

# DEMOGRAPHIC SHIFTS AND THEIR CONSEQUENCES FOR INVESTMENT FUNDS IN THE EUROPEAN UNION

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**Abstract.** *Solid theoretical reasons exist for the link between demographics and various economic, financial and social indicators. The aim of this article is to assess the influence of demographic shifts on investment fund flows in the EU from 1996 to 2013. In order to achieve this aim, a fixed effects model is constructed via panel regression and used to test the hypothesis as well as to derive conclusions. The authors hypothesise the presence of a statistically significant non-linear effect of demographic age shares on investment fund flows. The results are juxtaposed with a prior comparable research. This article is expected to benefit the financial sector and to provide guidance to market regulators.*

**Key words:** *demographic trends, life-cycle hypothesis, investment funds, ageing*

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## 1. Introduction

The implications of the ageing society for the economy have become a contentious topic of discussion across the globe. In the USA, facing the prospects of the most endowed cohort's withdrawal from the labour force has created demand for data-driven contingency plans, a development that shares common traits with the EU status quo.

A shift in the population's age composition coupled with low birth rates poses a challenging question in terms of economic growth. As the USA dominates the body of available research as a theatre, GDP-oriented studies make up a significant portion of this research.

Having covered the effects of demographic trends on real GDP in the EU<sup>1</sup>, in this paper we attempt to expand the utility of the methodological framework to analyse their influence on sector-specific variables in the EU, thus pivoting from the most common object of study thematically and geographically. The financial services sector is of special interest due to its integration in the economy and dependency on data. With consideration to differences in regulation among the EU countries, the scope is narrowed to

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open-ended investment funds due to their homogeneity under the Markets in Financial Instruments Directive and prevalence.

As such, the goal of this paper is to assess the influence of demographic age shares on investment fund flows with the hypothesis stipulating the presence of a statistically significant non-linear effect of the aforementioned demographic variable on investment fund flows. The following objectives are raised in order to achieve the goal:

- to review the body of literature pertaining to the topic by sourcing a comparable prior research, methodological guidance and chief interpretations;
- to construct an appropriate panel regression model to analyse the effect of every age group on investment fund flows;
- to interpret regression results to reach a comprehensive set of conclusions.

The paper consists of four parts. First, the authors review modern approaches towards the relationship of demographics and investment, followed by the methodological framework and analysis of results. Analysis is succeeded by a list of conclusions derived from the first three parts.

## **2. Modern approaches to the relationship of demographics and investment funds**

The influence of demographic trends on the economy as a whole has been debated in great detail. Multiple studies conducted over the last decade (McKinsey Global Institute, 2004; Dizard, 2013; Jensen, 2013; World Economic Outlook: Transitions and Tensions, 2013; Magnus, 2009, 2010, 2013) provided theoretical and empirical foundations for branching out into a sector-specific research. Despite receiving less attention, studies with a narrower focus have the capacity to improve the understanding of how demographic shifts affect business. In this part, the authors review such studies in order to help achieve the paper's goal.

Various forms of investment appear as objects of study. Bloch (2013) and Dizard (2013) independently wrote about the negative effect of ageing on different asset classes, concentrating on the challenges faced by the financial sector. Bakshi, Chen (1994) used the Euler equations to analyse the net flows of financial assets based on the USA demographic variables while Singh (2010) ran a similar case study with Japanese data. The case studies noted a move towards conservative investments. Bodie et al. (2007) sought to explain this change with the Life-cycle Hypothesis (LCH). The McKinsey Global Institute examined investment dynamics in Germany and Italy, observing a long-term negative slope attributed to changes in the countries' demographic makeup, namely, an increase in the share of retirees in the respective populations (2004, pp. 137–186).

According to Shepherd (2013), demographic shifts are of concern to financial markets due to their propensity to affect business cycles. In Shepherd's view, American savers caused a real shift in investment strategies and a movement towards conservative

assets, not just a broad theoretical indication for policymakers. He is not alone in taking this stance. Franchi (2013) points out equity funds which experienced a strong correlation with performance until 2007 and have subsequently lost this connection in the USA. The Investment Company Institute (ICI, 2013) also shows that American domestic equity funds have had six consecutive years of outflows up to 2013. At the same time, demand for bond funds has been above figures suggested by the historic relationship of inflows and returns. The ICI drew two explanations for this phenomenon: the secular trend of investors being worried about further negative developments on the equity market, and the demographic trend. The latter involves older investors reducing risk in their portfolio, according to LCH, which is of concern to the market (Purkayastha, 2008). Farrell (2008) produces a generalised standard deviation approach, without naming asset classes: he has found that the risk appetite increases in age groups from 25 to 39, where it levels off until the age group of 55 years and over, dropping at a slower rate than it rose. His conclusion explains the heightened interest in demographics with an expected increase of the relative population size of those aged 65 and over.

