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Time-Series Momentum in a Small European Stock Market:
Evidence from a New Historical Financial Dataset

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Abstract*:* In this paper, we examine the Portuguese stock market for indication of time-series momentum effects using a new historical financial dataset that covers about 120 years of data. We find strong time-series momentum effects that cannot be explained by conventional risk factors. The positive return continuation seems to last for a period of 12 months, being heavily concentrated at the first month. At longer investment horizons, returns tend to mean-revert. The market exhibited significant time-series momentum for all look-back and holding periods of 12 months or less. A strategy with a 1-month look-back period and a 12-month holding period is shown to be the most profitable yielding a Sharpe ratio roughly 5.4 times that generated by a passive strategy. Time-series momentum strategies tend to perform best during extreme up-market periods and deliver the worst returns during down markets. This suggests that the strategy may not offer significant diversification benefits. Our findings add to the evidence that time-series momentum effects are not a product of data mining and are difficult to reconcile with the assertion that stock markets follow a random walk.

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1. INTRODUCTION

In the context of the Efficient Market Hypothesis (EMH) (Fama, 1965, 1970), stock prices are expected to fully and instantaneously reflect all available information. This means that none of the market participants should be able to systematically predict the evolution of financial prices. However, suggestive evidence that the returns of financial assets are, to some extent, predictable has been piling up during the last decades (Fama & French, 1989; Sarantis, 2001; Baker & Wurgler, 2007; Koijen & Van Nieuwerburgh, 2011) Momentum effects are one of the most notorious patterns of predictability. These effects in asset pricing can be found in cross-sectional and time-series data. In the traditional cross-sectional momentum proposed by Jegadeesh and Titman (1993), assets that outperformed their peers in the recent past tend to continue to do so for periods up to a year. In the last decades, extensive research has found supportive evidence of cross-sectional momentum profitability in international stock markets (Rouwenhorst, 1998; Griffin *et al.*, 2005; Asness *et al.*, 2013).

More recently, Moskowitz *et al.* (2012) introduced the notion of time-series momentum, describing a strong positive predictability of a security's own past returns. Specifically, a time-series momentum strategy involves buying a particular asset if it had positive returns in some prior period, and selling the asset if it had negative returns.

The importance of finding persistent momentum effects in financial markets is difficult to be overstated. Since these effects imply a return predictability based on past returns, the anomaly of momentum indicates that financial markets are not efficient even in the weak form. According to Fama and French (1996), momentum represents the main embarrassment to rational asset pricing models.

Time-series momentum has arisen a lot of interest in the literature, with most studies confirming the significance of the phenomenon (e.g., He & Li, 2015; Georgopoulou & Wang, 2017; Ham *et al.*, 2019). Despite this, fears persist that time-series momentum effects might be just the result of a data mining bias (Zakamulin, 2014). An effective way to dispel these concerns is to use datasets different from those researchers used to document the effects in the first place (Lakonishok & Smidt, 1988). The study of historical databases is part of this effort, having led to the conclusion that cross-sectional momentum existed in ages as remote as in the Russia of the Tsars or in Victorian England (Chabot *et al.*, 2008; Goetzmann & Huang, 2018). However, in spite of recent calls for the use of long-term series (Subrahmanyam, 2018), the examination of time-series momentum in historical datasets has been practically non-existent.

Our paper adds to this literature by examining for the first time the Portuguese stock market for indication of time-series momentum effects using a novel and still unexplored historical financial dataset that covers about 120 years of data. We analyse the price predictability of the market's own returns considering different look-back and holding periods. We also investigate if the time-series returns can be attributed to risk and compare the Sharpe ratios of the different strategies to that of a passive strategy for different sample periods. Finally, we scrutinize the cyclicality of the time-series momentum effects by analyzing the relationship between the returns generated by the strategy and the contemporaneous returns of the stock market.

We report strong time-series momentum effects that cannot be attributed to risk factors. The positive return continuation seems to last for a period of 12 months and it is heavily concentrated at the first month. At longer investment horizons, returns tend to revert to the

mean. Time-series momentum strategies tend to perform best during extreme up-market periods and generate the worst returns during down markets. Overall, our findings add to the evidence that time-series momentum effects are not a product of data mining and seem difficult to reconcile with the idea that stock markets follow a random walk.

The remainder of this paper is organized as follows. Section 2 reviews the related research. Section 3 describes the dataset used in our study and develops the methodology. Section 4 discusses our empirical findings. Section 5 discusses our findings and their implications. Section 6 presents the main findings, some limitations of the study, and suggestions for further research.

2. LITERATURE REVIEW

Moskowitz *et al.* (2012) were the first to introduce the concept of time-series momentum in the scientific literature. The authors showed for a large set of futures and forward contracts traded in the US from 1965 through 2009 that their recent returns, that is, returns observed in the past one to 12 months, were positive predictors of future returns. Moreover, the abnormal returns obtained by a time-series momentum strategy could not be explained by risk, which suggests the existence of a true market anomaly. Ham *et al.* (2019) corroborated these findings in China's commodity futures markets in the period 2016-2018. Moreover, they showed that a time-series momentum strategy with a 1-month look-back period and a 1-month holding period exhibited the best performance. Hurst *et al.* (2013) and Baltas and Kosowski (2020) document that time-series momentum strategies are so important that they are able to explain a significant part of the performance of futures and commodity trading advisors. However, in a recent study, Huang *et al.* (2020) cast some doubts on the results obtained by Moskowitz *et al.* (2012). They re-examined an expanded version of the dataset used by Moskowitz *et al.* (2012) to conclude that the signs of time-series momentum are weaker than initially reported, although a strategy based on that effect remains profitable.

Despite the recent interest in time-series momentum, existing studies applied to stock markets continue to be relatively scarce. He and Li (2015) provide evidence of persistent time-series momentum in the S&P500 over the period 1988-2012. In a follow-up study, He *et al.* (2018) show that this pattern of price continuation and reversal in the US stock market can yield significant abnormal profits. Cheema *et al.* (2018) report that time-series momentum strategies applied to the US stock market from 1946 through 2015 generate returns of 1.81% (3.19%) per month when the market trend is positive (negative). Georgopoulou and Wang (2017) document a robust and consistent time-series momentum effect in a set of forty-five equity indices, covering developed and emerging markets from 1969 to 2015. Returns tend to persist for the first 12 months, reverting over longer horizons. Shi and Zhou (2017) corroborate these results in the Chinese stock market, highlighting that the profitability of time-series momentum strategies seems to be related to firm-specific characteristics.

The profitability of time-series momentum strategies has been found to extend to individual stocks in developed markets (Szakmary & Lancaster, 2015; D'Souza *et al.*, 2016; Goyal & Jegadeesh, 2018; Lim *et al.*, 2018; Chakrabarti & Sen, 2020).

The importance of the phenomenon has been so widely recognized that time-series momentum has begun to be used as an independent risk factor. This is the case, for example, of Koijen *et al.* (2018) who analyzed the exposure of carry trade returns observed in several markets to the returns generated by time-series momentum strategies. Still, the role of

momentum as a distinct risk factor remains under dispute. For example, in a recent article, Ehsani and Linnainmaa (2022) argue that the effect simply results from autocorrelations in other factors.

On a related research, Wang et al. (2021) document that a comprehensive sample of stock market anomalies exhibits a strong time-series momentum.

Some studies highlight the relationship between time-series momentum and technical trading rules based on past returns. For example, K. J. Hong and Satchell (2015) argue that the popularity of moving average trading rules amongst stock market investors may be due to the existence of time-series momentum. In the same vein, Marshall et al. (2017) analyze ten international stock markets during the period 1973-2013 to reach the conclusion that time-series momentum and moving average trading rules are closely related.

More recently, the phenomenon has been researched in intraday prices. For example, Y. Li et al. (2020) examined the intraday time-series momentum in the Chinese stock index futures market finding that the first trading-session return positively predicts the last trading-session return. These results have been subsequently confirmed in commodity futures (Jin et al., 2020; Zhang et al., 2020), exchange-traded funds (Gao et al., 2018; Onishchenko et al., 2021), cryptocurrencies (Shen et al., 2022), and developed stock markets (Z. Li et al., 2022).

In a synthesis of the literature on equity market momentum, Subrahmanyam (2018) urges researchers to increase the power of their analysis by considering longer time series. In spite of this appeal, to the best of our knowledge, only Lim et al. (2018) and Zakamulin and Giner (2022) studied time-series momentum effects using a long-run financial database. Lim et al. (2018) examined all the individual stocks listed on the NYSE, NASDAQ, and AMEX from 1927 to 2017 in addition to stock data of 13 other European stock markets. They document that the effect is strong and is not specific to sub-periods, firm sizes, formation and holding periods, or geographical markets. The profits of the strategy tend to be more pronounced during (extreme) down markets.

In a recent article, Zakamulin and Giner (2022) examine the same effects on the S&P Composite stock price index using a historical dataset that covers the period 1857-2018 (162 years of data). They report compelling evidence of the presence of short-term time-series momentum. The authors also show that suggest another methodology to better investigate the topic, as they argue that because the autocorrelation in excess monthly returns tends to be very weak, the time-series momentum may not be captured by traditional estimation methods.

On a related note, it is worth mentioning that some recent studies such as those conducted by Chabot et al. (2008), Geczy and Samonov (2016), Hurst et al. (2017), Goetzmann and Huang (2018), and Trigilia and Wang (2019) have been using financial history databases to perform out-of-sample analyses and to backtest trading strategies based on cross-sectional momentum effects.

In the context of the Portuguese stock market, the phenomenon of time-series momentum has not been studied yet. However, there are some articles about the related cross-sectional momentum effects in this market. For instance, Soares and Serra (2005) analyzed the period 1988-2003 and found weak evidence in support of momentum effects. The authors attributed these effects to an insufficient reaction to earnings announcements surprises. Lobão and Lopes (2014) studied the same topic in a significantly larger sample, covering the period 1988-2012. The main result is that momentum strategies can generate significant positive returns over three to twelve months holding periods. Concerning the performance of momentum strategies in the long run, the results seem to support the underreaction hypothesis.

More recently, Lobão and Azeredo (2018) confirmed that the Portuguese stock market exhibited significant levels of momentum in the period 1988-2015, and that momentum strategies can be combined with value strategies to increase investors' profits.

Our paper adds to this limited body of evidence by examining the existence of time-series momentum in an understudied market using a novel and still unexplored historical financial dataset. Thus, the hypothesis being tested in our study is that there is time-series momentum (i.e., return continuation) in the Portuguese stock market.

3. DATA AND METHODOLOGY

3.1 Data

In this empirical study, we consider the Portuguese stock index and the risk-free interest rate for Portugal from January 1900 to December 2020. For the period 1900-2013, we used the database with weekly frequency created by Mata et al. (2017). This new dataset covers the period January 1900-1974 and 1978-2013 since the stock market in Portugal was closed for about three years following the Carnation Revolution in 25 April 1974. The main source of numerical data of Mata et al. (2017) is the collection of Daily Bulletins published by the Lisbon Stock Exchange for the period December 1899 – December 1987, available in the Documentation Centre of the Lisbon Exchange. The data provided by Mata et al. (2017), which refer to the evolution of the market as a whole, were converted to a monthly basis following the method proposed by Martinović et al. (2016). The data algorithmic conversion process suggested by Martinović et al. (2016) can be seen as a method of data compression. The method is based on the concept of "average data value" and is found to generate a negligible conversion error (i.e., loss of the original value). Subsequently, the database was completed with the values of the stock index PSI Geral for the period 2014-2020 obtained from Datastream, since "the time series from 1900 replicates as closely as possible the methodology of the PSI Geral index of the Lisbon stock exchange for the entire century" (Mata et al., 2017, p. 71). The PSI Geral is a market capitalization-weighted price index of the eligible companies listed on Euronext Lisbon. The index is based on the last trade prices of the stocks and the weights are based on the current market capitalization. To estimate the cross-asset time-series momentum alphas, the Fama-French risk factors referring to the Portuguese stock market are needed. Since there is no data available referring to the Portuguese market on Prof. Kenneth French's website, data on the European stock market for the period 1990-2020 obtained from the same source were used as a proxy. In addition, data on the Portuguese risk-free interest rate were also provided by Mata et al. (2017) for the period 1900-2013 and were completed with the Euro Overnight Index Average (EONIA) rate for the period 2014-2020, following the same criteria adopted by the authors.

Table no. 1 presents the descriptive statistics on the data used in this study.

It is worth noting that the monthly mean of returns was remarkably similar in the subperiods 1900-1974 and 1978-2020. However, the market has been more volatile in the subperiod 1978-2020. The measures of skewness and, especially, kurtosis are, in general, inconsistent with normality. In fact, all the return series show a positive skewness which indicates a longer right tail. They also exhibit excessive kurtosis, which means that their distributions are leptokurtic.

Table no. 1 – Descriptive statistics of the data

	1900-2020	1900-1974	1978-2020
Daily Mean	0.015%	0.013%	0.019%
Monthly Mean	0.535%	0.532%	0.538%
Daily St. Dev.	0.249%	0.166%	0.348%
Skewness	1.506	0.407	1.425
Kurtosis	24.747	3.315	16.231

The new database provides an interesting opportunity to compare the historical returns of the Portuguese stock market with those of some of the most important world markets. Thus, we collected the historical returns for the national stock markets of the US, the UK, Germany, and France using the Asset Allocation Database of Global Financial Data. The Asset Allocation Database includes historical return indices for stocks of 50 countries.

Figure no. 1 depicts the mean annual returns of the stock markets of those markets in different historical periods.
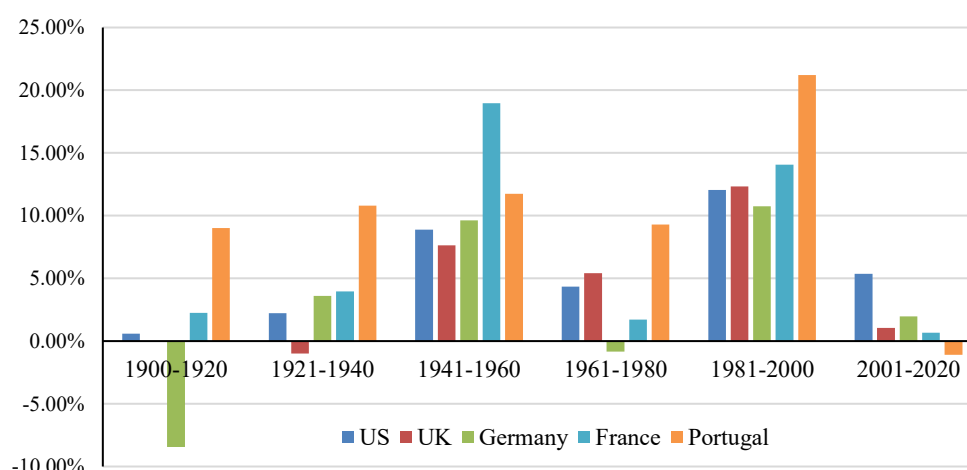
Figure no. 1 – Mean annual returns of the national stock markets of the US, the UK, Germany, France, and Portugal in several historical periods[1]

In the period 1900-1920, the Portuguese stock market had a mean annual return higher than the markets of the US, Germany, and France. It is not possible to make a comparison with the UK market, as we only have data for this market from the year 1933 onwards. It is worth noting the significant negative mean return on the German market in this period, marked by the political and economic turmoil that followed the First World War (1914-1918).

In the periods 1921-1940 and 1941-1960, the Portuguese market exhibited a mean annual return of almost 11%. The annual returns for all markets increased in the period 1941-1960 in comparison to the previous period. This performance can be associated with the events that characterized the world financial history in these two eras: the period 1921-1940 witnessed the Great Depression, whereas the period 1941-1960 includes the post-Second World War reconstruction of Europe and the positive effects of the Marshall Plan.

The mean return of the Portuguese stock market was the highest among all the markets under analysis in the period 1961-1980. In this period, an investor in the Portuguese stock market

could have obtained a mean annual return close to 10%. The development of the Portuguese capital markets throughout the 1980s and the country's entry into the European Union in 1986 attracted large flows of capital that boosted the gains of the national stock market. As a result, the returns on this market once again exceeded those of the other markets in the period 1981-2000. The mean returns of all markets suffered a sharp decrease in the most recent period (2001-2020) with an emphasis on the negative mean return of the Portuguese stock market. The poor performance of this market has been attributed to the stagnation of the country's GDP in the period after the accession to the euro area. Moreover, the stock market was severely impacted by the Global Financial Crisis and the economic crisis associated with the COVID-19 pandemic (Blanchard, 2007; Baer *et al.*, 2013; Mata *et al.*, 2017; Phan & Narayan, 2020).

3.2. Methodology

Following Moskowitz *et al.* (2012) and Ham *et al.* (2019), we begin our empirical analysis by examining the time-series predictability of the market. We scale the returns to control for potential heteroskedasticity caused by different levels of volatility. The objective is that the performance of the strategy is not overly influenced by periods of heightened risk. The ex-ante annualized variance is calculated as the sum of exponentially weighted squared returns:

$$\sigma_t^2 = 12 \sum_{i=0}^{\infty} (1 - \delta)\delta^i \left(r_{t-1-i} - \bar{r}_t \right)^2 \qquad (1)$$

In Moskowitz *et al.* (2012) and Ham *et al.* (2019), the parameter δ is chosen so that the mass center of the variance is equal to 60 days ($\delta/(1 - \delta) = 60$) since the authors consider daily returns in their analyses. Because we will be operating with monthly returns, we selected a mass center of 2 months ($\delta/(1 - \delta) = 2$) instead. The average monthly return ($\bar{r}_t$) is calculated as the exponentially weighted average, applying the same weights. We scale all the returns by dividing them by their ex-ante volatility.

In order to detect price continuation patterns across different time horizons, we then perform a pooled panel regression, with lags of $h = 1, 2, \ldots, 60$ months, as follows:

$$\frac{r_t}{\sigma_{t-1}} = \alpha + \beta_h \left(\frac{r_{t-h}}{\sigma_{t-h-1}} \right) + \varepsilon_t \qquad (2)$$

where r_t and σ_{t-1} are respectively the excess return in month t and ex-ante volatility, and r_{t-h} and σ_{t-h-1} are respectively the excess return in month t and the ex-ante volatility lagged h months. The excess return in month t is calculated as the difference between the return of the Portuguese stock market for that month and the corresponding risk-free interest rate. Finally, we compute t-statistics for group clustering.

Following the literature on the topic, we further examine the time-series predictability of the data by investigating whether the signs of the market lagged returns are significant predictors of future returns. This analysis is thus independent of the magnitude of the excess returns. Accordingly, the excess monthly return in month t, scaled by its ex-ante volatility, is regressed against the signs of the excess monthly return on month $t-h$, with lags of $h = 1, 2, \ldots, 60$ months:

$$\frac{r_t}{\sigma_{t-1}} = \alpha + \beta_h sign(r_{t-h}) + \varepsilon_t \qquad (3)$$

where the sign is defined as +1 if the excess return at month *t-h* is positive and −1 if the excess return at month *t-h* is negative.

Then, in order to assess the influence of risk on the phenomenon we proceed to calculate the *t*-statistics of the alphas of time-series momentum strategies for the different combinations of look-back and holding periods (1, 3, 6, 9, 12, 24, 36, or 48 months). As a robustness test, we examine the subject by calculating and comparing the Sharpe ratio of the different strategies. The Sharpe ratio takes into account the total risk inherent in each strategy and is defined as the average return earned in excess of the risk-free rate per unit of the standard deviation of returns.

Finally, we study the cyclicality of the time-series momentum effects. For this purpose, we adopt the procedure used by Moskowitz *et al.* (2012), which consists of regressing the returns generated by the time-series momentum strategies against the contemporaneous returns of the stock market in order to analyse the market conditions that favor a more pronounced profitability of the strategy.

4. EMPIRICAL RESULTS

4.1 Time-series return predictability

Figure no. 2 plots the *t*-statistics of β_h by month lag *h* resulting from the estimation of equation (2), where positive *t*-statistics indicate return continuations and negative *t*-statistics indicate return reversals.
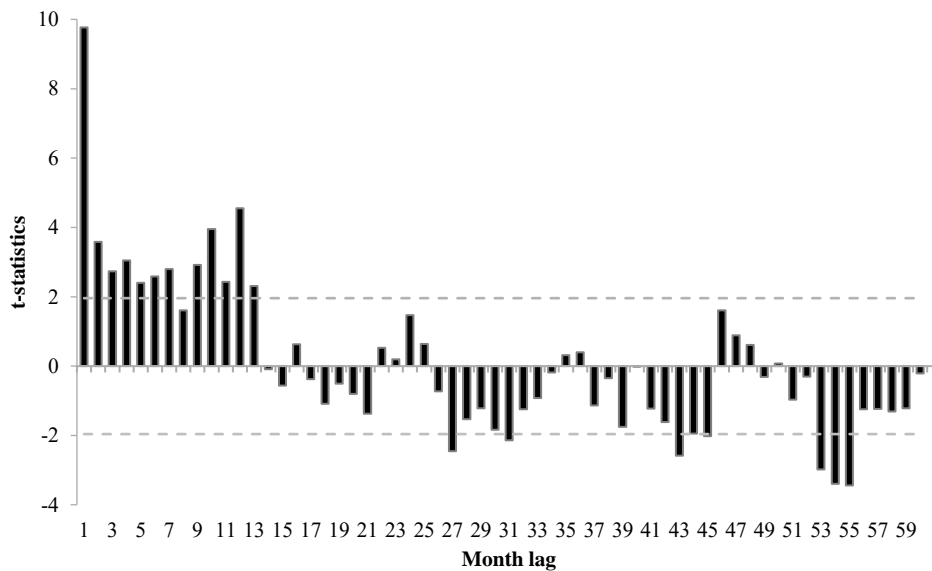
Figure no. 2 – Time-series return predictability (eq. 2)[2]

The figure depicts a pattern of positive *t*-statistics for the first 12 months, indicating return continuations over the first year, and mostly negative *t*-statistics thereafter, suggesting return reversals over the next four years. Moreover, Figure no. 2 shows that the market exhibits the strongest return continuation in the most recent month. These results are similar to those presented by Moskowitz *et al.* (2012) for a set of index futures and forwards traded in the US. The *t*-statistics of the β_h in equation (3) are depicted in Figure no. 3.
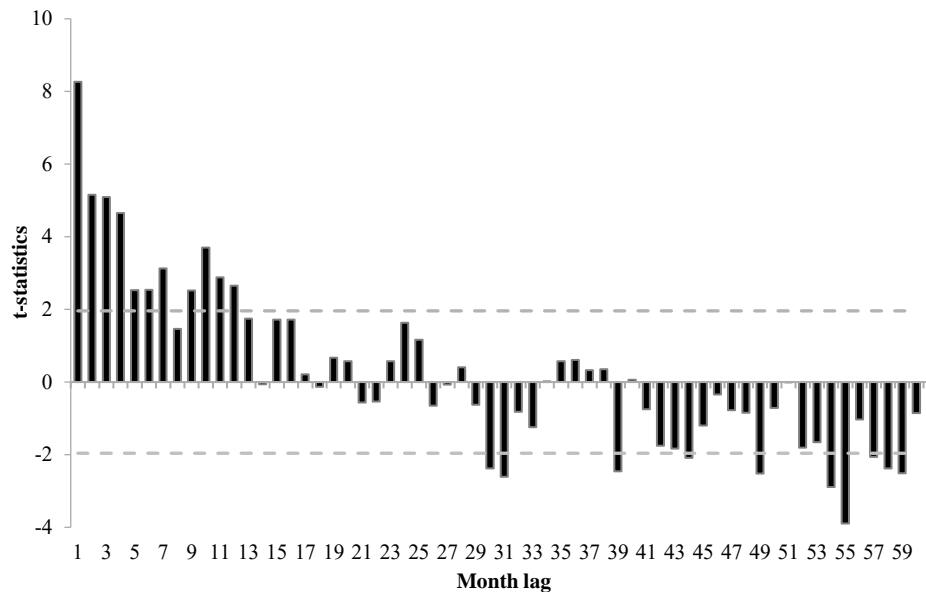
Figure no. 3 – Time-series return predictability (eq. 3)[3]

Figure no. 3 confirms the general pattern of continuation and reversal previously described: a very strong return continuation in the most recent month and one to 12-month positive time-series momentum followed by reversals at longer time horizons. Again, the positive return continuation is heavily concentrated at the first month.

4.2 Robustness to risk factors

In this section, we investigate if the time-series momentum returns simply reflect exposure to conventional risk factors.

In this regard, Table no. 2 shows the *t*-statistics of the alphas of time-series momentum strategies with different look-back and holding periods.

The table reveals that a significant time-series momentum was observed for all look-back and holding periods of 12 months or less. For all look-back and holding periods combinations, the highest *t*-statistics are observed in the case of the 1-month look-back period. The importance of the 1-month look-back period is consistent with our previous evidence regarding the existence of price continuation in the period 1900-2020. The higher *t*-statistic is observed for the strategy with a look-back period of 1 month and a holding period of 12 months (henceforth TSMOM_1_12 strategy).

Table no. 2 – *t*-statistics of the alphas of time-series momentum strategies with different look-back and holding periods[4]

		Holding period (in months)							
		1	**3**	**6**	**9**	**12**	**24**	**36**	**48**
Look-back period (in months)	1	6.15	7.01	8.57	9.42	9.93	8.73	8.61	8.61
	3	4.76	5.05	6.01	6.51	6.81	6.45	6.74	7.03
	6	4.59	4.92	5.37	5.61	5.48	3.81	2.67	2.00
	9	3.44	3.87	4.27	4.18	4.07	2.56	1.40	0.11
	12	2.18	2.03	2.32	2.29	1.91	-0.25	-1.98	-4.47
	24	1.05	0.36	1.07	0.66	0.20	-0.86	-1.47	-5.23
	36	1.37	0.29	1.73	1.82	1.77	0.57	-2.44	-7.45
	48	0.84	-1.01	0.00	-0.31	-0.52	-3.83	-10.17	-14.74

As a robustness test, we proceed with the computation of the Sharpe ratios, one of the most widely recognized measures of reward-to-total risk. In addition to the strategy that seems to be more profitable in the Portuguese stock market (TSMOM_1_12) we consider two other strategies in our analysis that are often referred to in the literature (e.g., Moskowitz *et al.*, 2012): the strategy with a look-back period of 12 months and a holding period of 1 month (henceforth TSMOM_12_1 strategy) and the strategy with a look- back period and a holding period of 1 month (henceforth TSMOM_1_1 strategy). Figure no. 4 depicts the annualized Sharpe ratios for the three time-series momentum strategies (TSMOM_12_1, TSMOM_1_12, and TSMOM_1_1) and for the buy-and-hold strategy for the whole sample period and also for the subsample periods of 1900-1974 and 1978-2020. We report a Sharpe ratio of 0.37 for the Portuguese market portfolio during the whole sample period which is remarkably close to the figure of 0.39 computed by Daniel and Hirshleifer (2015) for the US stock market during the period 1963-2014. We observe that in all the sample periods under scrutiny the time-series momentum strategies deliver higher Sharpe ratios than the passive strategy. The TSMOM_1_12 strategy significantly outperforms all other strategies yielding a Sharpe ratio of 1.99 on an annual basis, or roughly 5.4 times the Sharpe ratio generated by the passive strategy during the period 1900-2020.
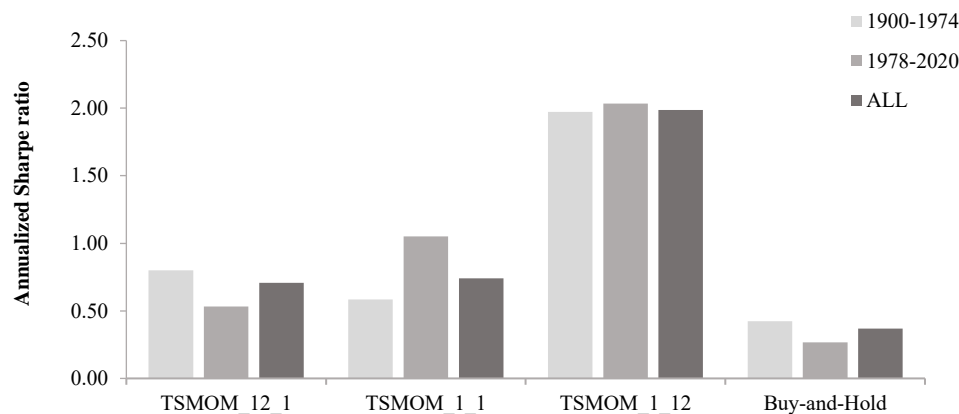
Figure no. 4 – Annualized Sharpe ratios of the time-series momentum strategies and the buy-and-hold strategy

4.3 Performance over time and in extreme market conditions

Figure no. 5 presents the cumulative returns of the TSMOM_12_1, TSMOM_1_12, and the buy-and-hold strategy from 1900 to 2020. The figure shows that the TSMOM_1_12 strategy produces the highest cumulative returns, outperforming the remaining strategies.
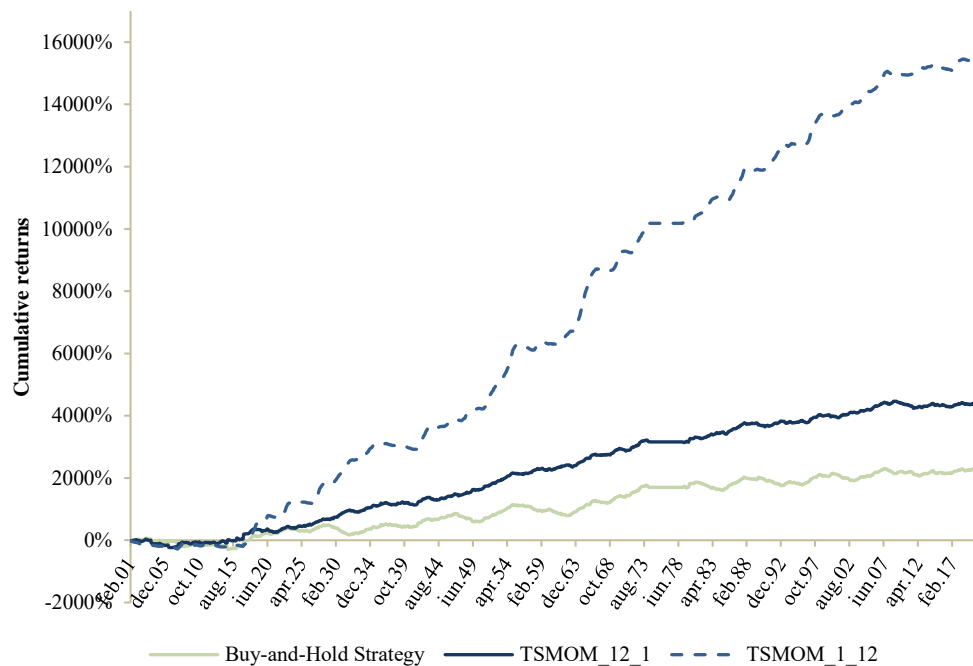
Figure no. 5 – Cumulative excess returns of the TSMOM_12_1, TSMOM_1_12, and the buy-and-hold strategy

The TSMOM_12_1 and TSMOM_1_12 strategies generated monthly mean returns of 0.93% and 4.31%, respectively, during the whole sample period. Time-series momentum effects seem to have remained robust over the most recent decades. In fact, whereas in the period 1900-1974 the TSMOM_12_1 and TSMOM_1_12 strategies yielded monthly mean returns of 0.83% and 3.72%, respectively, in the subsequent period, that goes from the reopening of the Portuguese stock exchange after the Carnation Revolution in 1978 until the end of 2020, the observed returns were even higher, reaching 1.10% and 5.33%, respectively. Finally, we investigate the cyclicality of the time-series momentum effects. In this regard, Figure no. 6 shows the returns generated by the TSMOM_12_1 and TSMOM_1_12 strategies plotted against the returns of the stock market in the period 1900-2020.

Panel A: TSMOM_12_1 returns against the returns of the market index

Panel B: TSMOM_1_12 returns against the returns of the market index
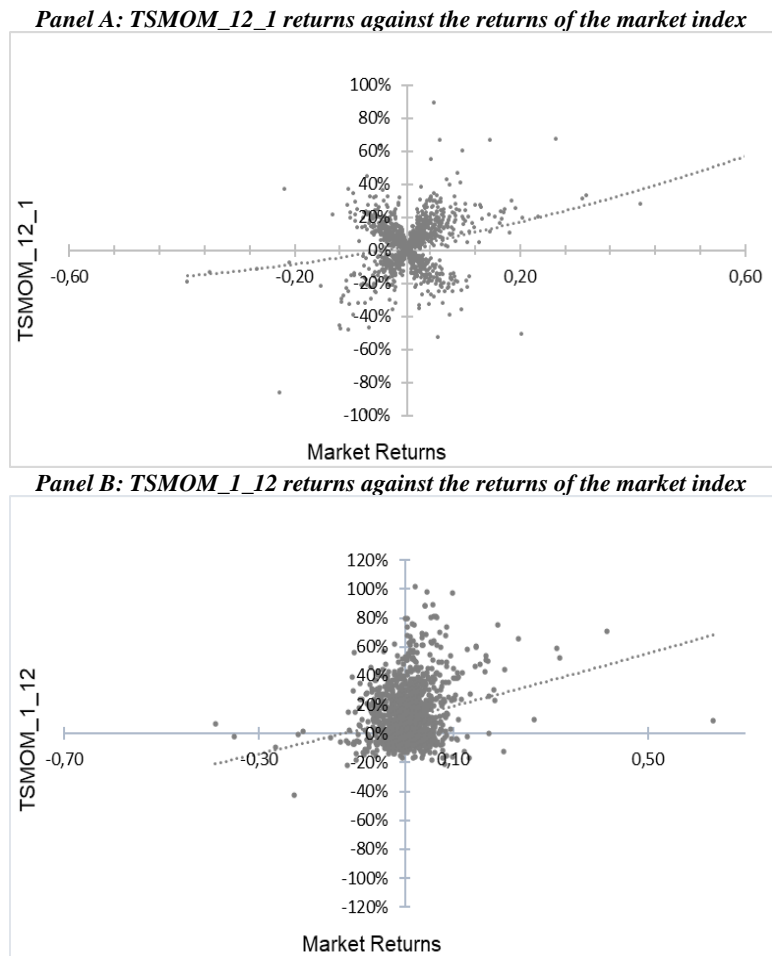
Figure no. 6 – TSMOM_12_1 and TSMOM_1_12 returns in extreme market conditions[5]

The positive slope of the quadratic trend indicates that both strategies have performed particularly well in extreme up years for the stock market. These findings suggest that the time-series momentum strategies are not especially valuable from a diversification perspective.

5. DISCUSSION

In this paper, we document strong time-series momentum effects in the Portuguese stock market during the last 120 years. The positive return continuation seems to last for a period of 12 months and is shown to be heavily concentrated at the first month. At longer investment horizons, returns tend to revert to the mean. The strategy that considers the returns on the previous month and holds the market portfolio for a period of 12 months provides the highest risk-adjusted return among the strategies under scrutiny, with an annualized Sharpe ratio of 1.99.

Our finding of a significant return continuation over a period of 12 months contrasts with the results reported by Moskowitz et al. (2012) for the US stock market since in this market a strategy with a look-back period of 12 months and a holding period of just 1 month is shown to present the highest significance from all the strategies under study. However, it should be noted that the results reported by Moskowitz et al. (2012) also indicate that a TSMOM_1_12 strategy would be profitable in the futures and forward contracts traded in the US as the respective alphas are found to be positive and statistically significant at the conventional levels (the reported t-statistics considering as underlying assets the equity indexes and all assets are 3.24 and 5.12, respectively). The greater persistence of price continuation observed in the Portuguese stock market corroborates similar results regarding the cross-sectional momentum effect in this market (Soares & Serra, 2005; Lobão & Lopes, 2014; Lobão & Azeredo, 2018). We conjecture that this phenomenon may be attributed to the slower diffusion of information in the Portuguese stock market, in line with the arguments asserted by H. Hong and Stein (1999). The reasons for this slow reaction of prices can be found in some institutional factors that have characterized the Portuguese stock market throughout its history (Mata et al., 2017; OECD, 2020). The scarce liquidity of the market goes together with a country's economic structure inhabited mainly by very small firms that are not interested in accepting the fixed costs and the loss of control resulting from going public. In addition, institutional investors have historically played a relatively minor role in market transactions, which tends to slow down the impact of information on stock prices. In this context, it is understandable to find fairly persistent price trends in the Portuguese stock market.

The signs of strong time-series momentum that have been found in such dissimilar geographies as the US, China (Moskowitz et al., 2012; Ham et al., 2019), and now in an unexplored Portuguese historical dataset, are highly suggestive that the phenomenon is not a spurious pattern resulting from data mining.

The pattern described in our study of an initial underreaction and a delayed overreaction reflected into a reversion to the mean is consistent with the predictions of several sentiment theories. In this context, under-reaction could be caused by self-attribution or conservatism biases and the delayed overreaction might be the result of overconfidence or representativeness biases (Barberis et al., 1998; Daniel et al., 1998), for example.

The returns of time-series momentum strategies seem to be positively correlated with the performance of the market portfolio. That means that those strategies tend to perform best during extreme up-market periods and to deliver the worst returns during down markets. Consequently, time-series strategies do not seem to be a good fit for investors in the Portuguese stock market who value portfolios with a counter-cyclical profile. In this regard, our results differ significantly from those obtained in the US market by Moskowitz et al. (2012) as these authors concluded that time-series momentum in that country realized its largest gains during extreme negative-or-positive market conditions. Differences in the characteristics of the samples under scrutiny may explain this discrepancy. In fact, Moskowitz et al. (2012) analyzed equity futures, among other assets, while our study focuses on the evolution of the stock market. Furthermore, Moskowitz et al. (2012) considered a more limited period (1965-2009) while our analysis covers a period of about 120 years. Lastly, and probably most importantly, there are very significant institutional differences between the two markets, as it was mentioned above.

