

REVISITING THE INFLUENCE OF REFORMED PENSION REGIMES ON DOMESTIC CAPITAL MARKETS: 1990-2014

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Abstract. *Personal funded systems have experienced significant growth in recent decades, following the trend of aging populations and crises in pension systems that have affected all countries globally. The aim of this study was to determine whether the implementation of these pension schemes has developed domestic capital markets, as established by structural reforms. For this purpose, regression data panels were constructed using indicators of depth and liquidity of stock and bond markets as well as variables representing pension systems and other indicators of development of financial markets in the period 1990-2014. The regressions also considered the detected linkages between pension systems, using a methodology based on clustering analysis and hierarchical tree statistical tools, following representative statistical information of their performance. The results showed that the seniority of the systems was relevant to explain the associations between them, but not the mandatory or voluntary nature of systems nor their geographical location. There were important sources of heterogeneity of the impact of pension funds on capital markets. The analysis revealed that individual capitalization pension schemes have meant a stimulus to stock market depth. Membership to a cluster determined significant impacts of pension systems on capital market development indicators. Stock markets depth and liquidity indicators received the positive impacts of greater magnitude from those systems included in the intermediate gradual maturation cluster. Pension schemes belonging to the low gradual and incipient maturation cluster exerted significant incentive on public bond markets depth. The high gradual maturation cluster was associated with substantial increases in stock depth as well as public bond depth. On the other hand, the advanced maturation cluster showed a positive impact on private bond depth, as well as systems with an incipient maturation. A negative causality with stock market liquidity was also evidenced for the incipient maturation cluster, which was linked to the long-term profile of pension portfolio management that privileges funding strategies to trading strategies.*

Keywords: *individual capitalization pension funds; capital markets; cluster analysis; panel data regression; structural pension reforms.*

Introduction

In 1981, Chile introduced structural reforms in its PAYG (Pay-as-you-go) social security system, implementing a pure individual capitalization scheme. In 1994, the World Bank released a book on pension reforms, titled *“Averting the Old Age Crisis: Policies to Protect the Old and Promote Growth”*, which has been a seminal work in this field. That document suggested that countries should adopt a multipillar pension system, whose first pillar was comprised by a PAYG system – or defined benefit system- and the second by an individual capitalization mandatory system, which is a defined contribution scheme, where future pensions are determined by contributions made by workers and the return generated by them. The scheme could be even supplemented with a third defined contribution pillar, consisting of voluntary contributions. That book included as an additional objective, the hypothesis for the beneficial effect of capitalization systems on domestic capital markets, that is, the deepening and development of domestic capital markets, through the financing and decentralized control in the second pillar. On the contrary, with PAYG systems, generally managed by governments, there is no stimulus to capital markets, as these schemes are based only on contribution transfers between active and passive workers. When institutional investors replace PAYG systems, either partially or totally, managed assets grow as pension systems mature, stimulating the investment and development of capital markets.

Over the last two decades, in response to the demographic and fiscal pressures that menaced the traditional PAYG systems, a significant number of countries globally have closed their depleted public pension systems based on defined benefits, towards defined contribution schemes.

Limited to our knowledge, literature related to the impact of funded pension schemes on domestic capital markets mainly refers to technical reports of local or international organizations related to these issues, comprising either country assessments of pension systems or empirical research methodologies. In particular, Ashok and Spataro (2013), Catalan, Impavido and Musalem (2000), Davis and Steil (2001), Hryckiewicz (2009), Impavido and Musalem (2000), Impavido, Musalem and Tressel (2001, 2003), Meng (2010) and Walker and Lefort (2002) have produced research studies that apply statistical-econometric methodologies that are considered significant references for this paper. An important channel through which funded pension plans may affect financial efficiency is promoting the development of domestic capital markets. The academic literature recognizes that the stimulus for financial progress is the most important positive externality that the introduction of funded pension schemes can achieve. For example, Iglesias (1997) argues that the introduction of pension funds lowers transaction and emission costs in the capital markets in which they operate. Blommestein (1998) also states that the presence of strong institutional investors' environment is a prerequisite for the development of the capital markets. Merton and Bodie (1995), Davis (2011) and Raddatz and Schmukler (2008) argue that the growth of pension funds may increase the development of the capital market through its long planning horizon term ability to attract and shift resources to more productive activities. Giannetti and Laeven (2009) discuss that the development of local pension funds in Sweden can provide a stimulus to

enhance domestic capital markets, especially bond markets. Hu (2012) finds a strong link between Asian pension fund assets and stock market capitalization, as well as a positive impact of pension funds on market liquidity in less developed economies.