Shepherd adds that there is no ready solution with reference to information from the Congressional Budget Office about the uniform asset distribution among the Baby Boomer cohort. 70 per cent have investment funds in their portfolios, and it totals up to 59 per cent of aggregate investment fund holdings by generation. His research went as far as saying that age is a determinant more important than the performance of the selected investment vehicle.

Data gathered by the ICI and presented by Franchi (2013) revealed another connection related to demographics and investment funds. He found a strong correlation between birth rates lagged by 36 years and Assets under Management (AuM). According to his analysis, ROI becomes an issue during selloffs, with those aged over 55 being most sensitive to changes in the securities market. While AuM is of limited utility compared to net money flows, as AuM may fluctuate without changes in the number of distributed units, it delivers the message that also persists in the said flow metric.

What is more, the AuM decline, not explained by performance, drives the world investment fund holdings down due to USA's weight in the industry (49 per cent) despite regions like Asia (13 per cent) and Europe (31 per cent) having an increase in AuM. Noland (2009) notes that the others' gains are temporary and Asia's so-called *demographic dividends*, as defined by Lee et al. (2006), are subject to policy changes with Japan's fate becoming an eventuality otherwise.

Japan is a theatre categorised not only by a high life expectancy and developed investment infrastructure, but also investor behaviour. Gollier and Zeckhauser (1997) focused on time horizons and the way age affects investment choices in a theoretical study, suggesting that age was irrelevant as long as an individual's utility function and time horizon remained unchanged. Magnus (2013, p. 1) summarised it the following way:

“In addition to the demographic structure of a country, it’s what people do that matters.” With changes in life expectancy and activity, LCH stages may also shift.

Another survey with a sample of 5000 individuals, conducted in Australia via mail interviews, concludes that profiling via demographic factors was convenient to financial institutions despite more robust models having the explanatory power greater by 6 p. p. The researcher used the principal component analysis and data reduction to achieve this conclusion (Baumann, 2007).

Purkayastha (2008) provides a useful input on the matter in relation to risk tolerance. He explains that the LCH point of view is the traditional method of asset allocation, and other attempts to classify investors consist of similar categories. However, he points out that the relationship between age and experiencing investment risk is not linear, a representation of the individual’s goals and time are required to achieve them. The author’s findings are based on a survey analysed with one-way ANOVA, chi-square tests, and multivariate techniques such as factor analysis.

In his work, Purkayastha explains that survey-based studies habitually resulted in positive relationships between age and risk tolerance. Though, the results were non-linear with risk appetite reducing up to five years to retirement and then growing in the last five-year period. Such conclusions were backed by behavioural parameters. Another point raised by the author was the effect of education and a positive relationship between degree holders and risk appetite.

A comprehensive explanation of financial asset pricing is provided by Bergatino (1998). The author measured the effects of ageing on stock, bond prices and real estate in the USA. Regression results showed that demographic shifts were responsible for 59 per cent of observed annual price increase in the housing market, 31 per cent in real GDP growth, and 80 per cent in real stock and bond prices between 1966 and 1986 in the AR(1) model. While these conclusions represent a historic view, Bergatino’s message is valuable for two reasons:

1. Investment portfolios may avoid cyclical performance fluctuations by altering their bond and equity ratio.
2. Inflection points created by demographic shifts provide an equilibrium to financial asset prices.

Macunovich (2010) conducted a study of inflection points in the form of financial crises in the USA, Japan and Latin America, pointing out the importance of the 15–24 age group as a source of future growth capable of mitigating an increase in the relative share of those in retirement. Recessions appeared past the peak in the 15–24 age group’s relative size. The effect was also discovered in European countries such as Belgium, Sweden, and Russia. Macunovich warned against grouping together countries with different population pyramids and stages of development.

