



Adam Marszk

ORCID ID: 0000-0002-9369-7147

Department of Economic Science

Faculty of Management and Economics

Gdańsk University of Technology, Gdańsk, Poland

amarszk@zie.pg.gda.pl

Sustainable investing exchange-traded funds: US and European market

Accepted by Editor Ewa Ziemba | Received: November 7, 2018 | Revised: March 11, 2019; June 5, 2019 | Accepted: June 17, 2019.

Abstract

Aim/purpose – The key aim of the paper is to examine the diffusion of the sustainable investing exchange-traded funds (ETFs) on the European and US ETFs markets, with the special focus on the market shares of sustainable investing and conventional funds.

Design/methodology/approach – The model of diffusion of innovation (logistic growth model) is applied. Monthly data on the assets of ETFs in the time period of 2006-2017 are used.

Findings – Increasing assets of sustainable investing ETFs were identified in both examined regions. The average value of assets was higher in the United States, but the European market became larger in the late 2017. Exclusively for Europe, the diffusion of sustainable investing ETFs was confirmed for the entire analysed time period as the market share of this category was increasing in relation to the conventional funds. In the United States, the diffusion was short-lived and took place in the time period 2006-2008.

Research implications/limitations – Applied diffusion models assume an S-shaped trajectory of the innovation's diffusion and the estimations are sensitive to historical data.

Originality/value/contribution – It is the first study to apply the methodological framework of innovation diffusion for the examination of the sustainable financial

Cite as: Marszk, A. (2019). Sustainable investing exchange-traded funds: US and European market. *Journal of Economics & Management*, 37(3), ????.
<http://doi.org/10.22367/jem.2019.37.04>

products. It addresses an issue of switching between sustainable investing and conventional financial products that has not been examined previously.

Keywords: sustainable investing; exchange-traded funds; financial innovation; diffusion of innovation.

JEL Classification: G11, G23, O16.

1. Introduction

Exchange-traded funds (ETFs) have been one of the most rapidly growing categories of investment products on the major financial markets over the last several years (Lettau & Madhavan, 2018). Due to their innovative attributes they are able to compete with the more established investment products such as mutual funds or closed-end funds. Even though first ETFs were launched in the early 1990s, they have already accumulated substantial assets – in the mid-2018 their total global value reached almost \$5 trillion, managed by more than 11 thousand funds (ETFGI, 2018).

Another important process in the global investment industry is the rising popularity of various forms of sustainable investing (Przychodzen, Gómez-Bezares, Przychodzen, & Larreina, 2016) – this initially niche market has emerged to become a mainstream part of the asset management industry (Utz & Wimmer, 2014). It is evidenced not only by the increasing assets allocated worldwide (as of early 2016 they exceeded \$22 trillion (Global Sustainable Investment Alliance, 2017)), but also by the burgeoning number of studies devoted to various aspects of sustainable investing.

The key aim of this paper is to examine the diffusion of the sustainable investing ETFs (environmental, social and governance (ESG) ETFs) on the European and US ETFs markets. In particular, the purpose of the study is to evaluate the changes in the market shares of sustainable investing versus conventional ETFs in Europe and the United States and to identify the differences between the two regions. Diffusion in the context of this study is understood as increasing inclination of investors towards the socially responsible products, i.e. diffusion of this specific investment style. In other words, one of the crucial purposes of the analysis is to check if the growth of the sustainable investing ETFs in terms of their aggregate assets in the analysed regions has been accompanied by their growing market share. Diffusion of ETFs, considered as specific financial products, is not evaluated as it was examined in the previous studies, including Marszk & Lechman (2018) who analysed a number of ETFs markets, including the ones in Europe and the United States.



In order to reach the stated aims, a model of diffusion of innovation is used – it is the first study to analyse the sustainable investing of financial products by employing the diffusion of innovation framework. Such an approach is substantiated by the novel attributes of ESG ETFs (when compared to conventional funds) that facilitate their analysis as a subset of financial innovations – applicability of the innovation-based methods in this context has been proven in the previous studies, including Hull (2016). The time period of the analysis is 2006-2017 and time series on the assets of ETFs in Europe and the United States are used.

The remainder of this paper is organised as follows. In the next section, main attributes of ESG ETFs are discussed, followed by the review of the previous studies on the analysed topic. After that the research method and data used are presented. In the next section, the results of the analysis are reported and the main findings are discussed in the subsequent section. The last section concludes the paper.

2. Theoretical background and literature review

Exchange-traded funds can be most briefly defined as, referring to the explanation suggested by Hill, Nadig, & Hougan (2015, p. 2), as hybrid investment products that combine the investment features of mutual funds with the trading features of the stocks. Due to similar investment aims and range of users, ETFs may be considered as an alternative to the leading category of investment funds – mutual funds. ETFs differ in several aspects from these traditional, well-established and broadly recognised investment products (Abner, 2016; Agapova, 2011; Gastineau, 2010; Hill et al., 2015). Their units are listed and traded through stock exchanges or similar trading facilities (with the market-determined prices), the structure of the ETFs market is dual (it consists of primary and secondary segment), transparency of the investment portfolios is high, and investors have access to derivatives linked to the units of ETFs.