The aim of this paper was to analyze the impact of the introduction of funded pension schemes on the development of domestic capital markets, in order to verify one of the main objectives of structural pension reforms that were implemented globally from the 90's onwards. For this purpose, a total of thirty-one personal individual capitalization systems, - twenty-five mandatory and six voluntary- from countries located in South America, Central, Caribbean and North America, Western Europe, Eastern Europe, Africa and Oceania, were selected. The data consisted of stock markets depth and liquidity indicators, bond markets depth indicators, variables representing the main characteristics of pension systems and other explanatory indicators of the development of financial markets. The methodological strategy employed included panel data regression and hierarchical tree (HT) statistical tools as well as dynamic and static clustering classification techniques.

The paper is organized as follows. Section 2 describes the data to be investigated in this research. In section 3, the panel data regression methodological strategy and the corresponding empirical results are detailed. Section 4 identifies the clustering strategy of capitalization pension systems and its empirical results. Section 5 iterates the panel data regression methodology on each of the identified clusters and results of the impact analysis of funded pension schemes on domestic capital markets development are evaluated. In section 6 the main conclusions of the investigation are reported, including the linkage of the funded pension schemes' maturation stage to their impact on capital markets and their policy implications.

Description of data

The dependent variables in this study were related to domestic capital markets' development, while the explanatory variables characterized funded pension systems. Furthermore, as control variables, financial markets' development representative indexes, and general economic indicators were used.

Domestic capital markets

Market capitalization/GDP was used as a representative indicator of stock market depth. In reference to the liquidity of the stock market, the analysis included *Stocks traded/GDP* and the *Turnover* ratio, equivalent to *Stocks traded/Market Capitalization*. Finally, fixed income market' depth was measured through *Outstanding private bonds/GDP* and *Outstanding public bonds/GDP* indicators, for private and public bond markets, respectively.

Funded pension systems

In this work, *Funded pension schemes/GDP* measured the importance of capitalization pension plans in domestic financial markets. According to the OECD,

this indicator provides information on the maturity of the system and highlights the importance of individual capitalization pension funds in relation to the size of the economy. In addition, other indicators of pension systems were used, which relate to voluntary or mandatory schemes, seniority of the systems, the distinction between pure, mixed or parallel capitalization systems and their geographical location, among others.

Financial systems and general economic indicators

Finally, as variables that could affect both domestic capital markets and pension systems, we considered the following set of indicators: a) Population ages 65 and above (% of total); b) annual rate of inflation; c) GDP per capita (in dollars); d) legal strength indicator; e) real interest rate; f) bank nonperforming loans to total gross loans; g) interest rate spread and h) balance of payments' current account to GDP.

The universe of countries with individual capitalization personal pension systems was determined according to the documents *"Social Security Programs throughout the World"*, elaborated by ISSA (International Social Security Association) and *"Private Pensions: OECD classification and glossary"*. Table I shows the year of inception of each regime, the ISO code of the country, the attribute of mandatory or voluntary and its type of design, whether a pure capitalization, mixed integrated or mixed parallel pension fund, depending on its interactions with PAYG systems. Annual data refer to the period between 1990 and 2014.

Table 1. Global review of capitalization pension systems (AIOS, AISS, FIAP, OECD)

Country	Start year	ISO Code	Mandatory/ Voluntary	Pure capitalization	Mixed integrated	Mixed parallel
Chile	1981	CL	M	X		
Spain	1988	ES	V			
Australia	1992	AU	M	X		
Peru	1993	PE	M			X
Argentina	1994	AR	M			X
Brazil	1994	BR	V			
Colombia	1994	CO	M			X
Czech Rep.	1994	CZ	V			
Uruguay	1996	UY	M		X	
Bolivia	1997	BO	M	X		
El Salvador	1998	SV	M	X		
Hungary	1998	HU	M		X	
Kazakhstan	1998	KZ	M	X		
Mexico	1998	MX	M	X		
Panama	1999	PA	M		X	
Poland	1999	PL	M		X	
Sweden	1999	SE	M		X	
Ukraine	2000	UA	V			
Costa Rica	2001	CR	M		X	
Latvia	2001	LV	M		X	