Studies presented earlier generally stopped at the problem of ageing, omitting the influence a rapid increase in births would have on investment choices. Cutler (2009) points out that the dependency ratio is not attributed to old age alone, with youth and workers' dependency also being present for analysis. His research shows that dependency in general, not just that of retirees, has a negative influence on returns, which coincides with Singh's findings on dependency. This is not always present in analysis due to generational interdependency and those aged 0–14 being left out as economically inactive.

The aforementioned group was included in a 2012 article by Arnott and Chaves aiming to analyse the relationship between stocks, bond yields, GDP growth and demographics. Having constructed two panel regressions spanning 22 and 176 countries over the period of up to 60 years, they discovered “a strong and intuitive link between demographic transitions and both GDP growth and capital market returns” (Arnott, 2012, p. 23).

To sum up, the discussion on the influence of demographics on economic variables is far from over with several interpretations present. In this literature review, it has been discovered that there are two main approaches to this phenomenon. The first involves gathering primary data via sampling and questionnaires, which offers a broader range of variables to work with and provides flexibility, but is more challenging to apply on an international scale without incurring significant costs, as evidenced by the Australian survey. The second entails the analysis of secondary data. It requires a greater analytical precision and robust models to gauge large sets and filter out effects maintained by variables outside the study's field of interest. The data, while readily available, provide a challenge in standardisation and, in case of emerging countries, fragmentation. Additional research is required to improve our understanding of the relationship between parts of the economy and demographic trends. The next section aims to describe a set of tools to achieve this goal.

### 3. The methodological framework of the econometric model

The model's basic premise entails the use of secondary time series data as reported in a sample of countries over a specified period. The data are panelised, labelling the demographic variables as the regressors and the economic variable as the regressand in a panel least squares single-equation regression. To capture valuation and business cycle effects, the equation contains a proxy economic variable on the regressor side. This may be seen in equation (1):

$$r_t = \alpha + \gamma X_{t-1} + b_1 s_{t,1} + b_2 s_{t,2} + \dots + b_N s_{t,N} + \varepsilon_t, \quad (1)$$

here  $r_t$  – annual net fund flows generated by households in domicile as a percentage of GDP at period  $t$ ,

$\alpha$  – intercept term,

$X_{t-1}$  – stock market index annual percentage change, used to gauge the business cycle in the period  $t-1$ ,

$b_i$  – coefficient for non-overlapping five-year age group  $i$ ,  $i \in \mathbb{N}$ ,  $i \in [1; 18]$ ,

$s_{t,i}$  – relative population share size of non-overlapping five-year age group  $i$  at period  $t$ .

Note that the equation contains an intercept term, a lagged term for the valuation effect and denotes age shares for every cross-section in every period.

The main issue with equation (1) is that statistical data for most countries in a sufficiently large panel are available for a limited selection of years. As such, the number of data points is reduced, which complicates both the analysis of the demographic variables' slow evolution and its effect on the macroeconomic variable. In fact, estimating equation (1) directly is impossible for any country currently in the EU, because including the intended number of five-year non-overlapping age groups ( $s_{t,i}$ ) does not leave enough degrees of freedom, as  $i$  spans from 1 to 18 (ages 0–4, 5–9, ... 80–84, 85+), coinciding with the number of periods  $t$ . Excluding a particular age group, for example, ages 0 to 4 or broadening the groups is an *ad hoc* solution that hides a part of the information contained in the original equation.

Hence, we may include a restriction for the number of coefficients:

$$b_i = D_0 + D_1 i + D_1 i^2 + \dots + D_k i^k. \quad (2)$$

This expression suggests replacing the coefficient  $b_i$  next to every demographic share with a single polynomial of the order  $k$ , supposed to reduce the number of coefficients to estimate from  $N$  to  $k$ . The order of the polynomial is determined by testing it against redundancies with parsimony in mind via the Wald coefficient restriction test. It is worth noting that the  $i$ , representing the number of the age group, spanning from 1 to  $N$ , is raised to the power from 0 to  $k$ .