Our findings also carry relevant implications for investors as they suggest that a simple strategy of going long (short) in a well-diversified stock portfolio when the market as recently

gone up (down) is able to outperform the standard buy-and-hold strategy. The existence of derivatives on the Portuguese stock index as well as the recent emergence of low-cost online brokers is likely to facilitate the exploitation of the strategies based on the time-series momentum effect.

Overall, our results add to the evidence that time-series effects are not a product of data mining and seem difficult to reconcile with the assertion that stock markets follow a random walk.

6. CONCLUSION, LIMITATIONS, AND SUGGESTIONS FOR FURTHER RESEARCH

In this study, we examined for the first time the Portuguese stock market for indication of time-series momentum effects. For that purpose, we used a new historical financial dataset that covers about 120 years of data.

We report strong time-series momentum effects that cannot be subsumed by the conventional risk factors. The positive return continuation lasts for a period of 12 months, being heavily concentrated at the first month. At longer investment horizons, returns tend to revert to the mean. A strategy with a 1-month look-back period and a 12-month holding period yields a Sharpe ratio roughly 5.4 times that generated by a passive strategy. Time-series momentum strategies present a procyclical profile.

A limitation of our study stems from the fact that we did not consider in our analysis the transaction costs that an investor would have to bear to explore strategies based on time-series momentum effects. Unfortunately, given the restrictions on the availability of historical data on the Portuguese stock market, it was not possible to take such factor into account.

The anomaly of momentum, in its different varieties, is one of the main challenges to the market efficiency hypothesis. Further avenues of research on this topic may include examining the relationship between time-series momentum and other investment strategies, including the traditional cross-sectional momentum; augmenting the robustness tests with macroeconomic risk factors; and examining the impact of trading costs on the profitability of time-series momentum strategies.

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Notes

[1] Figure no. 1 shows the geometric mean annual returns of the national stock markets of the US, the UK, Germany, France, and Portugal in several historical periods. The initial source of the data referring to the Portuguese stock market is Mata *et al.* (2017). This database, covering the period 1900-2013, was subsequently completed with the values of the stock index PSI Geral for the period 2014-2020 obtained from Datastream. Data referring to the stock markets of the US, the UK, Germany, and France were collected from the Asset Allocation Database of Global Financial Data. The data for the markets of the US, Germany, France, and Portugal cover the entire period under analysis (1900-2020) while the data for the UK is only available from 1933 onwards.

[2] Figure no. 2 shows the results of the regression of the monthly excess returns on its lagged excess return over several horizons. The reported t-statistics are computed using the lagged monthly excess

returns as independent variables for lags h=1, 2, ..., 60 months, and returns are scaled by their respective ex-ante volatility to make them comparable. The dashed lines represent the significance level at 5%. The sample covers the period from February 1900 to December 2020.

[3] Figure no. 3 shows the results of the regression of the monthly excess returns on its lagged excess return over several horizons. The reported t-statistics were computed using the signs of the lagged monthly excess returns as independent variables for lags h = 1, 2, ..., 60 months, and returns are scaled by their respective ex-ante volatility to make them comparable. The dashed lines represent the significance level at 5%. The sample covers the period from February 1900 to December 2020.

[4] Table no. 2 reports the t-statistics of the alphas from regressing the time-series excess returns with different look-back and holding periods (1, 3, 6, 9, 12, 24, 36, or 48 months) against the standard risk factors of the Fama-French three-factor model. Due to the unavailability of risk factors referring to the Portuguese market, the risk factors of the European stock market were used as a proxy. The sample period spans from July 1990 to December 2020.

[5] Figure no. 6 presents the scatterplot of the non-overlapping TSMOM_1_12 and TSMOM_12_1 monthly returns against the corresponding non-overlapping monthly returns of the stock market index. The dashed line represents the quadratic fit. The sample covers the period from February 1900 to December 2020. Panel A plots the TSMOM_12_1 returns against the returns of the stock market index. Panel B plots the TSMOM_1_12 returns against the returns of the stock market index..

Audit Quality Review: An Analysis Projecting the Past, Present, and Future

Niva Kalita*, Reshma K. Tiwari**

Abstract*:* Literature on audit quality remains plenteous, with researchers contemplating the area for 'forever and a day'. The present study proposes synthesising the existing literature on audit quality, discerning the prominent themes and providing future research avenues. This paper attempts to analyse and synthesise the dynamics of audit quality research by employing the diminuendos of systematic literature review with bibliometric and content analysis. Scopus database has been gleaned to systematically retrieve the literature on audit quality from 1981-2022. Analysing the 1101 relevant articles under review makes the USA the highest contributor. It is, however, enthralling to note that developing countries have also registered increased interest in the topic. Apart from the other documented findings, the study concluded that research has witnessed impeccable growth over the years under various lenses, which have been precisely synthesised into six clusters. While various reviews have been conducted using innumerable qualitative methods, this study attempts to employ quantitative methods to synthesise the extant literature, which is a rarity.

Keywords: audit quality; auditor; bibliometric analysis; content analysis; systematic review.

JEL classification: M420.

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1. INTRODUCTION

Dwelling on the agency theory of corporate governance (CG), audit quality (AQ) plays an indispensable role in mitigating information asymmetries (Matoke & Omwenga, 2016) and encourages strong CG functioning (Chow, 1982). The stakeholders' confidence level traces a favourable and significant link with AQ (Al-Qatamin & Salleh, 2020). A high AQ boosts the accuracy of financial reports and promotes informed investment decisions and financial stability. AQ proportionately influences firm performance (Ani & Mohammed, 2015). However, the extant literature on AQ remains plenteous, with diverse definitions that are more generic than specific (Tritschler, 2013). Knechel and Sharma (2012) metaphorically refer to the Hindu apologue of four blind men defining an elephant as an exemplar of the conundrum in the existing literature defining AQ. The seminal definition of AQ by DeAngelo (1981) is the probability that an auditor will discover and report material misstatements. In Simunic (1984), AQ is the probability that when an auditor gives an unqualified opinion on a firm's financial position, the results are presented without prejudice. Again, the practitioner literature houses manifold definitions of AQ. While some believe that adherence to auditing standards is the yardstick of AQ (J. Krishnan & Schauer, 2001), others believe that the greater the detection of errors, the greater the AQ (Chang et al., 2009).

Even with these, others attest AQ to the number of audit assignments undertaken by the audit firm (Carcello et al., 2002). The UK's Financial Reporting Council (FRC) made a maiden attempt in this regard. In the FRC framework, five cardinal attributes that sum up AQ were outlined, as shown in Figure no. 1.
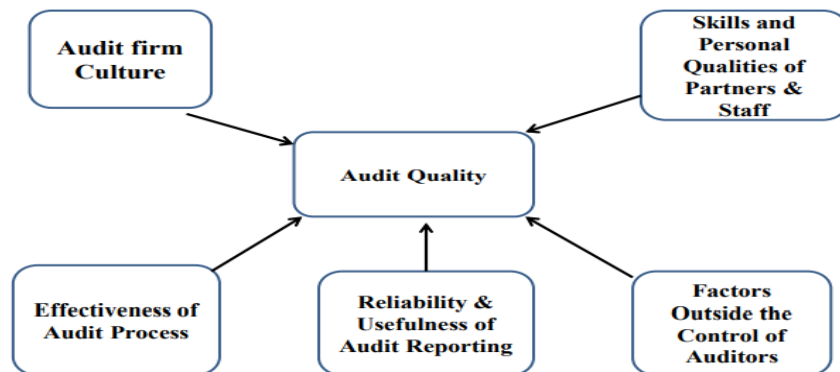
Figure no. 1 – UK's Financial Reporting Council: Audit Quality Framework
Source: Financial Reporting (2008)

Knechel and Sharma (2012), in their attempt at synthesising AQ literature, categorised them into four divisions to facilitate a better understanding of these idiosyncrasies.
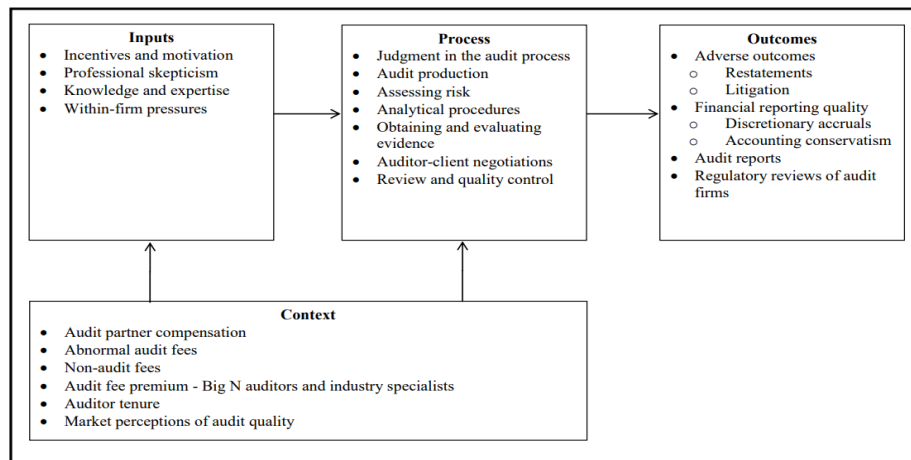
Figure no. 2 – Audit Quality Indicators
Source: adopted from Knechel and Sharma (2012)

Extant literature on AQ has, albeit not limited, primarily contemplated the aspects of AQ as depicted under the four broad categories in Figure no. 2: input, process, outcome and context. These numerous aspects of AQ have variegated impacts similar to the prismatic nature of AQ itself. In the case of inputs, while a higher level of professional scepticism and expertise results in a higher quality of audit, the pressure exerted by clients and lucrative incentives offered may hinder the objectiveness of the auditor, thereby exhibiting a negative impact on AQ (Liu *et al.*, 2016).

Despite being widely cerebrated, AQ as an area remains nebulous. In order to provide comprehensive documentation of the multifaceted area of AQ, the authors aim to address the following research questions (RQ) through this study:

RQ1: What is the trend of publication of audit quality research?
RQ2: Which are the most underpinning studies on audit quality?
RQ3: What is the status quo of collaboration concerning audit quality research?
RQ4: Who are the prominent authors in the area of audit quality?
RQ5: Which are the most researched themes of audit quality?
RQ6: What is the intellectual structure of research concerning audit quality?
RQ7: What are the avenues for future research in audit quality?

This paper contributes to the existing literature in several ways. First, as far as our knowledge transcends, this is the first literature review to employ an admixture of systematic literature review (SLR) with bibliometric analysis and content analysis for furnishing panoramic information on AQ research. Previous studies (Ciger, 2020; Taqi, 2021) have limited their methodology to bibliometric analysis alone. Table no. 1 elaborately highlights the differences between the present study and previous studies on AQ review. Secondly, previous studies conducted in similar footings have left the intellectual structure of AQ unexplored. The analysis of intellectual structure can reveal research links, such as reciprocal citations and shared methodology. This information helps identify leading AQ research concepts and theories and track their evolution. The present study elaborates on addressing the same using a co-citation analysis. Thirdly, a primary objective of this study is to contribute

to future scholarly research on the topic of AQ by identifying and examining the most prospective avenues for further investigation. Hence, the examination of the RQs mentioned above can generate substantial benefits for future researchers in the field of auditing. Fourth, the results of this study may provide policymakers with valuable insights for developing effective audit practices that might enhance stakeholder confidence.

Table no. 1 – Comparison of the present study and recent review papers on AQ

Basis of comparison	Review Studies						
	Behrend and Eulerich (2019)	Ciger (2020)	Cruceana (2021)	Fallatah *et al.* (2021)	Taqi (2021)	Maggiorani (2022)	Present study
Period *Search string*	1926-2016 Not specified	1981- 2020 Limited to "Audit Quality"	2001-2020 Limited to "Audit Quality"	2005-2019 Not specified	1981-2020 Limited to "Audit Quality"	1991-2021 Not specified	1981-2022 Extensive and carefully constructed string of keywords related to AQ.
Focus area	Internal audit	All aspects of AQ	All aspects of AQ	IFRS adoption and AQ	All aspects of AQ	Audit Quality in the public sector	All aspects of AQ
Methodology	Bibliometric analysis	Bibliometric analysis	Bibliometric analysis	Bibliometric analysis	Bibliometric analysis	SLR and Bibliometric analysis	SLR, Bibliometric analysis and Content analysis

Source: authors' compilation

The remainder of the study is divided into sections that address the literature review, research methodology and data statistics, data analysis, discussion, and conclusion.

2. LITERATURE REVIEW

AQ is a Daedalian concept subjected to myriad gradations over the decades Francis (2011). The fact that corporate scandals burst into flames in the already enkindling area cannot be considered a hyperbole (Francis, 2004). Rapid advancements in information and communication technologies, the capacity of organisations to compete more readily, their sustainability, and the rise in stakeholder expectations have enhanced the relevance of the idea of AQ. The literature synthesis from previous decades reveals that AQ is characterised by ongoing evolution, as persistent research endeavours contribute to acquiring novel insights. The primary focus of scholarly investigations has been on the comprehensive examination of many factors that have the potential to influence the quality of audits (Taqi, 2021).

While auditors' independence is the radar under which AQ has been predominantly scrutinised (Tepalagul & Lin, 2015), analysing the contextual factors affecting AQ is yet another domain that remains centrifugal (Salehi *et al.*, 2019). Studies embarking on this area return several factors influencing the quality of audits. While (Leventis & Caramanis, 2005) establish the auditor's size and reputation as the factors that significantly influence the AQ, Hoitash *et al.* (2007) refute this by positing that the economic bonding shared by the auditor

and auditee captures the highest ascendancy among the determinants of AQ. Kusumawati and Syamsuddin (2018) further catalogue professional scepticism as another intrinsic factor of AQ. Nevertheless, numerous auditor-auditee characteristics undeniably influence the AQ (Caramanis & Spathis, 2006). Amongst these attributes, auditors' professional scepticism, however, forms the building block upon which the rationale of all auditor decisions rests (Chiang, 2016). Ignoring this idiosyncrasy will land anyone into the 'what you see is all there is" fallacy by the Nobel laureate Daniel Kahneman. Auditors are often denounced for ignoring their scepticism and uninhibitedly relying on the management for information, which obliviously impairs the auditor's independence (Mardijuwono & Subianto, 2018).

While the debate concerning the cardinal factors influencing AQ continues, in the absence of any consensus on the definition of AQ, measuring the same has also been onerous. According to M. DeFond and Zhang (2014), the quality of an audit can be mapped using either input-based or output-based standards. The audit's tools and procedures are the primary focus of input-based criteria. In comparison, the audit results are the mainstay of output-based criteria. In their review, Montenegro and Brás (2018) noted that most of the studies using 'input-based' criteria in AQ focused on audit fee, auditor brand name and auditor industry experience as AQ proxy since the 2000s.

Moreover, even when AQ was treated as an 'outcome', studies employing auditor litigation actions to reflect AQ are negligible. Thus, brand name, audit firm size, audit fee, auditor reputation, audit hour, auditor opinion, auditor tenure and auditor experience remain the most common proxies developed and employed by researchers across the continuum. Lennox (1999) in his study asserted that auditor size is the most appropriate proxy of AQ from the vantage of both the 'reputation hypothesis' (DeAngelo, 1981) and the 'deep pockets hypothesis' (Dye, 1993). However, over the last decade, regulatory agencies, audit companies, and scientists have been prompted to assess AQ using novel metrics (Ciger, 2020). As a result, it is necessary to explore the context and applicability of certain indicators to understand AQ thoroughly. Employing these measures of AQ, several researchers have also tried to assess the linkage between AQ and CG. According to the agency theory of CG, AQ serves as an apparatus for reducing information asymmetry and bolstering stakeholder trust (Matoke & Omwenga, 2016). As the foundation of an efficient stock market, high-quality audits naturally promote effective corporate governance (Chow, 1982), affecting the firm performance (Ani & Mohammed, 2015).

Moreover, many scholarly investigations have also explored various strategies to enhance the quality of audits, including the utilisation of technology and the adoption of novel auditing standards (Maggiorani, 2022). However, despite scores of advancements, the area of AQ remains obscure and demands further orchestration. This study aims to draw a comprehensive picture of research in AQ, diagnose its trends and highlight the areas of eminence in the field.

3. DATA STATISTICS AND METHODOLOGY

Following Donthu et al. (2021), this study employs a four-pronged review procedure. It begins with documenting the aims and scope of the study in the form of research questions. In the second step, the techniques for analysis are highlighted, followed by collecting the data and concluded by documenting the findings. The present study employs an SLR approach, utilising bibliometric analysis clubbed with content analysis, to understand the current

research trends on AQ. As a component of SLR, bibliometric analysis is a quantitative technique employed to ascertain, examine, and evaluate patterns and trends within published literature on a certain subject (Roemer & Borchardt, 2015). Initially, SLR is employed as a methodological approach to systematically and methodically seek, categorise, and locate relevant articles to conduct critical analysis and objective evaluation of the literature (Queiroz *et al.*, 2020). The process involves the establishment of criteria for inclusion and extraction, the identification of pertinent research papers, and selecting the most appropriate studies for inclusion in the analysis. Following this, bibliometric analysis is applied to the selected research papers to help discern the publication trends, highlight the field's intellectual structure, and map the cumulative scientific knowledge (Kent Baker *et al.*, 2020; Donthu *et al.*, 2021). Finally, content analysis is conducted to cluster the data into relevant groups.

3.1 Techniques of analysis

The elemental structure of any scientific field can be discerned by its research activities (Ronda-Pupo, 2017). Drawing upon Kent Baker *et al.* (2020), a performance analysis is conducted on the review corpus using citation and co-citation analysis, keyword analysis, PageRank and co-authorship analysis. While citation analysis is the study of an article's effect and presumed analysis and evaluation of how often it works and others have cited authors, co-citation remains a citation relationship-based semantic similarity metric for documents that envisages the delimitation of 'foundational knowledge' of an area and allows the springing of intellectual connections (Goodell *et al.*, 2021). Further, keyword co-occurrence happens when two keywords appear in the same article, showing that the two concepts have a link (Comerio & Strozzi, 2019).

The modularity of network nodes based on the Louvain method enables performing the abovementioned analyses (Blondel *et al.*, 2008). Modularity is a scalar value between -1 and 1 representing the density of linkages inside a community versus links between communities. Defined mathematically as:

$$Q = \frac{1}{2m} \sum_{ij} \left(A_{ij} - \frac{k_i k_j}{2m} \right) \delta C_i C_j$$

where A_{ij} represents the weight of the edge (link) between i and j; $k_i = \sum_j A_{ij}$ is the total of weights of the edges attached to vertex I; c_i implies the class or community to which vertex i is assigned; δ function $\delta(u,v)$ is assigned '1' if u = v and '0' otherwise; and m = $\frac{1}{2}\sum_j A_{ij}$.

Further, PageRank has also been employed as a technique of bibliometric analysis. The rationale behind employing PageRank analysis is that the influence of research publications can be calculated using PageRank (Brin & Page, 1998). In other words, PageRank analysis is a way to determine an article's reputation, which improves when other highly cited articles mention the article in question. The formula for calculating the same is:

$$PR(A) = (1\text{-}d) + d\ (PR(T_1)/C(T_1) + \ldots + PR(T_n)/C(T_n))$$

where,
A is the article cited by T_1, T_2,......, T_n

$C(T_1)$ denotes the number of citations for article T_1,
PR(T1) denotes its PageRank,
d denotes a damping factor, and
the network's size is denoted by the letter N.
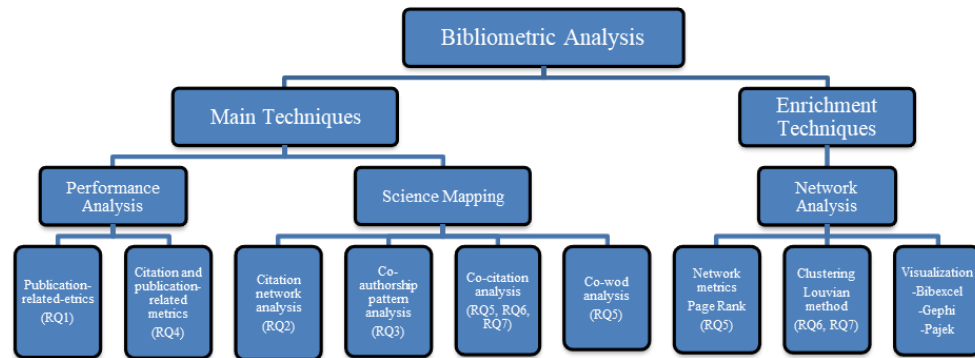
Figure no. 3 – Bibliometric analysis techniques applied
Source: Adopted from Donthu *et al.* (2021)

While various techniques are available for conducting a bibliometric analysis, the techniques resorted to for the present study have been picturesquely manifested in Figure no. 3.

3.2 Data collection

Following Goodell *et al.* (2021), Scopus is the data source because it provides the most comprehensive coverage of business-related peer-reviewed research compared to other databases such as the Web of Science (Valtakoski, 2019). Tracing the footsteps of Frost and Choo (2017) and Widmann *et al.* (2021), a broad-spectrum search string has been devised, which returned a final corpus of 1101, as exhibited in Table no. 2. In addition to the concepts of "audit quality" and "quality of audit," the search terms "audit efficiency" and "audit effectiveness" were also utilised. The lack of agreement over the precise definition of AQ has made quantifying it challenging. Hence, some scholars have occasionally employed the terms "audit effectiveness" (Joe & Vandervelde, 2007; Knechel & Sharma, 2012; Kasper & Alm, 2022) and "audit efficiency" (Knechel *et al.*, 2009; Haapamäki & Sihvonen, 2019; Knechel *et al.*, 2020) interchangeably with AQ. Therefore, we utilise these terms as our search criteria to mitigate discrepancies. Moreover, considering the extensive body of literature in this field, following the study conducted by Kent Baker *et al.* (2020), we searched for articles using 'title' as the only criterion to identify the most pertinent publications.

Table no. 2 – Search strategy and data selection criteria

Research Protocol	Details	Result
Research database	Scopus	
Publication type	Peer-reviewed journals	
Search period	1981- June, 2022	
Search term	(audit AND quality*) OR (quality AND of AND audit*) OR (audit AND effectiveness*) OR (audit AND efficiency*)	
Search field	Title	
Total results		3791
	First stage filters	
Language	English	
Subject area	"Business, management and accounting", "Economics, econometrics and finance" and "Social sciences"	
Source Type	Journal	
Total		1528
	Second stage filters	
Document type	Article	1425
Content screening (Exclusion of articles irrelevant to the scope of the topic)		324
FINAL CORPUS		**1101**

Source: authors' compilation

4. DATA ANALYSIS AND FINDINGS

4.1 Publication activity

The publication trend of AQ was scrutinised using total publications by year, nation, journal, and contributing author to answer RQ 1 (*What is the trend of publication of audit quality research*?).

4.1.1 Country-wise publication

The pre-ponderous literature on audit extends its tentacles to as far as 80 nations, spreading across the six habituated continents of the globe. The distribution of the studies limited by the threshold of at least ten publications has been exhibited in Table no. 2. The USA has emerged as the most prolific nation, contributing 319 studies, followed by Australia and Indonesia, which have documented 111 and 88 studies, respectively. The benefaction of the USA to the field can be attributed to the revolutionary Sarbanes (2002), the pre and post-implementation and speculation engulfing which converted the USA as the epicentre of research concerning AQ and its various facets and idiosyncrasies. Moreover, regarding annual publication trends, the leading three nations outlined in Table no. 3, namely the United States, Australia, and Indonesia, generate an average of around 8, 3, and 2 articles, respectively.

Table no. 3 – Country-wise publications

Rank	Countries	Publications	Rank	Countries	Publications
1	USA	319	13	Taiwan	32
2	Australia	119	14	New Zealand	31
3	Indonesia	88	15	Jordan	26
4	Malaysia	80	16	Iran, Singapore	25
5	China	81	17	France, Germany	23
6	Hong Kong	60	18	Netherlands	18
7	UK	58	19	Italy	16
8	South Korea	50	20	Egypt, Finland, Vietnam	15
9	Canada	47	21	Iran, Sweden	14
10	Spain	37	22	South Africa, UAE	13
11	Saudi Arabia	35	23	India, Thailand	11
12	Tunisia	34	24	Belgium, Greece, Norway, Yemen	10

Source: Scopus database and authors' compilation

It is evident that despite the rise in publication volume, there continues to be a significant concentration of publications within a few industrialised nations. Although developing nations have contributed to the literature in recent decades, there is still a noticeable gap. In the current study, eleven developed countries alone constitute approximately 65 per cent (724) of the literature.

Table no. 4 – Publications based on the development status of countries

Status	Countries	Publications
Developed	Australia, Canada, France, Germany, Italy, Netherlands, South Korea, Spain, Sweden, United Kingdom, United States	724
Emerging	Argentina, Brazil, China, Egypt, India, Indonesia, Iran, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Russia, Saudi Arabia, South Africa, Thailand, Turkey, Vietnam	585

Source: Scopus database and authors' compilation

Furthermore, upon screening the publications categorised by continent, it becomes apparent that Asian nations account for around 48 per cent (530) of the overall corpus, placing them at the forefront regarding continent-wise publications. In that order, North America (366) and Europe (199) succeeded Asia.

Table no. 5 – Continent-wise publications

Continents	Countries	Publications
Asia	China, Hong Kong, Indonesia, Malaysia, Singapore, South Korea, Taiwan, Vietnam, Iran, Jordan, Saudi Arabia, United Arab Emirates	530
Australia/Oceania	Australia, New Zealand	150
Europe	Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, United Kingdom	199
North America	Canada, United States	366
Africa	Egypt, Finland, Morocco, Tunisia	64

Source: Scopus database and authors' compilation

4.1.2 Year-wise publication trend

The publication trend of literature on AQ from 1981-2022 has been arrayed in Figure no. 4. Skyrocketing of studies since the early 2000s with occasional nosedives of minuscule nature till 2010 can be witnessed. The spark kindled by the Sarbanes Oxley Act 2002 was further fuelled heavily by the reforms brought into the audit regime in the aftermath of the Global Financial Crisis 2008 and, hence, the upswing in literature (Kend & Basioudis, 2018). The increase in research over the past decade may be ascribed to the convergence of new auditing regulations, developments in technology, and the internationalisation of the audit industry. In light of the release of many auditing standards (including ISA 260, 315, and 330) by the International Auditing and Assurance Standards Board (IAASB) in December 2020, scholars have shown a keen interest in evaluating the influence of these advancements on audit quality (AQ). The year 2021, which recorded the highest number of publications, provides empirical support for this claim. Given the current advancements, ongoing research in the domain of AQ is poised to make significant progress.
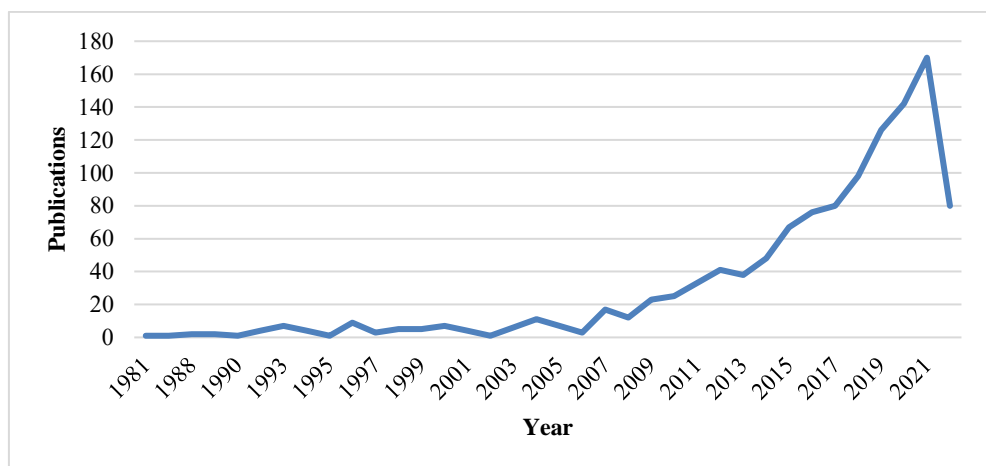
Figure no. 4 – Year-wise publication trend
Source: Scopus database and authors' compilation

4.1.3 Publication activity by journal

The final corpus of 1101 articles spread across 319 journals, with Auditing, Managerial Auditing Journal and Contemporary Accounting Research occupying the first, second and third most-publishing journals on AQ. Effectuating a minimum of 15 publications threshold, Table no. 6 demonstrates the top journals in the area. Approximately 30 per cent of the documented journals have an ABDC rating of A and B, which serves as a testimony that AQ has garnered the patronage of impactful and premier journals across the globe, attracting the interest of numerous researchers.

Table no. 6 – Journal-wise publication trend

No. of articles	Journal name	Publisher	ABDC ranking
85	Auditing	Auckland University Law Students' Society	C
69	Managerial Auditing Journal	Industry Qualifications	C
55	Contemporary Accounting Research	Conference on Consumer Finance Law	C
41	Accounting Review	American Accounting Association	N.R.
37	International Journal of Auditing	Management International	B
33	European Accounting Review	European Accounting Association	N.R.
32	Journal of Accounting and Public Policy	Elsevier	A
31	Academy of Accounting and Financial Studies Journal	Wiley-Blackwell Publishing	A
22	Asian Review of Accounting	Phillippine e-Journals	C
21	Journal of Accounting, Auditing and Finance	Elsevier	A
17	Corporate Ownership and Control	Emerald Group Publishing	C
16	Accounting and Business Research	Association for Accountancy & Business Affairs	B
16	Journal of Asian Finance, Economics and Business	Taylor & Francis Online	C
16	International Journal of Applied Business and Economic Research	Taylor & Francis Online	A
16	International Journal of Economic Research	Serials *Publications* Pvt. Ltd.	N.R.
15	Journal of Accounting and Economics	Association of International Certified Professional Accountants	C
15	Accounting Horizons	Sage Publications	B
15	Asia-Pacific Journal of Accounting and Economics	Emerald Group Publishing	B
15	Quality Progress	American Society for quality	N.R.

Source: Scopus database and authors' compilation

4.2 Citation network analysis

According to Ding and Cronin (2011), although there are various approaches for determining the influence of a research paper, the most common is citation analysis. The number of citations is used to determine the effect of a publication (Kent Baker *et al.*, 2020). To address the RQ2 (*Which are the most underpinning studies on audit quality?*), Gephi and BibExcel were employed. Table no. 7 accounts for the ten most-cited works in the literature on AQ.

Table no. 7 – Top-cited authors with their articles

Author(s)	Title	Year	Citations
DeAngelo, L.E.	Auditor size and audit quality	1981	2129
Becker, C.L., Defond, M.L., Jiambalvo, J., Subramanyam, K.R.	The effect of audit quality on earnings management	1998	1504
Francis, J.R.	What do we know about audit quality?	2004	544
Francis, J.R., Yu, M.D.	Big 4 office size and audit quality	2009	462
Lawrence, A., Minutti-Meza, M., Zhang, P.	Can big 4 versus non-big 4 differences in audit-quality proxies be attributed to client characteristics?	2011	449
Reichelt, K.J., Wang, D.	National and office-specific measures of auditor industry expertise and effects on audit quality	2010	436

Author(s)	Title	Year	Citations
Gul, F.A., Kim, J.-B., Qiu, A.A.	Ownership concentration, foreign shareholding, audit quality, and stock price synchronicity: Evidence from China	2010	435
Ghosh, A., Moon, D.	Auditor tenure and perceptions of audit quality	2005	334
Francis, J.R.	A framework for understanding and researching audit quality	2011	326
Behn, B.K., Choi, J.-H., Rang, T.	Audit quality and properties of analyst earnings forecasts	2008	273

Source: authors' compilation

Table no. 7 exhibits that the most influential article remains the pioneering work of DeAngelo (1981), with a citation count of 2129. Following the revolutionising work, Becker *et al.* (1998) and Francis (2004) occupy the position of the second and third most coveted articles with a citation count of 1504 and 544, respectively. Furthermore, the research demonstrates that a cumulative sum of 37 publications exceeds the threshold of 100 citations. Moreover, out of the remaining publications, 600 have been cited at least once, emphasising the significance of the investigated issue.

Figure no. 5, created on the Gephi software with the top 50 cited references, exhibits the citation network of articles on AQ.
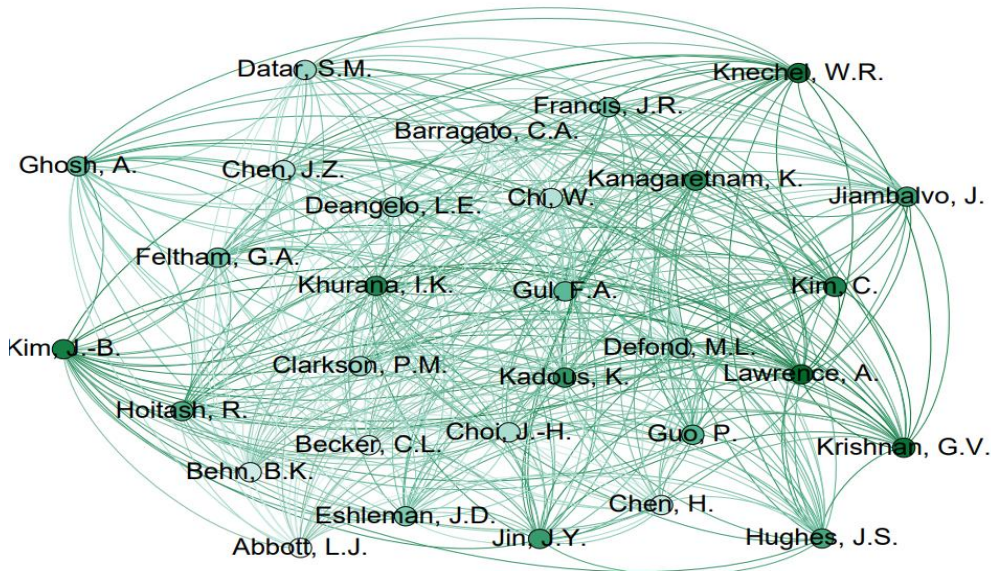
Figure no. 5 – Citation Network
Source: authors' compilation

Table no. 7 presents a comprehensive compilation of highly cited writers in the domain of audit quality, along with the names of their most often referenced publications. In alignment, Figure no. 5 visually illustrates the interconnectedness of these papers with other scholarly works inside the network. It implies that the articles mentioned above are significant and influence the discipline. An exemplar in auditing is the seminal work conducted by DeAngelo (1981), which investigates the relationship between auditor size and audit quality. The abovementioned publication has received over 2,000 citations, indicating its significant impact

on the academic community. Furthermore, it is interconnected with several other scholarly works inside the network. The research by Francis (2004) investigates the relationship between auditor tenure and AQ. This study is referenced by 12 other studies within the network and is connected to several others over multiple lines, indicating its significance as a key work. Moreover, M. DeFond and Zhang (2014) and Becker *et al.* (1998) emerge as other noteworthy contributors to the network. Furthermore, the network demonstrates a multitude of disparate scientific discoveries. This observation implies that there exist several pathways for investigation within the domain of research on audit quality.

4.3 Co-authorship pattern analysis

An analysis of the co-authorship pattern has been undertaken to address the third research question (*What is the status quo of collaboration concerning audit quality research?*). Palacios-Callender and Roberts (2018) argue that global collaboration networks enable emerging countries to participate in the knowledge generation process historically spearheaded by affluent countries.
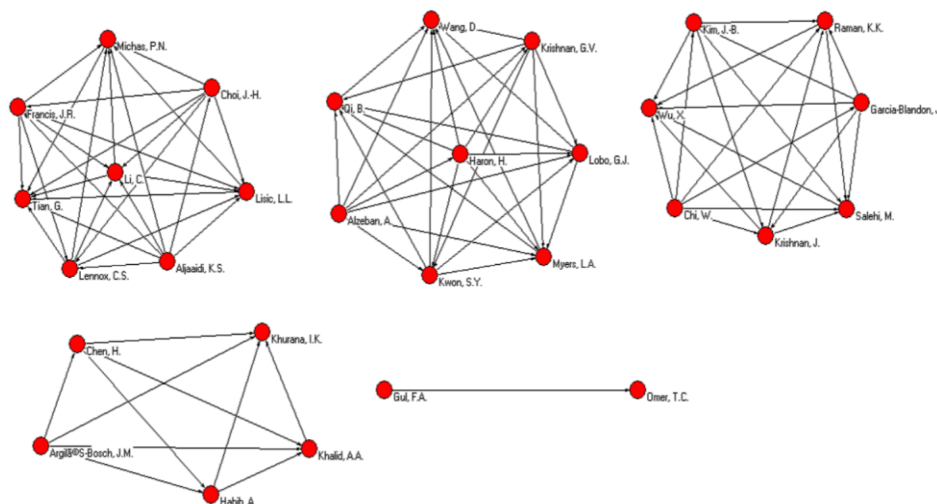
Figure no. 6 – Co-authorship network
Source: authors' compilation

Figure no. 6 demonstrates the status quo of collaboration among the field's most dominant and prolific authors. The clustering exhibited by the figure denotes that collaboration has remained limited to closely-knit circles of a select few authors, chiefly sharing nationalities of developed economies. It highlights the need for more cross-country collaborative work, especially in developing and underdeveloped economies.