Bulgaria	2002	BG	M		X	
Croatia	2002	XR	M		X	
Estonia	2002	EE	M		X	
Honduras	2002	HN	V			
Kosovo	2002	XK	M	X		
Russian Federation	2003	RU	M		X	
Dominican R.	2003	DO	M	X		
Lithuania	2004	LT	M		X	
Slovakia	2005	SK	V			
Nigeria	2005	NG	M	X		
Macedonia	2006	MK	M		X	

Note: Pension systems are identified by the list of ISO codes for countries and territories (ISO 3166: 1993)

Panel data regression methodology and empirical results

Measuring the potential impact of individual pension fund on domestic capital markets was implemented by performing panel data regressions, controlling for other characteristics of the financial system and the overall economy of each country analyzed, in order to assess the levels of association and causality. Given the differences between countries in the time of inception of structural pension reforms, an unbalanced panel data set -with quantitative and qualitative information on systems and markets- was built. Formally, the panel data regression methodology is given by the following formulation:

$$y_{it} = \alpha + \beta x_{it} + \gamma z_{it} + \mu_i + \lambda_t + v_{it}$$

where y_{it} is the dependent variable to be explained, α is the constant of the model, x_{it} are the explanatory variables that describe features of pension systems, β are the coefficients of those explanatory variables and z represents other financial variables or macroeconomic indicators that may explain the development of capital markets; μ_i are the unobservable individual effects, λ_t are temporary effects and v_{it} is the idiosyncratic error.

A suitable estimation strategy was determined by the implementation of the Hausman test (1978) and the modified Wald test for heteroscedasticity. Following Impavido et al. (2003), the capitalization pension schemes variable was included with only one-year lag, in order to maximize the sample size. Using the instrumental variables approach, the independent variable was instrumented in turn through its second lag. Finally, estimates of the regressions were performed with standard errors robust to heteroscedasticity and autocorrelation.

Table 2. Funded pensions schemes impact on domestic capital markets

Dependent variable	Market capitalization / GDP	Stocks traded / GDP	Turnover ratio	Outstanding private bonds / GDP	Outstanding public bonds / GDP
Inflation (log)	3.7576 (6.876)	-.0341 (.0283)	1.636 (7.076)	-.0135 (.0084)	-5.554 (4.629)
Per capita GDP (log)	-3.0157 (6.422)	.0663* (.0338)	7.461 (7.219)	.0268 (.0252)	.8768 (7.124)
Real interest rate	1.66e-13 (7.72e-12)	-5.38e-15** (2.30e-15)	7.95e-13 (7.67e-12)	.0091 (.0504)	-5.38e-15 (4.59e-12)
Legal strength indicator	-195.7666 (239.140)	-2.226* (1.225)	69.046 (267.467)	-.8100 (.5397)	-73.773 (252.694)
Interest rate spread	-37.1784 (55.273)	.1269 (.3186)	-3.663 (63.285)	-.1732 (.2051)	-81.783 (62.667)
Bank nonperforming loans to total gross loans	31.9686 (70.158)	-.4601 (.3422)	-15.404 (72.872)	.0398 (.0968)	.9010 (48.711)
Current account balance of payments/GDP	-.05055 (.8805)	-.0041 (.00376)	-.5744 (.9314)	-.00259 (.0019)	2.369*** (.6827)
Funded pension schemes/GDP (lagged)	117.8073*** (27.379)	.0450 (.1289)	-21.245 (31.998)	.1055 (.0867)	60.897 (39.997)
No. of observations	339	328	327	324	326
No. of groups	30	30	30	30	30
R-sq: within	0.3747	0.3410	0.7586	0.5635	0.6196
R-sq: between	0.9883	1.000	1.000	1.000	0.7269
F test/Wald test	52.87 (0.000)	10075.7 9 (0.000)	576.90 (0.000)	3542.31 (0.000)	54.10 (0.000)

Notes: t-statistics based on estimations robust to heteroscedasticity and autocorrelation. The value of the estimated coefficient is reported, indicating the standard error in brackets. All regressions include year dummies. ***, **, *: 1%, 5% and 10% significance levels, respectively. According to the results of Hausman and Wald's tests, we used random effects model for *Market Capitalization/GDP*, *Turnover*, and *Outstanding public bonds/GDP* while a fixed effects model was used for *Stocks traded/GDP* and *Outstanding private bonds/GDP*. *Funded pension schemes/GDP* was instrumented through its second lag. Source: Own elaboration using STATA.