Since demographic shares have the cumulative sum of unity and the sum of their changes always equals to zero, a restriction is required on the transformed coefficients to avoid multicollinearity with the intercept term. The issue is captured by the initial term  $D_0$  as described in equation (3):

$$D_0 = -\frac{1}{N} \left( D_1 \sum_{i=1}^N i + D_2 \sum_{i=1}^N i^2 + \dots + D_k \sum_{i=1}^N i^k \right). \quad (3)$$

Following the coefficient transformation and after the inclusion of  $D_0$  as shown in (3), the model's regression equation intended for the panel LS estimation appears as follows:

$$r_t = \alpha + \gamma X_{t-1} + D_1 \sum_{i=1}^N \left[ i s_t^{(i)} - \frac{i}{N} \right] + D_2 \sum_{i=1}^N \left[ i^2 s_t^{(i)} - \frac{i^2}{N} \right] + \dots + D_k \sum_{i=1}^N \left[ i^k s_t^{(i)} - \frac{i^k}{N} \right] + \varepsilon_t. \quad (4)$$

Note that to preserve space, the presented equation (4) does not contain fixed cross-section effects which, after testing with the Redundant Fixed Effects test, determine the intercept term supposed to capture left-over differences among countries in the panel. Equation (4) with fixed effects is used for statistical testing, while equation (1) presents the end result containing implied regression coefficients of every demographic share.

The framework is put through a range of tests pertaining to the Gauss–Markov assumptions, its robustness, and is subject to adaptation in case one of these assumptions is not met and the result may contribute to misleading conclusions.

As demonstrated in the first part, the variables and underlying data quality are crucial for the BLUE estimation. The previously covered research limited to the USA theatre is mostly concerned with the former rather than the latter due to the relative legislative stability and availability of statistical data, allowing the researcher to focus on a variable selection. The European context adds complexity factored by historical and methodological divisions which affect the quality and availability of data and their variable forms.

Institutional changes are a noteworthy example limiting the number of data points available for study in multiple countries to a period spanning from years after the collapse of the USSR until 2013. The UN Penn World Tables provide estimates for the most general demographic and macroeconomic variables as well as official statistics with their quality classified accordingly. However, these data are limited to 5-year increments or 20 data points per 100 years in addition to complementary variables necessary for hypothesis testing being absent from their repository. Hence, the European statistical authority, Eurostat and the ECB act as the chief sources of data, providing demographic and macroeconomic time series used in this paper.

One of the key issues concerning the execution of the model was formulating the scope of detail to describe an EU member state’s demographic makeup. By referring to previous research and prior testing with draft models<sup>2</sup>, it was concluded that broad age groups withheld information present in the non-overlapping five-year cohorts reported by each member state. For countries such as France or Spain, these were published from 1948. For other countries, the series started from 1991 or 1993, a case not limited to CEE countries like Lithuania or Slovakia.

Unlike in the previously cited research, the number of groups  $i$  was 18, not 15, as the Eurostat’s age groups were concluded by 85 and over instead of 75 and over. Including all of the groups would have been impossible with the degrees of freedom available in an annual series from 1991 to 2013, excluding macroeconomic variables, were it not for the model’s transformation of demographic shares into a polynomial.

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<sup>2</sup> These draft models utilised broad age groups as defined by Eurostat (0–15, 16–64, 65 and over) or featured the ad hoc grouping.

The analysis includes the levels of demographic shares, as observed on January 1<sup>st</sup> of the year ( $t$ ) in question. While short-run effects may have a potential utility, the slow rate of change makes annual data the more feasible alternative.

The effect of demographic makeup shifts on investment funds, discussed in detail in American literature, is challenging to quantify due to data scarcity and their novelty in certain countries. The challenge is further compounded by questions of ownership and isolating the demographic effect from performance and national idiosyncrasy. The solution was focusing on open-ended investment fund shares owned by households, effectively filtering out institutional and non-resident holders as well as allowing the mobility of the shares. Additionally, the variable takes the shape of net annual flows as a percentage GDP rather than levels, which captures economic activity in the distribution of investment funds' shares, tackling the issue of filtering out the performance. Hence, the dependent variable  $r$  is represented by net annual household-generated fund flows in domicile as a GDP percentage.

The inclusion of a qualitative legislation ( $L$ ) variable was done to address the absence of investment funds in a member state. To retain the panel's balance, when this variable has a non-zero value, the country in question is assumed not to have legislation for aforementioned investment funds to function in its domicile.