4.4 Author-wise publications analysis

Table no. 8 demonstrates the top authors based on the quantum of their publications with a threshold of a minimum of five publications in the field of AQ. With 12 publications, T. C. Omer garners the top position, followed by F. A. Gul with ten publications to the author's credit. The third position is occupied by G.J. Lobo, K.K. Raman, J. Krishnan, X. Wu, M. Salehi, J. Garcia-Blandon, H. Haron, B.J. Kim and K.S. Aljaaidi with eight publications to the credit of each.

Table no. 8 – Author-wise publications

Rank	Authors	No. of publications by each author
1	Omer, T.C.	12
2	Gul, F.A.	10
3	Lobo, G.J.; Raman, K.K.; Krishnan, J.; Wu, X.; Salehi, M.; Garcia-Blandon, J.; Haron, H.; Kim, J.B.; Alijaaidi, K.S.	8
4	Alzeban, A.; Chi, W.; Qi, B.; Francis, J.R.; Kwon, S.Y.; Myers, L.A.; Krishnan, G.V.	7
5	Wang, D.; Choi, J.H.; Tian, G.; Li, C.; Lisic, L.L.; Michas, P.N.; Zhou, J.; Knechel, W.R.; Lennox, C.S.	6
6	Tan, H.T.; Khalid, A.A.; Zhang, J.; Chen, H.; Ravenda, D.; Kamardin, H.; Zang, Y.; Lim, C.Y.; Wang, Y.; Willborn, W.; Vanstraelen, A.; Chang, H.; Yu, Y.; Sun, J.; Zhang, Y.; Habib, A.; Khurana, I.K.; Mo, P.L.L.; Mayhew, B.W.; Monroe, G.S.	5

Source: authors' compilation

Table no. 8 provides a comprehensive record of authors who have achieved the greatest publishing rates, while Table no. 9 presents data on the frequency of publications concerning the number of authors involved. The data reveals that the collaboration of three authors has the highest number of publications, totalling 408.

Table no. 9 – Authors and Publications

Number of authors	Publications
1	237
2	445
3	480
4	208
5	46
6	3
7	2
8	9
10	1
12	1

Source: authors' compilation

Table no. 10 outlines the top contributing authors of the field based on their h-index (Bornmann & Daniel, 2007). It is a metric that evaluates the effect of a single scientist rather than a publication. With an h-index of 9, F. A. Gul emerges as the most prolific author in the field of AQ, followed by T. C. Omer at the second position with an h-index of 8 and J. Krishnan and J. B. Kim occupying the third place with seven as their h-index.

Table no. 10 – Top contributing authors concerning h-index

h-index	Unit	Citation sums within h-core	All citations	All articles
9	Gul, F.A.	1279	1283	10
8	Omer, T.C.	880	897	12
7	Krishnan, J.	346	1348	8
7	Kim, J.-B.	970	971	8
6	Haron, H.	208	209	8
6	Knechel, W.R.	360	360	6
6	Myers, L.A.	807	812	7
6	Lisic, L.L.	266	266	6
6	Raman, K.K.	274	277	8
6	Francis, J.R.	2079	2082	7

Source: authors' compilation

Table no. 11 arches the influence of authors' work employing PageRank analysis.

Table no. 11 – Top articles according to PageRank

Authors	PageRanks
Lawrence (1997)	0.205868
G. V. Krishnan (2003)	0.111299
Knechel (2016)	0.078117
Kim and Yi (2009)	0.060878
Choi *et al.* (2010)	0.050214
Khurana and Raman (2004)	0.042921
Kanagaretnam *et al.* (2011)	0.037596
Kadous (2000)	0.033526
Jin *et al.* (2011)	0.030307
Becker *et al.* (1998)	0.027692
Datar *et al.* (1991)	0.025522
Hoitash *et al.* (2007)	0.023691
Eshleman and Guo (2014)	0.022124
Gul *et al.* (2010)	0.020766
Ghosh and Moon (2005)	0.019577
Francis (2004)	0.018526
Datar *et al.* (1991)	0.017591
Eshleman and Guo (2014)	0.016753
M. L. DeFond and Lennox (2011)	0.015997
DeAngelo (1981)	0.015312

Source: authors' compilation

The table documents that the articles by Lawrence (1997), G. V. Krishnan (2003) and Knechel (2016) occupy the position of the most coveted articles as per the PageRank analysis. According to Baker *et al.* (2023), an article's prestige is not always determined by the number of citations it receives; it might also be determined by how many times it contributes to other high-quality research. The results exhibited in the above table demonstrate affinity to the same.

4.5 Keyword analysis

Keywords act as the door to the original content. It portrays a fair idea about the research article beforehand. To identify the pattern of keywords prevalent in AQ research and to address the fifth research question *(Which are the most researched themes of audit quality?),* an analysis of the keywords of the final corpus of articles has been conducted.

Table no. 12 – Range of Keywords

No. of articles	No. of keywords
1	12
1	14
3	11
5	10
10	9
20	8
68	7
166	3
172	6
321	4
334	5

Source: Author's compilation

Table no. 12, prepared with the aid of Bibexcel software, provides that the range of keywords used lies between 3 to 14, with 5 being the highest number. It can be witnessed that a total of 334 articles have resorted to using five keywords, followed by four keywords employed by 321 articles and six keywords by 172 articles.

The Bibexcel software was further employed to glean the most frequently used keywords as they help discern the most researched themes in the area. An analysis of the current corpus returns the following ten keywords in Table no. 13 as the keywords with the highest frequency. AQ fetches the top position in the table. It is justifiable as keywords form the most integral element of any search. They are also fundamental in garnering citations for any research; hence, the area appears in the first place. Following the same, the audit committee (AC) and CG clinch the second and third positions, respectively.

Table no. 13 – Highest frequency keywords

Frequency of keyword	Keyword
564	Audit Quality
158	Audit Committee
109	Corporate Governance
97	Earnings Management
82	Audit Fees
76	Financial Reporting Quality
72	Auditor Independence
65	Auditing
63	Discretionary Accruals
52	Earnings Quality

Source: authors' compilation

Furthermore, Baker *et al.* (2023) assert that keyword co-occurrence is another pivotal part of keyword analysis. They posit that keyword co-occurrence happens when two keywords occur in an article, thereby substantiating the presence of any association between them. Nevertheless, Figure no. 7, developed using the Pajek software, depicts the co-occurrence network of the highest occurring keywords.

Figure no. 7 – Keyword co-occurrence network
Source: authors' compilation

The figure shows that the concept of AQ is multifaceted and characterised by many interdependencies. Several variables influence AQ, such as the length of time an auditor has served, the level of independence of the audit function, and the effectiveness of the internal audit function. The audit committee and earnings management co-occur for the maximum time. The justifiability of this assertion is supported by a substantial body of research investigating the influence of AQ and audit committee effectiveness on earnings management practices. The presence of an efficient AQ and an effective audit committee can contribute to the oversight and mitigation of earnings management practices (Mardessi, 2021). Subsequently, auditors and independence are identified as the second most often occurring terms. The topic of auditors' independence has been a subject of much debate since the influential study conducted by DeAngelo (1981), and it continues to attract the attention of scholars in contemporary times.

4.6 Literature classification and analysis

RQ6 and RQ7 *are* addressed using co-citation analysis. Co-citation helps create data clusters to discern the intellectual structure of the research area with a modularity index (Xu *et al.*, 2018). Employing the default Lovian algorithm of Gephi, the 945 nodes co-citation network was filtered to group the data into six clusters. These clusters have been discussed in the following section.

4.7 Content analysis

This section tabulates accounts of all six clusters on AQ carved by the modularity index. Table no. 14 synthesises the current research revolving around each cluster while simultaneously highlighting the opportunities for future research. The cluster label and the current research column highlight the intellectual structure of research in AQ (RQ6). Further, RQ7 is addressed through Table no. 14's future research avenues column.

Table no. 14 – Data clusters and their description

Cluster label	Current research	Future research avenues
1. AC characteristics and AQ Yassin and Nelson (2012); Inaam and Khamoussi (2016); Zgarni *et al.* (2016); Ghafran and O'Sullivan (2017); He *et al.* (2017); Sulaiman (2017); Asiriuwa *et al.* (2018); Kao *et al.* (2021); Mardessi (2021); Al-Ahdal and Hashim (2022	Two philosophies exist regarding AC and audit fee- one frame believes stronger AC demands superior quality audit, which in turn inflates the fees charged; the other deems that effectiveness exercised by AC reduces the required audit efforts and audit fees.	• The impact of AC features on earnings quality accounting for the influence of ownership concentration. • Attributes such as gender or specific nature of expertise demand attention.
2. CG and AQ K. Y. Chen *et al.* (2005); Gul *et al.* (2006); Abbott *et al.* (2007); Chang *et al.* (2009); Lin and Hwang (2010); Francis (2011); Farouk and Hassan (2014); Sayyar *et al.* (2015); AlQadasi and Abidin (2018); Kaawaase *et al.* (2021)	AQ is perceived as an external monitoring mechanism of CG. Numerous attributes of CG significantly affect the AQ and, ultimately, the performance of the firms. The magnitude of this influence, however, differs across economies.	• Studies employing cross-country longitudinal data to examine the impact of AQ on the firm performance. • Extensive testing of CG attributes against AQ.
3. Regulatory norms and AQ Arruñada (2000); Andrew *et al.* (2008); Kim and Yi (2009); Jamal and Sunder (2011); Arruñada (2013); Boone and White (2015); Cahan and Sun (2015); Knechel (2016); Jadiyappa *et al.* (2021)	Mandatory audit rotation, IFRS, PCAOB norms and related regulations conjointly form this cluster. Mandatory audit rotation remains a contentious issue. IFRS adoption/ convergence tested against AQ in domains such as lower discretionary accruals, better analyst prediction accuracy, and other factors continue to return debatable results.	• Impact of mandatory audit rotation considering variance in culture, geo-political and economic settings, and the post-implementation review. • Longitudinal studies assessing the impact of IFRS over periods of the financial crisis.
4. Earnings management (EM) and AQ Becker *et al.* (1998); K. Y. Chen *et al.* (2005); Abbott *et al.* (2007); Behn *et al.* (2008); Van Tendeloo and Vanstraelen (2008); S. Chen *et al.* (2010); Chi *et al.* (2011); Rusmin *et al.* (2014); Alzoubi (2016); Inaam and Khamoussi (2016); Astami *et al.* (2017)	EM has been established as a yardstick of financial reporting quality. While Some studies establish a significantly positive association between EM and AQ, others trace no or insignificant relation.	• Effects of the board of directors, AC, and CEO duality on earnings management. • Studies to assess the audit risk of clients having complex ownership structures.

Cluster label	Current research	Future research avenues
5. Non-audit services (NAS) and AQ DeAngelo (1981); Lennox (1999); Gul *et al.* (2006); Lim and Tan (2008); Knechel and Sharma (2012); Arruñada (2013); Svanström (2013); Bell *et al.* (2015); Bhattacharya and Banerjee (2019); Hohenfels and Quick (2020)	Two schools of thought are prevalent- one believes in the doctrine that joint provision of audit and NAS does not impair the independence of the incumbent auditor and thereby AQ; the other believes in the antithesis. Literature on both maxims being tantamount, the debate continues to flourish.	• Evaluating auditor independence by assessing the NAS provision at the audit office level. • NAS and AQ on private and financial companies.
6. Auditor-client relationship and AQ Lawrence (1997); Ghosh and Moon (2005); S. Chen *et al.* (2010); Reichelt and Wang (2010); Jamal and Sunder (2011); Svanberg and Öhman (2014); Bhattacharya and Banerjee (2019); Gunn *et al.* (2019); Van Raak *et al.* (2020)	Presumably considered a threat to auditor independence, it remains contentious. Some studies assert that a long-term association benefits the audit; however, the proclivity lies towards the negative assertion. It is a mainstream belief that it impairs an auditor's independence.	• Studies addressing the disparities in professional identity between Big 4 and non-Big 4. • Reasons for the tight auditor-client connection.

Source: Author's compilation

5. CONCLUSION

AQ is a multifarious area housing under its umbrella numerous dimensions pliable for research. This study attempted to harbinger the colossal research on AQ, synthesise and analyse its intellectual structure to harness encyclopaedic knowledge of the prismatic field and provide directions for future research. The ever-escalating trend projected by the number of publications undoubtedly extrapolates the signification of the domain. The 1101 pertinent articles under consideration reveal that the USA is the primary contributor to AQ. The current study reveals that most of the literature is contributed by industrialised nations. Nevertheless, it is crucial to emphasise that developing economies also have a growing inclination for the subject matter.

Moreover, in corroboration with the previous reviews of Ciger (2020), Cruceana (2021) and Taqi (2021) the study found that while the area has witnessed the expansion of its tentacles to the widest regions across the globe, collaboration among authors in the field, however, is yet to witness a more dynamic nature. Hence, more diverse and widespread collaboration in AQ is highly desired. Nevertheless, a cursory look at the extant literature provides that AC characteristics, CG, financial reporting quality and auditor's independence are the prominent themes of the area. The keyword and cluster analysis have corroborated the same. Overall, this research's findings can potentially yield advantages for a diverse range of individuals and entities, such as investors, creditors, government regulators, auditors, accounting instructors, and academics. The regulators may utilise the findings to make well-informed investment decisions, while future researchers can benefit from them in their comprehension of the elements influencing audit quality. It may further inspire them to pursue novel studies aimed at enhancing audit quality through innovative approaches.

To conclude, while the utmost care has been taken to draft this study, it has certain limitations. Firstly, articles only published in the English language were considered. Articles of significant importance may have been omitted because of the language barrier. Secondly,

while many bibliometric analysis techniques exist, not all could be covered in this study. Finally, albeit the keyword search was extensive, comprehensiveness cannot be guaranteed as other keywords may also be available.

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Resilience to Online Privacy Violation: Developing a Typology of Consumers

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Abstract*:* This study examines which segments of population with similar resilience to online privacy violation, severity of online privacy violation, and attitudes towards online privacy concern exist in Croatia, and whether they can be differentiated by demographic characteristics and attitudes towards other online constructs. Research is performed on a representative sample of Croatian Internet users who experienced online privacy violation. The survey data were analyzed using factor analysis, k-means cluster analysis, chi-square test and ANOVA. The findings indicate three groups of consumers with: (1) low-resilience, (2) moderate-resilience, and (3) high-resilience; who differ in age, income, and online buying habits.

Keywords: resilience; online privacy violation; privacy concern; consumer typology; Croatia.

JEL classification: D12, D91.

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1. INTRODUCTION

Online activities take an increasing part in almost all aspects of everyday life in the digital era. In time of pandemics consumers turn even more to online shopping, e-banking, e-learning, e-government services, and other online services for the sake of convenience, accessibility, and safety (Das *et al.*, 2021). This increase in the volume of online activities also carries certain privacy risks and raises privacy concerns (Liao *et al.*, 2011; Baek *et al.*, 2014; Bansal & Zahedi, 2015; Ginosar & Ariel, 2017; Anić *et al.*, 2019; Škrinjarić *et al.*, 2019). The neglected aspect of online privacy violation studies is how Internet users cope with this stressful event. Preliminary survey data for Internet users in Croatia reveal that an average consumer recovers rather quickly after subjectively experiencing online privacy violation (Škrinjarić *et al.*, 2019). Assuming there are some statistical differences in the level of resilience among different socio-demographic groups, a more in-depth analysis is needed to better understand the interrelationship between socio-demographic characteristics and consumer resilience to online privacy violation.

The objective of this study is to investigate consumers' resilience to online privacy violation associated with their level of online privacy concern and with the perceived severity of the privacy violation incident. It provides new insights in the typology of consumers who had recently experienced online privacy violation by finding evidence-based answers to the following research questions: (1) Can consumers be segmented into distinct groups based on the resilience to online privacy violation?; and, if so, (2) What common characteristics are shared among members of each cluster?; and (3) Are there differences in these groups based on the demographics, online buying behavior and attitudes of consumers in each cluster?

This research contributes to literature in several ways. Firstly, the increased rate of digitalization, which in turn increases the need for large amount of (individual) information to be available online, raises the opportunity of various online privacy violations. Hence, governments, private firms, researchers, and everyday consumers are paying more attention to effects of these adverse events, especially in increasing resilience to such attacks. Stakeholders might face the dilemma of increasing in general Internet users' resilience to online privacy infringements or e.g., of educating the already quite resilient Internet users to nonetheless care about preserving their privacy when online. Debate on these ethical issues is important, yet beyond the scope of this study.

Secondly, online privacy has recently gained importance, especially since the introduction of General Data Protection Regulation (GDPR). Governments and businesses are shaping their strategies to be in line with these regulations and to improve security for their online services. Finally, this research presents an important novelty since it combines "privacy" and "resilience" concepts to the analysis of consumers in an online environment. This is particularly important, given that both concepts originated outside of the social domain, and have, to the best of our knowledge, not yet been analyzed in digital environment. This study has elements of interdisciplinary online privacy research as suggested by Ginosar and Ariel (2017) and adds value to the existing knowledge.

The remainder of our paper is structured as follows. Section 2 provides a short literature review on variables used to explain the typology of online consumers, followed by Section 3 with the survey data and methodology. The results of the empirical analysis are presented and discussed in Section 4. Section 5 concludes on findings and implications and suggests directions for future research.

2. LITERATURE REVIEW

This research incorporates intertwined concepts of privacy concern, privacy violation and resilience, all in an online environment and focused on consumers who use Internet. In the core of the research lies resilience – a complex multifaceted concept used in different research disciplines (Brand & Jax, 2007; Bhamra et al., 2011; Herrman et al., 2011). Among many definitions (Martin-Breen & Anderies, 2011), consumers resilience to online privacy violation incident might be defined according to B. W. Smith et al. (2008) as the ability of an individual to "bounce back", i.e., to successfully recover from a stressful situation.

Online privacy concern can be defined as individuals' apprehension and uneasiness over the use of their personal data (Lwin et al., 2007), and it reflects the level of discomfort felt by an individual when using the Internet. Consumers who experienced online privacy violation have more privacy concerns (Xu et al., 2011; Afolabi et al., 2021). Besides feeling concerned, consumers might feel more frustrated by incidents that have severe consequences. It is therefore reasonable to assume that consumers who are more concerned about their online privacy might be less resilient to online privacy violations. Here the subjective assessment of privacy breach seriousness plays a crucial role in the individual adaptation and recovery process (Calo, 2011; Bansal & Zahedi, 2015).

To explain differences in the typology of consumers, a set of attributes was included in the cluster analysis. Past research evidence is in favor of including socio-demographic characteristics of consumers (Kaapu & Tiainen, 2009). However, in the face of massive Internet usage and increasing number of 'digital natives' (Reed, 2014), contemporary studies do not provide a clear-cut socio-demographic picture of consumer profile and online behavior. Earlier studies on socio-demographic characteristics of online consumers showed they are likely to be older, better educated, and have a higher income (Graeff & Harmon, 2002; Swinyard & Smith, 2003). The influence of personality types of Internet users to their Internet usage motives and online activities has been confirmed as well (Bubaš & Hutinski, 2006). More recent studies are not so conclusive, at least about the impact of gender on the use of Internet and online commerce purchasing (Akman & Rehan, 2014). However, different age groups may have different tendencies towards online purchasing (Hwang et al., 2006).

Consumer behavior literature and more recent research exploring online consumer behavior deal with online shopping (Islam, 2019), e-commerce (Oliveira & Toaldo, 2015), and m-commerce (Sharif et al., 2014). On the other hand, studies include more specific aspects in the analysis (Dennis et al., 2009), such as online privacy concern (Anić et al., 2019). Research findings show that both privacy concerns and previous privacy violations stand as an obstacle to the growth of e-commerce (Miyazaki & Fernandez, 2001) by inhibiting more customers from engaging in e-commerce (Lee, 2002; Pavlou & Fygenson, 2006). Although privacy stands as a major concern for online purchasers (Lee, 2002), the skeptical attitude towards online shopping could be mitigated by customer positive experience (Soopramanien, 2011). Balancing between protecting privacy and providing benefits for consumers is a significant challenge for companies because consumers ask for personalized services but resist collecting personal information (Awad & Krishnan, 2006). Privacy paradox and privacy calculus (J. H. Smith et al., 2011) seem to considerably determine the behavior of consumers and need to be addressed carefully in business policies as well. Consumers would voluntarily give away some privacy and disclose personal information in exchange for the benefits of using online services. Enduring privacy violation online might impact their individual privacy calculus and

consequently affect online consumer online (Xu *et al.*, 2011). Rare studies of consumer resilience indicate that level of resilience differently affects consumer attitudes (Rew & Minor, 2018) and purchasing outcomes (Kursan Milaković, 2021) wherein the online privacy violation context has not been regarded.

3. DATA AND METHODOLOGY

3.1 Survey Data

This research is based on the survey data on Internet users in Croatia who reported to having experienced online privacy violation in a period of three years prior to the survey. The target population were Internet users in Croatia aged 18 years old or older. The sample structure was determined according to the Eurobarometer 91.1 (European Commission, 2023). The sample was two-way stratified by region and settlement size.

The survey questionnaire, developed by the co-authors, had two filter conditions. Firstly, potential respondents had to be an Internet user; and, secondly, had to have experienced privacy violation on the Internet in the last three years. The sampling quota required that at least 66% of respondents are consumers who engage in buying online while the remaining one third do not purchase online but search online catalogues, use e-banking services, social networks and perform other activities on the Internet.

The fieldwork was conducted using Computer Assisted Telephone Interviewing (CATI) in the period from January to February 2021. The response rate was 4.6% and the net sample consists of 1,000 Internet users who experienced online privacy violation (sample characteristics are presented in Table no. A1).

3.2 Empirical Methodology

The first stage of data analysis included techniques for scale reliability and validity assessment of latent constructs used in our study. Within this stage we used Cronbach's alpha (CA) and Alpha-if-deleted coefficients, and exploratory and confirmatory factor analysis techniques. CA coefficient is used as a measure of scale reliability because it measures internal consistency, that is, how closely related a set of items is as a group. Alpha-if-deleted coefficient is used for measuring the internal consistency of the scale. The dimensionality of the scale is tested by exploratory and confirmatory factor analysis with measurement models where each manifest variable only loads on one latent variable, and with the assumption of the independence of measurement errors (Kline, 1998).

The second stage of data analysis included K-means cluster analysis which was employed to determine the specific groups within the population with similar attitudes. Finally, the third stage of data analysis was oriented towards identifying the differences among the groups of respondents. The differences were tested using the chi-square test and ANOVA.

3.3 Description of Variables used

Latent constructs in our analysis include resilience to online privacy concern (RES), online privacy concern (OPC), online privacy awareness (OAW), Internet benefits (BNF), digitalization anxiety (DA) and protective behavior (PB).

Measurement scale to assess resilience (RES) was adapted from Brief Resilience Scale (BRS) developed by (B. W. Smith *et al.*, 2008). Two features of the BRS were in favor of choosing this scale. Firstly, BRS contains only six items to be incorporated in the large telephone survey; and secondly, it was originally developed to measure resilience of adults who were the surveyed population in this research as well. BRS statements were adapted to measure resilience to the online privacy violation after the most recent incident. Items 2, 4 and 6 indicate the reverse direction of actions from items 1, 3 and 5. The appropriateness of the adapted BRS as measurement scale was tested and its psychometric characteristics were found appropriate (Rajh *et al.*, 2021). It is important to emphasize that our survey examines the citizens' *subjective* assessment of privacy violation in an online environment, which does not necessarily need to coincide with the definition of privacy violation.

To measure online privacy concern (OPC), three constructs originating from the six-item online privacy concern scale developed by H. J. Smith *et al.* (1996) were borrowed. They cover different aspects of personal online privacy concern: general concern about online privacy, concern about information collection and about privacy violation when using Internet.

Online privacy awareness (OAW) was measured using three items adopted from Xu *et al.* (2008) and Malhotra *et al.* (2004). Online privacy awareness reflects the level of individual's awareness about the importance of online privacy and possibilities that some information and data could be used without owners' consent. Online privacy awareness is higher for respondents who have knowledge about privacy issues and the solutions employed by companies and governments to ensure privacy. Further, privacy awareness is higher for respondents consider that web sites seeking information online should disclose the way the data are collected, processed, and used. In addition, the level of online privacy awareness is higher if individuals consider that a good online privacy policy should have a clear and conspicuous disclosure.

Digitalization anxiety (DA) can be defined as the tendency of individuals to be uneasy, apprehensive, or fearful about the increasing pace of digitalization, the loss of data and possible mistakes of using the computers (Cazan *et al.*, 2016). Although some studies did not find significant relationship between DA and information privacy concern (Korzaan & Boswell, 2008), other studies indicate that individuals who experience high levels of DA behave less comfortably around computers and exhibit higher levels of privacy concern (Škrinjarić *et al.*, 2018).

Measures for protective behaviors (PB) were adopted from Lwin *et al.* (2007) and adapted to our specific context. These behaviors are motivated by the individuals' need to protect sensible personal information. Lwin *et al.* (2007) stated that protective behavior implies personal information fabrication, withholding and protecting by using privacy enhancing technologies. Their results suggest that firms and regulators need to be perceived by consumers as acting responsibly in their utilization of personal data if they wish to avoid negative behavioral responses by consumers.

To control the consumers' intrinsic motivation for using the Internet, perceived benefits of using the Internet (BNF) from Dinev and Hart (2006) were also included in the model. Previous research found that Internet users develop rules of information disclosure by evaluating the perceived risks and benefits to manage their privacy effectively (Petronio, 1991). Past research also confirmed that perceived benefits have an impact on information disclosing intention (Dinev & Hart, 2006; Li, 2011). Perceived benefits through intentions

affect actual behavior, which means that individuals will reduce their tendency to engage in Internet protective behavior (Li, 2011).

Items used to measure these latent constructs are presented in Table no. A2. Answers to what extent a respondent agrees with the item statements were given at 5-point Likert scale ranging from 1 - Strongly disagree to 5 - Strongly agree.

Finally, our study also includes directly observed variables. Privacy violation seriousness (PV_ser) is measured by assessing subjective evaluation of how severe the experienced privacy incident was for the respondent. The straightforward individual answers to 'How serious was this case of online privacy violation for you?' were recorded on the scale from 1 – *Negligibly serious* to 5 – *Very serious*. General Internet attitude scale (GIAS) is also a single-item variable. This item is adapted from one item of the attitude scale of the theory of planned behavior (Ajzen, 1991; Yoon, 2011). Description of all variables used in this research is presented in Table no. A3.

4. RESULTS

4.1 Descriptive Statistics

Privacy violation instances experienced by sampled Internet users were reported as answers to an open-ended question, which were then grouped into six respective categories of privacy violations (Figure no. 1). In the content analysis we employed inductive (open) coding where categories are 'data-driven' i.e., constructed *a posteriori* based on the actual content of survey responses (Popping, 2015; Lune & Berg, 2017; Vears & Gillam, 2022).

Almost half of privacy violation cases refer to receiving unwanted advertisements and commercials after visiting a website. The second most common type of online privacy violation was recording one's location, conversations, Internet searches and messages.
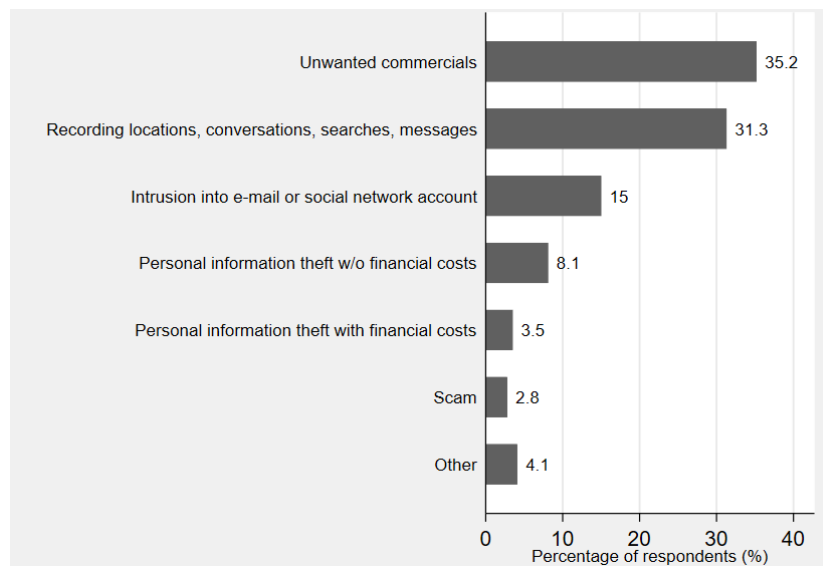
Figure no. 1 – Privacy violation online cases

After naming and describing a form of their online privacy violation, respondents also gave their subjective assessment of the "seriousness" of this privacy violation on the Likert scale with scores ranging from 1 - *Negligibly serious* to 5 - *Very serious*. For each different group of online privacy violation cases, we calculated the average of this subjective assessment of the severity of the violation (Figure no. 2). While unwanted commercials are the most common form of online privacy violation, it poses the least serious problem for Internet users. As expected, the most serious violations are those including the theft of personal data with financial costs, but fortunately, they are also among the rarest ones.
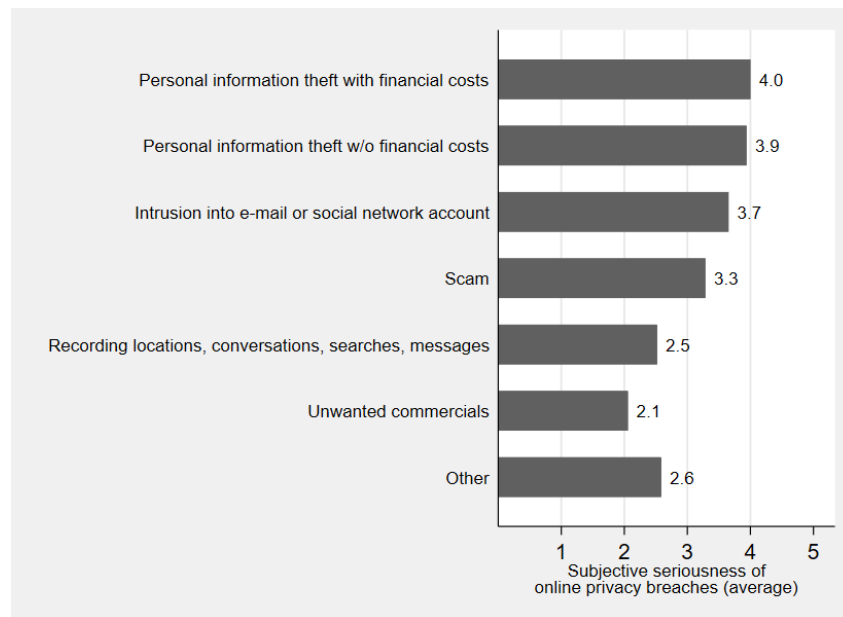
Figure no. 2 – Perceived severity of online privacy violations

Descriptive statistics used to measure latent constructs are presented in Table no. 1. Internet users on average have a certain level of resilience to online privacy violation. For most respondents, it didn't take much time to recover from the most recent online privacy violation incident (res_3 = 3.32). In fact, they reported they came through the most recent online privacy violation incident with little trouble (res_5 = 3.55). These findings are in line with the prevalence of "soft" privacy violation cases and their perceived low severity. On the other hand, Internet users are on average concerned about their privacy when online, which is in line with past research (Anić *et al.*, 2019). A major concern is reported about extensive collection of personal information over the Internet (opc_2 = 3.69). Regarding online privacy awareness, consumers are not up to date with privacy issues and solutions offered on the market (oaw_1 = 2.85), while on the other hand, they agree that web sites should be clear about their data-gathering policies (oaw_3 = 4.31) and how this information is used (oaw_2 = 4.12). Most of sampled consumers feel that digitalization is a threat to privacy (da_1 = 3.45), but they are also somewhat willing to forego their online privacy concerns if the need for obtaining a certain piece of information is high (bnf_1 = 3.34).

Finally, concerning protective behavior, most consumers employ tactics of refusing to provide personal information to untrustworthy websites (pb_6 = 3.91) and only filling out data partially when registering to certain web sites (pb_3 = 3.27).

Table no. 1 – Latent construct item descriptive statistics

Latent construct	Item	Mean	St. dev.	Min.	Max.
Resilience to online privacy violation (RES)	res_1	2.93	1.22	1	5
	res_2	2.57	1.23	1	5
	res_3	3.32	1.21	1	5
	res_4	2.41	1.18	1	5
	res_5	3.55	1.16	1	5
	res_6	2.24	1.20	1	5
Online privacy concern (OPC)	opc_1	3.31	1.03	1	5
	opc_2	3.69	1.08	1	5
	opc_3	3.51	1.07	1	5
Online privacy awareness (OAW)	oaw_1	2.85	1.05	1	5
	oaw_2	4.12	1.07	1	5
	oaw_3	4.31	0.88	1	5
Internet benefits (BNF)	bnf_1	3.34	0.98	1	5
	bnf_2	2.92	1.03	1	5
Digitalization anxiety (DA)	da_1	3.45	1.09	1	5
	da_1	2.99	1.15	1	5
Protective behavior (PB)	pb_1	2.08	1.09	1	5
	pb_2	2.05	1.22	1	5
	pb_3	3.27	1.27	1	5
	pb_4	3.17	1.25	1	5
	pb_5	2.49	1.29	1	5
	pb_6	3.91	1.25	1	5

Note: "St. dev." denotes standard deviation.

4.2 Latent Construct Estimation

Table no. 2 presents the CA coefficients and item correlations for all items used to estimate latent constructs. Regarding the RES variable, a CA coefficient value of 0.8962 and the results of the measurement scale reliability analysis indicate that the measurement scale used in constructing the RES variable possesses a satisfactory level of reliability. Both analyzed types of correlations indicate a high degree of correlation of each statement with the overall measurement scale, while Alpha-if-deleted values indicate that in this case the removal of any statement would cause a decrease in CA coefficient, i.e., the scale would become less reliable. A similar argument is used when deciding to keep all the items for OPC variable, as removal of any item would decrease the CA coefficient value of 0.7679. The story is somewhat different for OAW variable, where the alpha-if-deleted value for the first item (oaw_1) indicates that CA coefficient would increase from 0.3244 to 0.5846. Based on this result, we proceeded without item *oaw_1* to estimate the OAW variable. The same is true for item pb_6, whose removal would marginally increase CA coefficient from 0.7375 to 0.7381.

Table no. 2 – Item correlations and Cronbach alphas

Latent construct	Item	Inter-item correlation	Item-rest correlation	Cronbach alpha	Alpha-if-deleted
Resilience to online privacy violation (RES)	res_1	0.6101	0.6623	0.8962	0.8867
	res_2	0.5828	0.7398		0.8748
	res_3	0.6129	0.6543		0.8879
	res_4	0.5746	0.7637		0.8710
	res_5	0.5799	0.7484		0.8734
	res_6	0.5787	0.7516		0.8729
Online privacy concern (OPC)	opc_1	0.5281	0.5964	0.7679	0.6912
	opc_2	0.5499	0.5798		0.7096
	opc_3	0.4927	0.6239		0.6602
Online privacy awareness (OAW)	oaw_1	0.413	0.0006	0.3244	0.5846
	oaw_2	0.0437	0.2563		0.0837
	oaw_3	-0.0427	0.3301		0.0005
Internet benefits (BNF)	bnf_1 bnf_2	0.2907		0.4505	
Digitalization anxiety (DA)	da_1 da_1	0.3740		0.5444	
Protective behavior (PB)	pb_1	0.3094	0.5002	0.7375	0.6914
	pb_2	0.2899	0.5687		0.6712
	pb_3	0.3122	0.4908		0.6941
	pb_4	0.349	0.3691		0.7283
	pb_5	0.2861	0.5821		0.6671
	pb_6	0.3603	0.3331		0.7381

EFA was conducted to test convergent validity of measurement scales for each latent construct, as well as to preliminary test their dimensionality. The principal component was used as a method of factor extraction and Kaiser-Guttman rule (specifying that factors with eigenvalues greater than 1 are retained) was used as a method for determining the number of extracted factors (Table no. 3A). Results indicate that measurement scales for all our latent variables are unidimensional, as all items have high factor loadings on their respective factor (Table no. 3B). EFA results also indicate that latent variable scales pose the attribute of convergent validity. Therefore, the initial set of selected items can be considered as one measurement scale for each of those variables.

Table no. 3 – Exploratory factor analysis results

Panel A: Eigen values

Factor	Eigen values	Cumulative eigen values	Percentage of explained variance	Cumulative percentage of explained variance
1	5.0116	5.0116	0.2278	0.2278
2	2.6823	7.6939	0.1219	0.3497
3	2.0323	9.7262	0.0924	0.4421
4	1.5299	11.2562	0.0695	0.5116
5	1.3037	12.5598	0.0593	0.5709
6	1.1031	13.6629	0.0427	0.6136
7	0.8446	14.5075	0.0384	0.6520
8	0.7902	15.2977	0.0359	0.6879
9	0.7433	16.0410	0.0338	0.7217

Factor	Eigen values	Cumulative eigen values	Percentage of explained variance	Cumulative percentage of explained variance
10	0.6714	16.7124	0.0305	0.7522
11	0.6509	17.3633	0.0296	0.7818
12	0.6092	17.9725	0.0277	0.8095
13	0.5657	18.5383	0.0257	0.8352
14	0.5616	19.0999	0.0255	0.8607
15	0.5348	19.6346	0.0243	0.8850
16	0.4905	20.1251	0.0223	0.9073
17	0.4523	20.5775	0.0206	0.9279
18	0.4224	20.9999	0.0192	0.9471
19	0.3977	21.3976	0.0181	0.9652
20	0.3838	21.7814	0.0174	0.9826
21	0.2176	21.9990	0.0099	0.9925
22	0.1651	22.1641	0.0075	1.0000

Panel B: Eigen vectors

Latent construct	Item	F1	F2	F3	F4	F5	F6
Resilience to online privacy violation (RES)	res_1	0.7352					
	res_2	0.7981					
	res_3	0.7678					
	res_4	0.8357					
	res_5	0.8317					
	res_6	0.8325					
Online privacy concern (OPC)	opc_1		0.7037				
	opc_2		0.7010				
	opc_3		0.6976				
Online privacy awareness (OAW)	oaw_1				-		
	oaw_2				0.766		
	oaw_3				0.730		
Internet benefits (BNF)	bnf_1					0.694	
	bnf_2					0.697	
Digitalization anxiety (DA)	da_1						0.670
	da_1						0.671
Protective behavior (PB)	pb_1			0.727			
	pb_2			0.806			
	pb_3			0.546			
	pb_4			0.514			
	pb_5			0.762			
	pb_6			-			

Notes: Principal factor method was used, and factors were rotated using orthogonal varimax rotation. Factor loadings lower than 0.5 were dropped and are not reported ("-").