Regression estimates results can be found in Table II. In the mentioned table, estimates of stock market depth, stock market liquidity, and bond market depth are showed, according to the corresponding estimation method used in each case. In terms of control variables, the regressions showed that the rate of legal strength negatively affected stock market liquidity. This indicator was also negatively impacted by the real interest rate and positively by GDP per capita. On the other hand, public bond depth was positively influenced by the balance of payments' current account.

Referring to the impact of pension systems on capital markets, a positive and highly significant direct effect of *Pension funds/GDP* over stock market' depth was

found, implying that a 1% growth increase in funded pension schemes in the economy led to a 1.178% rise in stock market capitalization. This result agrees with those recorded in Hu (2012) and Meng and Pfau (2010). The rest of capital markets development' indicators did not report significant findings.

Clustering and empirical results

In order to compare the results by type of individual capitalization systems, we carried out a segmentation of the population into homogeneous groups according to the importance of pension funds in the economy, measured by *Funded pension schemes/GDP*, at different points in time. Therefore, each pension system i was represented by the time series $S_i = (S_{i,1999}, S_{i,2000}, \dots, S_{i,2014})$ of *Funded pension schemes/GDP* values, defined in the period 1999-2014. The segmentation was performed using hierarchical clustering techniques, with the Average Distance, defined as:

$$d(i, j) = \sqrt{\sum_{t=1}^{t=T} \frac{(S_{i,t} - S_{j,t})^2}{T}}$$

where $S_{i,t}$ and $S_{j,t}$ were the values of *Funded pension schemes/GDP* systems i and j at time t , respectively and T was the total amount of periods studied. This distance, calculated in mobile time windows, allowed analyzing whether the performances of two systems converged or not. Based on this metric, a hierarchical tree (HT) was built, associating and grouping systems with its closest neighbors, according to the concept of distance used (Ramal, Toulouse & Virasoro, 1986; Lia, Chu & Hsiao, 2009). These trees can show information about taxonomic aspects present in the structure of connections from the systems under study (Mantegna, 1999; Brida & Risso, 2010a and 2010b). The aggregative-hierarchical clustering algorithm employed in the classification was the Ward algorithm. In turn, two indicators of detention, the pseudo-F, and pseudo-t, were employed to determine the optimal number of clusters (Tibshirani, Walther & Hastie, 2001). For the construction of HT, the R software was used.

In the classification analysis, the period 1999-2014 was selected as the baseline scenario, containing annual information for a set of fifteen pension systems, and a second period was added, from 2006 to 2014, which condensed information for a population of thirty systems. Dynamic clustering analysis involved analyzing distance matrices taking eleven mobile windows, each with duration of six years, in order to assess the stability of linkages or associations between different pension systems.

According to the HT for the base period (1999-2014), the first cluster was recorded between Colombia and Uruguay' pension systems, with the minimum distance, followed by Kazakhstan and Spain. Chile was the system that registered the greater distance from the others, followed closely by Australia. It was concluded that systems that presented a similar average distance in the thirteen-year period surveyed were not necessarily linked by geographical proximity or the fact of being a mandatory or voluntary system.

The HT for 2006-2014 period showed the formation of two clusters, the first of them integrated by Chile and Australia, and the second, by the rest of the systems studied. The analysis of the distances revealed that the strongest associations between the surveyed systems (in terms of lower distances) were basically recorded between systems created in this century. Note for example that in the first place Honduras was linked with Ukraine; then, Nigeria and Latvia; followed by Bulgaria and Dominican Republic; Kosovo and Mexico; the Dominican Republic and Lithuania; Dominican Republic and Latvia, to name the first associations. Therefore, again we noted that the attribute of mandatory or voluntary was not a good discriminant between systems, while in contrast, their seniority was a defining characteristic among them.

Cluster analysis results showed that the population of pension systems was divided into five groups, integrating twenty of the thirty-one systems analyzed, not including systems that could be considered heterogeneous or outsiders, as they did not maintain any links with the other systems analyzed throughout the period studied.

Given the maturity of the pension systems and their levels of depth in their respective domestic economies, it was possible to construct typologies of individual capitalization systems. From the aforementioned typologies, a pension schemes lifecycle was determined, classifying the different regimes depending on the maturation stage found (Seijas, 2009). In this regard, the life cycle of a pension system, regardless of its nature, consists of different stages of evolution, which can be characterized generally as of incipient, gradual and advanced maturation.