ETFs with the sustainable investing profile may be still considered a nascent part of the aggregate ETFs market (Meziani, 2016). However, it has already become quite diversified and includes various categories of ETFs. In terms of the specific sustainable investing theme, most ESG ETFs focus on the technology sector. More generally, as of 2017, the most popular investment themes of the ESG ETFs were (Levitt, 2017): climate change and renewable energy, gender diversity, driverless cars and electric vehicles, digital security, and organic food.



In a broader perspective, ESG ETFs should be perceived in the context of the sustainable investing. One of the broadest yet highly informative definitions of sustainable investing was suggested by Schoenmaker (2018, p. 2) who defined sustainable investment as “long-term investment approach, which integrates ESG factors into the research, analysis and selection process of securities within an investment portfolio”. Krosinsky (2017) lists seven categories of sustainable investing (also known as ‘impact investing’): values first (negative screens on certain sectors), value first (using ESG as one of the main portfolio’s selection criteria), community/impact (investing aimed at achieving positive societal and environmental impact), thematic investing (focused on environmental issues), ESG integration (using ESG data gathered from various sources as part of the financial analysis), engagement/advocacy (shareholder engagement), and norm-based screening (usually applying some category of international principles that must be met by the potential investments). Another distinction was suggested by Derwall, Koedijk, & Ter Horst (2011) who distinguished between values-driven (using mostly negative screens) and profit-driven (using mostly positive screens) socially responsible investors.

Even though sustainable investing is more demanding than the conventional approach as it requires analysis of additional non-financial dimensions of the considered assets (Przychodzen et al., 2016), it may regardless be beneficial for the overall investor’s financial performance. There are a number of financial motives for incorporating ESG issues into the investment decisions – they can be divided into three categories (Swiss Sustainable Finance, 2017): economic performance of companies, their cost of capital, and performance of the traded equities of companies. Two former aspects are related to the shareholder value creation. An overview of the empirical studies devoted to this topic presented in the seminal paper by Margolis & Walsh (2003) showed that the results of the analysis of the effects of ESG factors on the economic performance of companies are inconclusive. However, a more recent overview of more than 2200 empirical and review studies conducted by Friede, Busch, & Bassen (2015) demonstrated that their results mostly confirm the positive relationship between ESG criteria and financial performance of corporations. Similar ambiguity refers to the strongly linked issue of the returns that can be gained on various types of securities – no finite conclusion can be drawn from a myriad of studies in this field. For example, Derwall et al. (2011) concluded that short run abnormal returns of SRI equities do not persist in the long run. Halbritter & Dorfleitner (2015) demonstrated that investors cannot obtain abnormal returns by creating portfolios focusing on the differences between companies with low and high

ESG ratings. Meta-analysis of almost 300 studies and experiments performed by Revelli & Viviani (2015) proved that taking into consideration ESG factors in the management of stock portfolio leads to neither higher nor lower returns than is the case for conventional approaches. Auer & Schuhmacher (2016) analysed the performance of ESG versus socially irresponsible investing in the three regions and demonstrated that neither category of investments offers abnormal returns in relation to the passive investments; nevertheless, in Asia-Pacific and the United States the performance of sustainable investments is similar to that of broad stock market whereas in Europe some types of ESG investments tend to underperform, which means that European investors bear additional costs of such choice. Apart the aforementioned effects, adhering to the ESG principles can result in lower volatility, both in terms of the company's financial profitability (Djoutsa Wamba, Braune, & Hikkerova, 2018) and stock returns (Sahut & Pasquini-Descomps, 2015).

The number of studies specifically devoted to the financial performance of ESG ETFs is limited, mostly because of their short presence in the financial industry. Alexopoulos (2018) compared the performance of clean and conventional energy ETF funds and stated that the portfolio with both categories included yields the best results. Chen & Scholtens (2018) adopted a broader perspective and compared the performance of US ESG active and passive investment funds (with ETFs in the second group), demonstrating no sufficient evidence for the abnormal returns of active funds.

The significance of the ESG ETFs is not limited to the investment industry and should be framed in a broader context of the economic and social consequences of sustainable investing (investments). Above all, it may be perceived as a contribution to the process of sustainable development. There are many channels of potential impact (for an in-depth outline see Weber (2014)). Busch, Bauer, & Orlitzky (2016) claim that integration of ESG criteria in the investment decisions may result in business practices being more ecologically and socially sustainable, leading to self-sustaining human-social and ecological systems in the long term; the financial dimension is necessary as it can contribute to efficient allocation of resources. Furthermore, decisions made by investors may create barriers for some companies that are socially irresponsible through the effects on the company's cost of capital, resulting from pressure of various institutions, in some extreme cases leading to withdrawal from stock markets (Waygood, 2008). However, as stressed by Narula (2012), the positive economic and social impact of sustainable investing is dependent upon the regulatory framework and public policy actions that take into account ESG standards (their discussion with regard to the European and US economies lies



outside the scope of this paper). Finally, it needs to be stressed that the changes in the popularity of sustainable investing and its economy-broad effects reflect a variety of factors, including behavioural aspects (as shown by Paetzold & Busch (2014) investors tend to refrain from sustainable investing due to (mostly incorrect) perception of their unfavourable financial results; crucial role is played by the communication with investment advisors (Paetzold, Busch, & Chesney, 2015)) or socialisation of the markets (Moon, 2007). According to Trudel (2019), other important behavioural issues include: cognitive barriers to sustainable behaviour, consistency with self-identity (e.g. self-signalling), social norms and influences, and expected benefits.