The empirical literature deliberated on in the first section suggested the inclusion of a variable to account for valuation effects and business cycles, a proxy variable for information that would otherwise be omitted (referred to as  $X$  in the regression equation), referring to public trading statistics as a feasible solution. The ECB provides an array of leading EU stock market indices, either taken directly from the market or synthesised via a long-lasting index such as the Euro Stoxx 50. Whenever possible, this variable is supplemented with data from the member state stock market's main index used for settlements, adjusted for breaks. The measure is not taken for countries lacking such an index during the analysed period. In case of multiple markets being present, as is the case in states such as Germany and France, data from the operator with the highest index capitalisation are selected. To reflect the measures taken in the preparation of other variables, raw closing values of a year's first trading session are converted into annualised percentage growth rates. The timing and magnitude are to match those of the demographic shares, with the step of one year.

Dividend yields are cited as an alternative and a supplement to stock market indexes. However, these would be problematic to use as an efficient measurement instrument in markets with the endemic higher volatility, compounded by the fact that dividends are generally distributed several months after the end of the year in question. It generates a time lag the length of which differs from country to country, that the market index does not have. Furthermore, indices in Western Europe have been dividend-inclusive since as early as 1999. Adjusting pre-1999 values accordingly preserves the yield information while avoiding a structural break.



As a proxy solution outside the financial market, the economy's production function was considered. However, such a function's estimation for every country in the sample would add complexity and reduce the number of degrees of freedom upon its inclusion in the regression.

Stationarity is often a question when dealing with demographic variables due to their susceptibility to time trends. The variables selected for analysis, i.e. the demographic shares, are held within an interval [0;1] and are taken from a sample of more than 20 countries experiencing different stages of the demographic transition, thus increasing the power of the tests or, in case of economic variables, are presented in the form of annual percentage changes.

It is worth noting at this point that the model's primary goal is to examine dependencies rather than make predictions while building upon previous research in the model's implementation.

The EU's changing composition poses another challenge of analysing dependencies in an all-inclusive fashion. The Eurostat does not publish the aforementioned data for years prior to 2001 for newest members such as Romania and Croatia. Therefore, the EU25 is the basis for the analysis. With regard to data availability, the model described in this part involves data from 1996 to 2013, which yields 18 periods for each of the 25 countries, a total of 450 observations.

#### **4. Estimating the relationship of demographic shares and investment fund flows**

In this part, we apply the methodological framework detailed above to analyse the relationship between demographic shares and net investment fund flows generated by households in domicile. The goal is to determine whether the demographics-based disconnection of flows and performance reported in the USA manifests itself in the EU context.

The net annual investment fund flows generated by households in domicile valued as a percentage of GDP are acting as a dependent variable, noted with  $r$ . The basis for the model is a panel containing transformed age shares, D1, D2, D3 and D4, divided by the order of their magnitude to maintain the estimates' levels, respectively by 1, 10, 100 and 1000. The country's main stock market index appears under the label of X. In addition to this, an extra dummy variable, named L, is included in the model, a country's legislation enabling the registration of investment funds. It takes the value of unity for the period that a country is incapable of hosting an investment fund and naught when suitable laws are enacted. In Lithuania's case, this variable has the value of 1 in the period from 1996 to 2003. To address a serial correlation, the value of  $r$ , lagged by one period ( $r(1)$ ), is taken into account as an independent variable.

After making the steps described above, the demographic share variable D2 does not appear statistically significant. To measure the order of the implied polynomial, we run

the Wald coefficient restrictions test for both D3 and D4. The disturbance variance is addressed by employing a White cross-section covariance matrix to obtain heteroscedasticity-consistent standard errors. The final model presented in Table consists of variables that are statistically significant at a 5 per cent significance level, with the absolute value of the  $t$  statistic ranging from 2.24 to 11.78. The value of the  $F$ -statistic is 43.63. Running the Breusch–Godfrey test with up to five orders does not exhibit contradictory results at the aforementioned significance level.

TABLE. Estimated regression variables, coefficients and test values

Variable	Coefficient	Standard error	$t$ -statistic	Probability
C	-6.8792	1.57198	-4.3761	0.000
D1	-15.025	2.96585	-5.0651	0.000
D3	25.685	5.21517	4.9252	0.000
D4	-13.279	2.71685	-4.8877	0.000
L	-0.9462	0.27598	-3.4285	0.000
X	0.00587	0.00262	2.2356	0.026
$r(1)$	006145	0.05215	11.783	0.000

Source: authors' calculations based on Eurostat and ECB data.