Convergent validity was also assessed with CFA, where we tested two models: (1) model with all items for all latent variables; and (2) model using only items with positive direction for RES variable, and without items *oaw_1* and *pb_6* for OAW and PB variables. CFA results, presented in Table no. 4, further confirm EFA results. Fit indices show that measurement Model 2 has an acceptable level of fit to empirical data. Hence, in all further analysis RES variable will be based only on items with positive direction (*res_1*, *res_3* and *res_5*), OAW variable will be based on items *oaw_1* and *oaw_2*, and item *pb_6* will not be

used for PB variable. All analyzed items load on their respective factors and all loadings are statistically significant. Thus, results indicate that all scales are unidimensional.

Table no. 4 – Confirmatory factor analysis results

	Model 1	Model 2
Resilience (RES)		
res_1	1.000 (-)	1.000 (-)
res_2	1.124*** (0.048)	-
res_3	0.981*** (0.049)	1.027*** (0.059)
res_4	1.116*** (0.049)	-
res_5	1.093*** (0.048)	1.121*** (0.064)
res_6	1.161*** (0.051)	-
Online privacy concern (OPC)		
opc_1	1.000 (-)	1.000 (-)
opc_2	1.003*** (0.058)	1.005*** (0.058)
opc_3	1.119*** (0.063)	1.119*** (0.064)
Online privacy awareness (AOW)		
oaw_1	1.000 (-)	-
oaw_2	-14604.33 (35526.89)	1.000 (-)
oaw_3	-8086.436 (19687.9)	0.631*** (0.139)
Internet benefits (BNF)		
bnf_1	1.000 (-)	1.000 (-)
bnf_2	1.129*** (0.242)	1.112*** (0.216)
Digitalization anxiety (DA)		
da_1	1.000 (-)	1.000 (-)
da_1	1.032*** (0.093)	1.034*** (0.094)
Protective behavior (PB)		
pb_1	1.000 (-)	1.000 (-)
pb_2	1.201*** (0.067)	1.200*** (0.065)
pb_3	0.948*** (0.071)	0.851*** (0.066)
pb_4	0.737*** (0.069)	0.689*** (0.066)
pb_5	1.261*** (0.077)	1.217*** (0.074)
pb_6	0.606*** (0.068)	-
N	1,000	1,000
Chi-squared	7435.139***	4041.444***
RMSEA	0.152	0.055
CFI	0.871	0.920
TLI	0.821	0.974
GFI	0.866	0.982

Notes: (***) denotes significance level $p<0.01$. Standard errors are in parentheses.
RMSEA = Root mean square error of approximation, CFI = Comparative fit index,
TLI = Tucker-Lewis index, GFI = Goodness of fit index.

4.3 Typology of Consumers

The next step in the analysis was the classification of consumers according to their resilience to online privacy concern. K-means cluster analysis was employed to classify consumers based on three online privacy related variables: seriousness of privacy violation

incidents, online privacy concern of consumers and consumers' resilience to online privacy violation. Elbow method was used as a criterion for determining the optimal number of clusters in a dataset. Mean values were calculated for RES and OPC variable-items and these mean values were taken as an input in the K-means cluster analysis. Since privacy violation seriousness (PV_ser) is measured using a single-item scale, its original values were taken as an input in the K-means cluster analysis. Results of the K-means cluster analysis differentiated three homogeneous segments of consumers (Table no. 5 and Figure no. 3).

Table no. 5 – K-means cluster analysis results

	Total sample (n = 1,000)	Cluster 1 (n = 283)	Cluster 2 (n = 406)	Cluster 3 (n = 311)	ANOVA
Privacy violation seriousness	2.7	4.5	2.5	1.3	F = 2,274.6***
Online privacy concern	3.5	3.9	3.7	2.8	F = 170.6***
Resilience to online privacy violation	3.3	2.4	3.3	4.1	F = 383.4***

Note: (***) denote significance level $p<0.01$.

Cluster 1 (Low Resilience) is a low resilience cluster with the lowest value of RES variable. Consumers in this cluster, according to their subjective assessment, have experienced quite serious online privacy violations (mean value 4.5). These consumers also exhibit the highest level of online privacy concern.

Cluster 2 (Moderate Resilience) is a medium resilience cluster. Consumers in this cluster have experienced online privacy violations that are considerably less serious than those experienced by consumers from cluster 1. However, consumers in this segment still exhibit relatively high levels of online privacy concern.

Cluster 3 (High Resilience) is a high resilience cluster. Consumers in this cluster have experienced online privacy violations that are the least serious of all three clusters. Also, when compared to consumers from other clusters, consumers in this cluster exhibit the lowest levels of online privacy concern.
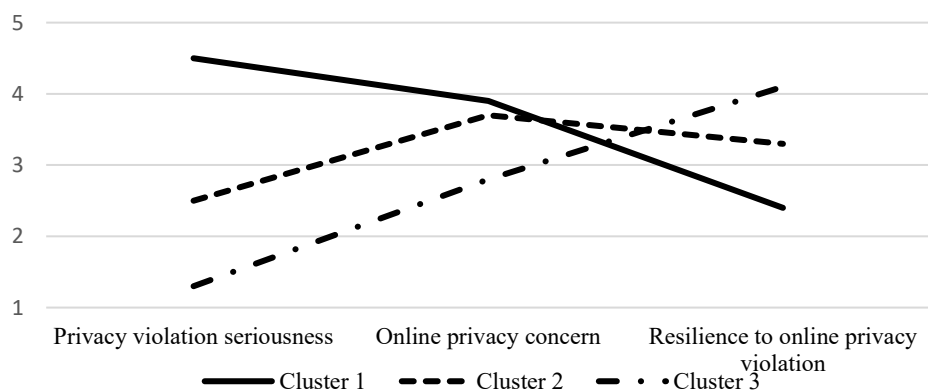
Figure no. 3 – K-means cluster analysis results

4.4 Differences among groups of consumers

Next, we examine the differences among the identified clusters based on the demographic characteristics and attitudes of member consumers (Table no. 6 and Table no. 7).

Table no. 6 – Differences in demographics among clusters (relative frequencies, %)

	Total sample (n = 1,000)	Cluster 1: Low Resilience (n = 283)	Cluster 2: Moderate Resilience (n = 406)	Cluster 3: High Resilience (n = 311)	Chi-squared test statistic
Gender					
Male	48.7	45.9	51.7	47.3	2.607
Female	51.3	54.1	48.3	52.7	
Age					
18-34	34.7	36.8	35.0	32.5	
35-50	30.4	35.3	28.6	28.3	9.868**
51+	34.9	27.9	36.5	39.2	
Education					
Secondary school or less	53.8	55.8	52.7	53.4	
Some level of higher education	46.2	44.2	47.3	46.6	0.686
Monthly household income					
Up to 6,500 HRK [a]	23.4	21.5	23.2	25.5	
6,501-10,000 HRK	29.5	23.7	33.7	29.2	19.867***
10,001-15,000 HRK	32.6	43.8	27.6	28.8	
More than 15,000 HRK	14.5	11.0	15.6	16.5	
Shopping on Internet					
Yes	66.7	52.7	71.2	73.6	35.555***
No	33.3	47.3	28.8	26.4	

Notes: (**), (***) denote significance levels p<0.05 and p<0.01, respectively. Pearsons' Chi-squared statistic was used. Due to missing data, for monthly household income N = 777. [a] 1 EUR ~ 7.5 HRK.

There are statistically significant differences among identified clusters considering age, monthly household income and their previous involvement in online buying. There are no statistically significant differences in gender and the level of education.

Members of Cluster 1 (Low Resilience) are dominantly young consumers whose low resilience is in line with their high privacy concern and the highest perceived seriousness of the privacy violation incident they had experienced. These Internet users employ some protective measures and have a high digitalization anxiety which at first sight, contrasts with their digital native nature. However, the strongest negative experience with online privacy violation explains these characteristics and the perceived low benefits of using Internet. It might as well be that this rather high-income group of a younger age is taking Internet benefits as granted. Intensive Internet usage could also increase their fear of losing the data and making mistakes when working on computer or being online. This distress is one aspect of being anxious about going digital.

The age composition of Cluster 2 (Moderate Resilience) is in line with the average of the whole sample. Nevertheless, Cluster 2 is the most interesting group. Consumers showed moderate resilience and lower perceived levels of severity of the privacy violation incident. Despite some extent of online privacy concern and general negative attitude towards Internet, they keep on practicing e-commerce/shop online. Most likely they see advantages

of the Internet and therefore balance between perceived costs in terms of privacy violation risk and benefits of services and activities offered online.

Members of Cluster 3 (High Resilience) are dominantly older consumers aged over 51. In Cluster 3, the proportion of consumers with either the highest or the lowest income is above the entire sample average. The high resilience to online privacy violation is in line with the lowest perceived seriousness of the incident experienced. Cluster members are not privacy concerned, have positive attitudes towards Internet and no digitalization anxiety. It is not surprising they see many benefits of Internet as many of them regularly engage in e-commerce/shop online.

Table no. 7 – Differences in attitudes among clusters (means)

	Total sample (n = 1,000)	Cluster 1: Low Resilience (n = 283)	Cluster 2: Moderate Resilience (n = 406)	Cluster 3: High Resilience (n = 311)	ANOVA F-statistic
Online privacy awareness	3.76	3.78	3.76	3.74	0.336
General Internet attitude scale	3.79	3.75	3.70	3.95	8.939***
Internet benefits	3.13	2.98	3.12	3.29	11.329***
Digital anxiety	3.22	3.47	3.33	2.84	42.767***
Protective behavior	2,83	3,00	2,94	2,53	32.547***

Note: (***) denote significance levels p<0.01.

5. CONCLUSIONS

The findings on the typology of Internet users who experienced Internet privacy violation differentiated three groups of consumers (low-resilience, moderate-resilience, and high-resilience) that are homogeneous within group and heterogeneous between identified groups for all three analyzed variables. The typology is based on the respondents' online privacy concern, their subjective assessment of the severity of privacy violation and their resilience to it. These are novel aspects included in consumer behavior online research.

A self-reported measure of concern about online privacy and a subjective notion of severity of privacy violation incident seem to be closely associated to the consumer's resilience to online privacy violation incident. Additionally, consumers who perceive positive outcomes of using Internet would recover faster or cope easier with the privacy violation event. Here the most interesting finding is that even moderately resilient consumers do not sustain e-buying. Surprisingly, older customers belong to the high-resilience cluster, suggesting that other personal characteristics might affect their behavior. Their longer life experience might prevent them from dramatically reacting to online privacy violation. On the other side, younger generations are highly sensitive to privacy breaches and show a higher rate of digitalization anxiety. They therefore employ more protective measures online. Low resilience of upcoming generations of consumers calls for an increased attention of marketers and business policies in general as well as for better communication of privacy protection regulations.

This study is not without limitations. First, although the notion of resilience is a very broad term appearing in various domains, it was not possible to include all theoretical contributions of resilience in this paper. Even though our dataset contains a representative sample of citizens over the age of 18, children begin to be active online from an early age, and

their level of resilience may differ from that of the older population. Likewise, the measured level of resilience certainly changes over time as technology advances, so the time component should certainly be included in future research. This model is set to analyze online privacy violation breach effects on citizens' attitudes towards various digital public services (via their degree of resilience). However, this adverse event may also have spillover effects to citizens' closer circle of relatives and friends, which are currently not included in the model. Our dataset is "cross-section" type, as opposed to panel structure, so the results can be interpreted only in terms of correlations or associations, and not causations. Finally, the model is tested on citizens of one country in specific socio-cultural and economic conditions, and without additional empirical verification it cannot be generalized outside these conditions.

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ANNEXES
Table no. A1 – Descriptive statistics of respondents' socio-demographic characteristics

Variable	N	Mean	St. dev.	Min.	Max.
Gender					
Female	513	0.51	0.5	0	1
Male	487	0.49	0.5	0	1
Age[a]	1,000	43.31	15.88	18	86
Age categories					
18-34	347	0.35	0.47	0	1
35-50	304	0.30	0.46	0	1
50+	349	0.35	0.48	0	1
Number of people in household[a]	1,000	3.35	1.42	1	10
Education					
Secondary school or less	538	0.54	0.49	0	1
Higher education	462	0.46	0.49	0	1
Occupation of respondent					
Self-employed	50	0.05	0.22	0	1
Manager	45	0.05	0.21	0	1
Professional	160	0.16	0.37	0	1
Technician/clerk	191	0.19	0.39	0	1
Worker	191	0.19	0.39	0	1
Retired	159	0.16	0.37	0	1
Student	111	0.11	0.31	0	1
Unemployed	93	0.09	0.29	0	1
Income of respondents' household					
Up to 6.500 HRK [b]	182	0.18	0.39	0	1
6.501-10.000 HRK	229	0.23	0.42	0	1
10.001-15.000 HRK	253	0.25	0.43	0	1
> 15.000 HRK	113	0.12	0.32	0	1
No answer	223	0.22	0.42	0	1
NUTS2 region of respondent [c]					
Panonian Croatia	263	0.26	0.44	0	1
Adriatic Croatia	353	0.35	0.48	0	1
City of Zagreb	163	0.16	0.37	0	1
North Croatia	221	0.22	0.42	0	1
Place or residence size					
10,000 or less	309	0.31	0.46	0	1
10,001–50,000	296	0.3	0.46	0	1
50,001–100,000	79	0.08	0.27	0	1
More than 100,000	316	0.32	0.47	0	1

Notes: "St. dev." denotes standard deviation. a As these are not categorical variables, here we present averages rather than frequencies. b 1 EUR ~ 7.5 HRK. c Definitions of these regions are available here: https://ec.europa.eu/eurostat/web/nuts/nuts-maps.

Table no. A2 – Description of items used to build latent constructs

Latent construct	Items	Description
Resilience to online privacy violation (RES)	res_1	I bounced back quickly after the most recent online privacy violation incident.
	res_2	I had a hard time making it through after the most recent online privacy violation incident.
	res_3	It didn't take me long to recover from the most recent online privacy violation incident.
	res_4	It was hard for me to snap back when the most recent online privacy violation happened.
	res_5	I came through the most recent online privacy violation incident with little trouble.
	res_6	It took me a long time to get over the most recent online privacy violation incident.
Online privacy concern (OPC)	opc_1	I am concerned about my online privacy.
	opc_2	I am concerned about extensive collection of my personal information over the Internet.
	opc_3	I am concerned about my privacy violation when using the Internet.
Online privacy awareness (OAW)	oaw_1	I keep myself updated about privacy issues and the solutions that companies and the government employ to ensure our online privacy.
	oaw_2	Web sites seeking information about me should disclose the way the data are collected, processed, and used.
	oaw_3	A good online privacy policy should have a clear and conspicuous disclosure.
Internet benefits (BNF)	bnf_1	In general, my need to obtain certain information or services from the Internet is greater than my concern about online privacy.
	bnf_2	The greater my interest to obtain a certain information or service from the Internet, the more I tend to suppress my privacy online concerns.
Digitalization anxiety (DA)	da_1	Digitalization is a real threat to privacy.
	da_1	I am easily frustrated by increased digitalization in my life.
Protective behavior (PB)	pb_1	I give fictitious responses to avoid giving the web site real information about myself.
	pb_2	I use another name or e-mail address when registering with certain web site without divulging my real identity.
	pb_3	When registering with certain web site, if possible, I only fill up data partially.
	pb_4	I try to eliminate cookies that track my Internet activities.
	pb_5	I try to disguise my identity when browsing (private browsing option).
	pb_6	I refuse to provide personal information to untrustworthy websites.

Table no. A3 – Description of variables in the model

Variable	Description	Values
PV_ser	Privacy violation seriousness scale	1 – Negligibly serious, 2 – Moderately serious, 3 – Medium serious, 4 – Serious, 5 – Very serious
RES	Resilience to online privacy violation	1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree
OPC	Online privacy concern	1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree
OAW	Online privacy awareness	1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree
GIAS	General Internet attitude scale	1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree
BNF	Internet benefits	1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree

Variable	Description	Values
DA	Digitalization anxiety	1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree
PB	Protective behavior	1 – Never, 2 – Rarely, 3 – Sometimes, 4 – Often, 5 – Very often
Gender	Gender of respondent	1 – Male, 0 – Female
Age	Age category of respondent	1 – 18-34, 2 – 35-50, 3 – 50+
Education	Education of respondent	1 – Secondary school or less, 2 – Higher education (university, college, PhD, MBA, …)
Income	Average household income[a] of respondent	1 – Up to 6.500 HRK, 2 – 6.501-10.000 HRK, 3 – 10.001-15.000 HRK, 4 – More than 15.000 HRK, 5 – Does not want to answer
Region	NUTS 2 region[b] of respondent	1 – Panonian Croatia, 2 – Adriatic Croatia, 3 – City of Zagreb, 4 – North Croatia
Settlement	Settlement size of respondent	1 – 10.000 or less, 2 – 10.001-50.000, 3 – 50.001-100.000, 4 – More than 100.000

Notes: [a] 1 EUR = 7.53 HRK. [b] Definition of NUTS2 regions are available here: https://ec.europa.eu/eurostat/web/nuts/nuts-maps
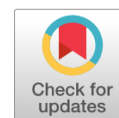
The Economic Impact of the LEADER Program in the
Rural Communities of Romania

Ana-Maria Opria* ⓘ**, Lucian Roșu**** ⓘ**, Corneliu Iațu***** ⓘ

Abstract*: The sustainable development of rural areas is one of the European Union's objectives. LEADER program contributes to its fulfillment by offering financial support to disadvantaged rural areas. The purpose of this paper is to assess the LEADER program's economic impact in the Romanian rural communities. Econometric methods of impact assessment were used to analyze the evolution of economic indicators in the beneficiary communities. Propensity Score Matching and Difference in Differences were the methods applied in order to meet the objectives of the paper: analysis of the spatial distribution of projects submitted and funds allocated to LAGs (1), and of the economic evolution of LAG and non-LAG communities, before and after LEADER funding (2). The results indicate a stronger economic growth for the beneficiary rural communities, confirming in all cases the initial hypothesis. LEADER seems to have acted in these directions: the creation of new jobs and increasing the local businesses performance. However, the contribution made was minimal and insignificant. Conclusions of the study highlight that the contribution of the LEADER program to the economic development of rural communities can be at most one of supporting the current level of development, but not of reaching a much higher level. LEADER can be considered, from a quantitative point of view, only an instrument with a positive effect on rural areas, but not an instrument of impact. This is because LEADER did not bring significant changes and didn't ensure that critical mass that could trigger the economic development of rural communities.*

Keywords: LEADER funds; rural communities; economic impact; economic development; Difference in Differences method.

JEL classification: O18; O47; R15; R51.

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1. INTRODUCTION

The LEADER program is a European financial instrument offering support to disadvantaged rural communities. Through the projects implemented and funds granted the objective envisaged by LEADER is that of making changes for the better in the rural communities, changes regarding the local governance (by stimulating collaboration between stakeholders), but also the local economy (by stimulating entrepreneurship and SMEs), changes that contribute to a sustainable development. Thus, LEADER program has the capacity to bring both a social and an economic impact at the level of the beneficiary communities. Most of the studies conducted so far focused on appreciating the social impact of the program, the economic contribution being less investigated. However, economic development remains an important component of sustainable development insofar as it ensures the material well-being of communities that has a direct impact on populations quality of life. As stated by Feldman *et al.* (2016), economic development is essential because it creates the conditions necessary for the sustainable development of communities. Taking these into consideration, the present paper argues that LEADER has the potential of leading disadvantaged rural communities to a sustainable development not only through its specific approach (bottom-up), but also through the financial support granted that can have a significant impact on the local economy. LEADER can contribute through its actions to reducing development disparities and making the transition from economic development to sustainable development. Thus, LEADER is a tool for economic development because it brings innovation, change that are necessary to achieve the goal of economic development and, in the end, the sustainable development of rural communities.

The present study focuses on appreciating the LEADER program's contribution in the economic development of the beneficiary communities, contribution seen as economic impact. The main question of this paper is whether the investments made through the LEADER program have been sufficiently effective to lead to a significant and properly invested economic growth that could subsequently generate economic development. This study will assess if the financial support provided by LEADER ensures that critical mass that could trigger the economic development of the Romanian rural communities. In this regard, two objectives were pursued: the analysis of the spatial distribution of projects submitted and funds allocated to LAGs (1), and the comparative analysis of the economic evolution of LAG and non-LAG communities, before and after LEADER funding (2). The hypothesis to be tested is that the LEADER beneficiary territories registered a more accentuated positive evolution of the economic indicators compared to other similar rural communities, but which did not benefit from the financial support of the LEADER program.

Evaluating the economic impact of development programs, such as LEADER, is a topic of great importance. This is because impact assessment studies can provide a much clearer picture of the effectiveness of financing programs, their weaknesses and aspects that need improvement (Gertler *et al.*, 2011). Thus, they can provide essential information to decision makers and concrete answers to questions about the aspects that need to be changed. When it comes to the LEADER program, measuring its economic impact can reveal whether this is indeed the desired change that could lead disadvantaged rural communities to economic development and then to sustainable development – one of the main objectives pursued at European level.

The assessment of the economic impact of the LEADER program has been a subject rather secondarily approached in scientific research. Most of research papers focus on appreciating the social impact because of the LEADER program's focus on making changes in the local governance system through the bottom-up approach. However, we must consider also that LEADER remains a financial tool who gives support to rural communities for their economic development by supporting SMEs and stimulating local entrepreneurship. Thus, changes in the local economy can be one of its results. When it comes to the economic impact, both in Romania and in other European beneficiary countries, the impact studies consist mostly on a basic analysis of the overall evolution of certain quantitative economic indicators (e.g. new enterprises, job creation), in a limited number of beneficiary communities, but without a special focus on appreciating the differences brought in the local economy. Compared to previous research studies, the present paper brings a contribution by analyzing the impact of LEADER program on new economic directions such as turnover, no. of employees and per capita income at the level of the LEADER beneficiary communities. These indicators will help create a broad picture on the economic results of the program. Moreover, the effects of LEADER and the contribution made to the development of communities differ from one region to another and therefore the conclusions obtained from conducting case studies (that predominate in previous research studies) cannot be generalized (Jalalian et al., 2021). To overcome this shortcoming, this study will apply econometric methods of impact assessment that allow more robust conclusions to be drawn, and the larger scale of analysis than previous studies will ensure a high degree of confidence in the results obtained.

Section 2 of the paper presents the main findings in the literature regarding the LEADER program's economic impact and underlines the present paper's contribution to the existing knowledge on the subject. Subsequently, the data used and methods applied (e.g. propensity score matching, difference in differences) for the evaluation of the economic impact are presented in detail in Section 3. Results and discussions follow, Section 4 being divided in two parts, each of which corresponds to the objectives of the present study: analysis of the LEADER projects and funds spatial distribution (1) and comparative analysis of the economic evolution of LEADER and non-LEADER communities. The paper concludes by highlighting the main findings of this study and relating them to previous research. Section 5 also proposes future research directions.

2. LITERATURE REVIEW

As presented in the introduction, the debate of this study is that the LEADER program can lead to the sustainable development of rural communities not only through its qualitative contribution (social impact) but also through its financial, quantitative contribution (economic impact). The literature is rich in the analysis of the qualitative results of the LEADER program, especially in the appreciation of its contribution in stimulating collaboration between local actors and improving local governance through the new type of bottom-up approach introduced in the beneficiary communities. In terms of its quantitative contribution, the assessment of economic results is less addressed. It is often superficially analyzed in papers that focus mainly on qualitative issues. However, the few studies that refer also to quantitative results highlight the capacity of the LEADER program to generate effects in the local economy. Neto et al. (2014) show that LEADER has played a positive role by increasing the number of job-generating projects from one funding period to another. Also, Krievina et

al. (2015) demonstrate that LEADER projects had an impact on the development of economic activity of the beneficiary communities and Jalalian *et al.* (2021) appreciate that best results of LEADER are on the economic dimension. These studies, while giving a glimpse on the contribution LEADER has made to the local economy, fail to capture the true economic impact of the program. In order to address this need, more in-depth studies are needed, studies that apply specific impact analysis methodologies.

Why is it necessary to assess the economic impact of the LEADER program? Why is it important to know its contribution to the economic development of communities? Economic development, that can be stimulated through the support of European funding programs, is part of sustainable development (Onofrei *et al.*, 2023) and LEADER is a funding instrument for disadvantaged rural communities which aims through its actions at the sustainable development of the beneficiary territories. Sustainable development involves 3 dimensions: economic, social and environmental (Mihai *et al.*, 2019). The objective of sustainable development is to ensure the long-term stability of the economy and the environment, the interdependence between the two being the foundation of sustainable development (Emas, 2015). Thus, the economic dimension is one of the pillars of rural development that LEADER seeks, alongside education, health, culture and environment (Kim & Yang, 2016; Mihai *et al.*, 2019).

Economic development represents a fundamental transformation of an economy (Schumpeter, 1961) involving major structural changes (Nafziger, 2012) targeting infrastructure, production, labor qualification, etc., changes that ultimately lead to an improvement in the population's quality of life, way of living and mentality. These structural changes bring both quantitative and qualitative results, facilitating economic growth and improvement in social conditions as a result of a prosperous economic activity (Hammer & Pivo, 2017). Traditionally, economic development outcomes are appreciated by reference to quantitative indicators such as jobs, per capita income and gross domestic product (Blakely & Bradshaw, 2002; Koven & Lyons, 2010 as cited in Hammer & Pivo, 2017), economic development being seen as a process of wealth creation. However, economic development aims to introduce qualitative improvements also through innovation, entrepreneurship, changes able to put a territory's economy on an upward and lasting trend (Schumpeter, 1934; Feldman *et al.*, 2016). The changes made concern the improvement of the material condition of the lower social stratum of the population, the reduction of the share of agriculture in the economy and a focus on the service sector in the formation of GNP, investment in technology, education and in the training of the labor force. Thus, an economically developed community is a community able to cope and adapt easily to change (Nafziger, 2012).

The LEADER program contributes to the economic development of rural communities through the nature and diversity of projects funded (Biczkowski, 2020). These projects aim to achieve objectives such as diversifying economic activities (Alonso & Masot, 2020), stimulating entrepreneurship, creating jobs, modernizing businesses by introducing new equipment/technologies, improving the economic performance of businesses, etc. Revitalizing rural areas through economic diversification is mentioned as a basic objective of the CLLD approach that underlies the LEADER program (Ruiz Pulpón & Cañizares Ruiz, 2020). The research carried out so far underlines the success of the financial instrument in this direction, of diversifying economic activities by stimulating tourism and supporting mainly tertiary sector projects to the detriment of agricultural activities that have been predominant in rural areas so far (Alonso & Masot, 2020; Olar & Jitea, 2021). The contribution made by LEADER to the economic development of rural communities consists also in stimulating

entrepreneurship through these projects (Chmieliński *et al.*, 2018), which often results in the emergence of new SMEs or the development of existing ones. The results of projects implemented in the local economy are reflected in the number of new jobs created, increased quality of services offered, better conditions for investments and new sources of non-agricultural income (Biczkowski, 2020). All this indicates that LEADER investments are directed towards activities capable of exploiting local economic potential (Biczkowski, 2020).

The first years of the LEADER program's implementation were characterized by a predominant focus on achieving quantitative results. An example of this is the 2007-2013 funding period which was dominated by "classic" projects focusing on tourism, agriculture, economy among others (Stoustrup, 2022). Studies show that between 2007-2013 some LAGs were obliged to favor those projects that generate higher economic results - e.g. projects that stimulate the creation of new jobs (Chmieliński *et al.*, 2018). Some authors consider the primary role of LEADER to be that of creating new jobs with the help of the implemented projects that envisage the improvement of production processes, access to innovation and diversification of economic activities (Cañete *et al.*, 2018). Thus, the contribution of the LEADER program to the economic development of the beneficiary territories is seen as considerable. Currently, however, the focus is more on achieving qualitative results with the LEADER program, such as improving collaboration between local actors or increasing their involvement in local governance with the specific LEADER bottom-up approach. However, many LAGs find it difficult to implement the bottom-up approach because of the reluctance of local actors to get involved. In these situations, central public authorities tend to compensate for the absence of the private sector and local people in the decision-making process and dominate it. In such cases the public sector often favors the funding of LEADER projects with a higher economic contribution (Stoustrup, 2022). In other words, the failure of LAGs to achieve their qualitative objectives leads to a higher LEADER contribution on the side of local economic development. This is often the case for LAGs in Romania, where many of the measures adopted by LEADER associations fall under the EU's priority 6 (Olar & Jitea, 2021), which concerns, among other things, the economic development of communities. This makes the potential of LEADER to bring a significant economic impact to beneficiary territories to be higher.

According to Alonso and Masot (2020), there is a clear need to evaluate the quantitative results of the LEADER program giving that at its core are sufficient objectives and funding measures focused on the development of the local economy of the beneficiary communities. LEADER finances a high proportion of quantitative projects, which makes it necessary to assess its success in terms of its economic results. Thus, LEADER success is a mixture of both sphere: qualitative and quantitative (Marquez *et al.*, 2005 as cited in Alonso & Masot, 2020). Moreover, there is a major gap in the literature on the assessment of the LEADER program's quantitative results. There is a need to objectively assess the quantitative impact by comparing LEADER beneficiary and non-beneficiary areas (Esparcia Perez, 2000). This study aims to fill this gap by assessing the economic impact of the LEADER program using counterfactual methods which allow the two types of territories: beneficiary and non-beneficiary, to be mirrored. These counterfactual methods also provide a higher degree of accuracy in estimating the contribution made to the local economy, ultimately leading to robust conclusions on the subject.

3. MATERIALS AND METHODS

3.1 Study area

This study focuses on appreciating the LEADER program's economic impact in the beneficiary communities in Romania, an EU Member State since 2007. As a level of economic development, Romania is below the European average in terms of GDP per capita according to Eurostat data (Opria *et al.*, 2021) – see Figure no. 1. Regarding the development level of the rural communities, Romania faces pronounced territorial disparities (Dachin, 2008). In the western half are located the more developed rural settlements, and in the eastern and southwestern part of the country are concentrated most of the severely disadvantaged rural communities (Niţescu, 2014; Mitrică *et al.*, 2020). At European level, in 2010 Romania was among the countries with the strongest agricultural fragmentation, subsistence agriculture being prevalent (Dachin, 2008; Niţescu, 2014). Most of the active rural population is employed in the agricultural sector which faces low economic efficiency (Chivu *et al.*, 2020). This, together with the rural population low standard of living, the lack of rural entrepreneurs, the low interest for innovation, are just some of the problems facing Romanian rural communities that explain the need for external financial support in the form of European development programs. Currently, LEADER operates in Romania through 239 LAGs that occupy 88.9% of the Romanian territory, most of the rural communities being included in one of the LEADER associations.
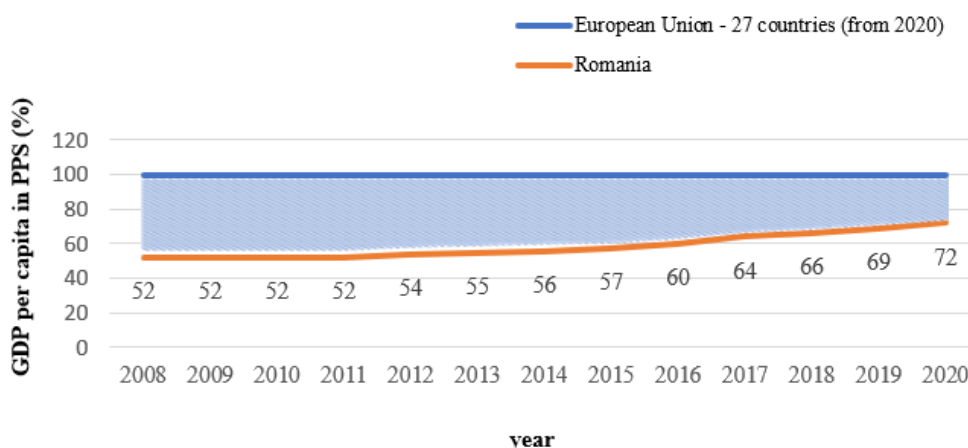
Figure no. 1 – Evolution of GDP per capita in Romania between 2008-2020 compared to the European Union average

3.2 Data and methods

In order to assess the initial development level of the rural communities and to appreciate the LEADER program's impact, an analysis was carried out on 3 economic indicators: turnover, number of employees and per capita income. The economic impact was assessed by reference to the dynamics of the 3 indicators at commune level between two benchmarks. These were the year 2011, which marked the establishment of the first Romanian LAG, and

the year 2018, 7 years after the effective implementation of the LEADER program in Romania. For the first objective - the analysis of the spatial distribution of the submitted projects and funds allocated through LEADER - the data were analyzed and mapped at the level of the Romanian LAGs. Regarding the economic impact assessment, the reference scale was the local scale (commune), the contribution brought by LEADER being determined by making a comparison between the rural communities benefiting from LEADER and those not included in the program.

Step one: the first step consisted in processing the database comprising details about the implemented LEADER projects and the funds allocated at the level of each Romanian LAG during the years 2011-2018 and mapping the information in question. This contributed to shaping an overview of the LEADER program's results in Romania and especially to the achievement of the first objective of the paper: the analysis of the spatial distribution of projects submitted and funds allocated to LAGs.

Step two: In order to test the hypothesis of the study and, implicitly, to respond to the second objective of the paper, econometric methods of impact assessment were applied. These were as follows:

- **Propensity Score Matching (PSM)**

The first step was to create pairs of rural communities included and not included in the LEADER program. For this, the *Propensity Score Matching* method was used, a counterfactual method developed by Rosenbaum and Rubin (1983) which consists in creating pairs of individuals different in terms of access to a particular intervention, but similar in terms of their internal composition, thus resulting a control group (non-beneficiary rural communities) and an experimental group (LEADER beneficiary rural communities). The covariates considered for the creation of community pairs were the level of development (LHDI[1] values), the population's material well-being (income / inhabitant) and the community size (population density). Starting form these three covariates, the propensity score was calculated based on the multiple logistic regression model (see Eq. 1):

$$Ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ ... + \beta_k X_k \tag{1}$$

where

$Ln\left(\frac{P}{1-P}\right)$ = log odds ratio ('logit')
β_0 = intercept
$\beta_1, \beta_2 \ ... \beta_k$ = regression coefficient
$X_1, X_2 \ ... X_k$ = covariates

Subsequently, the resulting propensity score was used to create pairs of different individuals in terms of access to treatment, but with similar propensity score values. The method approached in creating the pairs was *Nearest Neighbor Matching* which aims to minimize the absolute difference between the propensity scores of the two groups (control and experimental) (see Eq. 2). Individuals are randomly ordered, and the first individual in the experimental group is matched with an individual in the control group very similar in terms propensity score value (Thavaneswaran & Lix, 2008).

$$C(P_i) = \min_j |P_i - P_j| \qquad (2)$$

where:

$C(P_i)$ = the group of control subjects j matched to treated subjects i
P_i = estimated propensity score for the treated subjects
P_j = estimated propensity score for the control subjects
Source: Thavaneswaran and Lix (2008)

The application of this counterfactual method (*Propensity Score Matching*) resulted in a control group of 164 communes and an experimental group of 2,021 communes. In the creation of the pairs, the matching with replacement method was chosen so that the individuals from the control group could be matched with more than one individual from the experimental group (see Figure no. 2). This is due to the small number of communes in the control group. Considering that 88.9% of the Romanian territory is currently covered with LAGs, only 324 rural communes could be taken into account in the construction of the control group, these representing 10% of the total Romanian rural communes. However, out of these 324 communes, only 164 proved to be very similar to the communes that received LEADER funding from the perspective of the 3 covariates on the basis of which the propensity score was calculated. Regarding the experimental group, 2,021 communes were included in it, representing 63% of the Romanian communes, and 71% of the total communes included in LAGs.
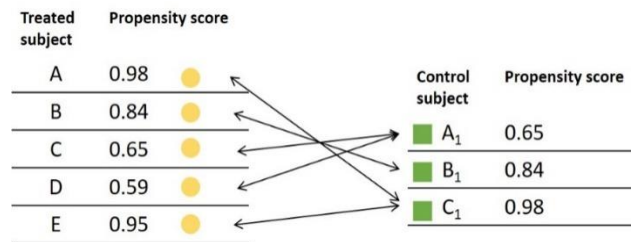
Figure no. 2 – Nearest neighbour matching (with replacement)

Subsequently, in order to appreciate the quality of matching, the balance was assessed by constructing the summary of matched data, eCDF plots, QQ plots and the covariate balance plot. Also, in order to assess whether the individuals from the control group are comparable, as an evolution of the analyzed economic indicators, with those from the experimental group, the parallel trends hypothesis was verified. The existence of these parallel trends is a condition for the *Difference in Differences* method, approached in this paper to assess the impact, to be implemented and to generate reliable results. Thus, in order to test the parallel trends hypothesis, the average of the logarithmic values was calculated for each of the 3 economic indicators for each of the two groups at the level of 2003 - 2018 period. In addition to the 2011-2018 period, based on which the assessment of the LEADER impact was made, the comparative evolution of the indicators in the 2003-2011 period was also considered. This is to ensure that the two groups are similar not only in general features (LHDI, income / inhabitant, population density), but also as dynamics of the 3 indicators in the period before the introduction of the intervention (LEADER program in this case).

