empirical models concerns the transmission canals between banks and financial systems represented by issuance, own capital and bonds. None of them are found statistically significant.

This last point brings us to the second part of the discussion: the analysis of the Generalized Linear Models results. Returning to the results concerning the Random Coefficient Models, the channels of transmission are found partially negatively correlated with our definition of FISIM but are not significant.

Turning to the Gamma GEE, Table 5 reports the marginal effects of the independent variable evaluated at the mean of FISIM. We find that the three transmission channels are statistically significant and negatively correlated with the FISIM. The explanatory variable Bond are statistically significant at 1% level for the three models. Issuance is statistically significant and negatively correlated with our dependant variable in the Model 7. This model considers the link of the channel of transmission wit FISIM without considering the complementarity index like the Model 8. The Model 9 adds the square of the channels of transmission in the regression. Surprinsigly, in this model Own Capital are found positively correlated with FISIM and statiscally significant, but not the square of this variable. This variable exhibits a negative sign in the two other models. This result does not state in the Table 6 which report the marginal effects of the independent variable measured as the mean of the Market Capital Efficiency Ratio. All of the transmission canal coefficients exhibit a negative sign. Specifically, the coefficients representing the Own Capital variable is significant at, respectively for the models 8 and 9, 5% and 10%.

The conclusions stated above concerning the complementarity index – and complementary systems – remains the same.

To put in a nutshell, the complementarity theory stating that the complementer systems are mode efficient, works. Furthermore, the Complementarity Index could be consider as relevant to represent this theory because the channels of transmission described by Song and Thakor exhibit (mostly) the same sign to explain the FISIM and Market Capital Inefficiency.

6 Conclusion

This paper addresses the question whether financial systems with a high degree of complementary are more efficient compared to financial systems in which the banking sector and the stock market are less intertwined. Efficient financial architecture facilitates the transfer of capital between savers and investors. To study the potential correlation between the degree of complementarity and the efficiency of the financial system empirically, we propose an index of complementarity that as two explanatory variables of FISIM and Market Capital Inefficiency as proxies for the degree of inefficiency.

More generally, the goal is to test the complementarity theory empirically. That's the reason why we use other variables considered theoretically by Song and Thakor: Issuance, Own Capital and Bond. If we use the random coefficient models, these channels are not relevant to explain the complementer systems.

However, using Generalized Linear Models does not bring to the same conclusion. Two of the channels have an explanatory power to explain FISIM and Market Capital Inefficiency. This result is in accordance to the conclusion of Song and Thakor. The authors states that these channels are useful to prevent the frictions impeding borrowers to get financing. An important other result is that the complementarity index that we computed in line with the Song and Thakor theory works. The complementer systems are more efficient and the channels identified have an explanatory power to support efficiency.

Finally, a few words must be said about the implications of this paper. Instead of considering two sorts of system: bank- and market-based, the regulators could integrate the existing inter connexion between banks and markets and the determinants of it in their decisions. It remains to be seen whether other canal of transmission could be found to link bank and market systems? We leave it for further research.