Structure of the US and European ETFs markets was rarely analysed in the previous research, in particular with regard to the position of ESG ETFs. The most notable exception is the report by Bioy & Lamont (2018) who analysed the global markets for passive sustainable investing funds, providing detailed data on its size and structure. Crigger (2018) analysed the growth of the ESG ETFs in the United States. Hale (2018) examined the aggregate US market for sustainable investment funds, including ETFs. However, the publications mentioned in this paragraph are above all market reports and industry analyses and as such they did not deal directly with the issues examined in this study, including the diffusion of funds.

3. Research methodology

The analysis is conducted by applying the innovation diffusion model in order to examine the diffusion of the sustainable ETFs, considered as their share in the total net assets (henceforth, assets) of ETFs. This part of the paper is of the utmost importance as the diffusion of ESG ETFs has not been addressed in any of the previous studies. As the aggregate ETFs markets in the analysed regions have developed rapidly, it must be verified whether the development of the ESG ETFs has in fact represented increasing propensity of investors towards sustainable investing.

The concept of evolutionary dynamics is the backbone of the innovation diffusion framework (Dosi & Nelson, 1994; Mansfield, 1961). Its core element is a logistic growth function that can be expressed using the following ordinary differential equation (Meyer, Yung, & Ausubel, 1999):

$$\frac{dY_x(t)}{dt} = \alpha Y_x(t) \quad (1)$$

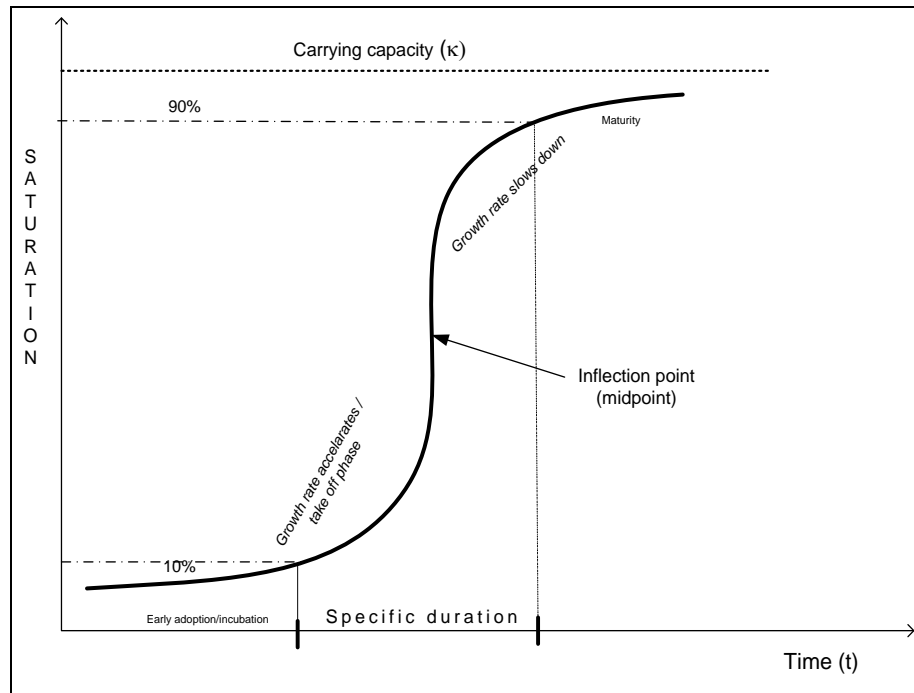
where $Y_x(t)$ denotes the level of variable x , (t) is time, and α is a constant growth rate. Eq. (1) represents the time path of the variable x .

Expansion of certain types of innovations (e.g. investment styles as in the current analysis) may not be expected to be infinite (Meyer, 1994). In order to address this issue, a 'resistance' parameter is added to the simple growth model (Kwasnicki, 2013). Consequently, an upper 'limit' is introduced, thus making the growth curve sigmoid (the S-shaped trajectory in Figure 1). It means that there are three characteristic stages: logistic growth stage, exponential growth stage, and, finally, saturation stage. The modified version of Eq. (1) is thus a logistic (rather than ordinary) differential function:

$$\frac{dY_x(t)}{dt} = \alpha Y_x(t) \left(1 - \frac{Y_x(t)}{\kappa}\right) \quad (2)$$

where κ stands for the imposed upper asymptote that limits the growth.

Figure 1. Theoretical specification of the S-shaped diffusion trajectory.



Source: Lechman (2015).

The 3-parameter logistic differential equation, Eq. (2), may be re-written as a logistic growth function that takes only non-negative values throughout its path:

$$N_x(t) = \frac{\kappa}{1 + \exp(-\alpha(t-\beta))} \quad (3)$$

where $N_x(t)$ denotes the value of variable x in time period t .

Interpretation of the parameters of Eq. (3) is the crucial aspect of the analysis of innovation diffusion:

- κ is the upper asymptote – it represents the limit of growth; in case of some innovations it can be assumed that they may reach market share of 100% (i.e. full saturation) – in such cases logistic substitution models (LSM) are the more appropriate approach to the analysis; however, in the other cases (such as ESG ETFs discussed in this paper) the limit of growth must be estimated as it would be too far-reaching to claim that ESG ETFs can become the only category of ETFs (in particular taking into account the still very low market share of sustainable ETFs in the two examined regions);
- α is the growth rate – it represents the speed of diffusion;
- β is the midpoint – it represents the exact time when the logistic pattern reaches half of the ceiling's level.