- ***Difference in Differences (DID)***

The last step was the application of the *Difference in Differences* method, a counterfactual method. This allows the assessment of the impact by performing a double analysis, before and after the intervention and comparative between the two groups created. Thus, in order to assess the LEADER program's impact at the level of the beneficiary communities, the difference between the averages before (2011) and after (2018) intervention at the level of each group (control and experimental) was calculated for each of the 3 economic indicators analyzed (see Eq. 3). Thereafter, the impact assessment was made by calculating the level at which the experimental group would have been in the absence of treatment if the difference between the two groups had remained constant over time. The difference between the calculated theoretical level and the actual level at which the post-intervention experimental group was located represents the LEADER program's actual impact. Thus, the calculation of the impact was done by the formula:

$$DD = AT - BT - (AC - BC) \qquad (3)$$

where:

DD = impact
AT = average of treated group after the intervention
BT = average of treated group before the intervention
AC = average of control group after the intervention
BC = average of treated group before the intervention

This method provides high accuracy in assessing the quantitative impact of an intervention, in this case the LEADER program's economic impact. The results indicate the level at which the individuals in the experimental group would have been in the absence of treatment based on the evolution of the individuals in the control group. The impact analysis is based on the similarity of the two groups in terms of general features, the only difference between them being their access to the LEADER program. Thus, the *Difference in Differences* method highlights the direction (positive or negative) in which the intervention influenced the experimental group and what was the magnitude of the impact on the beneficiary communities.

The two methods used in this study, PSM and DID, ensure reliable results on the economic impact of the LEADER programme. PSM is a widely applied method in studies in various fields (e.g. medicine, education, economics) to assess the overall effect of an intervention (Caliendo & Kopeinig, 2008; Pufahl & Weiss, 2009). This is because it reduces the risk of selection bias by making the control group very similar to the experimental group, and the comparative analysis performed on the two groups can be reliable (Caliendo & Kopeinig, 2008). As Staffa and Zurakowski (2018) state, PSM "may create an "apples to apples" comparison while reducing bias due to confounding" and can improve and diversify research opportunities in a variety of fields. Compared to other methods of analysis, PSM is more attractive in that it provides more detailed analyses of the two groups being compared: experimental and control. The results thus obtained are stronger, generalizable, increasing the degree of confidence in the conclusions of the scientific study conducted (Staffa & Zurakowski, 2018). When it comes to assessing the effects generated by certain programs on groups of special interest, PSM is a very good method to apply (Bryson *et al.*, 2002; Pufahl & Weiss, 2009), this being the case of the present study.

In order to obtain a clear picture on the economic impact, PSM is frequently used in combination with DID, another counterfactual method addressed in the present study. As for DID, it is a very common quasi-experimental research design highly applied in a variety of studies - eg. local governments policy changes, natural disasters strike across seasons, firms laying off workers (Goodman-Bacon, 2021). This is because it is a powerful analytical tool able to address the problem of confounding in observational studies (Ryan *et al.*, 2015). Its popularity has grown over the years in impact evaluation studies (St. Clair & Cook, 2015; Roth *et al.*, 2023) due to the high credibility of the results obtained and the ease of implementation and estimation (Angrist & Pischke, 2010). As Dimick and Ryan (2014) state, DID is a very good option for impact studies based on comparative analysis of two groups because it allows to control for background changes in outcomes that occur with time.

The data used in this study were obtained from the Agency for the Financing of Rural Investments (AFIR), the National Institute of Statistics (INS), the General Directorate of Public Finance (DGFP) and the National Trade Register Office (ONRC).

As previously mentioned, the methods used in the impact assessment were *Propensity Score Matching (PSM)* and *Difference in Differences (DID)*, counterfactual methods applied through the R Studio program. Statistical data processing was done in the Excel program of the Microsoft Office package and the results were mapped using the ArcMap program.

4. RESULTS AND DISCUSSIONS

Step 1: Analysis of the submitted projects spatial distribution and the funds allocated at the level of the Romanian LAGs

As presented in the methodology section, the first step of the study consisted in analyzing the spatial distribution of projects submitted and funds allocated to LAGs in order to responds to the first objective of the paper.

2007 marked the LEADER program's introduction in Romania following the accession to the European Union, as well as the beginning of the fourth LEADER funding period at European level, but the first in Romania. The LEADER program's quantitative results in Romania since its implementation and until now consist in the establishment of 239 territorial associations, called Local Action Groups (LAGs). Within them 13,820 projects were implemented, according to the official data published online by AFIR until 27.05.2020. The spatial distribution of LEADER projects is relatively a uniform one, with a slightly higher frequency of projects to the center and northwestern part of the country where the interest in accessing LEADER seems to have been higher (see Figure no. 3). However, the differences between LAGs as number of projects per 1000 inhabitants are small, the values ranging only from 0.23 to 6.24.

The LEADER funds absorbed in Romania, as a result of the implementation of the projects, reached a value of 786,139,533.9 €. As in the case of the projects, the funds also have a relatively uniform spatial distribution between the 239 LAGs, with no significant gaps between the associations in terms of their ability to absorb LEADER funds (see Figure no. 4). This is confirmed by the small difference between LAGs as LEADER funds absorbed per inhabitant. The spatial distribution of funds per inhabitant highlights a greater concentration of LEADER financial support to the center and west, generally in the same LAGs that have implemented a larger number of LEADER projects.
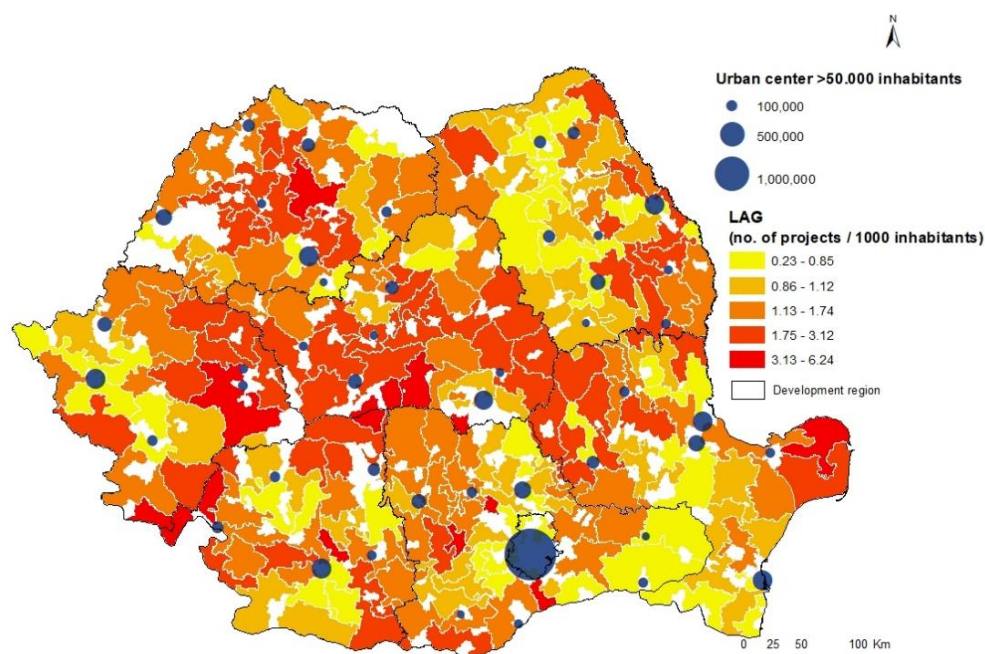
Figure no. 3 – Spatial distribution of LEADER projects implemented in Romania until 27.05.2020
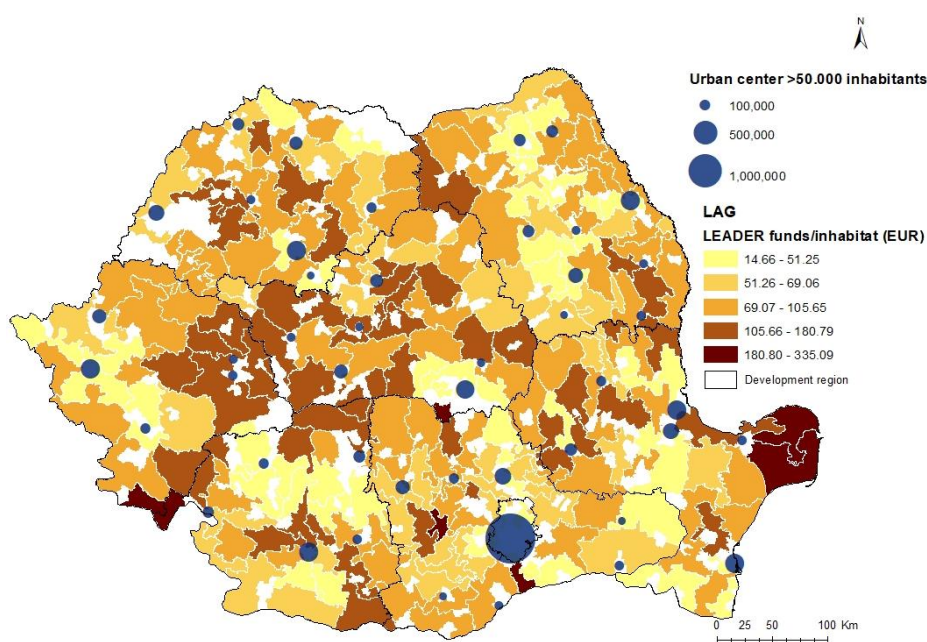
Figure no. 4 – Spatial distribution of LEADER funds in Romania until 27.05.2020

Step 2: Comparative analysis of the economic evolution of LAG and non-LAG communities, before and after LEADER funding
Creating the control and the experimental group

In order to assess the LEADER program's economic impact, the first task was to identify the beneficiary communes and those not included in the LEADER program that have similarities in terms of their internal composition. For this, the *Propensity Score Matching* method was applied, which allowed the construction of the control group (communes not included in LAGs) and the experimental one (communes included in LAGs). A detailed presentation of the method and its applicability can be consulted in the methodology section of the present paper. Following the propensity score calculation and the creation of pairs of individuals by the *Nearest Neighbor Matching* method, a control group of 164 communes and an experimental group of 2,021 communes resulted. The two groups are very similar in terms of the values of the 3 covariates used, as confirmed by the standardized mean differences (SMD) between treated and untreated units of less than 0.5 and the variance ratios between 0.95 and 0.97. Also, the covariate balance plot highlights that the level of similarity between the two groups has improved after matching, all the SMD values being within a threshold of .1 (see Figure no. 5). The eCDF plots before and after matching indicate good balance, the lines overlapping after matching, as well as the QQ plots, all the values falling on a 45-degree line (see Figure no. 6). Thus, the high similarity between the groups increases the probability that the results of the LEADER impact assessment analysis will reflect the reality.
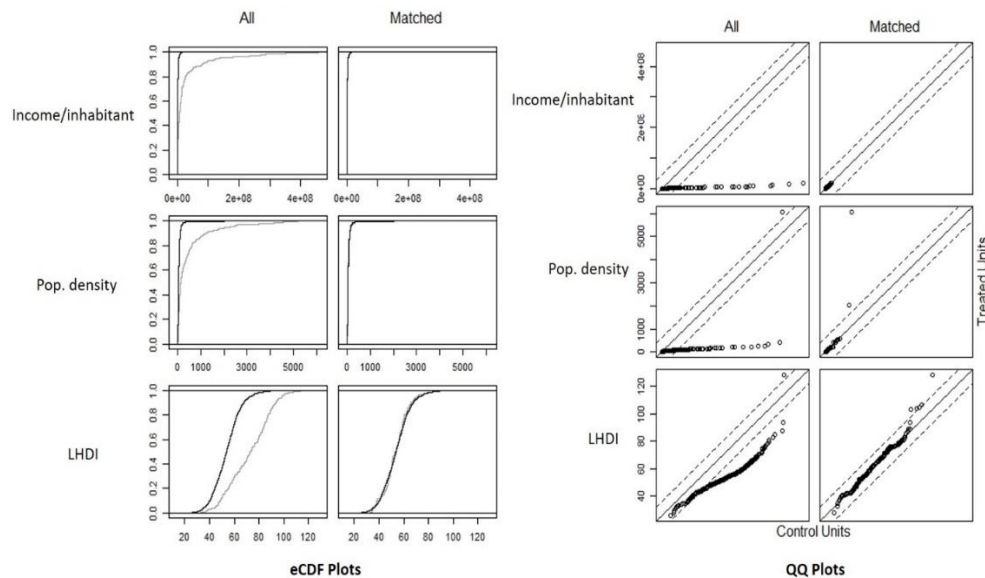
Figure no. 5 – Empirical Cumulative Distribution Function (eCDF) and Quantile-Quantile plots
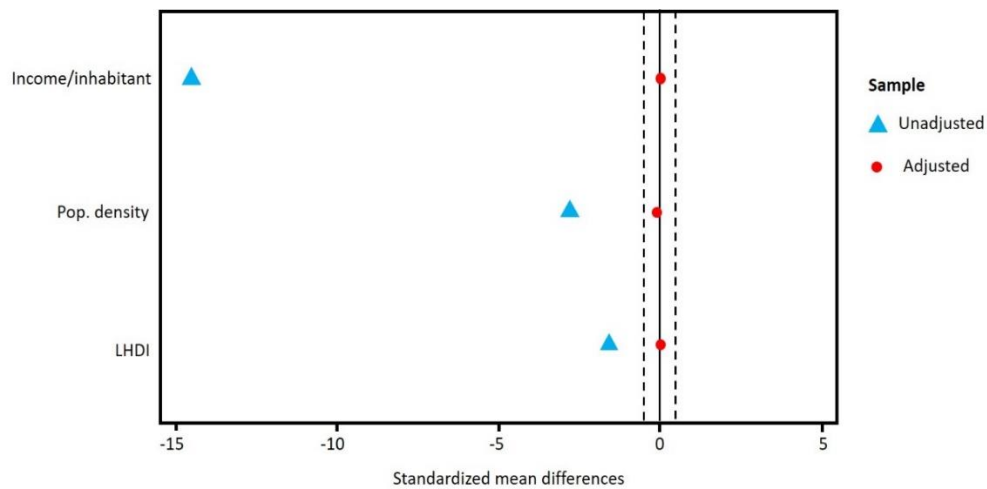
Figure no. 6 – Covariate balance plot

Testing the parallel trends hypothesis

Following the creation of the control group and the experimental group, the parallel trends hypothesis was tested. The parallel evolution of the two groups is a *sine-qua-non* condition for the application of the *Difference in Differences* (DID) method in order to assess the economic impact (see methodology section for a detailed presentation of DID). In this sense, the evolution of the 3 economic indicators between 2003-2011, the period preceding the LEADER program's implementation, but also between 2011-2018, post-implementation of the program, was analyzed.
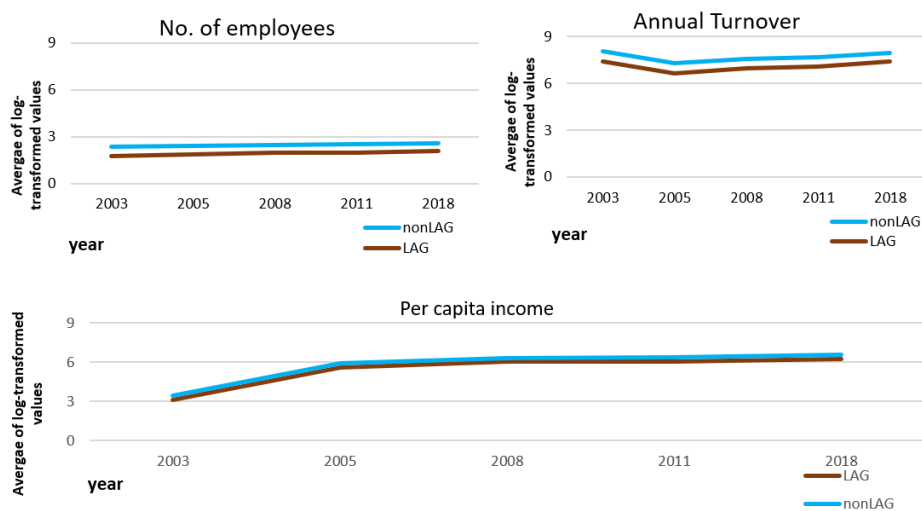
Figure no. 7 – The evolution of the 3 economic indicators between 2003 - 2018

The results show a predominantly upward trend in values, the differences between the two groups being quite small. In the case of the annual turnover the control group and the experimental group showed a similar dynamic, with an initial decline between 2003-2005 followed by a return to 2018 (see Figure no. 7). Regarding the number of employees, the values remain almost constant on the entire interval, with a very slight upward trend towards 2018. The third indicator, per capita income, recorded an upward evolution of values both in the case of the control group and in the experimental one, the difference between the groups remaining, generally, constant in time.

Calculating the economic impact using the Difference in Differences method

In order to assess the economic impact, the period 2011-2018 was analyzed more closely. The *Difference in Differences* method applied for the LEADER impact assessment at the level of the turnover per inhabitant highlights the higher contribution brought in the case of the secondary sector compared to the other two economic sectors. Thus, the secondary sector registered a 5.55% higher increase in the experimental group than the level at which it would have been in the absence of treatment, in contrast to the primary and tertiary sectors which increased by 3.8% and 1% respectively (see Figure no. 8). All these three percentages are statistically insignificant, as suggested by the p value, which in all cases exceeds the threshold of 0.05: primary = 0.3; secondary = 0.1; tertiary = 0.6. This means that the null hypothesis, which states that LEADER did not contribute to the evolution of turnover per inhabitant, cannot be rejected. Thus, the LEADER's impact remains far too small to make a significant difference.
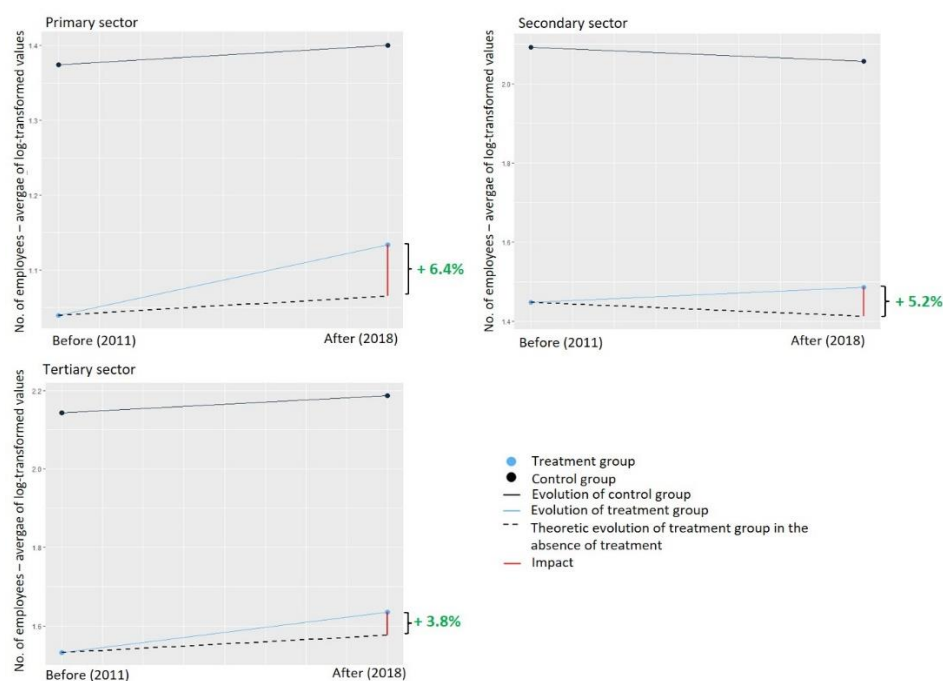
Figure no. 8 – The LEADER program's impact reflected in the evolution of the number of employees

In the case of the number of employees, the results indicate a higher increase for the primary sector than the other two economic sectors, an increase of 6.4% for the experimental group (see Figure no. 9). The number of employees positive evolution is also found in the case of the secondary sector, the experimental group being 5.2% above the theoretical level at which it would have been in the absence of treatment. The tertiary sector is the one that recorded the lowest growth, this being of only 3.8%. Thus, the LEADER program's contribution proves to have been the largest in the direction of increasing the number of employees in the agricultural sector. Although in all three situations the evolution of the values for the experimental group was a positive one, these increases are once more not statistically significant, p values exceeding the threshold of 0.05.
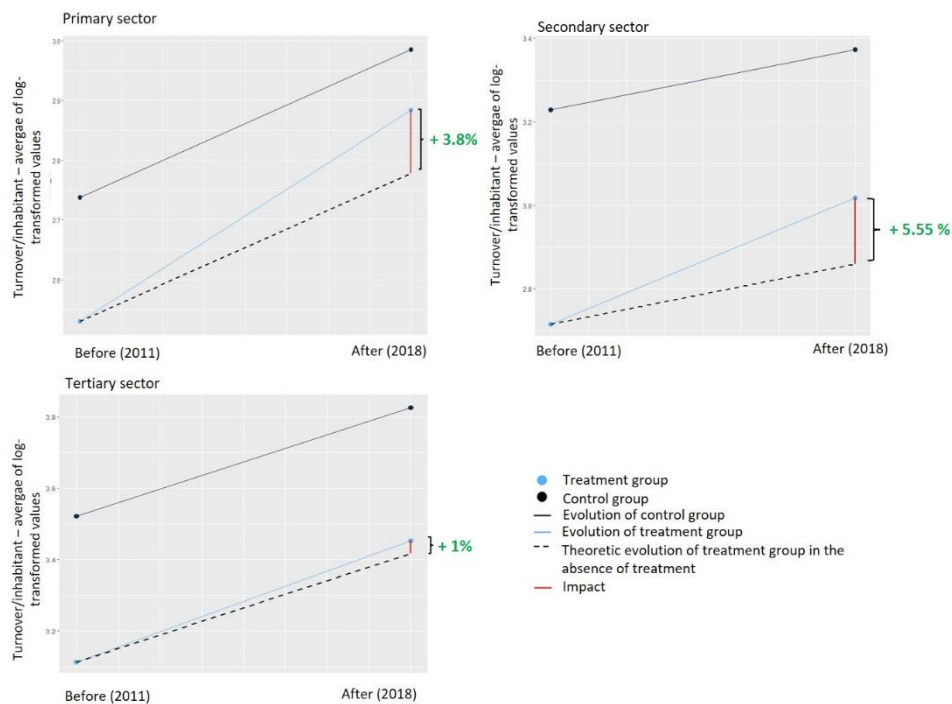
Figure no. 9 – The impact of the LEADER program reflected in the evolution of the turnover/inhabitant

The LEADER program's impact has proved to be the lowest in terms of per capita income. Thus, the contribution brought in the sense of increasing the income / inhabitant among the population from the beneficiary territories was of only 0.08%, (see Figure no. 10). The p value is also statistically insignificant in this case, exceeding the threshold of 0.05, proving again that these upward trends are not strong enough to be considered a result of the LEADER program's introduction.
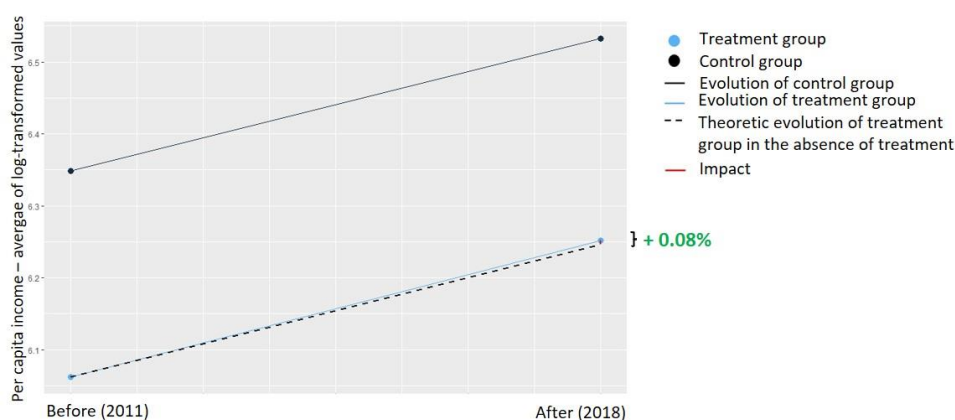
Figure no. 10 – The LEADER program's impact reflected in the evolution of per capita income

Analyzing the impact of LEADER on the three dimensions (turnover, number of employees and per capita income), some of the LEADER program's contributions brought to the economy of the beneficiary communities can be highlighted. The fact that LEADER has made a greater contribution in the secondary sector in terms of turnover shows that the program was successful in stimulating the activity of businesses, making them more dynamic and performant. At the same time, it contributes to the diversification of economic activities by stimulating the secondary sector in a context where the rural economy is dominated by the primary sector. However, its contribution is minimal and fails to generate substantial change at local level. Thus, the program is successful in that it succeeds in achieving its objectives. However, the inability to generate significant change highlights the need for more funding. In terms of the number of employees, it is worth noting that all three economic sectors have recorded an increase, higher in those municipalities benefiting from LEADER. Thus, this time too, the program is proving to have made its contribution to the development of the local economy because the increase in the number of employees means an increase in the attractiveness of housing in those communities to the extent that the local population has employment opportunities in the area of origin, and the temptation to emigrate decreases. The result will surely be seen in time through the gradual slowing down of the depopulation process currently faced by rural areas in Romania. As far as per capita income is concerned, the results underline the fact that LEADER fails to bring gross financial benefits to the inhabitants of rural communities. This is because the financial resources of the program are too limited, but also because this type of results appear after longer periods of time after the implementation of the projects, when the supported initiatives reach maturity.

5. CONCLUSIONS

Developmental disparities in Romania represent an issue of actuality, an issue that has been questioned and highlighted many times in scientific research (Dachin, 2008; Goschin *et al.*, 2008; Sandu, 2011; Bran *et al.*, 2018). Romania is a territory conducive to the LEADER program's implementation because of these development disparities. They can be diminished by introducing tools, such as the LEADER program, aimed at supporting less favored

territories. Through the financial support provided under the LEADER program, the European Union aims at the economic development of disadvantaged rural areas, the improvement of the rural communities living standards and, finally, their sustainable development (Turek Rahoveanu & Turek Rahoveanu, 2013).

The hypothesis of the study was that the LEADER communities registered a more accelerated positive evolution of the economic indicators compared to other similar rural communities, but which did not benefit from the LEADER program. The results obtained indeed indicate a stronger economic growth for the beneficiary rural communities, confirming in all cases the initial hypothesis. Of all the 3 economic indicators analyzed, the turnover/inhabitant in the secondary sector and the number of employees in the primary and secondary sectors registered the highest growth. This highlights the LEADER program's high potential to stimulate job creation (Neto *et al.*, 2014), which can only be auspicious given the high unemployment rates and mass emigration of young population that a high part of rural settlements face (Badea *et al.*, 2015). Also, LEADER proved to bring a high contribution in increasing the performance and dynamics of enterprises, as shown by the high impact in the turnover per inhabitant in the secondary sector. LEADER seems to have acted in these directions: the creation of new jobs and increasing the local businesses performance. However, the contribution made was minimal and insignificant in all cases. Despite the openness of rural communities to take advantage of the opportunities provided through the LEADER program, the European instrument has not proved to be an important contribution to the economic growth of the beneficiary rural communities (Badea *et al.*, 2015). Although the general trend in the evolution of all the analyzed economic indicators is an ascending one, it cannot be attributed to the LEADER program, the results obtained not being statistically significant. Thus, the contribution of the program to the economic development of rural communities can be at most one of supporting the current level of development, but not of reaching a much higher level.

Most likely, the main cause of this insignificant economic impact are the small funds available to rural communities through the LEADER program in relation to the needs of the beneficiary territories. As stated by Feldman *et al.* (2016), economic development requires substantial financial resources to enable large-scale investments. From this perspective, LEADER cannot be considered a sufficiently strong financial instrument, as the funds made available are undoubtedly helpful to rural communities, but not sufficient to be able to bring significant changes. The financial support provided by LEADER and the projects implemented under its umbrella have provided new development opportunities to the beneficiary rural communities which over time will prove to have contributed to achieving the European goal of sustainable development. For the time being, however, LEADER can be considered, from a quantitative point of view, only an instrument with a positive effect on rural areas, but not an instrument of impact. This can also be attributed to the short implementation time of the program in Romania, compared to other European countries. Thus, LEADER-funded projects have not yet reached maturity in order to be integrated into a structural network, in a production chain, so that they can bring a significant contribution to the economy. It takes time to see if this effect will eventually turn into an impact. As White (2010) points out in one of his papers, the difference between impact and effect lies in the ability of an intervention to change things significantly. Viewed from this perspective, LEADER did not bring significant changes and didn't ensure that critical mass that could trigger the economic development of rural communities, as we saw in the impact analysis.

Therefore, for the moment in Romania LEADER cannot be considered an impact instrument at the level of the rural territory.

Another explanation for the insignificant economic impact may be the relatively short period that has passed since the introduction of the program in Romania until present. It should be kept in mind that the LEADER program started to work concretely in Romania quite late, the first project being implemented only in 2011, 2012, unlike other Western European countries where LEADER was introduced in 1991 and which already have 30 years of experience in its implementation. The relatively short time that has passed since the implementation of the first project in Romania and until now can explain why LEADER is only a tool with a positive effect, but not an impact tool (Feldman *et al.*, 2016). Therefore, it is imperative that this impact assessment be resumed at a time when LEADER will be a mature financial tool in Romania. This maturity should be understood as number of years of implementation, as communities experience in managing the European instrument. The resumption of the impact assessment and the recalculation of the economic contribution made by taking in consideration a longer time period could highlight whether this currently observed positive effect has turned over time into the expected economic impact.

As stated in the literature review section, the subject of the LEADER program's economic impact is to little approached in the specialized literature. In most of the cases, studies that manage to highlight aspects related to the LEADER program's economic impact have other objectives in the foreground, and the capture of the economic impact is rather a transversal, indirect result of the research. Compared to other studies that have been conducted so far on the LEADER program and its economic impact, the scientific value – added of this study consists in conducting a larger quantitative analysis and with a higher level of accuracy. Thus, the evaluation was made based on 3 economic indicators, in order to capture LEADER's contribution on multiple levels. Also, the national scale analysis allowed even more accurate identification of the contribution brought to the economy and drawing solid conclusions about the economic impact. At the same time, the methodology approached in the present study is a much more complex and solid one, offering the certainty of obtaining exact and reliable results. The econometric methods approached in this paper are dedicated to quantitative impact assessment, having the ability to highlight the contribution of an intervention in making a positive or negative change. Although these methods are frequently approached in economic studies, the analyses carried out so far on the LEADER program's subject have not resorted to them, the present study being a pioneer in this regard. The results obtained support the ideas stated in previous studies, in the sense that the LEADER program's economic impact has proved to be insignificant in Romania as well. If in previous research this was more of a passing statement, in this paper it has become a certainty and has taken the form of a solid conclusion. Also, this insignificant impact was calculated at the level of 3 different indicators, on each economic sector, thus offering a much clearer, more detailed perspective on the LEADER results and on the levels on which it acts more. In other words, this study can be considered preliminary and represents a serious starting point for next studies that will try to complete the analyzes from multiple points of view and to contribute, in the end, to the construction of an integrative, overall view upon the LEADER program.

The results obtained in the present study are highly applicable taking into consideration the scale of analysis and the methods used. The study was constructed starting from the entire population (representing all LEADER beneficiary communities in Romania) and this together with the counterfactual methods used ensured reliable results. Thus, the effects observed

reflect the real situation at national level when it comes to the LEADER program's quantitative outcomes. These findings highlight that LEADER has the potential to make a quantitative contribution to help communities achieve sustainable development. As seen in the introduction, sustainable development includes both qualitative and quantitative changes (economic development). However, although LEADER has the potential to bring about quantitative changes (through the objectives underlying the program), it fails to really achieve them, to generate real impact at the level of the beneficiary communities. This is due to insufficient funding. As Feldman *et al.* (2016) state, large-scale investments with long time horizons are required for economic development to happen. However, when it comes to the LEADER program this is a real problem taking into account that LEADER receives less funding then other programs do (Alonso & Masot, 2020; Olar & Jitea, 2021). Thus, the main recommendations for policymakers that emerge form the present study consist in increasing the financial support offered and directing it mainly to the least developed communities. LEADER funding needs to be consistent in order to see concrete results in terms of economic development. More over, larger funds would make it possible to have better qualitative results along with the quantitative ones mentioned above. This is because larger funds would motivate local actors to be more involved in the decision-making process, in the LAG's activity, lack of interest being a problem often mentioned in qualitative research because of the too little financial support granted by LEADER.

The present study brings a contribution by constructing a broad and clear image on the LEADER program's success in fulfilling its quantitative objectives. The paper provides concrete results on the economic impact of the program, and these results can be used both in the objective evaluation of the LEADER program, but especially in determining future directions of intervention (changes to be made at program level by decision-makers) to achieve better results. As stated above, the main recommendations for policymakers that emerge from the present study consist in increasing the financial support offered and targeting it predominantly to the least developed communities in order to have a real impact on the economic development of the beneficiary communities. Regarding the limitations, the lack of a longer time span evaluation of the results can be mentioned here. It takes time for the economic impact of a policy or intervention (LEADER program in this case) to be visible. Thus, there is a need to reevaluate the LEADER program's quantitative contribution at a time when LEADER will be a mature financial tool in Romania. This maturity should be understood as number of years of implementation, as communities experience in managing the European instrument. Future studies could concentrate on this and on evaluating the qualitative impact of LEADER also by appreciating the program's contribution to the improvement of the collaboration relations at local level, the creation of new partnerships, the development of networking between the local actors, all these being the base of a good governance and to an overall higher level of development.

Data Availability Statement: Raw data were obtained from the Agency for the Financing of Rural Investments (AFIR), the National Institute of Statistics (INS), the General Directorate of Public Finance (DGFP) and the National Trade Register Office (ONRC). Derived data supporting the findings of this study are available from the corresponding author on request.

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Notes

[1] LHDI – local human development index computed by sociologist Dumitru Sandu. The index measures the level of development for each of the communes in Romania and is calculated based on the human, health, vital and material capital of localities (Sandu , 2020).
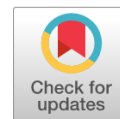
The Infancy of the Esports Industry as a Risk to its Sponsors

Bruno Duarte Abreu Freitas[*]

Abstract*:* In less than 10 years, esports have turned into a global phenomenon with a large following that rivals the audience size of popular established sports. This has resulted in a massive influx of esports sponsors. However, because it appeared and evolved so rapidly, sponsors have no idea of what esports really are nor of what risks they may face. Ergo, this research aimed to determine what issues are being caused by the infancy of the esports industry that is threatening sponsors. Hence, this exploratory research used a convergent-parallel mixed method with equal status. Empirical data was obtained through interviews with 22 experts in esports sponsoring and the application of a survey to 5,638 esports fans. Quantitative data was analysed with SPSS 25 and qualitative data with NVIVO 10. The results showed that the majority of experts considered that the problems associated with the infancy of the esports industry are a risk to esports sponsors and almost all esports fans reckon that the competitive gaming market has infancy-related issues to solve. Esports are not like general sports, so sponsors must holistically study this industry to mitigate the dangers of suffering from the problems of this new and unknown market.

Keywords: esports; sponsoring; threats; market analysis; market infancy.

JEL classification: M30.

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1. INTRODUCTION

Esports – short for *electronic sports* and also known as *professional* or *competitive gaming* – are professionally orchestrated, and widely popular, videogame tournaments where the best videogame players – often called *pro-players* or *pro-gamers* – participate (Shabir, 2017) with the objective of obtaining prestige, money, prizes, etc. (Mooney, 2018). Similarly to water sports, competitive gaming is a collective term because it is composed of multiple constructs (i.e. videogames), with a single tournament being able to hold competitions of different videogames (Ströh, 2017). Esports' past is intimately connected to the old LAN (Local Area Network) parties, where individuals would join in a predetermined real-world place to participate in small-scale friendly videogame competitions (Shabir, 2017). At present, thanks to high-speed internet, streaming platforms have become commonplace (Carter & Gibbs, 2013) and allowed videogame competitions to become grander, more serious, and to spread over the world (Ströh, 2017).

Tournaments are divided into tiers (Shabir, 2017), like amateur (Hamari & Sjöblom, 2017), semi-professional, and professional (SuperData, 2017). Regarding low-tier events, most occur at a distance, with pro-players participating via an internet connection from the comfort of their homes (Stein & Scholz, 2016). In relation to high-tier events, most take place in real-world locales (e.g. sport stadiums), with pro-players going there to compete and fans going to see their favourite pro-gamers (Gifford, 2017). In both cases, these events are streamed to millions of fans (Ströh, 2017).