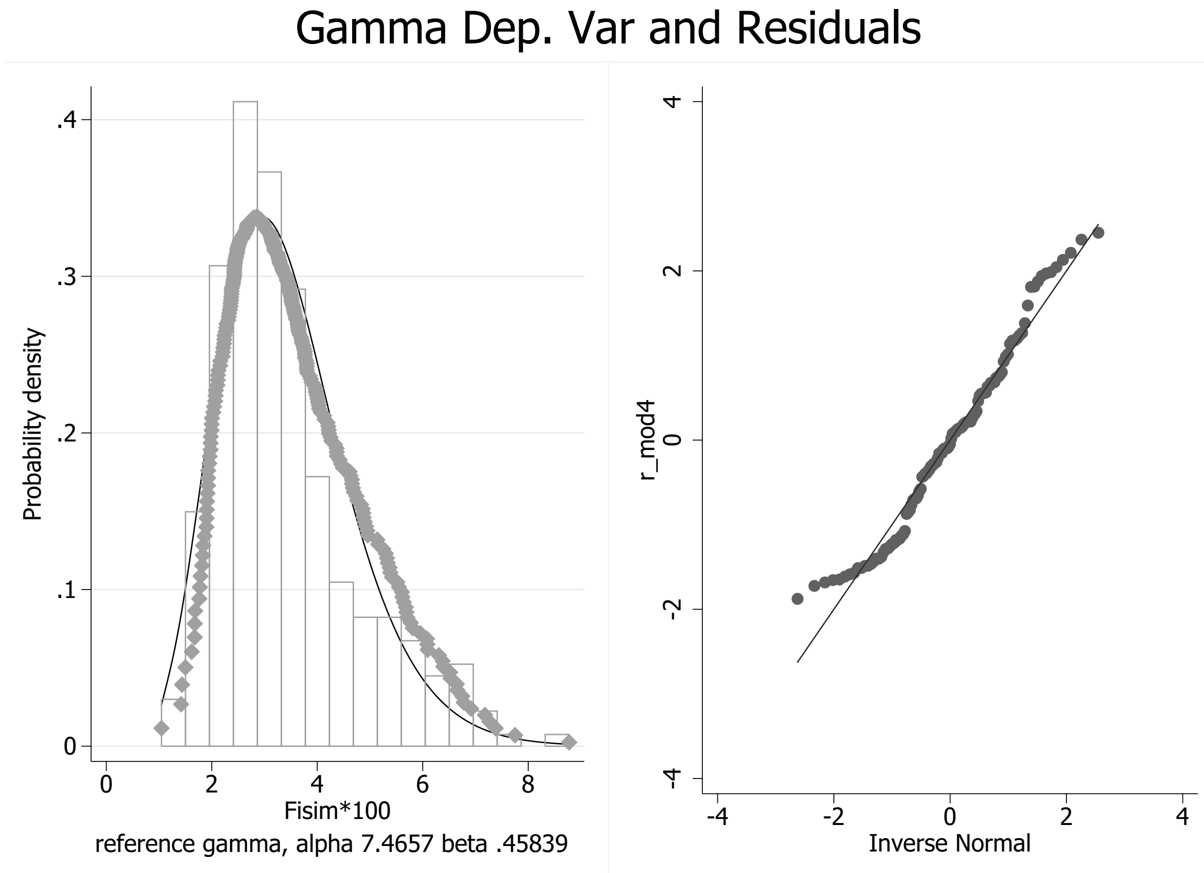

Figure 3: Dependent Variable FISIM. GEE Gamma Residuals

Table 1: Summary statistics

Variable	Mean	Std. Dev.	Obs.
FISIM	0.034	0.013	294
Market Capital Efficiency	0.371	0.756	211
Complementarity	0.403	0.1	307
Financial Development	8.359	15.607	268
Coevolution	0.317	2.077	304
Issuance	2.589	3.505	158
Own capital	11.954	3.546	179
Bond	237.763	260.179	295
Growth Rate	0.024	0.025	454
Interest Rate(short term)	0.06	0.039	482
Interest Rate(long term)	0.069	0.034	488
Interest Rate Spread	0.008	0.016	482
Inflation rate	0.032	0.03	494

Table 2: Correlation Matrix

FISIM	1												
Market Capital Efficiency	0.18**	1											
Complementarity	-0.16**	-0.054	1										
Financial Development	-0.037	0.67***	0.12*	1									
Coevolution	-0.40***	-0.22**	0.39***	-0.06	1								
Issuance	0.06	-0.26**	0.16	-0.21*	0.41***	1							
Own capital	0.42***	-0.06	-0.01	-0.06	-0.11	0.01	1						
Bond	-0.26***	-0.45***	0.16**	-0.42***	0.28***	0.65***	-0.15*	1					
Growth Rate	0.09	0.05	0.15*	-0.04	-0.06	-0.09	-0.03	-0.148*	1				
Interest Rate(short term)	0.51***	0.19**	-0.41***	0.02	-0.33***	0.14	-0.15*	-0.22***	0.10*	1			
Interest Rate(long term)	0.63***	0.20**	-0.49***	-0.05	-0.42***	-0.11	-0.03	-0.31***	0.13**	0.92***	1		
Interest Rate Spread	-0.01	-0.04	0.08	-0.11	-0.12*	-0.37***	0.2**	-0.06	-0.01	-0.65***	-0.30***	1	
Inflation rate	0.31***	-0.13	-0.38***	-0.12	-0.2***	0.2*	0.05	-0.03	0.0940*	0.750***	0.777***	-0.357***	1