Δt is an additional parameter, calculated in order to facilitate the interpretation. It is labelled as 'specific duration', defined as $\Delta t = \frac{\ln(81)}{\alpha}$. By using specific

duration, it is possible to estimate the approximate time needed for x to grow from 10% κ to 90% κ .

The parameters of the logistic growth model can be estimated using various methods. The nonlinear least squares (NLS) method was chosen due to its relative advantages. Satoh (2001) suggests that it returns the relatively most robust predictions, as the estimates of standard errors of the crucial parameters are more valid than in case of the other approaches.

Sustainable investing ETFs are assumed to be a category of financial innovations due to the features they provide to the investors (in relation to the conventional ETFs). It was assumed that the growing share of sustainable ETFs in the total ETFs market represents their diffusion – consequently, the key parameters of the logistic growth model were estimated: κ_i^{SETF} , β_i^{SETF} , α_i^{SETF} , and Δt_i^{SETF} , (notations as already explained, 'SETF' stands for the share of sustainable ETFs and i for the region (Europe or USA)).

The research sample used in this study covers 61 ESG ETFs listed in the United States and 49 in Europe – however, at any particular moment the actual number of ETFs was lower as some of them were available only during a certain part of the analysed time period. Data on the assets of ETFs are used – monthly



observations were extracted from the Lipper's database provided by Thomson Reuters. The period of the analysis, March 2006 – September 2017, is subject to data availability and is limited above all by the rather short history of the ESG segment in both regions. In case of the US market, the data on the assets of ESG ETFs could be acquired for the period starting from December 2004, yet in order to ensure consistency the data prior to March 2006 (approximate beginning of the European ESG ETFs market) are not considered; the share of ESG ETFs was, however, extremely low in that period. The study focuses exclusively on the US and European ESG ETFs as in other regions (e.g. Asia-Pacific) this segment of the ETFs market remains substantially underdeveloped (Bioy & Lamont, 2018).

4. Research results

According to the Lipper's database, first sustainable investing ETFs were launched in the late 2004 in the United States and in the early 2006 in case of Europe. Initially, in both regions their assets were very low – at the end of 2006 (first year when they were available in both regions) they reached merely \$2.2 billion in the United States and \$30.5 million in Europe. Even though not only the initial, but also the average values of the assets of ESG ETFs were higher for the US market (the mean end-of-the-month assets were at c. \$3.6 billion in comparison to \$1.4 billion for Europe), by the end of 2017 European ESG ETFs surpassed its US counterparts in terms of total assets.

The examination of the shares of ESG ETFs in the aggregate ETFs markets in the two regions shows that they were minimal at the beginning of the analysed time period in both regions (mostly due to a very low number of available products). At the end of 2006, the respective values were 0.53% for the US and 0.04% for the European market. Average market shares taking into account the entire analysed time period were, though, similar: 0.39% in case of the United States and 0.34% in case of Europe. In the final years, the relative size of the sustainable investing ETFs sector became much bigger in Europe – in 2017 the mean share in this region was at c. 0.79%, contrasted with 0.20% in the United States.

The examination of the diffusion patterns (Figures 2 and 3) shows that the development paths of the ESG ETFs in the two discussed regions differed considerably. In the United States, the rapid growth occurred up to 2008, when the maximum share of c. 1.1% was reached – it was the highest share observed for the entire sample. However, since 2008 the position of the ESG ETFs was

deteriorating, with no signs of rebound – the overall trend has thus been clearly downward. For Europe the diffusion path indicates that ESG ETFs were still in the rapid expansion stage, with the maximum levels in the final months.

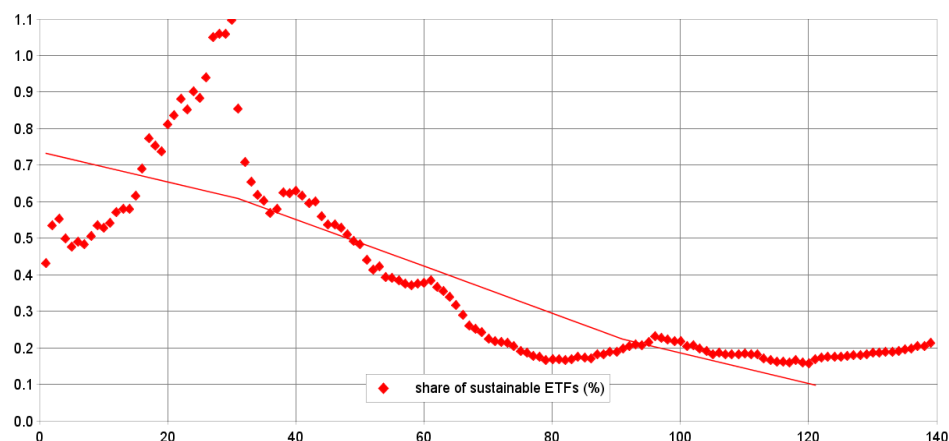
The estimates of the diffusion models (Table 1) show that using the diffusion model for the analysis of the ESG ETFs in the United States is problematic and may lead to dubious conclusions (proven by low R^2 of the model). What is important, is the negative values of α_{USA}^{SETF} and Δt_{USA}^{SETF} which indicate that ESG ETFs were losing their market share in the aggregate ETFs industry when the entire 2006-2017 time period is taken into account (Figure 2). The subperiod of the quick expansion (2006-2008) should thus be regarded as transitory and the maximum levels reached in 2007 and 2008 may be considered to be unattainable in the further years. The mean share since 2012 onwards was comparable to the early 2006, i.e. the nascent stage of both the aggregate US ETFs market and its ESG subsegment. To sum up, in case of the United States both graphical evidence and results obtained using the diffusion model suggest that diffusion of ESG ETFs was very limited.