The popularity of esports started to gain relevance very recently in the early 2010s (Ströh, 2017). Still, in just a decade, they rapidly grew (Shabir, 2017) to become a global phenomenon, and now some countries already recognize esports as a legitimate sport, including South Korea (Hiltscher & Scholz, 2017). The evolution of esports is so fast that they are now seen, not only as the fastest-growing sport in the world (Sylvester & Rennie, 2017), but also as one of the fastest-growing markets in general (Winnan, 2016). This significant popularity (Europe, 2015), along with a powerful worldwide reach (Intelligence & Elder, 2017) and a relevant economic power (Shabir, 2017), is attracting the eyes of multiple consumer brands looking to use it as a new and meaningful marketing channel (Europe, 2015). Because of this, just in 2016, over 600 brands signed esports sponsorship contracts (Shabir, 2017). Some of these include, Red Bull, Samsung, Microsoft (Funk *et al.*, 2018), Vodafone, Coca-Cola (Ströh, 2017), Nissan, Audi, Sony, Google, Paris Saint-German, and Manchester City (Shabir, 2017).

Competitive gaming sponsors are reaping substantial ROIs (Freitas *et al.*, 2020), particularly an increase in brand awareness (Ströh, 2017). According to market reports, in 2021, there were 474 million esports fans, and it is estimated that this figure will increase to 577 million in 2024 (Statista, 2022), a number that is on par with several popular sports and larger than the number of fans in the NFL (Shabir, 2017). In fact, esports already has higher viewership figures than some popular sports (Winnan, 2016). For instance, the match between the USA and Germany during the 2014 edition of the Football World Championship was viewed by 1.7 million individuals on ESPN (Europe, 2015), but esports tournament Intel Extreme Masters in Katowice was viewed by 46 million individuals on YouTube and Twitch (Statista, 2018). Sponsors are also reporting an increase in sales (Winnan, 2016; Freitas *et al.*, 2020). Research has concluded that most esports fans' income is above the average person (Ströh, 2017), that they are compulsive buyers, early technological adopters (Winnan, 2016) and important influencers of the buying behaviour of their social circles (Ströh, 2017).

Moreover, in 2021, the esports market was valued at $1.08 billion, and it is expected that, in 2024, it will be valued at $1.6 billion (Statista, 2022). Also, contrary to most developed sports, which do not depend completely on sponsor money, competitive gaming is still an underdeveloped industry that cannot survive, by any means, without sponsors (Ströh, 2017). Because this market is entirely dependent on sponsor funds, it is considerably cheaper to sponsor them when compared to general sports (Winnan, 2016).

As evidenced, competitive gaming is a novel and exciting market filled with benefits for sponsors (Freitas *et al.*, 2020). However, the videogame industry is very recent (Hansen, 2016), which means that esports market is even younger (AEVI, 2018; Funk *et al.*, 2018; Freitas, 2021). When referring to esports, (Fields, 2011), a journalist, retired esports player, and current president at VT Gaming, mentioned that "overall, it's still an industry in its adolescence" (p. 41). The truth is that, despite enjoying a rapid increase in popularity since the early 2010s (Franke, 2015), in terms of industry growth, competitive gaming is still between a niche and a mainstream market (Taylor, 2012). This infancy is quite concerning, and it is one of the main issues of the esports industry (Shabir, 2017).

In terms of economic development, esports are still at an early stage, meaning that they still need time to mature and reach their full potential (AEVI, 2018). It is true that this industry is already offering a vast array of attractive opportunities to those who enter it now (Shabir, 2017), but its underdevelopment also means that these early investors will be faced with a plethora of challenges (Keiper *et al.*, 2017). This is quite concerning because, if sponsors stop supporting competitive gaming due to its infancy issues, then the esports-dependent industry will likely crumble (Freitas, 2021).

According to McTee (2014), the current state of the esports market has already been compared to the state early baseball was in when it was struggling to be recognized as an official sport with legitimate leagues. Just like baseball, esports will continue to suffer from complex policies and doctrinal issues from multiple field of the law until they evolve into a mature and stable market (McTee, 2014). In light of these problems, a review of the literature will now analyse the multiple elements that contribute to the issues connected to the infancy of the esports industry that are threatening esports sponsors.

2. LITERATURE REVIEW

2.1 Lack of main governing body, regulation, and standardization

As stated by Salice (2010), federations have always been vital elements of regular sports because they are respected entities – like FIFA – that oversee and manage all elements of their sport. These federations try, not only to make their sport easily available to everyone, but also to create a valid and standardized ruleset (Salice, 2010). Yet, competitive gaming lacks a clearly identifiable governing body (Sylvester & Rennie, 2017). Because of this, its industry suffers from fragmentation (Europe, 2015), and is seriously lacking in organization (Winnan, 2016).

Contrary to the majority of regular sports, esports lack a hierarchically organized pyramid governance structure (Brickell, 2017). In particular, the issue with competitive gaming is not the lack of esports federations, it is the lack of a main one (Salice, 2010). There are dozens of esports leagues, governing bodies (Winnan, 2016), and national federations, but they are all different (Salice, 2010). The situation is so dire that the current state of the esports industry is being compared to the "wild west" (Shabir, 2017, p. 198).

The reason why esports have no main governing body is because their industry is still very young (Shabir, 2017). Also, according to Salice (2010), competitive gaming's lack of geographical boundaries made them have a very different development when compared to other sports. The author states that esports developed extremely fast and simultaneously throughout the entire world. Because of this, federations developed independently, with unique visions and needs, and with different stakeholders who also possess specific interests and influence. Salice defends that all the different views and interests from all the different entities make it extremely hard (and unlikely) that a decision can be made that makes everyone happy. This makes is very hard for these entities to reach a consensus and even harder for them to choose a federation to be the main one (Salice, 2010).

Schaeperkoetter *et al.* (2017) state that competitive gaming also still has not reached institutional stability because various companies are mainly worried about increasing their profits. The authors note that the little number of governing bodies that esports currently possess have the main objective of attaining commercial success, not of improving the scene for everyone. Moreover, the infancy of this market implies that the competition to take control of the whole structure of the industry will tend to escalate even more as time passes (Schaeperkoetter *et al.*, 2017).

However, another author, Salice (2010), mentions that this problem is not exclusive to competitive gaming. The author states that there are some regular sports, like boxing, that also lack a unique governing body. Salice stresses that, for over 40 years, multiple boxing federations have, and still act, like they are the main governing entity from this sport, with each one declaring their own world champion. The result is a confusing landscape for people outside boxing and it drastically reduces the prestige of the title of world champion (Salice, 2010).

Likewise, since there is no main governing body in competitive gaming, there are important leagues and tournaments occurring all the time and, sometimes, at the same time (Stein & Scholz, 2016). Despite some attempts at rearranging the time at which these competitions happen (Messier, 2011), currently, there still exist conflicting tournaments (Winnan, 2016), with each crowning their version of the best player or team for a particular videogame (Salice, 2010). To make things worse, there is no consistency in the yearly tournament structure (Nichols, 2017). Some events appear at random times throughout the year (Messier, 2011), which leads to a confusing, chaotic, and unorganized landscape (Winnan, 2016). This decreases the likelihood of competitive gaming obtaining a consistent image, which makes it difficult for traditional media to comprehend this confusing market where a league's prestige drastically changes over time (Salice, 2010).

In the same vein, there is very little regulation in esports (Li, 2016). Most tournaments do not have a thorough a clear set of rules that is applicable and prepared for all possible situations (Taylor, 2012). To make things worse, different tournaments possess different rulesets (Salice, 2010), which leads to a lack of coherency (Sylvester & Rennie, 2017) and of standardized rules that can be equally applied to all competitions (Taylor, 2012).

The two main reasons for this lack of established and clear legal framework is because of the underdevelopment and infancy of the esports market (Shabir, 2017; ONTIER, 2018) and due to each league entity establishing its own ruleset (Salice, 2010). However, this issue is also promoted by the continuous release of new videogames and by each of these intellectual properties (i.e. videogames) being owned by a specific company (Chao, 2017). For instance, Li (2016) mentions that *League of Legends*' copyright is tightly controlled by Riot Games. The publisher applies and controls a ruleset to every competition that features its videogame and all

tournament managers are required to abide by these regulations (Li, 2016). There are also some instances where event managers must purchase a license from the game developers to be able to feature and broadcast the videogame in their tournaments (Taylor, 2012).

As is evident, contrary to regular sports (where governing bodies possess control over the rulesets and the standardization of their specific sport), in esports, rulesets are created and applied by the creators of the videogame, not by the tournament's governing body (Schaeperkoetter *et al.*, 2017). According to Brickell (2017), this means that there multiple stakeholders (i.e. publishers and game developers) that have complete control over the videogames' rights. This is an element that is exclusive to esports, and it greatly complicates the implementation of a governance and regulatory model akin to that found in regular sports (Brickell, 2017) and makes it near impossible to establish a single governing structure that standardizes and stabilizes the industry (Schaeperkoetter *et al.*, 2017).

Just as Taylor (2012) states, the main difficulty in regulating and managing esports is not necessarily caused by the problematics of the rulesets. Instead, it is caused by the larger political, organizational, and structural elements that involve contractual arrangements, legal arguments, and governmental and nongovernmental entities (Taylor, 2012). Unfortunately, these competing companies cannot find ways to establish common rulesets and it is here that esports would benefit from the presence of a major, resourceful, and competent international federation (Salice, 2010).

According to Salice (2010), the contrasting and conflicting rulesets of esports have worsened the chaos of its market. There are various disputes, frustrations (Salice, 2010), and the scene is full of uncertainty (Shabir, 2017). As reported by Taylor (2012), some pro-players have even been accused of exploiting videogame glitches during competitions. However, the author defends that some of these scandals occur because some tournaments' rules allow for the exploitation of these glitches (because they perceive it as an integral element of the videogame), while others either allow the exploitation of just a selection of glitches or do not allow them at all. Taylor stresses that this confuses players who may be used to a particular playstyle and have difficulties adapting to the different rules from all the tournaments. Still, to avoid the unintentional exploit of certain glitches, some competitions have modified certain videogames (to fix prohibited glitches) so that pro-players cannot use them (Taylor, 2012).

Likewise, when the issue is centred on little regulation, there will always be people who try to exploit the rulesets and other people to gain short-term advantages (Winnan, 2016). For instance, according to Hollist (2015), pro-gamers are usually unknowledgeable about how to handle contracts or ensure adequate working conditions. The author states that even Riot Games (who is seen as a popular and friendly tournament organizer and videogame developer) allows pro-gamers (some of them minors) to work for illegal amounts of hours. Still, the main issue in this does not come from the nefarious nature of some developers and tournament organizers, it comes from the pro-players' inability to advance their particular interests (Hollist, 2015).

As stated by Hollist (2015), the ease of substituting pro-players, along with their short careers, means that it is very hard for them to form unions that would allow them to demand improved conditions. Although esports associations in some countries have tried to defend the pro-players' interests, and were even able to negotiate better terms in some aspects, other countries, like the USA, do not have these types of institutions (Hollist, 2015).

In conformity with Shabir (2017), because esports is a market with complex legal relationships, it is susceptible to conflicts of interest, collusive agreements, and anti-competitive practices. At the moment, it is not possible to determine if the actual provisions

and laws are sufficient to control every legal element that could lead to abusive situations inside the competitive gaming sphere, like dominant entities trying to impose their own regulations (Shabir, 2017). These behaviours drive out the competition a lead to monopolies (Winnan, 2016) that may jeopardize the integrity of the competitions and even of esports themselves (Shabir, 2017).

Based on Mooney (2018), the multiple problems that challenge the esports market have led several individuals to demand for more regulatory measures. This has promoted the creation of multiple institutions, like the World eSports Council, the World Esports Association (WESA), and the Esports Integrity Coalition (ESIC), which aim to manage the integrity of this market (Mooney, 2018) and standardize numerous policies from a multitude of competitions (Holden *et al.*, 2017b).

The esports industry is in dire need of a public intervention that regulates and protects its public interests and any parties that could be in a disadvantageous position (Shabir, 2017). For instance, Hollist (2015) states that, regarding the exploitation of pro-gamers, most barriers to a collectively bargained agreement would fall if pro-gamers were labelled as employees, instead of as independent contractors. Hollist stresses that, although this legislature would have to pass a law that labelled pro-players as employees (and that there would be some barriers for doing this), there are more than enough argument to label pro-gamers as employees. The author notes that this would be most beneficial since almost all law provisions protect employees but not independent contractors. Hollist comments that, by implementing this law, pro-gamers would be able to form unions and it would enable the application of multiple current laws that govern the amount of employee working hours and the nuances related to underage pro-players. Because of all these potential benefits, this solution is the best option (Hollist, 2015).

Still, according to Hollist (2015), no matter how beneficial these solutions are, they must not hinder the independence of leagues nor prevent the orchestration of casual competitions. The securement of safe and heathy working conditions for pro-gamers may be important to secure, but the new regulatory measures should only restrict elements that allow the accomplishment of the aforementioned well defined objectives (Hollist, 2015).

As esports evolve, the need of an objective legal framework that regulates and provides certainty inside this market will become more evident (Shabir, 2017). The improved regulations would mitigate numerous problems that are damaging the esports scene (Mooney, 2018). Yet, regulatory bodies must consider that overregulation of this industry may endanger its activities and future (ONTIER, 2018). In this sense, and in conformity with Chao (2017), regulatory agents should form an esports governing body capacitated to mitigate all anticompetitive conduct and standardize the market. To secure its independence, this governing body must not orchestrate its own competitions or leagues, but it must seek to mitigate the amount of leagues that overlap or vanish (Chao, 2017).

According to Chao (2017), the more the esports market grows, the more evident the need to manage the regulatory shortages that plague this industry at a holistic level. However, the author stresses that regulatory bodies should not implement an ecosystem that mimics the infrastructure of regular sports. Hence, Chao notes that this new independent governing body should be able to adapt to esports' rapid evolution, while also forming new legal rights and obligations. This idealized governing entity would have the power to conceive, promote, and apply regulations across all the esports industry (Chao, 2017).

Currently, no official and worldwide governing body exists capable of standardizing the global regulations and rules of the market, and it is not even clear if there is an entity in a more

dominant position to do that (Shabir, 2017). For instance, Brickell (2017) indicates that multiple organizations are trying to be the central regulatory agent of this industry. Some of these include: the Esports Integrity Coalition, the E-Sports International Federation, the International Esports Federation (IESF), the World Esports Association (Brickell, 2017), Major League Gaming, and the Cyberathlete Professional League (Schaeperkoetter *et al.*, 2017). At present, the most developed governing entity is the International Esports Federation (Shabir, 2017), which has 98 member nations (IESF, 2021). It aims to standardize the industry, promote esports and pro-players (Shabir, 2017), and improve every elements of competitive gaming (Salice, 2010). But, several other entities are trying to do the exact same thing (Shabir, 2017).

As per Shabir (2017), multiple people and institutions have been asking for a governing body for a long time. One of these is the International Olympic Committee, who mentioned that, for competitive gaming to be seen as an Olympic sport, it must first possess an entity that ensures compliance with the Olympic Movement's rules and regulations (Shabir, 2017).

With the aim of easing the formation of a unique entity, Brickell (2017) proposed guidelines on what each branch of this market should do. As stated by the author, one of the little things sponsors may do to reduce these issues is to promote integrity and good practices, abide by good behaviour clauses (e.g. regulations and codes of conduct), and demand more robust integrity measures. Videogame developers must no ignore the issues of esports and should begin allowing and investing in an independent regulatory entity. Tournament organizers should abide by the jurisdiction of this new regulatory entity and apply a ruleset that is equal for all the different leagues. Regulatory institutions must create a complete and independent regulation that applies to the whole industry (despite every videogame being different, it is possible to develop a harmonized regulation applicable to all intellectual properties), be transparent about every disciplinary decision and sanctions, and provide jurisdiction to one or multiple connected regulatory entities. Players should create a representative institution that protect their personal interests, inform regulatory agents of potential perpetrators, and take responsibility for learning and obeying the rules. Teams should protect players and teach them about the dangers they may be exposed to. Wagering companies must study this industry to better understand how it works, share data with regulatory institutions to better identify possible events of match-fixing, and ensure that they are able to effectively monitor the betting scene of this industry. Lastly, law enforcers and betting regulators should provide clear regulations, share data with esports regulators, teach publishers and tournament organizers about the dangers that some videogames pose in some countries, punish misconduct (e.g. unlicensed or underage gambling), and identify which esports videogames can be labelled as gambling (Brickell, 2017).

The most effective way for these organizations to reach the goal of a unique regulatory body is for all them to cooperate (Brickell, 2017; Holden *et al.*, 2017b) and forgo a part of their authority for the overall good of the industry (Holden *et al.*, 2017b). As stated by Hollist (2015), an institution that functions independently from tournaments, videogame developers, and pro-gamers would guarantee better uniformity and solve several of the industry's most severe issues. Furthermore, the author notes that if that institution operates globally, it could apply a homogenous ruleset applicable throughout the globe. This would also make it possible for entrepreneurs to engage with international markets without having to adapt to the specificities of each country (Hollist, 2015). Still, while there are several regulators trying to be the main one, this will be a difficult goal to reach (Brickell, 2017).

All agents of this scene must comprehend that a market of this size requires a clearly identifiable governing entity and a clear ruleset to guarantee sustainability and balance (Sylvester & Rennie, 2017). According to Salice (2010), the creation of an international and independent governing body will provide the market with more legitimization and credibility, and will make it easier to solve any irregularities. Moreover, if national federations accept to be part of this international federation, they are likely to obtain higher value and credibility (Salice, 2010).

Interestingly, Ströh (2017) indicates that the enhanced acceptance and awareness of esports in the west also has caused legal and political changes. This occurred because some governments have started looking at esports and are now evaluating its need for regulations (Ströh, 2017).

Based on Hollist (2015), governments should implement some strategies to provide pro-gamers with a better working environment while also enhancing the recognition of this market. Some examples provided by Hollist include: labelling pro-gamers as employees or making a pro-player association. The author notes that the latter option is the most viable option since governments could, for example, create national pro-gamers' associations. Although the USA has not create an association like this, China has created the Association for Chinese Esports (ACE), Korea has formed the Korea e-Sports Association (KeSPA), and the UK has created the United Kingdom eSports Association (UKeSA) (Hollist, 2015).

As stated by the AEVI (2018), the present amount of esports regulation in Spain is already sufficient to ensure the effective and safe operation of esports in that country. AEVI also indicates that regulatory bodies must be cautious not to misunderstand this sector and overregulate it, which could hinder and limit the development of competitive gaming in a specific country.

Likewise, France has started implementing some regulations and recognized the esports professional scene in their country (Shabir, 2017). According to Ströh (2017), a report has been filled by the French parliament that lists eleven propositions on how the government should regulate esports. Some examples include: pro-player rights, tax regulations, and the status of tournaments. Moreover, Ströh states that pro-gamers have started to be labelled as professional athletes in some countries, like the USA in 2013. If competitive gaming is recognized as a sport (like what happened in Denmark, Italy, and Russia), it will be fit to apply for governmental sport funding programs (Ströh, 2017). However, despite some positive steps like these, there is still an overwhelming lack of regulation around the globe (Shabir, 2017).

The large number of globally popular brands, like Amazon and Coca-Cola, that have demonstrated an ever increasing interest in competitive gaming shows that this market is very likely to be a main entertainment source in the near future, and one that will benefit and require a lot of regulation (Hollist, 2015). In this sense, Brickell (2017) states that, if there is not a proactive management of esports' regulatory problems, it will probably suffer from several reputational and commercial issues, which will require a large amount of time and money to fix. Due to this, this industry would greatly benefit from forward thinking strategists (Brickell, 2017).

As indicated by Salice (2010), prior to esports becoming an international sensation, they did not urgently required a main governing body. However, with the relevancy they have today, it is very notorious that such an organization is lacking (Salice, 2010). This issue has become so severe that some people have stressed that esports is a wild west in need of a sheriff (Hollist, 2015). Still, Salice (2010) points out that esports will never be able to be structured or regulated like football, with an international governing body, like FIFA, controlling

basically every element of it. Because of this, competitive gaming must aim for a balance, with governing bodies and private companies working together (Salice, 2010).

The fragmentation of this industry is creating numerous challenges (Sylvester & Rennie, 2017). According to Brickell (2017), when the credibility of a sport is severely damaged, it will lead to a decrease in viewership figures, less broadcasting, and fewer brands wanting to sponsor it. Due to this, the author states that it is vital to effectively manage the integrity of all sports that all stakeholders in esports must have the same aim in competitive gaming. However, the complex and fragmented state of esports means that this will not be an easy task (Brickell, 2017).

With that being said, it is expected that, sometime in the future, competitive gaming will be recognized in the west as an official sport and will benefit from clear and standardized regulations, governmental support, player rights, anti-doping policies, an overall better reputation, and an increased standardization and organizational efficiency (Ströh, 2017). As stated by Franke (2015), as the esports industry evolves, they are likely to slowly become more organized and standardized, and possess a strong support from global and national organizations. The competitive gaming audience has also demonstrated to prefer a better structured, organized, and regulated esports market (Franke, 2015).

2.2 Volatile market

It does not matter how internationally popular an industry is, their early years are always likely to have several issues of volatility (Winnan, 2016). For instance, according to Shabir (2017), in 1949, the NBA was established with 16 teams and, by 1955, this number had reduced to only eight. The NFL also suffered from a similar issue with franchises coming and going; and because one of its only four teams disbanded, NHL almost did not survive its first year (Shabir, 2017). Likewise, Winnan (2016) points out that, in 1910, Leicester Fosse and the Clapton Orient were some of the best teams in the English Football League, but these teams have either disappeared or changed their names. From all these sport changes, the most shocking one probably happened in 1902 when the Newton Heath LYR Football Club (a team that very few people today recognize) changed its name to Manchester United (Winnan, 2016).

In the same way, despite the popularity of esports (Winnan, 2016), the infancy of this industry (Taylor, 2012; Franke, 2015), means that it is very volatile (Shabir, 2017), unstable (Franke, 2015), and fragile (Taylor, 2012). At the present time, there is already a plethora of teams, pro-gamers, organizations, and websites that disappeared (Li, 2016). Esports are currently a start-up market with numerous start-up companies within it (Shabir, 2017). As stated by (AEVI, 2018), the large interest that competitive gaming is creating has promoted the appearance of increasingly more projects, but several are struggling with disappearing as fast as they appeared. Unfortunately this is very common in young and dynamic markets (AEVI, 2018).

There are several esports tournaments lacking enough funds (Sylvester & Rennie, 2017), and some have even been cancelled midway through because of monetary issues or because of sponsor withdrawal (Lu, 2016). Even one of the most popular esports tournaments (i.e. the League of Legends World Championship) is supported by fan crowdfunding campaigns promoted by the videogame developer Riot Games (Sylvester & Rennie, 2017). In addition, Taylor (2012) adds that esports are also highly susceptible to economic turbulence and recessions. The author provides the example of the 2009 economic recession, which resulted in multiple popular esports tournaments being closed, sponsors terminating their contracts,

and a decrease in cash prizes. Unfortunately, the severe economic fragility of the esports market is mainly rooted in its extreme dependence on sponsor funds (Taylor, 2012).

Moreover, it must be understood that, unlike in regular sports, the videogames are owned and controlled by the companies that developed those games and these enterprises have the legal power to shut down all competitions that feature their videogame (Li, 2016). According to Winnan (2016), since these videogame companies are the sole owners of these intellectual properties (i.e. the videogames or IPs), they can exert exclusive right and prohibit any broadcasting channel or competition that they do not like from featuring their games (even if it is just a small-scale tournament at a local library). The author gives the example of Nintendo, which has shut down numerous tournaments featuring their videogame *Super Smash Bros.*, and Capcom, which usually asks for royalty payments anytime a competition features their videogame *Street Fighter*. Winnan indicates that game developers can do this because videogames belong in the virtual world which, under the current archaic copyright laws, classifies them an audio-visual work. In other words, videogames must abide by the same legal laws of movies, which require a proper license to be publicly shown. However, the author stresses that, while the movie industry has a website where people can purchase legal performance rights, the videogame industry does not have any similar entity that provides legal clearance. Winnan states that this allows videogame developers to freely choose which competitions can feature their IPs and this law is open to abuse. It does not matter if a competitions features a plethora of different videogames, it can be completely shut down if just one developer does not allow its IP to be used in the tournament (Winnan, 2016).

As attested by Winnan (2016), at the present time, most videogame developers have recognized that showing their games at these competitions is a highly effective advertising tool and that these tournaments promote the creation of a community for their IPs but, even so, some developers still do not want their videogames to be shown to the public in an unsupervised manner. Winnan provides the example of Sega in 2012, where the company forced YouTube to delete any video showing the videogame *Shining Force III* because the company wanted to release a sequel for that IP and did not want people on YouTube to confuse the previous videogame with the newer one. The author notes that, due to this, all videos, including gameplay clips, walkthroughs, and even videos of fans simply commenting about the videogame and showing no footage of the IP were deleted under the justification of copyright violation. Winnan comments that this created a strong backlash from both fans of the IP and from the gaming community in general since it felt more like a total censorship than a copyright strike. The author mentions that this led multiple gamers in disgust to delete every piece of content from their YouTube channels that was connected to Sega or to any of its videogames, and this put Sega under a serious PR nightmare. These corporate acts of bullying and of abuse of power show the fragility of both the videogame and esports markets and how much they require a reform in their copyright laws (Winnan, 2016).

Pro-teams can also suddenly change, disappear, or disband (Winnan, 2016). It does not matter if the team has earned lots of money, fame, or if they seem economically stable, they are all susceptible to disappearing (Shabir, 2017). The volatility of these teams is promoted by numerous elements (Winnan, 2016). The infancy of this market creates a fragile setting where pro-gamers and pro-teams suddenly vanish (Shabir, 2017). This market infancy also means that the corporations controlling esports, pro-players, pro-teams, and tournaments are inexperienced (Quintana, 2012). And the corporal degradation (Zolides, 2015), like wrist and hand injuries, brought about by years of prolonged gaming sessions (Stivers, 2017; Wilson,

2017), and slower response times and weaker alertness from aging (Zolides, 2015), means that a pro-player's career tends to only last about three to five years, which is extremely shorter when compared to the career time of most athletes in regular sports (Lu, 2016).

Based on Winnan (2016), another element that promotes the volatility of pro-players and teams is their extreme dependence on sponsor funds. The author indicates the rare exception of some videogame developers, like Riot Games, who offer gaming houses and stable salaries to some esports teams of their game (i.e. *League of Legends*) so that these individuals do not become dependent on sponsor money to maintain their esports career. Winnan states that this increases the pro-players' feeling of security and allows them to completely focus on becoming better esports athletes which, in turn, has made them one of the best pro-teams in the world. Unfortunately, most teams are not so lucky. For example, Valve, the developers of the massively popular esports game, *CS:GO*, have not yet provided gaming houses or stable salaries to the pro-players of its game (Winnan, 2016). Moreover, Shabir (2017) points out that, for an industry that greatly capitalizes on esports as an advertising tool, earning billions of dollars every year in the process, the average pro-player salary is considerably low. Bearing in mind that pro-players are the celebrities of esports, this is a severe issue that must be addressed (Shabir, 2017).

The volatility is also affecting tournaments, with numerous competitions having already been closed (Winnan, 2016). According to Ströh (2017), the prize pools are one of the main promoters of this volatility. The author mentions that the constant increase of the prize pool sizes in major competitions is starting to create pressure because, if a yearly competitions appears with a prize pool that is smaller than the one in the year before, both the fans and the pro-players could perceive that the tournament's popularity and relevance is declining. This can be dangerous as it can quickly mean a severe drop in viewership figures (Ströh, 2017).

Authors like Li (2016), commonly state that, even with all the monetary investment that goes into esports, the industry is still considered a wild west. Although the large viewership numbers and intense focus on the celebrity status of pro-players seems to indicate that most of these players benefit from large fortunes and glory, the reality is that most suffer from job instability and uncertainty (Li, 2016). These underlying feelings are generating a sense of distrust and unpredictability about this market (AEVI, 2018), which is making sponsors less confident about investing too much into corporations and pro-teams that might suddenly vanish (Shabir, 2017).

2.3 Dependence on sponsors

The esports' economy is almost entirely dependent on sponsors (Hiltscher & Scholz, 2017; Shabir, 2017; Ströh, 2017; ONTIER, 2018). Even licencing of partners, and what initially seem to be other revenue sources, are frequently based on sponsorship structures (Donschen, 2010). This is proven by multiple data sources. For instance, SuperData Research notes that approximately three quarters of esports' revenue come from sponsorships (Ströh, 2017). Likewise, ONTIER (2018) indicates that between 70% and 80% of competitive gaming's worldwide income originates from sponsorships and advertisements. Comparatively, Winnan (2016) states that, regarding regular sports, the selling of media rights and sponsorships make up solely 57% of the revenues.

This dependence gives sponsors great power over esports and poses a severe threat for this market (Ströh, 2017). It is not viable to have a business model with such a high dependency on

sponsors (Hiltscher & Scholz, 2017) since it facilitates volatility (Salice, 2010). Unfortunately, revenue sources are dependent on a small number of clients, with most being sponsors (ONTIER, 2018), which places esports' sustainability in the hands of these select brands (Ströh, 2017). When a market, like esports, is dependent on sponsors, it means that any time a sponsorships is not renovated, the sponsored entity is at risk of closing (Silvers, 2008).

According to Donschen (2010), despite this dependence on sponsors not being sustainable, it is nevertheless the most used business model in all of competitive gaming. The author stresses that even the largest esports companies are highly dependent on sponsors. For example, the World Cyber Games (WCG) would hardly survive without Samsung's sponsorship, and numerous Electronic Sports League (ESL) competitions, like the ESL Pro Series (EPS) or the Intel Extreme Masters, owe their existence to Intel (Donschen, 2010).

Based on Donschen (2010), this extreme dependency has turned into a severe problem, particularly during economic crises. The author states that economic recessions can potentially place multiple esports organizations at risk because several brands will put an end to their sponsorships to minimize their marketing expenses. Since economic recessions promote the reduction of stock values, money loss, and a decline in sales, brands become much more cautious about their investments in these difficult times (Donschen, 2010).

As attested by Messier (2011), during the financial recession of 2007, competitive gaming's economic dependence on sponsors put the scene under pressure when brands decided it was too risky to invest. The author notes that tis led the general visibility and buzz around esports to decrease over time. Bearing in mind how dependent esports are on sponsors, it is very concerning to observe that esports were one of the first markets that brands scratched off from their investment lists (Messier, 2011).

Since marketing budgets are usually among the first things that companies cut during economic recessions, multiple esports competitions have been left without sponsors (Avallone, 2010). For instance, as per (Donschen, 2010), during the 2007 economic recession, NVIDIA stopped sponsoring the company Games-Services (GS), which caused serious issues for GS. Donschen states that, since most of GS's income comes from sponsors (particularly from NVIDIA), the company went bankrupt because they had no way of paying employees nor of covering running costs. The author mentions that, although GS tried to find other sponsors, the economic recession at that time made brands extremely cautious about their budgets and on what to invest. Since stock values and sales were declining, sponsors knew it would not be long before they started losing money, so they chose to lower their communication and marketing budgets, and this left no room for sponsorship investments (Donschen, 2010).

On the report of Donschen (2010), GS even tried to locate a broadcasting platform that would pay for broadcasting rights. The author notes that GS attempted to change their esports events to be better suited for TV audiences (i.e. more thrilling and comprehensible for non-esports fans), but there was no interest. Donschen states that, even if a TV channel had bought the broadcasting rights, it would probably not be successful because the large majority of the esports fanbase watches these competitions via the internet. Moreover, the author stresses that it is important to keep in mind that videogame developers decide if they allow their IPs to be shown on TV, particularly since the TV channel will be profiting from displaying that videogame. In the end, regardless of all of GS's efforts to locate more revenue sources (other than sponsors), they could not escape bankruptcy. The reality is that after just one year without sponsor revenue they closed (Donschen, 2010), and were sold (Ströh, 2017).

As attested by Donschen (2010), since the closure of GS, there are still multiple pro-gamers who have not been paid their prize money, which range from $1,000 to $14,500. The author defends that this is unfair and harmful both for pro-gamers and esports in general, particularly for pro-players who do not have a lot of money or do not win competition money regularly. Donschen further mentions that some pro-gamers stated, in online forums, that they were in desperate need of their prize money, and that one of them had a son. These pro-gamers dedicated a lot of their time and energy to win these competitions and now they feel that the organizations they once respected have betrayed them (Donschen, 2010).

It is further stated by Donschen (2010) that GS's bankruptcy resulted in the closure of Electronic Sports World Cup (ESWC), which was its flagship tournament. Donschen stresses that the situation around GS scared the esports industry because GS was a company that did multiple things the right way and even better than the competition. This included: promoting esports as a lifestyle; attracting a large audience with a significant percentage of women; filling esports venues with 31,000 to 35,000 attendants, attracting popular pro-gamers, dramatizing matches, nourishing live audiences, and developing apps that provided information and emotion in real-time. The author states that, if all of these efforts were not enough to convince brands to invest in sponsorships, then all other tournament organizers are susceptible to struggle with their economy sustainability, particularly during financial crises. And the truth is that other esports companies have also suffered from sponsorship cutback (Donschen, 2010), including the Irish World Cyber Games (O'Beirne, 2010).

Interestingly, Hiltscher and Scholz (2017) note that South Korean esports competitions are even more dependent on sponsor funds than the ones in Europe or the United States. For example, the South Korea's high dependence on sponsors resulted in the closure of numerous *StarCraft II* pro-teams and in the eradication of the StarCraft II League. The authors stress that, although South Korea is the leading country in terms of esports, several incidents are demonstrating that can become fragile even where they thrive the most. Hiltscher and Scholz (2017) state that the several esports incidents that occurred in South Korea led the marketing manager of a popular Korean videogame development brand to state that "eSports is dead" (p. 7). By contrast, the authors note that popular European esports corporations like DreamHack, Fnatic, and Turtle Entertainment, are not as dependent on sponsors, while still managing to be profitable. These attractive corporations have made numerous South Korean pro-players (who are usually perceived as the best), such as Polt or Jaedong, change to non-Korean corporations (Hiltscher & Scholz, 2017).

According to Ströh (2017), despite the recent evolution of the esports scene, with it not being as dependent on sponsor revenue as it once was, the truth is that this industry was, is, and will continue being extremely dependent on sponsors. To make things worse, the sponsors' large investments put esports under pressure to meet their high expectations and not lose their contracts (Ströh, 2017).

As stated by Messier (2011), it seems that the state of the competitive gaming industry is highly correlated with the number and value of the sponsorships. The more investments there are from sponsors, the higher the growth and, the fewer the investments, the higher the volatility and regression of the market. Unfortunately, for the time being, competitive gaming is no sustainable (Messier, 2011). This is creating concerns because some esports fans have demonstrated signs of possible dislike towards companies that, after terminating their sponsorships, caused some esports companies to close (Winnan, 2016).

2.4 Unknown market

Regardless of the success of some vanguards of competitive gaming marketing, most marketing and advertising professional from other areas, along with brand managers (Europe, 2015), general population, sponsors and investors, and the overall political spheres (AEVI, 2018) are still unaware of what esports really are (Taylor, 2012; AEVI, 2018). The large majority of these entities are still unfamiliar with the potentials and benefits that this market offers (Europe, 2015). According to Nichols (2017), Nicolas Maurer, the manager of Team Vitality, indicated that, although esports' exposure is constantly increasing, numerous sponsors still do not know or understand esports. This happens because esports has not yet entered the mainstream, it is still largely broadcasted solely on gaming-related streaming platforms, like Twitch (Nichols, 2017). To complicate things, there have been little efforts to promote esports and its business achievements of corporations and pro-gamers outside the esports sphere (AEVI, 2018).

As stated by Pike and Master (2017), comprehending all the nuanced specificities and intricacies of esports is actually one of the main barriers that sponsors face. There is a large number of competitions, pro-teams and pro-gamers, broadcasting channels, and videogames (Pike & Master, 2017). Furthermore, there is a massive exposure of incorrect and ambiguous data (AEVI, 2018).

As claimed by AEVI (2018), there have been several instances of data and figures being published about the videogame and esports markets that did not show a truthful image of the sectors. Although there is plenty of information about esports' triumphs, several hold overly optimistic forecasts or misinterpreted figures. AEVI notes that, despite the sectors' promising future, every piece of information that is published must be realistic and avoid setting unrealistic expectations for investors, sponsors, consumers, and other stakeholders. The author also indicates that, other times, the data shows an overly negative image of the market. For these reasons, it is crucial to be transparent and regularly educate consumers, the media, administrators, etc. (AEVI, 2018).

According to Taylor (2012), since most sponsors only know that esports are related to the negative gaming stereotypes, they frequently need to be educated that competitive gaming is not a nerd or niche industry, but a brand-new and exciting market. Taylor states that esports-related organizations often need to inform potential sponsors of what competitive gaming really is, what occurs there, how leagues work, and that pro-gamers are not nerds but beneficial endorsers for their products. In other words, esports organizations need to convince consumer brands that sponsoring competitive gaming will grant them attractive marketing opportunities (Taylor, 2012).

In the same vein, since this market is still very young, with scant data available (particularly when compared to regular sports), most measurements and forecasts greatly differ (Nichols, 2017; Lokhman *et al.*, 2018). For instance, as reported by Nichols (2017), both the predicted percentage growth and revenue of this market tend to greatly fluctuate depending on who made the study. For example, while Newzoo predicted that, in 2015, the esports market made $325 million in revenue, SuperData reported $750 million, and Deloitte $400 million. The same occured in 2016, with Newzoo estimating $493 million, SuperData $892 million, and Deloitte $500 million (Nichols, 2017).