The launch and implementation of a pension scheme coincide with *Incipient maturation* stage, characterized by the exponential growth of managed pension funds and affiliates, a limited selection of allowed investments and low levels of profitability. The following phase of a pension's scheme is the *Gradual maturation*, or growth stage, where the list of permitted investments is expanded -with a positive impact on profitability in general-, gradually introducing risk rating to adjust investment limits and generally enabling asset allocation to shares and foreign investments. At this stage, widespread in time, it is highly possible to distinguish different sub-stages of evolution, since the demographic, politic and economic characteristics of each system determine a different rhythm in their transition to stability. Finally, we can find the phase of stability or consolidation of the system, or *Advanced maturation*, where the growth of managed funds and affiliates is stabilized, matching active workers' contributions with retirement benefits outflows. In addition, the flexibility of investment options is deepened, raising the ceiling of permitted investments. Typically, this stage also records the introduction of multi-fund, intended to meet the investment options of different affiliates' profiles.

The summary of the results obtained in terms of the association between pension systems and their stages of maturity is included in Table 3.

Table 3. Types of pension systems

Cluster	Maturation stage	Pension systems
1	Advanced	AU-CL
2	High gradual	CO-PL-UY
3	Intermediate gradual	ES-KZ
4	Low gradual	MX-PA-HU
5	Incipient	CZ-CR-HR-XK-UA-EE-HN-BG-RU-LV

Note: Own elaboration based on R – ISO country codes

These findings are consistent with Seijas (2009) who, from a cluster analysis applied to a set of quantitative information of pension schemes in Latin America, assigned Chile (2005, 2007 and 2008) and Uruguay (2007 and 2008) to an advanced stage of maturation; Colombia (2005, 2007 and 2008), Mexico (2007 and 2008) and Uruguay (2005), to a gradual maturation level, and Mexico (2005) and Costa Rica (2005), to an incipient stage of maturation.

Impact analysis and empirical results as cluster

For each of the clusters identified in Section 4, the panel data regression methodology described in Section 2 was iterated, in order to determine the impact of individual capitalization pension systems on domestic capital markets.

Table IV includes estimates for each of the capital market development' indicators used in the study, organizing results according to the cluster to which the system belonged in the classification analysis performed.

With regard to stock market depth, it was detected that high gradual maturation systems experienced a positive reaction of 0.068% following a one percentage point increase in pension funds' assets under management while systems that made up the low gradual maturation cluster recorded a significant but lower reaction to the increase in managed pension funds (0.016%). In relation to stock liquidity, it was reported that *Turnover* reacted negatively to an increase of lagged *Funded pension schemes/GDP* for incipient maturation countries. In particular, given a 1% increase in this variable, a reduction of 0.041% in stock liquidity was registered in this cluster. Intermediate gradual maturation systems observed increments in this indicator instead (0.099%).

Relevant to private fixed income market depth, the evidence found positive causality of advanced, intermediate gradual and incipient maturation clusters against the growth of pension fund systems (0.002%, 0.036%, and 0.001%, respectively). Finally, regarding the development of public bond markets, results indicated that low gradual maturation and incipient maturation clusters showed a positive and significant correlation of this indicator to pension fund assets' growth (19.885% and 16.634%, respectively). This causality was of greater magnitude in the case of the incipient maturation cluster, which consisted mostly of recently incepted systems. However, advanced maturation systems observed a positive and significant impact as well (10.309%). Hu (2012) and Gianetti and Laeven (2009) also found evidence of positive impact of pension funds on fixed income markets development.