Table 1. Estimates of the diffusion models of sustainable investing ETFs

Specification	USA	Europe
κ_i^{SETF} (ceiling/upper asymptote)	0.83	720 492.19
β_i^{SETF} (midpoint)	61	1076
α_i^{SETF} (rate of diffusion)	-0.034	0.015
Δt_i^{SETF} (specific duration)	-131	300
R^2 of the model	0.36	0.847
# of obs.	139	139

Note: Misspecifications in italics.

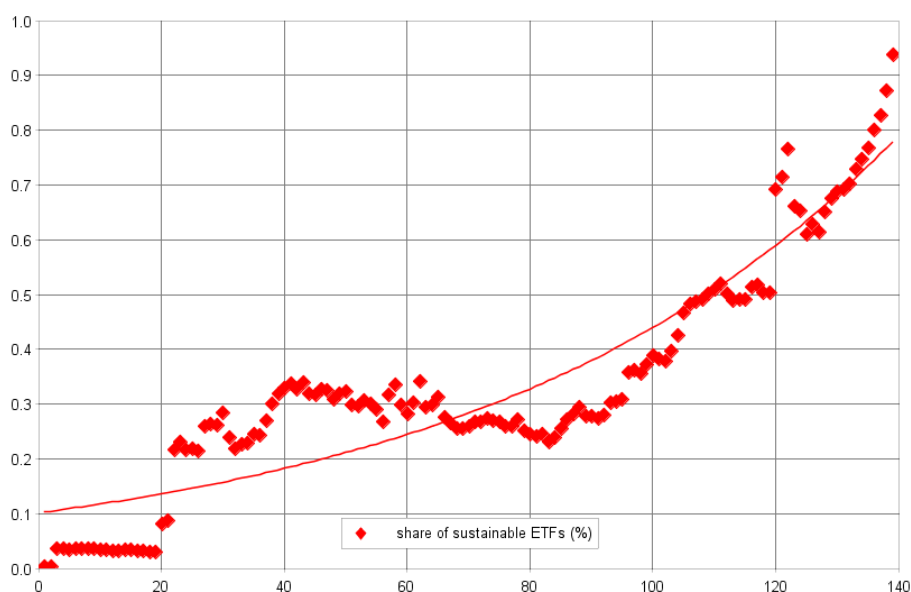
Figure 2. Diffusion pattern of sustainable investing ETFs in the United States



Note: Solid line represents theoretical line. Month no. 1 = March 2006, month no. 139 = September 2017.

For Europe the estimates are dramatically different. Due to their extremely high values, both $\kappa_{\text{Eur}}^{\text{SETF}}$ and $\beta_{\text{Eur}}^{\text{SETF}}$ are clear misspecifications yet they are also the evidence for ongoing diffusion of the European ESG ETFs whose limit cannot be determined reliably (as they are still in the second stage of diffusion – Figure 3). Estimates of $\alpha_{\text{Eur}}^{\text{SETF}}$ and $\Delta t_{\text{Eur}}^{\text{SETF}}$ confirm that the diffusion of ESG ETFs took place – in contrast with the estimates obtained for the US market they are both positive. Moreover, it should be stressed that these results are much more robust than in case of the model estimated for the US market, thus implying that diffusion model is a better tool for the analysis of the European sustainable investing ETFs.

Figure 3. Diffusion pattern of sustainable investing ETFs in Europe



Note: Solid line represents theoretical line. Month no. 1 = March, 2006, month no. 139 = September, 2017.

5. Discussion

The findings discussed in the preceding section show that main target of the study was achieved as the diffusion processes of ESG ETFs in Europe and the United States were examined and the differences between the two regions were identified. What is even more important, switching between sustainable investing and conventional ETFs was confirmed in case of the European ETFs market, based on the increasing market shares of ESG ETFs. It was thus proven that development of the ESG ETFs in this region was driven not only by the growth of the overall ETFs market but also by the increasing preference of investors towards the socially responsible products. Opposite conclusions can be drawn for the US ETFs market for which lack of such a process was convincingly proven. What is also important, in both regions, the share of ESG ETFs declined subsequent to the 2008 global financial crisis. However, in case of the US market this decrease marked the beginning of the continuing decline phase whereas in case of Europe the trajectory of changes was substantially different. Between 2009 and 2013 the share of ESG ETFs was rather constant,



indicating that even among the turmoil caused by the eurozone debt crisis European investors did not resign from sustainable investment funds. After 2013, their assets were increasing much faster than the assets of conventional ETFs. In the United States there was no rebound of ESG ETFs, even during the strong increases of the stock prices in the final years of the examined time period. It indicates that US ESG ETFs were mostly unaffected by the general trends on the US financial markets.