As stated by Nichols (2017), since there is a lot of dissimilar data, Yvonne Hobden, the lead of consumer marketing at HP, commented that, while they, as a brand, are serious about

esports, they still consider their involvement to be a leap of faith because all effective sponsorships are driven by data and need reliable figures to ensure positive ROIs. And this is not something that esports have (Nichols, 2017).

According to Korpimies (2017), in comparison to regular sport sponsorships, the method of creating and maintaining an esports sponsorship is not nearly as refined. Regular sports presents fewer uncertainties during the negotiations period and both parties effectively understand what they can offer from the start (Korpimies, 2017).

In the opinion of Nichols (2017), the esports industry still requires time to develop, mature, and show sponsors that it is a reliable marketing tool. The author notes that, as of now, several brands are still being cautious about esports and opt not to risk a sponsorship that may fail. Before diving into esports, they want to see proof that sponsors can be successful. In this sense, if an industry can solidify and clarify its organizational structure and show viable data and case studies that indicate that these investments are profitable, the amount of sponsors is going to increase (Nichols, 2017). As stated by Härig (2015), an example that should be shown to all brands that are doubtful about sponsoring esports is the case of Red Bull and its commitment to competitive gaming. This non-endemic consumer brand was one of the first esports sponsors and established its own esports league, sponsored esports pro-teams, and was very successful in its sponsoring activities (Härig, 2015).

Even so, some authors stress that the esports industry still has not proved its relevance (Franke, 2015) nor its commercial or social significance (Burk, 2013). The unique characteristics and quick evolution of esports means that they must overcome several barriers to ensure a continuous positive development (AEVI, 2018). Due to this, the future of competitive gaming is unknown and there is little proof to support the idea that they will rival the prestige, profitability, and function of regular sports (Bayliss, 2016).

Although the competitive gaming market has shown constant progress, this continuous evolution, which has been accompanied by numerous changes, implies that it is hard to not lose track of everything that is occurring in the esports industry (Parmar, 2012). This causes a lack of knowledge about competitive gaming and creates numerous barriers to access, promotes misunderstandings, and causes preconceptions that prevent this market from evolving at a faster speed (AEVI, 2018).

Numerous sponsors still find it difficult to profit from competitive gaming (Stein & Scholz, 2016). According to AEVI (2018), there have been several instances of brands that, without a proper understanding of esports or of how it operates, orchestrated failed or ineffective sponsorships. This creates a negative image, struggles, and distrust between sponsors, investors, and other stakeholders (AEVI, 2018). Since the esports audience is extremely vocal (Nichols, 2017; Freitas *et al.*, 2022) and critical (Europe, 2015; Freitas *et al.*, 2022), a sponsor that communicates with the esports fans without a proper knowledge of this industry is at risk of suffering negative repercussions (Nichols, 2017).

2.5 Hypothesis

Based on the literature review, we pose the following:

H: The problems associated with the infancy of the esports industry (e.g. lack of main governing body, regulation, and standardization; volatile market; dependence on sponsors; and lack of knowledge about the market) are a risk to esports sponsors.

3. METHODOLOGY

This research used an exploratory and convergent-parallel mixed method with equal status. In particular, data was collected from two samples simultaneously. On the one hand, from sample 1, mostly qualitative data was gathered. On the other hand, from sample 2, mostly quantitative data was obtained. The two datasets were firstly analysed separately and, afterwards, they were compared and given the same level of importance when drawing conclusions. That is to say, conclusions were reached by triangulating the results of samples 1 and 2. During the entirety of the study, the researchers adopted an overt stance, the time horizon was cross-sectional, and the study setting was non-contrived.

Sample 1 comprised of 22 experts in esports sponsoring who were working at companies with experience in these commercial partnerships. Specifically, sample 1 consisted of seven marketing agencies (MAs), eight non-endemic esports sponsors (NEESs), and seven endemic esports sponsors (EESs). The sampling methodology was nonprobability purposive expert heterogeneous. Particularly, diverse companies were purposeful contacted to promote the acquisition of heterogeneous perspectives, which allowed to better understand the topic under scrutiny. It must be stated that, for an organization to be included in this research, it had to possess at least two years of experience in competitive gaming sponsoring. This limitation was set to ensure that members of sample 1 provided knowledgeable and reliable data. The limitation was of just two years since – as stated by Ströh (2017) – esports, as an official industry, as only existed for less than a decade. The companies were contacted via publicly available email addresses or contact sections in their websites.

The empirical data of sample 1 was obtained through skype interviews – sometimes other platforms, like Zoom or Microsoft Teams, were used at the request of the interviewee. The members of sample 1 were asked about the characteristics of the companies they worked in and they were presented with a 6-point Likert scale accompanied by the statement "The problems associated with the infancy of the esports industry (for example: lack of main governing body, regulation and standardization; volatile market; dependence on sponsors; and lack of knowledge about the market) are a risk to esports sponsors" and were asked to select their agreement or disagreement level with it (i.e. Strongly disagree, Disagree, Somewhat disagree, Somewhat agree, Agree, or Strongly agree). A neutral option was not included since – as stressed by Lavrakas (2008) and Mooi *et al.* (2018) – people tend to not take a stance or to select the safest option. Nonetheless, they were presented with a follow up open-ended question asking "Please justify your selection", which gave participants the chance to freely express themselves and provide rich and deep qualitative information. A structured questionnaire was used to guide the interviews. This questionnaire was pretested between 14 April 2019 and 21 May 2019 on nine individuals from the fields of marketing, management, and social research. The data collection of sample 1 began on 15 August 2019 and ended on 12 December 2019. Tables no. 1 and no. 2 present the detailed characteristics of sample 1's members.

Table no. 1 – Characteristics of sample 1 – esports sponsors

ID	Industry	Interviewee position	Year of foundation	Years sponsoring esports	Current no. of sponsorships					Total no. of sponsorships					No. of connected games [a]
					Players & teams	Commentators	Tournaments & leagues	Videogames	Other	Players & teams	Commentators	Tournaments & leagues	Videogames	Other	
EES1	Gaming chair	Country General Manager in Brazil, Portugal, Spain, and UK	2010s	7	≥6	3	3	1	1	≥11	≥11	≥11	1-2	≥11	41
EES2	Gaming peripherals	Marketing Manager in Spain and Portugal	2000s	≥10	≥6	3	3	1	3	≥11	≥11	≥11	≥11	≥11	20
EES3	Gaming retail	Head of Partnerships	1980s	2	5	0	2	0	0	5-6	0	1-2	0	1-2	7
EES4	Gaming computer hardware and peripherals	Gaming Partnership Specialist	1990s	9	≥6	≥6	≥6	0	0	≥11	≥11	≥11	9-10	0	13
EES5	Gaming computer hardware and peripherals	UK Marketing Manager	1990s	4	1	1	1	0	0	3-4	1-2	1-2	1-2	3-4	10
EES6	Gaming computers and peripherals	Esports Specialist	2000s	≥10	≥6	≥6	≥6	≥6	≥6	≥11	≥11	≥11	≥11	≥11	34
EES7	Gaming computers, hardware, and peripherals	Esports and Partnerships Manager	1980s	8	2	0	0	3	0	≥11	1-2	5-6	9-10	≥11	10
NEES1	Consumer electronics (smartphones)	Head of Global Brand Partnerships	2010s	3	1	0	3	0	1	1-2	1-2	0	1-2	0	11
NEES2	Automotive	Head of Sponsoring and UEFA	1930s	3	1	0	1	1	0	1-2	0	1-2	1-2	1-2	5
NEES3	Software development, computer hardware, consumer electronics, etc.	Brand Partnerships Manager	1970s	≤1	1	0	0	0	0	1-2	0	0	0	0	9
NEES4	Craft beer and brewing	Community, Partnerships, Sponsorships, and Major Events Manager	1990s	2	5	1	1	4	0	5-6	1-2	3-4	0	1-2	6
NEES5	Energy drink	Esports Manager	1980s	≥10	≥6	≥6	≥6	≥6	≥6	≥11	≥11	≥11	≥11	≥11	25
NEES6	Insurance	Marketing Director, Media, and Sponsorships	1920s	2	1	0	2	2	1	1-2	0	3-4	5-6	0	6
NEES7	Online payments	EEA Chief Executive Officer	2000s	6	1	0	≥6	0	0	1-2	0	9-10	0	0	8
NEES8	Conglomerate (consumer electronics, medical equipment, computer hardware, ships, automotive, apparel, chemicals, etc.)	Head of Mobile Marketing Partnerships in America	1930s	5	≥6	0	2	3	3	≥11	1-2	3-4	3-4	1-2	4

Note. EES = Endemic esports sponsor; NEES = Non-endemic esports sponsor. NEES2 and NEES3 function at a national level. All other EESs and NEESs function internationally.

[a] No. of connected games is associated with the number of different videogames that the brands' sponsored entities are tied to (e.g. games featured in sponsored tournaments, games sponsored by the brand, games played by sponsored players and teams, games linked to other sponsored entities).

Table no. 2 – Characteristics of sample 1 – marketing agencies

ID	Interviewee position	Year of foundation	Years connected to esports	Provide marketing advice outside videogames	Approximate no. of esports sponsors assisted	No. of connected games[a]
MA1	Founder and Director	2010s	2	No	40	39
MA2	Member of the Board of Directors	2010s	4	No	50	6
MA3	Founder and Director	2010s	2	No	100	9
MA4	Account Director and Esports Specialist	1990s	4	Yes	15	15
MA5	Founder and Director	2010s	3	No	10	21
MA6	Sr. Market Analyst and Esports Specialist	2000s	6	No	50	43
MA7	Founder and Director	2000s	11	No	100	35

Note: MA = Marketing agency.
[a] No. of connected games refers to the number of the different videogames related to the sponsors and brands that the marketing agencies assisted.

Regarding sample 2, it was composed of 5,638 esports fans. The sampling method was nonprobability purposive heterogeneous. Specifically, esports fans were reached with a purposeful intent of collecting a heterogeneous cluster to promote the gathering of different fan perspectives. To effectively reach esports fans, a database of the existing most popular esports videogames was developed and used to identify online communities of these popular IPs on two digital platforms: Reddit and Discord. Communities within Reddit are called *Subreddits* and communities inside Discord are called *Discord channels*. These two platforms were used because, as stated by Roth (2017), they are the most popular social websites for esports and gaming-related socialization. The database was put together by merging the names of the 20 most-watched esports videogames between January 2019 and May 2019 – data obtained from Newzoo (2020) – and the names of the 100 esports games with the highest prize money awarded – data obtained from Esports Earnings (2020). Esports Earnings and Newzoo are esports-related databases that are highly sought out by numerous researcher and authors like Jenny *et al.* (2018), Ströh (2017), Cunningham *et al.* (2018), Owens (2016), Menasce (2019), Shabir (2017), and Sylvester and Rennie (2017). The database made use of 103 esports games and can be consulted in Table no. 3.

Table no. 3 – Most watched and highest prize money awarded esports videogames

Esports videogames	
Project Gotham Racing 3	Painkiller
Blade & Soul	Halo 5: Guardians
Halo 2 Anniversary	Point Blank
Street Fighter V: Arcade Edition	Magic: The Gathering Arena
Halo 4	Turbo Racing League

Esports videogames	
Pokémon Sword/Shield	FIFA 13
Call of Duty: Ghosts	FIFA Online 3
Halo: Combat Evolved	rFactor 2
Call of Duty: Black Ops III	Call of Duty: Black Ops
PlayerUnknown's Battlegrounds Mobile	Super Smash Bros. Ultimate
NBA 2K18	Counter-Strike Online
Free Fire	Guild Wars 2
KartRider	Arena of Valor
Magic: The Gathering Online	Madden NFL 2018
Heroes of Newerth	Call of Duty: Modern Warfare
Paladins	Apex Legends
Call of Duty 4: Modern Warfare	Counter-Strike: Source
Shadowverse	Super Smash Bros. Melee
Counter-Strike: Global Offensive	Call of Duty: Infinite Warfare
World in Conflict	Clash of Clans
Teamfight Tactics	Dead or Alive 4
Super Street Fighter IV Arcade Edition	Vainglory
League of Legends	Mortal Kombat 11
PlayerUnknown's Battlegrounds	Fortnite
Rocket League	Call of Duty: Modern Warfare 3
Super Smash Bros. for Wii U	Tom Clancy's Rainbow Six: Siege
Quake Live	Quake 4
StarCraft II	Madden NFL 2017
F1 2019	Heroes of the Storm
Gwent	Quake III Arena
FIFA 18	Defense of the Ancients
Team Fortress 2	Hearthstone
CrossFire	Age of Empires II
Ultra Street Fighter IV	FIFA 19
World of WarCraft	FIFA 17
FIFA 20	WarCraft III
iRacing.com	Call of Duty: Advanced Warfare
Clash Royale	Tekken 7
Call of Duty: Black Ops 2	Pro Evolution Soccer 2017
H1Z1	Call of Duty: Black Ops 4
Forza Motorsport 7	Brawlhalla
Pokémon: Let's Go, Pikachu! and Eevee!	Call of Duty: World War II
World of Tanks	StarCraft: Brood War
SMITE	Gears of War 4
Halo 3	TEPPEN
Halo 2	Injustice 2
Counter-Strike	Mortal Kombat X
Old School Runescape	Attack on Titan Tribute Game
Dota 2	Street Fighter V
Halo: Reach	Auto Chess
Quake Champions	Overwatch
Madden NFL 2013	

Note. Table based on data from Esports (2020) and Newzoo (2020).

Because esports fans spend most of their time in the online world, an online survey was used to gather their empirical data. Their questionnaire was largely closed-ended and it was applied via self-recruitment and self-administration. Google Forms was used to design the questionnaire, which is a digital platform specially developed to create and apply surveys. It is recommended by various social research experts, like Cohen *et al.* (2018). Overall, the requests to participate in the survey – and a link to the survey – were placed in 392 subreddits and 263 Discord channels.

The starting question of the questionnaire was a filter yes/no item asking "Do you regularly watch and/or participate in esports?" so that those who select "No" would not be eligible to fill out the survey. Subsequently, besides demographic items, participants were asked the closed-ended question "Do you think that esports have problems related to their infancy to solve?" and the answer options were "Yes" and "No". Those who answered "Yes" were asked the closed-ended question "What are the main infancy-related problems of the esports industry? (Select all that apply)" and the answer-options were: "Lack of a main governing body (for example, FIFA largely governs football; FIBA largely controls Basketball; but no organization is governing esports)", "Lack of regulation", "Lack of standardization (for example: different tournaments have different rules for the same videogames; etc.)", "Volatility (tournaments, pro-players, teams, etc. disappear as quickly as they appeared)", "Dependence on sponsors", "Lack of knowledge about the esports industry (sponsors still do not have enough knowledge about esports)", and "Other". The last item of the questionnaire was an optional open-ended question asking "Would you like to add anything else about what was addressed in this survey? (Optional)".

Overall, 167 individuals from subreddits and Discord channels related to esports and videogames participated in a pretest phase that occurred between 14 April 2019 and 25 May 2019. The real data collection occurred between 29 June 2019 and 3 December 2019. The demographic characteristics of sample 2 can be observed in Table no. 4.

Table no. 4 – Demographic characteristics of esports fans

	N = 5,638					
	Valid	No answer	Valid %	Mean	SD	Mode
Gender	5,560	78				
Female	407		7.3			
Male	5,153		92.7			
Age	5,412	226		23.05	6.062	18
Marital status	5,510	128				
Single	4,056		73.6			
Cohabiting	932		16.9			
Married	480		8.7			
Divorced	33		.6			
Widowed	9		.2			
Ethnicity	5,477	161				
American Indian or Alaska Native	71		1.3			
Asian	824		15			
Black or African American	147		2.7			
Hispanic, Latino or Spanish origin	421		7.7			
Middle Eastern or North African	116		2.1			
Native Hawaiian or other Pacific Islander	38		.7			
White	4,255		77.7			

	Valid	No answer	Valid %	Mean	SD	Mode
			N = 5,638			
Other	197		3.6			
Employment status	5,527	111				
Student	2,720		49.2			
Employed	2,293		41.5			
Homemaker	40		.7			
Unemployed	324		5.9			
Retired	17		.3			
Other	133		2.4			
Education	5,497	141				
6th grade or less	11		.2			
7th to 12th grade	2,178		39.6			
Bachelor degree	2,332		42.4			
Master degree	525		9.6			
PhD	90		1.6			
Post-doctorate	16		.3			
Other	345		6.3			
Region	5,553	85				
Africa	32		.6			
Asia	322		5.8			
Europe	1,860		33.5			
North America	3,013		54.3			
Oceania	191		3.4			
South America	135		2.4			

Note. N = Sample size, SD = Standard deviation. For ethnicity, participants were able to select more than one option.

It was verified that the demographic characteristics of sample 2 are closely related to those from the literature on esports fans. Particularly, while Zolides (2015) indicates that 90% of esports fans are male, and Billings *et al.* (2019) state 92.4%, sample 2 was 92.7% male. Similarly, while Pike and Master (2017) reports that the average age of esports fans is 26 years-old, and Mooney (2018) mentions that it is between 18 and 25 years-old, sample 2's average was 23.05. Since there is a high lack of viable literature on the demographic information of esports fans, a comparison of other demographic data was not possible.

Because there are so few studies on esports sponsorships, the number of questions on the questionnaire was limited so that it would be possible to attract several participants. If participants were presented with too many questions, the easily bored competitive gaming fans would not want to participate and the experts on esports sponsorships might have not had enough time for such a long interview. Therefore, the large samples promoted the relevance and reliability of the results and mitigate the limitation of a scarce literature.

The software NVivo 10 was used to assist in the analysis of qualitative data and IBM SPSS Statistics 25 was used to analyse quantitative data. To abide by the ethics of confidentiality and social research, all sensitive information that could be used to identify or trace participants (e.g. names of companies or interviewees, and year of foundation) were excluded or altered. Sample 1's unit of observation and unit of analysis was the organization and sample 2's unit of observation was the individual and the unit of analysis was the organization.

4. RESULTS

4.1 H₂c – Infancy of the industry (Sample 1)

In Figure no. 1, it is possible to observe the frequencies of the data from the esports sponsoring experts when asked to indicate their level of disagreement or agreement with the statement "The problems associated with the infancy of the esports industry (for example: lack of main governing body, regulation and standardization; volatile market; dependence on sponsors; and lack of knowledge about the market) are a risk to esports sponsors". The closed-ended response options were: "Strongly disagree", "Disagree", "Somewhat disagree", "Somewhat agree", "Agree", and "Strongly agree". In general, the figure shows that 36.4% (i.e. $n = 8/22$) of participants expressed disagreement and 63.6% (i.e. $n = 14/22$) expressed agreement.
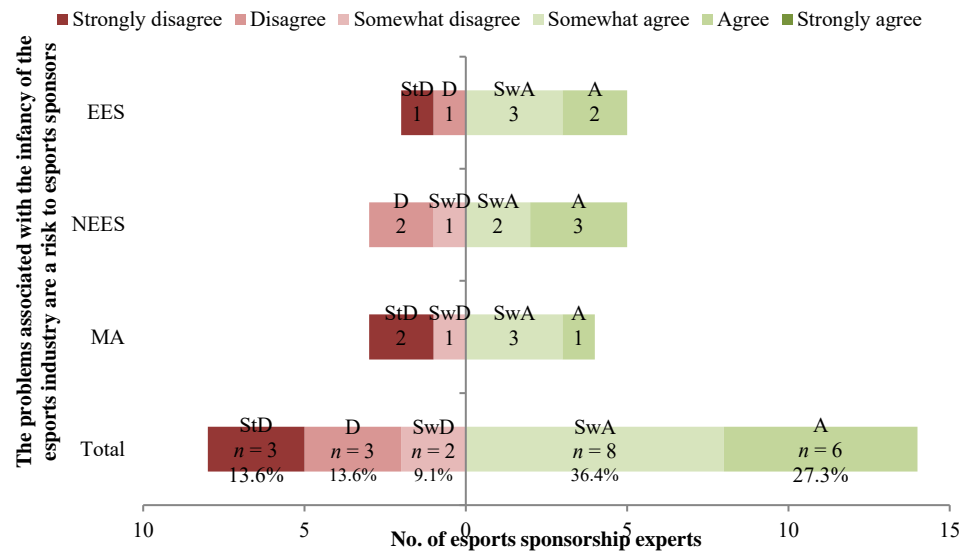
Figure no. 1 – Esports sponsoring experts' opinion on whether the problems associated with the infancy of the competitive gaming industry are a risk to its sponsors

Note. N = 22; *n* = 22; No answer = 0. StD = Strongly disagree; D = Disagree; SwD = Somewhat disagree; SwA = Somewhat agree; A = Agree; StA = Strongly agree

In Table no. 5, it is possible to observe the most relevant quotes from the esports sponsoring exports when asked to justify their agreement or disagreement level with the statement "The problems associated with the infancy of the esports industry (for example: lack of main governing body, regulation and standardization; volatile market; dependence on sponsors; and lack of knowledge about the market) are a risk to esports sponsors". Overall, 19 participants provided arguments supporting the statement, 14 provided arguments refuting it, and one claimed that it depends (some participants provided arguments for and against the statement). Afterwards, Table no. 6 presents the most important of these quotes in thematic categories.

Table no. 5 – Experts' most relevant quotes on whether the problems associated with the infancy of the esports industry are a risk to esports sponsors

ID	Quote		
Stance	**Agreeing**	**Disagreeing**	**Depends**
EES7 Strongly disagree		"I actually don't think that this is something that is happening in the esports industry. . . . Now I think we have more standardized tournaments than we ever had before, with ESL going out and having a lot of different tournaments, regular tournaments as well, we have formats like Majors and Minors now, in the segments, where you have to apply to get the points, you need to have a certain amount of rules, you need to have a certain amount of money like price pools to be a part of this Minor and Major. There are different rules you need to follow for you to actually be a part of this circuit and in the different games. So, I actually think it's very mature at the moment. At least for the bigger tournaments. And also just in general, when we talk about our sponsoring teams and all this stuff, it's very much a more professional now than it was years ago when we first started. The players are more professional now as well. The organizations are more professional now as well. And also because they have to, because there are a lot more sponsors now, there is a lot more money in the scene now. So, the times of course have to follow the professionalism as well when the money does it."	
EES6 Somewhat agree	"Sponsorship value may not be maximized . . . by unexperienced partners, which can decrease the ROI of the sponsorship. . . . You have a lot of people . . . who don't have professional experience outside of gaming, right? So you don't have somebody who's activated brand partnerships for the NFL for 20 years, right? That person knows how to do that more effectively than somebody who wasn't, right?"		
EES5 Somewhat agree	"We know it's a volatile market so that's why we don't invest too much or we don't invest too little. All of our contracts have a maximum of 1 year because we don't know what is going to happen next year. . . . It is a risk and it's a fear for non-endemic companies such as big companies like car companies. All of those companies obviously it is a risk because they don't know what is happening here or they don't understand what could happen in the near future, so sometimes they don't invest because of that."	"Endemic companies such as our company [EES3], we completely know everything that is inside this market . . . For endemics it is not a risk at all."	
EES4 Disagree	"*Fortnite* is gigantic, but in esports it's still not that strong and teams come in and out all the time. This won't happen in sports. You won't be sponsoring Paris Saint-Germain and all of a sudden Paris Saint-Germain doesn't have a football team anymore. That doesn't happen."	"No, that is actually a benefit. . . . For the esports institutions that are more reasonable and you know a little about how much they're really worth, you can have a very good return by sponsoring esports."	

ID Stance	Quote		Depends
	Agreeing	**Disagreeing**	
EES3 Somewhat agree	"There's a risk factor involved with all of that."	"It's worth the risk in my opinion if you are smart enough to do your research and do it properly."	
EES2 Agree	"Several companies and teams suddenly disappear and it can be a problem to the brands that already created partnerships with them."		
EES1 Agree	"The scene is just so new and it hasn't been established to the point in which I think it should be. . . . As of now I would say there is still a risk in terms of, I would say, smaller tournaments or newer games that come out."	"A lot of the big mainstream publishers are getting it very right though. I would say Riot, when they're working with their franchise league for LCS, they're acting as the main governing body, they have a ruleset in place, they fine teams when they kind of are trying to poach different players, things like that. And so, they're really really working very heavily on the regulation and standardization of the scene. You have other publishers like Blizzard that are, you know, working with Overwatch League, *Call of Duty*, and they're all really really working heavily to work on the regulation and standardization. But I think it's definitely improving and I think it's going to get there very very soon."	
NEES7 Somewhat agree	"I'm pretty sure that the industry will learn . . . Even with this risk, it will still grow."		
NEES6 Agree	"That is definitely scary. For esports, sponsoring when everything is so volatile, you see leagues popping up and disbanding, you see teams popping up and disbanding. . . . If you do like an advertising campaign around a specific, like let's say the Cloud9 *League of Legends* team . . . if you partner with them and you do an ad about the five starters and then they slit and there's only one remaining, that's a weird thing because you were showcasing your athletes you'd have to pull down the ads and things like that. So that can be seen as a risk if there's not much stability."		
NEES5 Somewhat disagree		"The benefit is bigger than the risk here. There's still a lot of development which is more interesting than it's a risk. It will be very interesting to see how certain things will develop. But it's also kind of like a fresh field and not too overregulated. There's also more room for creativity. So that's definitely positive."	
NEES4 Disagree		"I wouldn't call it a risk, I would call it a challenge."	
NEES3 Agree	"On the esports side of the world it's been less than 2 years since *Fortnite* has been introduced and now it's the biggest game in the world, but I'll tell you, right before *Fortnite* came out people were all clamouring about *PUBG* and how great it was, and now there's very little talk about *PUBG*. And so, it's more about the volatility and the fickleness of the esports marketplace and the gamers themselves wanting to move on to the new, fun, hot thing. And		

ID	Quote		
Stance	Agreeing	Disagreeing	Depends
	so that has some problems in that it's hard to want to make a long-term bet. It's very easy for me to make a long-term bet on the NFL or College basketball because I know it's going to be there, it's not going away. . . . It's really about what has the staying power and that becomes an issue around long-term investment in the space. We all know it's going to be here, it's just where are the consumers going to be? And what game are they going to be playing?"		
NEES2 Agree	"Without a governing body or kind of an over-arching ideal of how this works… again it is the wild west . . . Can the market hold its own self? . . . Risks in the esports community is esports itself. Being so new, how does it grow in a manner that is safe and makes money and keeps it healthy for the players?"		
NEES1 Disagree	"There is a lack of true understanding of, not just the problems with esports, but with esports as a whole. That's the biggest challenge I face working in a major company. Every single executive I talk to about gaming in general, it's like I'm talking to a 5 year-old. I have to teach them everything about this. So I think there's just so much unfamiliarity with it, other than maybe a Netflix video they watched at some point. And anything that you don't understand you're hesitant to participate in."	"This is just making it slower for sponsors to get involved . . . This is less about the problems and more about educating brands about the benefits here and the long-term benefits here."	
NEES8 Somewhat agree	"Esports may become a 'black hole' for a budget of a company if it doesn't know what it is doing when investing into esports. A lot of brands sign large contracts with esports organization just because it's a new and popular trend without a good and comprehensive marketing strategy around it."		
MA7 Somewhat agree	"It's the lack of knowledge and the other is not being concerned but they are always in the table when you're talking about that."	"It's not relevant."	
MA6 Somewhat agree	"Volatile, yeah, it probably is . . . it's more the lack of understanding."	"I think standardization we have plenty, that's relatively fine. . . . Dependence on sponsors, actually I would say we've now left the top area of dependency on sponsors, now it's just venture capital money . . . Riot has fantastic governing body, it's Riot, fantastic regulation and standardization, there is no volatility in it and no teams are truly dependent on sponsors so actually with that one, no it's perfectly fine."	
MA5 Strongly disagree	"Non-regulation also means a higher rate of issues. You know? Criminal people trying to not perform, run away with money, etc. . . . There's a higher risk attached compared to a fully governed industry. . . . With the infancy there's also a lack of education, sometimes the bad black sheep are not sorted out yet. So there's also a certain risk level which is higher than in an industry that is 20 years old, fully governed, and everybody knows each other, right? You know that guys are not messing around with your money."	"In terms of governing bodies, rules and regulations, it goes into the same direction because you as a brand, you're not very much dependent on if a sport or esports is actually regulated you don't really care. In fact, not having franchise league, certain rules or business rules applied to a whole IP . . . Let's say Counter-Strike would be governed and they would say like 'Hey, a sponsorships package has to be about 50,000$', then a lot of brands would stop investing into Counter-Strike because a lot of them just sponsor here a guy for 1,000$, there for 5,000$, a	

ID Stance	Agreeing	Disagreeing	Depends
		tournament for 20,000\$, etc. So, the non-regulation is always good for sponsors in terms of budget . . . It's beneficial to sponsor . . . I think the infancy aspect of esports is not an issue, it's actually an advantage."	
MA4 Strongly disagree	"You can have volatile trends like *Apex Legends* or *Fortnite* who's still popular but no one knows if it's still going to last in the next 2 years."	"The market has really structured in the past 2 years with game publishers regaining control over competitions and their games . . . I wouldn't say these are all volatile companies . . . we see a real structuration around the top 15 or 20 global top teams that are raising millions of dollars back-to-back, they are very serious venture capitalists and private investors who are hiring professional marketers and finance people etc. . . . If we take a global look at the market I'd say volatility is less a thing than it was 2 or 3 years ago."	
MA3 Somewhat disagree	"A lack of knowledge about the market is the biggest risk because there's a lot to know about the market and the community. For example, one potential client approached us with an event they wanted to sponsor and wasn't aware that it was a *Counter-Strike* event. Knowing them from their traditional communications, where they're positioned as a PG 12 brand, a PG 16 game would have been a problem for them. But they just didn't know what it was. To them, esports was one large, amorphous mass of games and they had no idea what they were buying."	"Lack of a main governing body also means that, as a sponsor, I'm much freer in what I want to do. The dependence on sponsors is also, in fact, a good aspect from a sponsor's perspective because that means you get more say."	"A lot of these have two sides."
MA2 Somewhat agree	"Governing oversight indeed makes the market more volatile, it makes it more prone to still having match-fixing or other types of cheating, or toxicity, player scandals that happen, so I definitely think that this increases the risk for those things to happen. . . . It would definitely help to have more governing and I think that would also make it less of a risk to sponsors."	"There are organizations that look into this, I think that's a big plus that there is big orga–nizers and companies involved with things like the Esports Integrity Coalition and other types of bodies that do try to work on coun-tering and regulating things. I also think that big game publishers, for example Riot Games, they do everything mainly in-house, so they do a lot of the events themselves so they're very actively involved with regulating, stan-dardizing, their mainly almost a governing body of their industry. . . . It gives some mar-ket stability in large parts which I think those environments are very welcoming to sponsors, there's not a lot of risks or concerns there."	
MA1 Agree	"[Publisher] behaviour can really influence how the industry works. For example, in a *Fortnite* event at the very last moment they changed advertisements and the teams had to hide their sponsors which they had already made partnerships with. Valve has not this strict policy on whether pro-players can stream a *CS:GO* major or not. But this is an issue of standardization and regulation I would say. And yeah I think that in the future some governing body will appear that will be able to manage all this."		

Note. EES = Endemic esports sponsor; NEES = Non-endemic esports sponsor; MA = Marketing agency; . . . = edited cut; … = interviewee break.

Table no. 6 – Categorization of the experts' most relevant quotes on whether the problems associated with the infancy of the esports industry are a risk to esports sponsors

Theme	ID	Quotes agreeing
Lack of a main governing body, regulation, or standardization	NEES2	"Without a governing body or kind of an overarching ideal of how this works… again it is the wild west . . . Can the market hold its own self?"
	MA5	"Non-regulation also means a higher rate of issues. You know? Criminal people trying to not perform, run away with money, etc. . . . There's a higher risk attached compared to a fully governed industry."
	MA2	"Governing oversight indeed makes the market more volatile, it makes it more prone to still having match-fixing or other types of cheating, or toxicity, player scandals that happen, so I definitely think that this increases the risk for those things to happen. . . . It would definitely help to have more governing and I think that would also make it less of a risk to sponsors."
	MA1	"This is an issue of standardization and regulation I would say. And yeah I think that in the future some governing body will appear that will be able to manage all this."
Volatility of esports	EES5	"We know it's a volatile market so that's why we don't invest too much or we don't invest too little. All of our contracts have a maximum of 1 year because we don't know what is going to happen next year."
	EES4	"*Fortnite* is gigantic, but in esports it's still not that strong and teams come in and out all the time. This won't happen in sports. You won't be sponsoring Paris Saint-Germain and all of a sudden Paris Saint-Germain doesn't have a football team anymore. That doesn't happen."
	EES2	"Several companies and teams suddenly disappear and it can be a problem to the brands that already created partnerships with them."
	NEES6	"That is definitely scary. For esports, sponsoring when everything is so volatile, you see leagues popping up and disbanding, you see teams popping up and disbanding. . . . If you do like an advertising campaign around a specific, like let's say the Cloud9 *League of Legends* team . . . if you partner with them and you do an ad about the five starters and then they slit and there's only one remaining, that's a weird thing because you were showcasing your athletes you'd have to pull down the ads and things like that. So that can be seen as a risk if there's not much stability."
	NEES3	"On the esports side of the world it's been less than 2 years since *Fortnite* has been introduced and now it's the biggest game in the world, but I'll tell you, right before *Fortnite* came out people were all clamouring about *PUBG* and how great it was, and now there's very little talk about *PUBG*. And so, it's more about the volatility and the fickleness of the esports marketplace and the gamers themselves wanting to move on to the new, fun, hot thing. And so that has some problems in that it's hard to want to make a long-term bet. It's very easy for me to make a long-term bet on the NFL or College basketball because I know it's going to be there, it's not going away. . . . It's really about what has the staying power and that becomes an issue around long-term investment in the space. We all know it's going to be here, it's just where are the consumers going to be? And what game are they going to be playing?"
	MA6	"Volatile, yeah, it probably is."
	MA4	"You can have volatile trends like *Apex Legends* or *Fortnite* who's still popular but no one knows if it's still going to last in the next 2 years."
	MA2	"Governing oversight indeed makes the market more volatile."
	MA1	"[Publisher] behaviour can really influence how the industry works. For example, in a *Fortnite* event at the very last moment they changed advertisements and the teams had to hide their sponsors which they had already made partnerships with."
Esports are a very unknown market	EES5	"It is a risk and it's a fear for non-endemic companies such as big companies like car companies. All of those companies obviously it is a risk because they don't know what is happening here or they don't understand what could happen in the near future, so sometimes they don't invest because of that."
	NEES1	"There is a lack of true understanding of, not just the problems with esports, but with esports as a whole. That's the biggest challenge I face working in a major company. Every single executive I talk to about gaming in general, it's like I'm talking to a 5 year-old. I have to teach them everything about this. So I think there's just so much unfamiliarity with it, other than maybe a Netflix video they watched at some point. And anything that you don't understand you're hesitant to participate in."

Theme	ID	Quotes agreeing
	NEES8	"Esports may become a 'black hole' for a budget of a company if it doesn't know what it is doing when investing into esports. A lot of brands sign large contracts with esports organization just because it's a new and popular trend without a good and comprehensive marketing strategy around it."
	MA7	"It's the lack of knowledge and the other is not being concerned but they are always in the table when you're talking about that."
	MA6	"It's more the lack of understanding."
	MA3	"A lack of knowledge about the market is the biggest risk because there's a lot to know about the market and the community. For example, one potential client approached us with an event they wanted to sponsor and wasn't aware that it was a *Counter-Strike* event. Knowing them from their traditional communications, where they're positioned as a PG 12 brand, a PG 16 game would have been a problem for them. But they just didn't know what it was. To them, esports was one large, amorphous mass of games and they had no idea what they were buying."
Esports entities are commercially inexperienced	EES6	"Sponsorship value may not be maximized . . . by unexperienced partners, which can decrease the ROI of the sponsorship. . . . You have a lot of people . . . who don't have professional experience outside of gaming, right? So you don't have somebody who's activated brand partnerships for the NFL for 20 years, right? That person knows how to do that more effectively than somebody who wasn't, right?"
Esports are underdeveloped	EES1	"The scene is just so new and it hasn't been established to the point in which I think it should be."
	NEES7	"I'm pretty sure that the industry will learn . . . Even with this risk, it will still grow."
	NEES2	"Risks in the esports community is esports itself. Being so new, how does it grow in a manner that is safe and makes money and keeps it healthy for the players?"
	MA5	"With the infancy there's also a lack of education, sometimes the bad black sheep are not sorted out yet. So there's also a certain risk level which is higher than in an industry that is 20 years old, fully governed, and everybody knows each other, right? You know that guys are not messing around with your money."
Esports are now more regulated and standardized	EES7	"Now I think we have more standardized tournaments than we ever had before, with ESL going out and having a lot of different tournaments, regular tournaments as well, we have formats like Majors and Minors now, in the segments, where you have to apply to get the points, you need to have a certain amount of rules, you need to have a certain amount of money like price pools to be a part of this Minor and Major. . . . There are different rules you need to follow for you to actually be a part of this circuit and in the different games."
	EES1	"A lot of the big mainstream publishers are getting it very right though. I would say Riot, when they're working with their franchise league for LCS, they're acting as the main governing body, they have a ruleset in place, they fine teams when they kind of are trying to poach different players, things like that. And so, they're really really working very heavily on the regulation and standardization of the scene. You have other publishers like Blizzard that are, you know, working with Overwatch League, *Call of Duty*, and they're all really really working heavily to work on the regulation and standardization. But I think it's definitely improving and I think it's going to get there very very soon."
	MA6	"I think standardization we have plenty, that's relatively fine. . . . Riot [has] fantastic regulation and standardization."
	MA2	"There are organizations that look into this, I think that's a big plus that there is big organizers and companies involved with things like the Esports Integrity Coalition and other types of bodies that do try to work on countering and regulating things. I also think that big game publishers, for example Riot Games, they do everything mainly in-house, so they do a lot of the events themselves so they're very actively involved with regulating, standardizing, their mainly almost a governing body of their industry."
Lack of main governing	NEES5	"It's also kind of like a fresh field and not too overregulated. There's also more room for creativity. So that's definitely positive."