Table 3: Random Coefficient Regression on FISIM

	(1)	(2)	(3)	(4)
Compl. Index	-0.00744***		-0.00336**	-0.00234*
	(4.91e-05)		(0.0232)	(0.0521)
Issuance		0.0269	0.00423	-0.00433
		(0.732)	(0.873)	(0.291)
Iss. sq				0.00492
				(0.384)
Own Capital		0.00117	0.00114*	-0.00276
		(0.105)	(0.0561)	(0.838)
Own Cap. sq				0.000158
				(0.802)
Bond		3.42e-05	-7.77e-06	8.29e-05
		(0.831)	(0.922)	(0.481)
Bond sq				-1.27e-07
				(0.397)
Constant	0.0325***	0.0241***	0.0238***	0.0446
	(0)	(0.00376)	(0.00438)	(0.604)
Observations	267	117	104	77
Number of countries	17	12	12	8
Skewness	1.32	-1.87	-1.56	-2.72

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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Table 4: Random Coefficient Regression on Market Capital Inefficiency

	(1)	(2)	(3)	(4)
Compl. Index	-0.230		-0.0708*	-0.00995**
	(0.284)		(0.0563)	(0.0156)
Issuance		0.735	-1.477	0.00115
		(0.704)	(0.323)	(0.610)
Iss. sq				0.00118
				(0.659)
Own Capital		0.0179	0.0222	-0.00345
		(0.486)	(0.420)	(0.918)
Own Cap. sq				0.000309
				(0.872)
Bond		0.00246	0.00160	-6.77e-05
		(0.755)	(0.515)	(0.530)
Bond sq				6.59e-08
				(0.644)
Constant	0.209	0.133	0.0878	0.0103
	(0.176)	(0.462)	(0.558)	(0.956)
Observations	211	85	85	58
Number of countries	14	10	10	6
Skewness	2.20	-1.25	1.63	-1.40

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 5: Gamma GEE Regression on FISIM

	(6)	(7)	(8)	(9)
Comp. Index	-0.00564***		-0.00250***	-0.00268***
	(0)		(0)	(1.02e-09)
Issuance		-0.000358**	0.000127	0.000762
		(0.0323)	(0.227)	(0.105)
Iss. sq				-5.65e-05
				(0.122)
Own Capital		-0.000402**	-0.000690***	0.00525***
		(0.0156)	(1.83e-08)	(3.21e-08)
Own Cap. sq				-0.000212***
				(4.25e-09)
Bond		-1.77e-05***	-1.67e-05***	-1.92e-05***
		(1.08e-10)	(0)	(0.00146)
Bond sq				6.59e-09
				(0.239)
Observations	267	129	116	116
Number of countries	17	16	16	16

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: Gamma GEE Regression on Market Capital Inefficiency

	(6)	(7)	(8)	(9)
Comp. Index	-0.0867**		-0.00170**	-0.00249**
	(0.0143)		(0.0478)	(0.0217)
Issuance		-0.00525	-0.00402**	-0.00292
		(0.121)	(0.0283)	(0.233)
Iss. sq				-0.000276
				(0.449)
Own Capital		-0.000165	-0.00135**	-0.00307*
		(0.673)	(0.0444)	(0.0995)
Own Cap. sq				9.69e-05
				(0.123)
Bond		-7.56e-05**	-5.35e-05**	-3.46e-05*
		(0.0371)	(0.0186)	(0.0919)
Bond sq				-6.71e-10
				(0.984)
Observations	211	93	93	93
Number of countries	14	13	13	13

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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A Description and source of variables

Securitization Issuance of country of collateral in million of national currency divided by loan. Source: Association for Financial Market website, Bank of Australia, Bank of Canada.

Own capital Banks liabilities(Capital and reserves) divided by loans. Source: OECD Banking Statistics, Income Statement Balance sheet

Complementarity Index varying over time. See Saillard and Url, 2011.

Interest expenses Interest expenses by banks (all banks) on deposits. Source: OECD Banking Statistics, Income Statement and Balance sheet

Interest income Interest income by banks (all banks) on loans. Source: OECD Banking Statistics, Income Statement and and balance sheet

Bonds International debt securities Source: OECD, OECD Banking Statistics, Income Statement and Balance Sheet, Table 12B.

FISIM Own computation as follow:(interest income-interest expenses)/loan *100

Market Capital Inefficiency Own computation as follow: Fees and commissions receivable divided by stock market value traded