As mentioned in the literature review, there is scarce prior research on the issues analysed in this paper. Even though the literature on sustainable investing has been burgeoning in the recent years, vast majority of the previous studies focused exclusively on the financial performance of ESG investment products. Different focus is attached to this study as it considers ESG ETFs in a broader context of their position on the markets for innovative investment funds. It means that in fact the implications of the previous studies on, for instance, performance of ESG ETFs, are examined in this analysis as they influence the assets of these funds and their position on the ETFs markets.

Findings of this study confirm the basic conclusions of Bioy & Lamont (2018) who observed that participants of the US ETFs market were relatively less willing to invest into ESG funds than their European counterparts. They explain it by referring to the perception of their unfavourable financial performance in comparison to the conventional funds. However, such fears seem to be exaggerated as there is extensive evidence that contradicts the trade-offs between financial and ESG aims, including the studies conducted for the US market. For example, Hale (2017) provided evidence for the superior performance of the US sustainable investing ETFs; the conclusions concerning outperformance or comparable results of ESG and conventional investments were reached in a number of studies, including Alexopoulos (2018) or Leite & Cortez (2018); studies with opposing conclusions are less common (examples include Schmitz (2017)). Moreover, the US investors on the ETFs market are apparently not driven primarily by the ESG concerns thus confirming the conclusions of Nofsiger, Sulaeman, & Varma (2016) who studied institutional investors. According to Schoenmaker (2018), sustainable investing at large is less prevalent in the United States, which explains the lower share of ESG assets; this conclusion is based on the assumed more pronounced materialism of the US society, in line with the findings of Yan, Ferraro, & Almandoz (2019). Lack of switching to ESG funds in the United States stemming from financial motives was also demonstrated by Borgers, Derwall, Koedijk, & Horst (2015) who showed that (depending on the classification of socially sensitive investments) controversial stocks offer positive financial payoff, yet some



mutual funds still decide to focus on ESG assets in order to meet the demand from their socially conscious clients – it means that demand factors play the most crucial role in case of the ESG mutual funds; similar can be hypothesised for the ETFs market.

More pronounced diffusion of ESG ETFs in Europe can also be perceived in the context of the policy actions undertaken in the European Union in order to promote various forms of sustainable investing, including the European Commission's action plan entitled 'Financing Sustainable Growth' targeted at boosting long-term and sustainable investment (Schoenmaker, 2018); other examples include various efforts undertaken by the European Sustainable Investment Forum (Eurosif, 2018). On the contrary, in the United States the scope and significance of such actions is much more limited. To conclude, it can be stated that in case of the European ESG ETFs market its development is boosted by both demand and supply factors (the latter linked to the various initiatives that promote sustainable investing).

6. Conclusions

The results of the study can be summarised in the following two key conclusions. First, exclusively for Europe, the diffusion of ESG ETFs was confirmed with regard to their shares in the aggregate ETFs market, implying that switching between ESG and conventional products took place. Second, for the United States, diffusion of ESG ETFs was short-lived and unsustainable. The results of this study can be important for both academics and professionals with the interest in the ETFs markets as they confirm the increasing prominence of the sustainable investing subcategory of the innovative funds.

This study contributes in a few ways to the current intensive discussion on the sustainable investing. It is the first study to apply the methodological framework of innovation diffusion for the examination of the financial products within the sustainable investing category. By using this research method, an important issue of switching between sustainable investing and conventional financial products can be addressed, impossible to examine with the basic descriptive statistics. Finally, no previous studies covered the entire group of both the European and US ESG ETFs and there was no analysis conducted at the market-broad level for the basic indicators of its development – total net assets.

The research method applied in this study has a few limitations. The analysis is based on the logistic growth model that assumes S-shaped trajectory of the diffusion of innovation. While this assumption is true for the majority of



innovations in the economic system (Lechman, 2015), it may be inconsistent with the attributes of the financial innovations. This study has not addressed (with the exception of some suppositions based on the previous research) the factors that influence the diffusion processes in the two regions. Therefore, future research could focus on the analysis of the determinants of the diffusion of ESG ETFs in various regions or countries.

Acknowledgements

The paper is the result of scientific project no. 2015/19/D/HS4/00399 financed by the National Science Centre of Poland. The author is supported by the Foundation for Polish Science (FNP).