In order to determine the effect of each age group on the annual net fund flows, coefficients obtained via equation (4) are transformed back to their forms as seen in (1), referred to as implied regression coefficients and depicted in Figure. The functional form does not seem to contradict conclusions reached by the prior research analysing stock and bond ROI, nor does it challenge the hypothesis in terms of non-linearity or accordance to LCH (Arnott, 2012; Farrell, 2008).

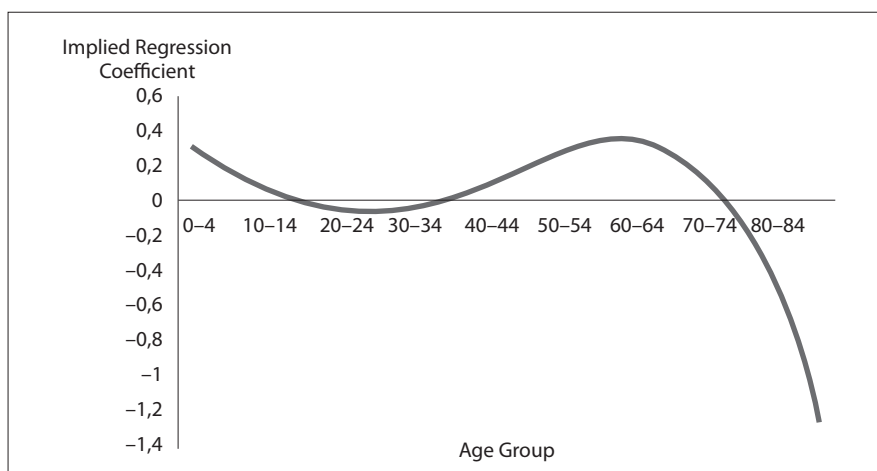


FIGURE. Implied regression coefficient representation of every age group

Source: authors' calculations based on the Eurostat and ECB data.

For the sake of clarity, the implied regression coefficient signifies the percentage by which the household-owned annual net investment fund flows change when the demographic share of a particular age group increases by 1 per cent.

The curve crosses the horizontal axis in the fourth, seventh, and sixteenth groups, describing the effects of up to the 70–74 age group. Such a late final crossing of the horizontal axis may be explained by the dependent variable containing stock, bond, and mixed open-ended investment funds. The variable does not capture movements among different investment funds.

It is worth noting that the coefficients between the fourth and seventh age groups (ages 15–34) are negative while the effect of children aged 0–14 is positive. Furthermore, an increase in the 18<sup>th</sup> group aged 85 and over has an effect exceeding 1%. Conversely, an increase of one per cent in the 18<sup>th</sup> group's relative size in the population mitigates an increase of three per cent in the 50–54 age group. As life expectancy increases, this signposts a possible challenge for growth, *ceteris paribus*. These observations appear in line with Farrell (2008) in terms of changes in risk tolerance, but contradict Macunovich (2010) regarding the positive impact of the 15–24 age groups as a dampener of the retirees' negative effect.

The aforementioned effects may differ depending on the region and mix of asset classes a particular investment fund invests in. However, this outlines the model's key utility – helping investment fund managers identify most profitable demographic profiles, potential market depth, and benchmark their performance across all age groups.

Furthermore, the period chosen to analyse the dependency of fund flows on demographics from 1996 to 2013 contains episodes of growth and economic contraction. The EU experienced a series of asymmetrical shocks, which allowed the model to capture investment fund flows as they occurred in changing conditions, demographics included.

While the model is not intended to be used as a forecasting tool and dependencies may change over time should the current conditions hold, the process of ageing does not appear to have an immediate downside for the investment fund industry catering to households because people close to retirement age seem to be prime contributors for this type of asset, peaking at 0.4 per cent for ages 60–64. Even once they enter retirement, they may not be keen to unwind.

## **5. Conclusion**

An array of empirical and theoretical studies dedicated to the relationship of demographics and various forms of investments published in the 21st century by the IMF, ICI and numerous independent researchers signifies the timeliness of the paper's topic. The research spanning from the USA to the EU and Asian countries affirms interest in demographic phenomena and their implications. Ageing, the role of retirement and the Baby Boomer phenomenon are specific points of interest.

