

*Do sociodemographic factors influence the maturity structure of sovereign debt?*

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Increases in life expectancy, medical and technological advances, and falling birth rates have produced widespread population aging in most developed countries. In the context of the EU, the population aged over 65 years, representing only 10% of the total in 1950, will represent over 30% in 2050 according to the United Nations. This phenomenon not only has implications in the social field but also affects economic growth and many economic and financial decisions that relate to the investment horizon (Lee and Shin, 2019; Kamiguchi and Tamai, 2019; Lyons, Grable and Joo, 2018). According to Papademos (2007), population aging may have important political and economic implications on economic growth, monetary policy, the structure of financial markets, public finances, and international capital flows.

Regarding the maturity structure of sovereign debt, sovereign debt has been an important object of study for economists, government authorities and researchers in recent years and it is a topic very related with the sustainable economic growth. This issue has gained importance due to the financial crisis that began in 2007 and its implications for public finances in euro zone countries, such as Greece, Portugal, Ireland and Spain. In times of crisis, the horizon of debt issues shortens because the risk of long-term bonds increases at a higher rate than the risk of bonds with shorter maturities. Therefore they are pushed to issue more short-term debt to reduce funding costs. This trend even intensifies during periods of financial crisis (Broner, Lorenzoni and Schmukler 2013; Broner, Erce, Martín and Ventura, 2014). However, a short maturity structure can lead to liquidity constraints which increase the risk of default (Drudi and Giordano, 2000; Goudswaard, 1990).

The sovereign debt maturity is the average period until the date when the debt of a state must be paid (Kanczuk and Alfaro, 2006). States decide to issue debt with different ma-

turities because it may be beneficial to smooth the cost of debt (Niepelt, 2014). Therefore, the optimal maturity attempts to determine the ideal combination of a country's short and long-term issues (Arellano and Ramanarayanan, 2012). In this sense, several studies have analyzed the determinants of sovereign debt maturity (Goudswaard, 1990; Missale and Blanchard, 1994; De Haan, Sikken and Hilder (1995); Bodnaruk, 1999, among others).

In this paper we contribute to the literature on this topic by providing an analysis of the influence of certain sociodemographic factors on the maturity of sovereign debt in ten highly developed European countries between 1990 and 2013 because most of these countries had recovered from the crisis of 2008 this year. Knowing which factors affect the maturity structure of sovereign debt we can implement measures designed to lengthen the maturity structure to be in a better situation when facing a debt crisis.

For this we use data panel regression and consider the traditional determinants of sovereign debt maturity (debt/GDP ratio, inflation, GDP, and interest rates on sovereign bonds) and distinguish different generations of investors that coexist at any moment in time and have different investment horizons (Guibaud, Nosbusch and Vayanos, 2013). Thus, we consider the age of population, proxied by the median age of the population, as a variable of interest on debt maturity. Younger investors have longer-term investment horizons, while older investors seek shorter-term investments. The combination of investors with different investment horizons can modify the structure of sovereign debt maturities and interest rates, modifying supply and demand (cliente effects). This idea links directly to the preferred habitat theory (Culbertson, 1957, Modigliani and Sutch, 1967), which establishes the existence of investors with different investment horizon preferences.

Besides age, we include proxies for income per capita by generation. Older age implies that potential investors' investment horizons shorten, which in turn shortens sovereign debt maturity. Similarly, a higher level of income among the younger generation implies a greater capacity for investment over a long-term horizon, which will lead to a longer maturity structure. For the older generation, the opposite results from a higher level of income are expected.

We obtain evidence of a significant inverse relationship between population aging and the maturity structure of sovereign debt, which is consistent with the preferred habitat theory (Modigliani and Sutch, 1967) and the lifecycle hypothesis (Bommier and Lee, 2000). These results hold whether we consider the median age of the population or this value corrected by life expectancy. The conclusion we can draw is that an increase in population age shortens the maturity structure of sovereign debt. Because the trend in developed countries is toward an aging population, this result indicates that the maturity structures of these countries tend to be reduced by this demographic factor.

Regarding income per capita by generation (for the younger generation between 25 and

49 years old and the older generation between 50 and 74 years old), we also obtain relevant results. We find evidence that an increase in the per capita income of the younger generation implies a lengthening of the maturity structure because they have more resources to invest over their preferred investment horizon, which is long term.

These results indicate that those countries with an ageing population are more prone to have a debt maturity structure biased towards short-term debt. This finding has important implications, especially at the dawn of a sovereign debt crisis. A shortening of the maturity structure increases the liquidity constraints of a country when facing a debt crisis and, subsequently, increases the risk of default. Therefore, public authorities should be aware of this issue and propose measures to lengthen the maturity structure of sovereign debt that offset the ageing of population and its consequences on debt maturity structure. In this sense, the authorities, which represent the supply side of the sovereign bond market, should increase the issues of long-term debt. This measure must be complemented with incentives to invest in long-term bonds. In this sense, our results also suggest that, whether the younger generations have more income, they will be more prone to invest in long-term bonds, lengthening the maturity structure and relieving liquidity constraints. Thus, authorities should build the adequate environment that allows that young people invest in long term securities. This is in line with the statements of Vice-President of the ECB Papademos (2007) which assures that one of the implications of population ageing in financial markets is that debt maturity management should play a more important role.

Thereby, this paper continues this line of research by attempting to contribute fresh insights to the study of the effects of population aging on economic and financial factors.

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