References

- Abner, D. (2016). *The ETF handbook. How to value and trade exchange-traded funds* (2nd ed.). Hoboken, New Jersey: John Wiley & Sons. <http://doi.org/10.1002/9781119297727>
- Agapova, A. (2011). Conventional mutual index funds versus exchange-traded funds. *Journal of Financial Markets*, 14(2). <http://doi.org/10.1016/j.finmar.2010.10.005>
- Alexopoulos, T. A. (2018). To trust or not to trust? A comparative study of conventional and clean energy exchange-traded funds. *Energy Economics*, 72, 97-107. <http://doi.org/10.1016/j.eneco.2018.03.013>
- Auer, B. R., & Schuhmacher, F. (2016). Do socially (ir)responsible investments pay? New evidence from international ESG data. *The Quarterly Review of Economics and Finance*, 59, 51-62. <http://doi.org/10.1016/j.qref.2015.07.002>
- Bioy, H., & Lamont, K. (2018, May). Passive sustainable funds. *Morningstar Manager Research*, 1-33. Retrieved from <https://alphaarchitect.com/2019/06/10/passive-sustainable-funds/>
- Borgers, A., Derwall, J., Koedijk, K., & Horst, J. (2015). Do social factors influence investment behavior and performance? Evidence from mutual fund holdings. *Journal of Banking & Finance*, 60, 112-126. <http://doi.org/10.1016/j.jbankfin.2015.07.001>
- Busch, T., Bauer, R., & Orlitzky, M. (2016). Sustainable development and financial markets: Old paths and new avenues. *Business & Society*, 55(3), 303-329. <http://doi.org/10.1177/0007650315570701>
- Chen, X., & Scholtens, B. (2018). The urge to act: A comparison of active and passive socially responsible investment funds in the United States. *Corporate Social Responsibility and Environmental Management*, 25(6). <http://doi.org/10.1002/csr.1529>



- Crigger, L. (2018, March). Where are the ESG flows? *ETF Report*, 6-8.
- Derwall, J., Koedijk, K., & Ter Horst, J. (2011). A tale of values-driven and profit-seeking social investors. *Journal of Banking & Finance*, 35(8), 2137-2147. <http://doi.org/10.1016/j.jbankfin.2011.01.009>
- Djoutsa Wamba, L., Braune, E., & Hikkerova, L. (2018). Does shareholder-oriented corporate governance reduce firm risk? Evidence from listed European companies. *Journal of Applied Accounting Research*, 19(2), 295-311. <http://doi.org/10.1108/JAAR-02-2017-0033>
- Dosi, G., & Nelson, R. R. (1994). An introduction to evolutionary theories in economics. *Journal of Evolutionary Economics*, 4(3), 153-172. <http://doi.org/10.1007/BF01236366>
- ETFGI. (2018). *Global ETF and ETP industry insights – June 2018*. Retrieved from <https://etfgi.com/research/report/19277/global-etf-and-etp-industry-insights-june-2018>
- Eurosif (2018). *European SRI Study 2018*. Retrieved from <http://www.eurosif.org/wp-content/uploads/2018/11/European-SRI-2018-Study-LR.pdf>
- Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2000 empirical studies. *Journal of Sustainable Finance & Investment*, 5(4), 210-233. <http://doi.org/10.1080/20430795.2015.1118917>
- Gastineau, G. L. (2010). *The exchange-traded funds manual*. Hoboken, New Jersey: John Wiley & Sons.
- Global Sustainable Investment Alliance. (2017). *2016 Global Sustainable Review*. Retrieved from http://www.gsi-alliance.org/wp-content/uploads/2017/03/GSIR_Review2016.F.pdf
- Halbritter, G., & Dorfleitner, G. (2015). The wages of social responsibility – where are they? A critical review of ESG investing. *Review of Financial Economics*, 26, 25-35. <http://doi.org/10.1016/j.rfe.2015.03.004>
- Hale, J. (2017). *Sustainable Funds Start to Perform*. Morningstar Research & Insights. Retrieved from <http://www.morningstar.co.uk>
- Hale, J. (2018, January). Sustainable funds U.S. landscape report. *Morningstar Research*, 1-48. Retrieved from https://cdn.ymaws.com/dciia.org/resource/collection/8606CD14-06A5-4277-9507-C397C1C8DEA0/Sustainable_Funds_Landscape_013018.pdf
- Hill, J. M., Nadig, D., & Hougan, M. (2015). *A comprehensive guide to exchange-traded funds (ETFs)*. Charlottesville, VA: CFA Institute Research Foundation.
- Hull, I. (2016). The development and spread of financial innovations. *Quantitative Economics*, 7, 613-636. <http://doi.org/10.3982/QE521>
- Krosinsky, C. (2017). The seven tribes of sustainable investing. In C. Krosinsky & S. Purdom, *Sustainable investing* (pp. 29-32). London: Routledge. <http://doi.org/10.4324/9781315558837>