The cited third-party case studies suggest the complexity of links between demographic changes and investment funds. Demographic-inclusive methodologies benefit from adherence to precise grouping, filtering and assessing linearity at a significant cost to degrees of freedom. Models based on these methodologies remain susceptible to behavioural assumptions if used for predictions.

Empirical analysis in parts of the world remains challenging due to the novelty of investment funds affecting data availability. Differences in the economic and demographic development, regulation and investment infrastructure compound difficulty in international studies.

Results stemming from regression analysis do not appear to reject the hypothesis of non-overlapping five-year age group weights having a non-linear effect on net annual household-generated open-ended fund flows in domicile in the EU over the 1996–2013 period.

These results do not contradict conclusions reached by comparable studies carried out with different asset classes in the USA and Japan, nor do they contradict the Life-cycle Hypothesis.

Throughout the course of this study, the utility of the methodological framework previously used by the authors to analyse the dependencies of GDP on demographics has been modified and expanded, demonstrating its flexibility. Given the limited number of empirical studies focused on EU data, compared to research dedicated to demographic phenomena in the USA, the framework has a potential for the further expansion.

It has been estimated that the largest positive effect on net open-ended investment fund flows generated by households in domicile is attributable to the 55–64 age range. An increase in the relative weight of this range by 1% increases the net flow by an average of 0.3%. Conversely, the group of 85 and over has the largest negative effect at –1.2%.

Financial institutions, investment fund managers, investors and the EU financial market regulators may benefit from this study. The application ranges from data-driven contingency planning, guidance to demographics-sensitive investment products, gauging demand, targeting the most profitable age groups and regions to benchmarking investment fund performance on the micro level. The authors expect the latter application to have the highest utility. *Ceteris paribus*, the proposed econometric model may also appear in a serial application to determine market saturation throughout a given lifecycle.

Finally, the article provides an EU-centric voice in an American-dominated discussion. It is a study encompassing a number of member states, taking into account the longest period possible for joint analysis of all five-year age groups. While it highlights similarities among the demographic challenges faced by the EU and the USA in comparable studies, it also presents an outlook from a different socioeconomic perspective in an environment that encourages reviewing performance to account for demographic shifts. The importance of dialogue during a period of uncertainty is further maintained

by providing a platform for subsequent research. Either utilising alternative macroeconomic indicators or slicing results into smaller regional clusters, there are possibilities to further our understanding of the effects of demographic trends on the financial sector.

## REFERENCES

Arnott, R. D., Chaves, D. B. (2012). Demographic changes, financial markets, and the economy. *Financial Analyst Journal*, Vol. 68, pp. 23–45.

Baumann, C., Burton, S., Elliott, G. (2007). Predicting consumer behavior in retail banking. *Journal of Business and Management*, Vol. 1, pp. 79–96.

Bakshi, G. S., Chen, Z. (1994). Baby boom, population aging, and capital markets. *Journal of Business*, Vol. 67, pp. 165–202.

Bergatino, S. M. (1998). Life cycle investment behavior, demographics, and asset prices: dissertation. MIT, Department of Economics, pp. 37–59, 120–126.

Bloch, B. (2011). Demographic trends and the implications for investment. Retrieved from <http://www.investopedia.com/articles/pf/06/demographicstrends.asp>.

Bodie, Z., Treussard, J., Willen, P. (2007). The theory of life-cycle saving and investing. *Public Policy Discussion Papers*, Federal Reserve Bank of Boston, May, pp. 1–20.

Catalán, M., Guajardo, J., Hoffmaister, A. W. (2007). Coping with Spain's aging: retirement rules and incentives. *IMF Working Papers*, Working Paper No. WP/07/122.

Cutler, N. E. (2009). Generational demographics, gerontology, and finance: size matters, but the story is more complex. *Journal of Financial Service Professionals*, June, pp. 18–22.

Dizard, J. (2013). Rapid population ageing creates investment opportunities. *The Financial Times*. Retrieved from <http://www.ft.com/intl/cms/s/0/62234c82-42e3-11e3-8350-00144feabdc0.html>.

ECB. (2014). Financial market data. [Data file]. Retrieved from [sdw.ecb.europa.eu/browseSelection.do?type=series&q=Financial+market+data](http://sdw.ecb.europa.eu/browseSelection.do?type=series&q=Financial+market+data).