Table 4. Funded pensions schemes impact on domestic capital markets

Dependent variable	Market capitalization / GDP	Stocks traded / GDP	Turnover ratio	Outstanding private bonds / GDP	Outstanding public bonds / GDP
Explanatory & control variables					
Inflation (log)	3.7576 (6.876)	-.0341 (.0283)	1.636 (7.076)	-.0135 (.0084)	-5.554 (4.629)
Per capita GDP (log)	-3.0157 (6.422)	.0663* (.0338)	7.461 (7.219)	.0268 (.0252)	.8768 (7.124)
Real interest rate	1.66e-13 (7.72e-12)	-5.38e-15** (2.30e-15)	7.95e-13 (7.67e-12)	.0091 (.0504)	-5.38e-15 (4.59e-12)
Legal strength indicator	-195.7666 (239.140)	-2.226* (1.225)	69.046 (267.467)	-.8100 (.5397)	-73.773 (252.694)
Interest rate spread	-37.1784 (55.273)	.1269 (.3186)	-3.663 (63.285)	-.1732 (.2051)	-81.783 (62.667)
Bank nonperforming loans to total gross loans	31.9686 (70.158)	-.4601 (.3422)	-15.404 (72.872)	.0398 (.0968)	.9010 (48.711)
Current account balance of payments/GDP	-.05055 (.8805)	-.0041 (.00376)	-.5744 (.9314)	-.00259 (.0019)	2.369*** (.6827)
Funded pension schemes/GDP (lagged)	117.8073*** (27.379)	.0450 (.1289)	-21.245 (31.998)	.1055 (.0867)	60.897 (39.997)
<i>Cluster</i>					
Advanced maturation cluster	565.8187 (620.1528)	-.0987 (.0528)	-.1009 (.3141)	.2250* (.0215)	-144.829 (130.859)
High gradual maturation cluster	1.6062** (.6758)	.3310 (.1256)	-.39348 (.4165)	-.0004 (.0138)	1030.853*** (221.481)
Intermediate gradual maturation cluster	6.8739** (3.232)	13.728 (8.712)	9.888** (4.766)	3.587* (.3376)	-138.811 (101.621)
Low gradual maturation cluster	.79021 (.7486)	.9459 (2.098)	-975.207 (2620.26)	.1933 (.1964)	1988.468*** (502.038)
Incipient maturation cluster	-.9195 (1.160)	-.8765 (.5799)	-4.088*** (1.421)	.1357* (.0717)	1663.431*** (369.138)
No. of observations	339	328	327	324	326
No. of groups	30	30	30	30	30
R-sq: within	0.3747	0.3410	0.7586	0.5635	0.6196
R-sq: between	0.9883	1.000	1.000	1.000	0.7269
F test/Wald test	52.87 (0.000)	10075.79 (0.000)	576.90 (0.000)	3542.31 (0.000)	54.10 (0.000)

Notes: t-statistics based on estimations robust to heteroscedasticity and autocorrelation. The value of the estimated coefficient is reported, indicating the standard error in brackets. All regressions include year dummies. ***, **, *: 1%, 5% and 10% significance levels, respectively. According to Hausman and Wald's tests, we use a random effects model for *Market Capitalization/GDP*, *Turnover*, and *Outstanding public bonds/GDP* while a fixed effects model is used for *Stocks traded/GDP* and *Outstanding private bonds/GDP*. *Funded pension schemes/GDP* is instrumented through its second lag.

Source: Own elaboration using STATA.

Conclusions and final thoughts

The purpose of this study was to determine if funded pension schemes had succeeded in developing domestic capital markets, as established by the original goals of structural reforms. Over a universe of thirty-one funded pension systems, panel data regressions were constructed, using stock and bond markets depth and liquidity indicators as well as proxies for pension systems variables and other indicators of financial markets' development over the period 1990-2014. The methodological strategy was complemented by static and dynamic clustering analysis of pension systems, together with HT statistical tooling, applied to representative statistical information of its performance.

The outcomes specified in Section 5 confirmed that the attribute of belonging to a cluster determined significant impacts of pension systems on capital market development indicators.

In particular, the intermediate gradual maturation systems performance is noteworthy, as stock and private bond depth, as well as stock liquidity indicators, showed the most significant positive impact from their rising pension assets, involving the greater magnitude effects among all clusters that were reported as statistically significant. The high gradual maturation cluster exerted a positive impact on the stock depth and also on public bond depth. As regards to private depth, it received positive impacts from the advanced and incipient maturation clusters. On the other hand, low gradual and incipient maturation systems growth generated significant levels of public bonds markets' depth.

These results demonstrate that pension systems with the higher level of maturation were related to a further development of equities and private debt instruments while those transiting low gradual and incipient stages of maturation were more linked to a greater depth of public debt instruments, which typically enjoy the preference of pension systems in their early stages of life. These results are in line with Hu (2012), Meng and Pfau (2010), Giannetti and Laeven (2009) and Seijas (2009).

The policy implications of this research relate to the differential impact of pension systems on capital markets in relation to the maturation stage of their life cycle. This finding highlights the importance of existing public policies that align individual capitalization pension systems developments with the financial instruments traded in capital markets, in order to enhance its positive effects on the economy.

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