- Kwasnicki, W. (2013). Logistic growth of the global economy and competitiveness of nations. *Technological Forecasting and Social Change*, 80(1), 50-76. <http://doi.org/10.1016/j.techfore.2012.07.007>
- Lechman, E. (2015). *ICT diffusion in developing countries. Towards a new concept of technological takeoff*. Switzerland: Springer International Publishing. <http://doi.org/10.1007/978-3-319-18254-4>
- Leite, P., & Cortez, M. C. (2018). The performance of European SRI funds investing in bonds and their comparison to conventional funds. *Investment Analysts Journal*, 47(1), 65-79. <http://doi.org/10.1080/10293523.2017.1414911>
- Lettau, M., & Madhavan, A. (2018). Exchange-traded funds 101 for economists. *Journal of Economic Perspectives*, 32(1), 135-154. <http://doi.org/10.1257/jep.32.1.135>
- Levitt, A. (2017). *Five sustainable investing trends in 2017*. Retrieved from <http://etfdb.com/etf-education/5-sustainable-investing-trends-2017/>
- Mansfield, E. (1961). Technical change and the rate of imitation. *Econometrica: Journal of the Econometric Society*, 29(4), 741-766. <http://doi.org/10.2307/1911817>
- Margolis, J. D., & Walsh, J. P. (2003). Misery loves companies: Rethinking social initiatives by business. *Administrative Science Quarterly*, 48(2), 268-305. <http://doi.org/10.2307/3556659>
- Marszk, A., & Lechman, E. (2018). New technologies and diffusion of innovative financial products: Evidence on exchange-traded funds in selected emerging and developed economies. *Journal of Macroeconomics*, in press. <http://doi.org/10.1016/j.jmacro.2018.10.001>
- Meyer, P. (1994). Bi-logistic growth. *Technological Forecasting and Social Change*, 47(1), 89-102. [http://doi.org/10.1016/0040-1625\(94\)90042-6](http://doi.org/10.1016/0040-1625(94)90042-6)
- Meyer, P. S., Yung, J. W., & Ausubel, J. H. (1999). A primer on logistic growth and substitution: The mathematics of the Loglet Lab software. *Technological Forecasting and Social Change*, 61(3), 247-271. [http://doi.org/10.1016/S0040-1625\(99\)00021-9](http://doi.org/10.1016/S0040-1625(99)00021-9)
- Meziani, A. S. (2016). *Exchange-traded funds. Investment practices and tactical approaches*. London: Palgrave Macmillan. <http://doi.org/10.1057/978-1-137-39095-0>
- Moon, J. (2007). The contribution of corporate social responsibility to sustainable development. *Sustainable Development*, 15(5), 296-306. <http://doi.org/10.1002/sd.346>
- Narula, K. (2012). 'Sustainable Investing' via the FDI route for sustainable development. *Procedia-Social and Behavioral Sciences*, 37, 15-30. <http://doi.org/10.1016/j.sbspro.2012.03.271>
- Nofsiger, J. R., Sulaeman, J., & Varma, A. (2016). *Institutional investors' socially responsible investments: It Just makes (economic) sense*. Retrieved from <http://www.fmaconferences.org/Vegas/Papers/InstiitutionalInvestorsSRI.pdf>
- Paetzold, F., & Busch, T. (2014). Unleashing the powerful few: Sustainable investing behaviour of wealthy private investors. *Organization & Environment*, 27(4), 347-367. <http://doi.org/10.1177/1086026614555991>

- Paetzold, F., Busch, T., & Chesney, M. (2015). More than money: Exploring the role of investment advisors for sustainable investing. *Annals in Social Responsibility*, 1(1), 195-223. <http://doi.org/10.1108/ASR-12-2014-0002>
- Przychodzen, J., Gómez-Bezares, F., Przychodzen, W., & Larreina, M. (2016). ESG issues among fund managers – factors and motives. *Sustainability*, 8(1078). <http://doi.org/10.3390/su8101078>
- Revelli, C., & Viviani, J. L. (2015). Financial performance of socially responsible investing (SRI): What have we learned? A meta-analysis. *Business Ethics: A European Review*, 24(2), 158-185. <http://doi.org/10.1111/beer.12076>
- Sahut, J. M., & Pasquini-Descomps, H. (2015). ESG impact on market performance of firms: International Evidence. *Management International/International Management/Gestión Internacional*, 19(2), 40-63. <http://doi.org/10.7202/1030386ar>
- Satoh, D. (2001). A discrete bass model and its parameter estimation. *Journal of the Operations Research Society of Japan*, 44(1), 1-18. <http://doi.org/10.15807/jorsj.44.1>
- Schmitz, A. (2017). *Why ETFs don't work for sustainable investors*. Retrieved from <https://seekingalpha.com/article/4112075-etfs-work-sustainable-investors>
- Schoenmaker, D. (2018). Sustainable investing: How to do it. *Bruegel Policy Contribution*, 2, 1-12. Retrieved from http://bruegel.org/wp-content/uploads/2018/11/PC-23_2018.pdf
- Swiss Sustainable Finance (2017). *Handbook on sustainable investment. Background information and practical examples for institutional asset owners*. Zurich: Swiss Sustainable Finance & CFA Society Switzerland. Retrieved from http://www.sustainablefinance.ch/upload/cms/user/201712_Handbook_on_Sustainable_Investments_CFA.pdf
- Trudel, R. (2019). Sustainable consumer behavior. *Consumer Psychology Review*, 2(1), 85-96. <http://doi.org/10.1002/arcp.1045>
- Utz, S., & Wimmer, M. (2014). Are they any good at all? A financial and ethical analysis of socially responsible mutual funds. *Journal of Asset Management*, 15(1), 72-82. <http://doi.org/10.1057/jam.2014.8>
- Waygood, S. (2008). Civil society and capital markets. In C. Krosinsky & N. Robins (Eds.), *Sustainable investing: The art of long-term performance* (pp. 177-188). Abingdon-on-Thames: Earthscan.
- Weber, O. (2014). The financial sector's impact on sustainable development. *Journal of Sustainable Finance & Investment*, 4(1), 1-8. <http://doi.org/10.1080/20430795.2014.887345>
- Yan, S., Ferraro, F., & Almandoz, J. (2019). The rise of socially responsible investment funds: The paradoxical role of the financial logic. *Administrative Science Quarterly*, 64(2). <http://doi.org/10.1177/0001839218773324>