Farrell, J. (2008). Demographics of risky investing. *Research in Business and Economics Journal – Special Edition*, Vol. 1, pp. 1–20.

Eurostat. (2014). GDP and main components – volumes. [Data file]. Retrieved from [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama\\_gdp\\_k&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=nama_gdp_k&lang=en).

Eurostat. (2015). Population on 1 January by five years age groups and sex. [Data file]. Retrieved from [http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo\\_pjangroup&lang=en](http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=demo_pjangroup&lang=en).

Franchi, P. (2013). Demographics and the decline of equity mutual funds. Retrieved from [http://www.advisorperspectives.com/newsletters13/Demographics\\_and\\_the\\_Decline\\_of\\_Equity\\_Mutual\\_Funds.php](http://www.advisorperspectives.com/newsletters13/Demographics_and_the_Decline_of_Equity_Mutual_Funds.php).

Gollier, C., Zeckhauser, R. J. (1997). Horizon length and portfolio risk. *NBER Technical Working Paper No. 216*. Retrieved from <http://www.nber.org/papers/t0216>.

ICI. (2013). 2013 Investment company fact book. Retrieved from [http://www.icifactbook.org/fb\\_ch2.html#developments](http://www.icifactbook.org/fb_ch2.html#developments).

IMF. (2013). World economic outlook: transitions and tensions, pp. 144–147. Retrieved from [www.imf.org/external/pubs/ft/weo/2013/02/pdf/text.pdf](http://www.imf.org/external/pubs/ft/weo/2013/02/pdf/text.pdf).

Jensen, N. (2013). Heads or tails? The Demographics of Investing. Access to the internet <http://www.creditwritedowns.com/2013/11/heads-or-tails-the-demographics-of-investing.html>.

Kasnauskienė, G., Michnevič, K. (2015). The effects of demographic trends on economic growth in the European Union. *European Scientific Journal*, Special Edition, Vol. 2, pp. 70–85.

- Lee, R., Mason, A. (2006). What is the demographic dividend? *Finance & Development*, Vol. 43, No. 3. Retrieved from <http://www.imf.org/external/pubs/ft/fandd/2006/09/basics.htm>.
- Macunovich, D. J. (2010). The role of demographics in precipitating economic downturns. *Journal of Population Economics*, Vol. 25, pp. 783–807.
- Magnus, G. (2010). Demographics, Destiny and Asset Markets. Retrieved from [http://www.investorsinsight.com/blogs/john\\_mauldins\\_outside\\_the\\_box/archive/2010/08/02/demographics-destiny-and-asset-markets.aspx](http://www.investorsinsight.com/blogs/john_mauldins_outside_the_box/archive/2010/08/02/demographics-destiny-and-asset-markets.aspx).
- Magnus, G. (2013). Do demographics matter? *BRICS Magazine*. Retrieved from <http://bricsmagazine.com/en/articles/do-demographics-matter>.
- Magnus, G. (2009). *The Age of Aging: How Demographics are Changing the Global economy and Our World*. Singapore: John Wiley & Sons (Asia), pp. 73–148.
- McKinsey Global Institute. (2004). *The Coming Demographic Deficit: How Aging Populations Will Reduce Global Savings*. Washington: McKinsey & Company, December, pp. 137–256.
- Noland, M. (2009). Comment on “Long-term Forecasts of the Demographic Transition in Japan and Asia”. *Asian Economic Policy Review*, Vol. 4, pp. 43–44.
- Purkayastha, S. (2008). Investment profiling and investment planning: an empirical study. *The Icfai Journal of Management Research*, Vol. 7 pp. 17–40.
- Shepherd, S. (2013). Dirt economics: Demographics matter! *Wealth Management Frontier Journal*, Vol. 2, pp. 5–9. Retrieved from <http://merage.uci.edu/journal/ciwm/july-2013/dirt-economics.html>.
- Singh, R. (2010). Equity investment decisions: are demographic variables really significant? *Paradigm*, Vol. 14, pp. 7–11.
- Wong, A. (2011). Financial risk tolerance and selected demographic factors: a comparative study in 3 countries. *Global Journal of Finance and Banking Issues*, Vol. 5, pp. 1–12.