Theme	ID	Quotes agreeing
body, regulation, and standardization is good	MA5	"In terms of governing bodies, rules and regulations, it goes into the same direction because you as a brand, you're not very much dependent on if a sport or esports is actually regulated you don't really care. In fact, not having franchise league, certain rules or business rules applied to a whole IP . . . Let's say *Counter-Strike* would be governed and they would say like 'Hey, a sponsorships package has to be about 50,000$', then a lot of brands would stop investing into *Counter-Strike* because a lot of them just sponsor here a guy for 1,000$, there for 5,000$, a tournament for 20,000$, etc. So, the non-regulation is always good for sponsors in terms of budget."
	MA3	"Lack of a main governing body also means that, as a sponsor, I'm much freer in what I want to do."
Some parts of esports are not volatile	MA6	"Riot . . . [has] no volatility in it."
	MA4	"The market has really structured in the past 2 years with game publishers regaining control over competitions and their games . . . I wouldn't say these are all volatile companies . . . we see a real structuration around the top 15 or 20 global top teams that are raising millions of dollars back-to-back, they are very serious venture capitalists and private investors who are hiring professional marketers and finance people etc. . . . If we take a global look at the market I'd say volatility is less a thing than it was 2 or 3 years ago."
	MA2	"[Some esports organizations give] some market stability in large parts which I think those environments are very welcoming to sponsors, there's not a lot of risks or concerns there."
Esports are not as dependent on sponsors as they were	MA6	"Dependence on sponsors, actually I would say we've now left the top area of dependency on sponsors, now it's just venture capital money . . . [With] Riot . . . no teams are truly dependent on sponsors so actually with that one, no it's perfectly fine."
Dependence on sponsors is good	MA3	"The dependence on sponsors is also, in fact, a good aspect from a sponsor's perspective because that means you get more say."
Not a risk for endemic companies because they know the esports market	EES5	"Endemic companies such as our company [EES5], we completely know everything that is inside this market . . . For endemics it is not a risk at all."
Some esports entities are commercially experienced	EES4	"No, that is actually a benefit. . . . For the esports institutions that are more reasonable and you know a little about how much they're really worth, you can have a very good return by sponsoring esports."
Esports is now more developed	EES7	"It's very mature at the moment. At least for the bigger tournaments. And also just in general, when we talk about our sponsoring teams and all this stuff, it's very much a more professional now than it was years ago when we first started. The players are more professional now as well. The organizations are more professional now as well. And also because they have to, because there are a lot more sponsors now, there is a lot more money in the scene now. So, the times of course have to follow the professionalism as well when the money does it."
Not a risk if the sponsor has esports expertise	EES4	"No, that is actually a benefit. . . . [If] you know a little about how much they're really worth, you can have a very good return by sponsoring esports."
	EES3	"It's worth the risk in my opinion if you are smart enough to do your research and do it properly."
	NEES1	"This is less about the problems and more about educating brands about the benefits here and the long-term benefits here."
The benefits outweigh the risks	EES3	"It's worth the risk in my opinion."
	NEES5	"The benefit is bigger than the risk here. There's still a lot of development which is more interesting than it's a risk."
The infancy of the esports industry is a benefit	EES4	"No, that is actually a benefit."
	MA5	"It's beneficial to sponsor . . . I think the infancy aspect of esports is not an issue, it's actually an advantage."

Note. EES = Endemic esports sponsor; NEES = Non-endemic esports sponsor; MA = Marketing agency; . . . = edited cut; … = interviewee break.

4.2 H$_{2c}$ – Infancy of the industry (Sample 2)

Figure no. 2 shows the frequencies of the empirical data from esports fans when answering to the closed-ended question "Do you think that esports have problems related to their infancy to solve?" The answer options were "Yes" and "No".
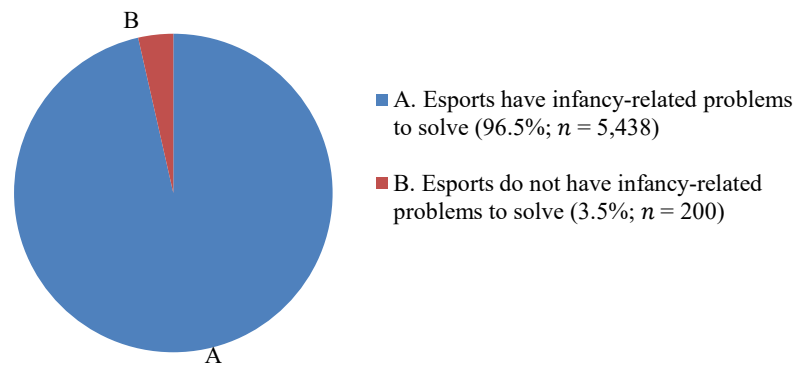
Figure no. 2 – Fans' opinion on whether the esports industry has infancy-related problems to solve
Note. N = 5,638; n = 5,638; No answer = 0

In Figure no. 3 it is possible to observe the frequencies of the data from the esports fans when answering to the closed-ended item "What are the main infancy-related problems of the esports industry? (Select all that apply)". The answer options were: "Lack of knowledge about the esports industry (sponsors still do not have enough knowledge about esports)", "Dependence on sponsors", "Volatility (tournaments, pro-players, teams, etc. disappear as quickly as they appeared)", "Lack of standardization (for example: different tournaments have different rules for the same videogames; etc.)", "Lack of regulation", "Lack of a main governing body (for example, FIFA largely governs football; FIBA largely controls Basketball; but no organization is governing esports)", and "Other". This item was a contingency question to the filter question "Do you think that esports have problems related to their infancy to solve?" and just the participants who answered "Yes" were able to answer it.

In the last question of the survey, which was an open-ended and optional item asking "Would you like to add anything else about what was addressed in this survey?", there were 11 participants who provied answers related to the topic of the infancy of the esports industry as a risk to sponsors. Table no. 7 shows the partial or full quotes from these esports fans. In this last open-ended question, there were also five fans who indicated that the infancy of the esports market sometimes leads to disreputable behaviour. The full or partial quotes from these participants are present in Table no. 8.
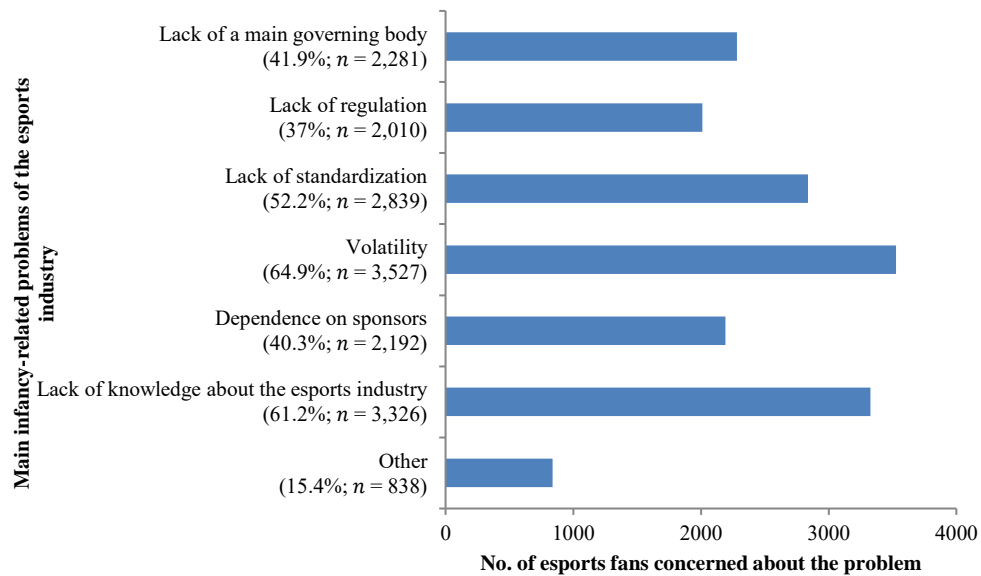
Figure no. 3 – Fans' opinion on what are the main infancy-related problems of the esports industry
Note: N = 5,638; *n* = 5,438; No answer = 200. This was a multiple response question.

Table no. 7 – Fan quotes supporting the main risk of the infancy of the esports industry

Subtheme and quote	Fan ID
Lack of main governing body, regulation, and standardization	
"Lack of authority and uniformed rules."	45
"I feel very strongly about having a regulating body for esports/streamers there need to be more rules in place so that players do not get screwed over so often."	262
"Governing bodies should be put in place solely for disciplinary purposes, i.e. the recent ban by blizzard should have been filtered through a higher power other than the chinese-influenced (bought) board members of a money centered corporation."	325
"One of the core issues is that the video game publisher typically also owns the primary tournament scene for that game. The result is business practices are pushed down into the tournament and they may vary from game to game or business to business."	38
Volatile market	
"The esports industry is inconsistent and changes shape with every game."	38
"Unionize esports staff and players. Give stability."	20
"Old/burnt-out players, that are retiring at an almost alarmingly high rate in some titles."	30
"There needs to be an established pro-gaming circuit that has great consistency."	147
"Sponsors giving up on sponsoring of teams because of roster stability."	196
"I truly think the main problem of esports currently is that it's very volatile and uncertain whether an aspiring professional can live off of playing the game, even if they are topping leaderboards. There needs to be more stability financially and higher wages in the t2-t3 scene."	208
"Lots of games die from lack of money for participating. It needs to be economically viable to aim for a career doing this before it'll become truly mainstream."	220
"From my point of view, volatility is the biggest problem that esports face."	390

Table no. 8 – Fan quotes indicating that the infancy of the esports market leads to disreputable behaviour

Quote	Fan ID
"I wouldn't like for sponsors to push agendas"	78
"People should be wary of the possible predatory aspect of esport sponsorships"	101
"Any time brands sink their teeth too deep into something they end up calling the shots for monetary purposes. . . . The biggest appeal of esports to me is the loose and fun feel of the commentating/community . . . Putting the players and the organizationz under the thumb of one company makes it much easier for said company to sway their decision making"	211
"There are definitely cases where it is incredibly problematic . . . which I believe is related to the one sponsor having too much say"	267
"I don't see any other options for pro players other than accepting sponsorships. So sponsors possess a lot of power over pro players and teams, so we need to hope they do right by the players themselves"	270

5. DISCUSSION

The general results confirmed the hypothesis that the problems associated with the infancy of the esports industry are a risk to esports sponsors. While the fans' data strongly supported the hypothesis, the experts' data moderately supported it.

For sample 1, the results showed that the majority of experts (i.e. 63.6%; $n = 14/22$) agreed with the phrase "The problems associated with the infancy of the esports industry (for example: lack of main governing body, regulation and standardization; volatile market; dependence on sponsors; and lack of knowledge about the market) are a risk to esports sponsors". However, it cannot be forgotten that there was still a significant percentage (i.e. 36.4%; $n = 8/22$) who disagreed. Nevertheless, because the majority of experts indicated to agree with the phrase, their data supported the hypothesis.

The most voted option was "Somewhat agree" (i.e. 36.4%; $n = 8/22$). This was followed by "Agree" (i.e. 27.3%; $n = 6/22$), "Strongly disagree" (i.e. 13.6%; $n = 3/22$), "Disagree" (i.e. 13.6%; $n = 3/22$), and "Somewhat disagree" (i.e. 9.1%; $n = 2/22$). Overall, the options "Somewhat agree" and "Agree" were selected by over half of sample 1 (i.e. 63.6%; $n = 14/22$). Also, there was not a single disagreement option that was more voted than any of the agreement options. Even so, the majority of participants who indicated disagreement had a medium to high confidence level with their stance. By contrast, the majority of the participants who indicated agreement had a medium to low confidence level with their stance. Another interesting aspect was that the amount of non-endemic and endemic sponsors who indicated the infancy of esports as a risk was relatively the same (i.e. 71.4% or $n = 5/7$ EESs vs 62.5% or $n = 5/8$ NEESs), hence the results did not indicate that this could be a significantly higher risk to a specific brand type.

Overall, sample 1's data showed that most esports experts perceive the infancy of this market as a risk to esports sponsors. The most mentioned problems that promote this risk are the lack of a main governing body, the unknown and volatile market, the commercial inexperience from esports entities, and underdevelopment of this industry. However, there were still some experts who stated that esports are becoming increasingly more regulated, developed, and standardized, as well as less dependent on sponsors and less volatile. One

expert stressed that this risk is a two-sided coin and that comment gained more credibility when several other experts pointed out that this risk can, in fact, be beneficial. According to these participants, the lack of a main governing body, regulation, and standardization was positive because it provided them with higher control to create partnerships. One expert also defended that the dependence on sponsors was beneficial because it granted the sponsors with greater control of the sponsorship. Even so, the overall sentiment was that the infancy of this market provided them with more risks than benefits.

For sample 2, the results showed that almost all esports fans (i.e. 96.5%; $n = 5,438/5,638$) reckon that the competitive gaming market has infancy-related issues to solve. This strongly supported the hypothesis. By contrast, only a very small group expressed disagreement (i.e. 3.5%; $n = 200/5,638$). From those who agreed, the most commented types of infancy-related problems that this market must solve were: volatility (i.e. 64.9%; $n = 3,527/5,438$), lack of knowledge about the competitive gaming market (i.e. 61.2%; $n = 3,326/5,438$), lack of standardization (i.e. 52.2%; $n = 2,839/5,438$), lack of a main governing body (i.e. 41.9%; $n = 2,281/5,438$), dependence on sponsors (i.e. 40.3%; $n = 2,192/5,438$), and lack of regulation (i.e. 37%; $n = 2,010/5,438$).

From the last item of the fans' survey (which asked them to add any information they believed to be relevant for the topic under study), it was possible to verify that the most commented issue about the infancy of esports is the market's volatility. This is in line with the fans' most voted problem created by the infancy-related issues (i.e. volatility) and is also in line with the experts' most commented problems, which was volatility and the lack of knowledge about the esports market.

The results from both sample 1 and 2 were mostly in line with the literature. EES1, NEES2, NEES7, and MA5, were in sync with AEVI (2018), Funk *et al.* (2018), Ströh (2017), Keiper *et al.* (2017), Shabir (2017), Winnan (2016), Bayliss (2016), Seo (2013), (Taylor, 2012), and Fields (2011), who state that the esports market is still too young. NEES2, MA1, MA2, MA5, and 2,281 fans were in sync with Sylvester and Rennie (2017), Stein and Scholz (2016), and Salice (2010), who mention that competitive gaming does not have a clearly identifiable main governing body. NEES2, MA1, MA5, and 2,010 fans were in accordance with ONTIER (2018), Ströh (2017), Shabir (2017), Li (2016), and Hollist (2015), who comment that there is a high lack of regulation competitive gaming. NEES2, MA1, and 2,839 fans were in conformity with Sylvester and Rennie (2017), Shabir (2017), Taylor (2012), and Salice (2010), who point out to the lack of a standardized ruleset in esports. EES2, EES4, EES5, NEES3, NEES6, MA1, MA2, MA4, MA6, and 3,527 fans were on the same page as AEVI (2018), Shabir (2017), Li (2016), Winnan (2016), Franke (2015), and Taylor (2012), who mention that this industry is highly volatile. EES5 stated that competitive gaming's volatility prevents them from committing to high investments, which is in sync with Shabir (2017), who comments that esports' severe volatility discourages sponsors from making large investments in esports entities that may suddenly disappear. EES5, NEES1, NEES8, MA3, MA6, MA7, and 3,326 fans were in sync with AEVI (2018), Nichols (2017), Europe (2015), and Taylor (2012), who report that sponsors are still not completely aware of what esports really are.

Interestingly, although MA6 commented that esports are no longer as dependent on sponsors as they once were, 2,192 fans stated otherwise. This still prevalent dependence on sponsors is further supported by numerous authors like ONTIER (2018), Ströh (2017), Shabir (2017), Nichols (2017), Holden *et al.* (2017a), Hiltscher and Scholz (2017), Callus and Potter

(2017), Winnan (2016), Europe (2015), and Taylor (2012). Even the latest report from Newzoo (2022) states that roughly 60% of esports' revenue comes from sponsors.

The overall findings reveal highly significant and relevant implications for every consumer brand interested in sponsoring competitive gaming and to become better acquainted with how the esports' market infancy may negatively affect their brands. One of the most effective tactics to avoid the infancy-related problems of the esports market is to acquire esports expertise before beginning or committing to any sort of sponsorship. This will allow brands to quickly identify which are the most secure and best entities to sponsor. In other words, sponsors must be capacitated to enter esports and effectively locate and partner with the most stable, sustainable, commercially experienced, and professional esports entities. This will prevent brands from sponsoring (and suffering from the issues connected to) commercially inexperienced esports entities. Regarding the sponsoring of tournaments, it is advised for brands to limit their sponsorships to the most standardized and regulated competitions as this provides them with a more predictable and secure environment. It is even more important for non-endemic sponsors to carefully study the esports industry because, as EES5 stated, endemic brands are more aware of what is happening inside esports. This is because, while endemic sponsors are much more intimately connected with the videogame market, the large majority of non-endemic companies do not have a habit of analysing the evolution of this industry.

MA3 also gave some important observations regarding esports' dependence on sponsors. According to MA3, this dependency is actually a positive aspect since it provides brands with more power over the entity they are sponsoring. However, although this is beneficial for the brands, it also incentivises sponsors to exert too much control and pressure over the sponsored entities and this is exactly what some fans mentioned in the last open-ended question when they stressed that the infancy of esports is leading to disreputable behaviours from some sponsors. The most common topics that the fans stated here were that they do not want brands to abuse the power they possess over the sponsored entities. Equally important is that sponsors should not try to control or change the sponsored party's behaviour nor constantly trying to micromanage them or having too much say over them. Therefore, although this industry's dependence on sponsors may be beneficial for brands, sponsors should be cautious about how they use their power because this may quickly backfire in the form of fan backlashes against the sponsors, which may severely damage their brand image and result in negative ROIs.

Despite some esports experts defending that the esports market is now less volatile, as well as more regulated, developed, and standardized, sponsors must still cautiously navigate over esports because these aspects are still significantly below the standards present in the majority of established sports. All this highlights the importance of holistically studying the esports industry in detail or acquiring individuals who actually understand the ins and outs of esports. This strategy will greatly mitigate the dangers of sponsors suffering from the problems of this new and unknown market.

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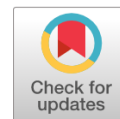
A Comprehensive Bibliometric Analysis of fNIRS and fMRI Technology in Neuromarketing

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Abstract: The aim of this study is to perform a comprehensive bibliometric analysis of functional near-infrared spectroscopy (fNIRS) and functional magnetic resonance imaging (fMRI) tools. To achieve this aim, we adopted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol and bibliometric analysis (VOSviewer) for extracting the relevant papers (articles and reviews) from the Scopus database between 2002 and 2022. A total of 86 papers were included in the analysis. The results showed an increasing trend in publications over the years—the top countries in terms of publication outcome were the United States, Germany, Spain, and Australia. The analysis also identified the most influential authors and institutions in the field. In addition, we analyzed the most frequently cited articles, journals, and keywords related to fNIRS and fMRI tools. This bibliometric analysis provides insights into the current state of research on fNIRS and fMRI tools. It also provides insights into the direction of future research in this field. In this study, we will provide general insights and details about current trends in neuromarketing research using fNIRS and fMRI.

Keywords: fNIRS; fMRI; bibliometric analysis; neuromarketing; consumer neuroscience; Scopus database.

JEL classification: M30; M31; M39; O3.

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1. INTRODUCTION

The field of neuromarketing has gained significant attention in recent years due to its potential to reveal the underlying mechanisms of consumer behavior (Pilelienė *et al.*, 2022; Alsharif *et al.*, 2023a). Neuromarketing is a hybrid field that includes marketing, neuroscience, and psychology (Alsharif *et al.*, 2021a), which relies on advanced technologies such as functional near-infrared spectroscopy (fNIRS) and functional magnetic resonance imaging (fMRI) to measure participants' neural activity as they engage with different marketing stimuli (Cherubino *et al.*, 2019; Alvino *et al.*, 2020; Alsharif *et al.*, 2022a; Alsharif *et al.*, 2022b). These non-invasive tools provide researchers with valuable insights into how consumers respond to various marketing tactics, such as advertisements, product packaging, and brand logos (Ernst *et al.*, 2013; Jackson & Kennedy, 2013). Thus, scholars have shifted to using neuroscience tools such as but not limited to fMRI to measure and record subconscious and unconscious consumer responses toward marketing stimuli, which cannot be measured by self-report methods such as but not limited to surveys (Cherubino *et al.*, 2019; Alsharif *et al.*, 2021b).

fNIRS is a non-invasive neuroimaging technique that measures changes in blood oxygenation in the brain as an indirect measure of neural activity (Nambu *et al.*, 2009; Gier *et al.*, 2020; Sargent *et al.*, 2020). It emits near-infrared light into the brain tissue and detects the reflected light using specialized sensors (Kopton & Kenning, 2014; Çakir *et al.*, 2018; Krampe *et al.*, 2018; Burns *et al.*, 2019). The amount of reflected light indicates the level of oxygenated and deoxygenated blood in the brain, reflecting the neurons' activity in that region. fNIRS has several advantages over other neuroimaging techniques, including its portability, ease of use, and lower cost (Çakir *et al.*, 2018; Krampe *et al.*, 2018; Alvino *et al.*, 2020; Alsharif *et al.*, 2021d). It is particularly useful in studying brain activity in naturalistic settings, such as when participants are watching television commercials or shopping in a retail store (Gier *et al.*, 2020; Sargent *et al.*, 2020). fMRI is a neuroimaging technique that uses powerful magnets to measure changes in blood flow in the brain, which indicates changes in neural activity (Linzmajer *et al.*, 2021; Sánchez-Fernández & Casado-Aranda, 2021). Unlike fNIRS, fMRI provides a more detailed spatial resolution, allowing researchers to identify the precise location of brain activity (Lloyd-Fox *et al.*, 2010; Burle *et al.*, 2015; Krampe *et al.*, 2018). However, fMRI is more expensive and requires participants to remain confined, making it less suitable for naturalistic settings (Alsharif *et al.*, 2020b). Nonetheless, fMRI is widely used in neuromarketing research to investigate how consumers respond to different marketing stimuli (Alsharif *et al.*, 2022c).

fMRI and fNIRS are two neuroimaging methods that are used to measure levels of oxygenated and deoxygenated hemoglobin in a non-invasive and metabolically interesting way (Shimokawa *et al.*, 2009; Ernst *et al.*, 2013; Jackson & Kennedy, 2013; Alvino *et al.*, 2020). While fMRI provides greater spatial accuracy, estimated at 1-10 mm3 in deep brain structures, fNIRS has poor spatial accuracy, estimated at 4cm in cortical activity regions (Lloyd-Fox *et al.*, 2010; Burle *et al.*, 2015; Krampe *et al.*, 2018). However, both methods have acceptable temporal accuracy, estimated in seconds (Sitaram *et al.*, 2009; Kopton & Kenning, 2014). Researchers have employed fMRI and fNIRS in marketing studies to record neural responses associated with consumer behavior, such as preference, perception, purchase decisions, and choices (Lloyd-Fox *et al.*, 2010; Kopton & Kenning, 2014). Additionally, fNIRS is a portable, innovative, and cost-effective neuroimaging method compared to fMRI (Plichta *et al.*, 2011; Ernst *et al.*, 2013; Kopton & Kenning, 2014; Çakir *et al.*, 2018; Krampe *et al.*, 2018).

Aware of the growing interest in neuromarketing, several studies analyzing scientific production on neuromarketing have already been published (Alsharif *et al.*, 2021d; Alsharif *et al.*, 2023b; Alsharif *et al.*, 2023c). However, no previous research was performed to map the ((neuromarketing OR consumer neuroscience) AND (functional near-infrared spectroscopy OR fnirs) OR (*magnetic resonance imaging OR *mri)) research production in the Scopus database. Therefore, this study differs from other review papers concentrating on the global academic research trends of studies that used fNIRS and fMRI tools in neuromarketing or consumer neuroscience research between 2002 and 2022 on the Scopus database. To this end, this study tries to fill the gap in scientific literature. This study aims to provide a comprehensive bibliometric analysis of the ((neuromarketing OR consumer neuroscience) AND (functional near-infrared spectroscopy OR fnirs) OR (*magnetic resonance imaging OR *mri)) identifying the most prolific countries, academic institutions, authors, journals. In addition, the articles having the highest numbers of citations, the co-citation network of authors and papers, and the hot keywords with occurrences will be determined. The main contributions and steps of this bibliometric analysis study are summarized and listed as follows:

(1) To identify the growth of annual scientific publications based on journals' outputs.

(2) To identify the overall performance, such as productive countries, institutions, journals, and authors.

(3) To identify the most prominent themes/keywords in the ((neuromarketing OR consumer neuroscience) AND (functional near-infrared spectroscopy OR fnirs) OR (*magnetic resonance imaging OR *mri)).

(4) To identify the most-cited articles to be considered in future studies.

(5) To provide new references and directions to the scholars who are interested in the ((neuromarketing OR consumer neuroscience) AND (functional near-infrared spectroscopy OR fnirs) OR (*magnetic resonance imaging OR *mri)).

The structure of this research is as follows: Section 2 outlines the methodology employed in this study. Section 3 is concerned with a bibliometric analysis of pertinent literature. Section 4 discusses the results of the paper. Section 5 provides concise conclusions. Finally, Section 6 presents the study's limitations and potential future directions.

2. METHODS

The research used the PRISMA protocol to find relevant papers and conducted a bibliometric analysis to determine global research trends in neuromarketing. The study looked at the most productive countries and academic institutions, leading journals in the field, prolific authors who published papers using fMRI and fNIRS tools, most-cited papers, and occurrences of keywords to assess improvements in publications. This study aims to provide an overview of the current trends to fill the existing gap. Accordingly, four research questions were established to justify the structure and to gain the full view of the existing scientific research in the analyzed domain:

RQ_1: Is there and what is the annual growth of scientific publications in the field?

RQ_2: What are the most productive a) countries; b) academic institutions; c) journals; d) authors?

RQ_3: What are the most prominent keywords in selected articles?

RQ_4: What are the most-cited articles in the field?

Endeavoring to answer the research questions, the current study starts by extracting articles from the Scopus database in March 2023. In addition, this study has followed the instruction Alsharif et al. (2020a) to present a thorough bibliometric analysis detecting and listing the most productive countries, academic institutions, journals, and authors; later on, a brief description of each analyzed parameter is provided. The VOSviewer software was utilized to create visualization maps, which simplifies bibliometric research across various fields, including neuromarketing (Alsharif et al., 2022a; Pilelienė et al., 2022; Alsharif et al., 2023b). In particular, VOSviewer has been used in several studies related to neuromarketing (see Alsharif et al., 2021c; Alsharif et al., 2022d) to gain a comprehensive understanding of the development of using fNIRS and fMRI in this field. The procedure used in the study enabled the identification of 86 papers that were published between 2002 and 2022. The study's authors focused specifically on papers, including articles and reviews, that utilized fNIRS and fMRI tools between 2002 and 2022 due to the significant increase in publications. Additionally, only papers written in English were included, as it was the most typically used language in the field. The study aimed to identify as many relevant papers as possible to explore and analyze the global academic trends (e.g., productive countries, institutions, authors, and other relevant factors) related to using fNIRS and fMRI in marketing activities. The selection process for selecting articles is shown in Figure no. 1, and the articles included in the study had to meet the following traits:

- Methods: fNIRS and fMRI.
- Publication year: 2002-2022.
- Language: English.
- Document type: article and review (conference papers (11 papers), book chapters (8), short survey (2), Books (1), Notes (1), and editorials (1) had been excluded).
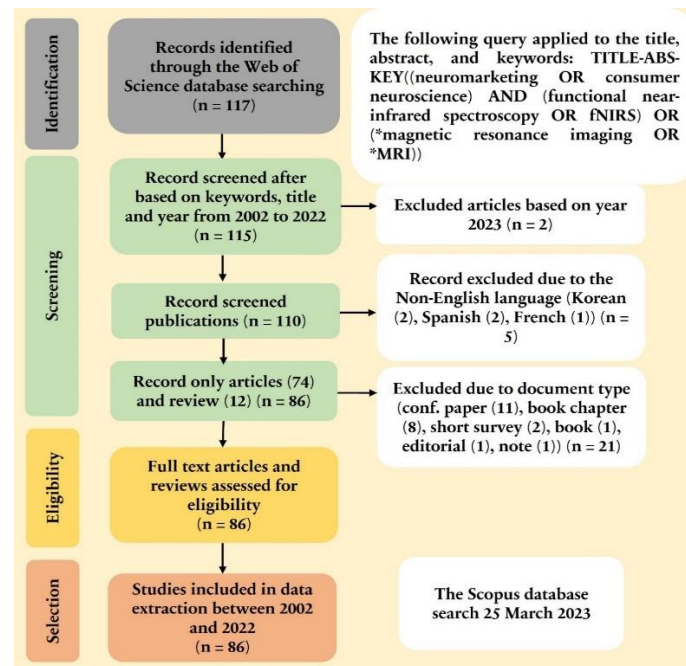
Figure no. 1 – PRISMA process for selecting papers

3. RESULTS

As a result of the procedure, 86 academic journal papers that utilized fNIRS and fMRI tools in marketing research were identified. The analysis revealed a significant publication growth, with over 50% of the total papers being published in the last five years, from 2018 to 2022. Figure no. 2 illustrates the annual publications published between 2002 and 2022, with one paper being published in 2002 and the number increasing almost seventeen-fold in 2020 before slightly decreasing to eight times in 2022. The increasing interest among researchers and practitioners in neuromarketing has led to a rise in the number of publications and researchers interested in using fNIRS and fMRI in marketing research.
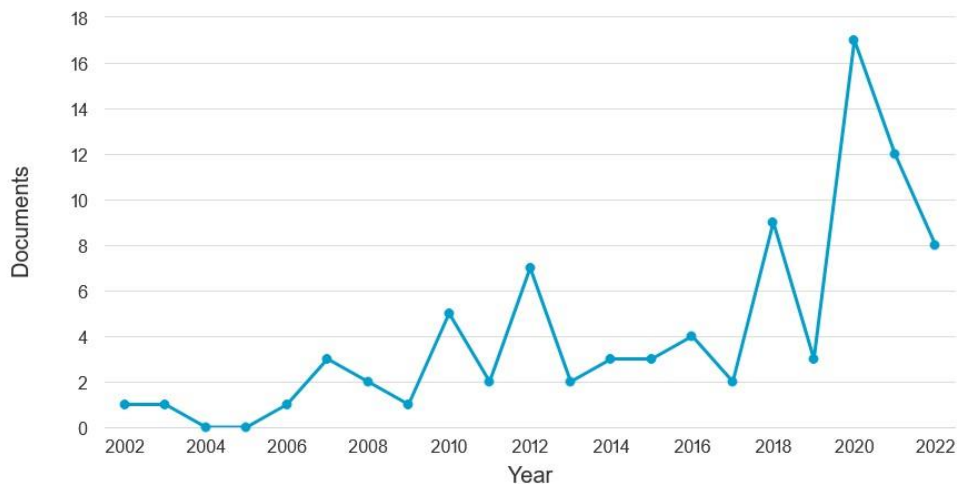
Figure no. 2 – The annual papers used fNIRS and fMRI from 2002 to 2022.

3.1 A bibliometric analysis

3.1.1 Leading countries and institutions

The analysis revealed that the countries that produced at least three papers could be classified into three groups based on their productivity levels. The first group consists of one country that produced more than twenty papers, the second group consists of one country that published between ten and twenty papers, and the third group consists of eleven countries that produced between three and ten papers each. As depicted in Table no. 1, the USA, Germany, and Spain have collectively contributed to more than half of the total papers since 2002. Specifically, the USA has been the most productive country, with twenty-five papers and the highest total citation count (1455 TCs). The University of Southern California, an institution in the USA, has published five papers with 471 total citations of the institution (TCsI). While Denmark has published four papers with 470 TCs, the Copenhagen Business School, the Danish institution, has published the second-highest-cited papers with 428 TCsI. Although at the bottom of the list, Mexico has contributed to the fifth-highest-cited papers with 220 TCs, and its institution, Tecnologico de Monterrey, has published two papers with the fifth-highest-cited papers (179 TCsI).

Table no. 1 – The most productive countries and academic institutions of neuromarketing research (minimum of three articles contribution of the country)

Country	TPs by the end of 2022	TCs by the end of 2022	The most prolific academic institutions	TPsI by the end of 2022	TCsI by the end of 2022
USA	25	1455	University of Southern California	5	471
Germany	15	674	Heinrich-Heine-Universität Düsseldorf	6	183
Spain	7	17	Universidad de Granada	4	5
Australia	6	131	Swinburne University of Technology	2	81
Canada	5	251	Université McGill	3	193
Austria	5	60	Wirtschaftsuniversität Wien	1	16
Italy	5	45	Sapienza Università di Roma	3	41
Netherlands	5	128	Erasmus Universiteit Rotterdam	3	121
Denmark	4	470	Copenhagen Business School	2	428
Japan	4	33	Tohoku University	2	24
China	4	10	Zhejiang University	2	8
South Korea	3	72	Sungkyunkwan University	2	24
Mexico	3	220	Tecnologico de Monterrey	2	179

Note: TPs; total publications, TCs; total citations, TPsI; total publications by institution, TCsI; total citation of the institution

3.1.2 Most productive authors

Table no. 2 displays the most prolific authors in neuromarketing research with the highest number of papers. Nine authors from seven different countries and nine different academic institutions were identified. Two authors have produced six papers each, two authors have published four papers each, and the rest of the authors have released three papers. Reimann, M. and Kenning, P. are the most productive authors, with six papers each and affiliations with Eller College of Management (USA) and Heinrich-Heine-Universität Düsseldorf (Germany) with 468 and 266 total citations (TCs), respectively. Krampe, C. and Casado-Aranda, L.A. have consecutively produced four papers each, with 65 and 5 TCs. The remaining authors have published three papers each. For more details, check Table no. 2.

Table no. 2 – The most-productive authors with a minimum of three papers

Author's name	TPs by the end of 2022	TCs by the end of 2022	Affiliation of the author	Country
Reimann, M.	6	468	Eller College of Management	USA
Kenning, P.	6	266	Heinrich-Heine-Universität Düsseldorf	Germany
Krampe, C.	4	65	Wageningen University & Research	Netherland
Casado-Aranda, L.A.	4	5	Universidad a Distancia de Madrid	Spain
Zaichkowsky, J.	3	460	Beedie School of Business	Canada
Smidts, A.	3	121	Erasmus Universiteit Rotterdam	Netherland

Author's name	TPs by the end of 2022	TCs by the end of 2022	Affiliation of the author	Country
Hubert, M.	3	76	Aarhus Universitet	Denmark
Babiloni, F.	3	40	Hangzhou Dianzi University	China
Sánchez-Fernández, J.	3	1	Universidad de Granada	Spain

3.1.3 Leading journals

Table no. 3 shows the journals that have published at least three papers that used fNIRS and fMRI tools in neuromarketing research. One journal has published five papers, one journal has published four papers, and the remaining journals have published three papers each. Frontiers in Human Neuroscience is the most productive journal with five papers, and published the third-highest-cited paper was written by Kopton and Kenning (2014) and used the fNIRS tool. The Journal Of Consumer Psychology, which has published three papers, has the highest-cited paper with 281 TCs written by Reimann et al. (2010) and used the fMRI tool. Qualitative Market Research, which is located at the end of the list with three papers, has the second-highest-cited paper with 88 TCs written by Kenning et al. (2007) and used the fMRI tool.

Table no. 3 – The most productive journals with a minimum of three published papers

Source/Journal	TPs by the end of 2022	TCs by the end of 2022	Reference of the most-cited paper by the end of 2022	Tool	TCs by the end of 2022	Publisher
Frontiers in Human Neuroscience	5	116	Kopton and Kenning (2014)	fNIRS	66	Frontiers Media Sa
European Journal of Marketing	4	101	Krampe et al. (2018)	fNIRS	37	Emerald Publishing
Frontiers in Neuroscience	3	9	Gier et al. (2020)	fNIRS	5	Frontiers Media Sa
Frontiers in Psychology	3	7	Cao and Reimann (2020)	fNIRS	3	Frontiers Media Sa
Journal of Consumer Psychology	3	476	Reimann et al. (2010)	fMRI	281	Wiley-Blackwell
Journal of Economic Psychology	3	98	Stallen et al. (2010)	fMRI	54	Elsevier
Journal of Marketing Research	3	120	Chen et al. (2015)	fMRI	49	American Marketing Association
Psychology and Marketing	3	26	Stillman et al. (2020)	fMRI	10	Wiley-Blackwell
Qualitative Market Research	3	119	Kenning et al. (2007)	fMRI	88	Emerald Publishing

3.1.4 Keywords analysis

In bibliometric analysis, keyword occurrences provide a quantitative approach to express the strength of links between paired keywords, with a larger number indicating a stronger link. This analysis provides a comprehensive explanation of the article's content. The link strength

between keywords reflects their frequency in the article, while the total number of links represents the overall number of keyword appearances in the article. The current paper conducted an author keywords co-occurrence analysis using VOSviewer software, which involved 35 keywords with at least two occurrences. This method is important for presenting general claims about the article's content and assessing trend themes in a particular subject, such as neuromarketing. The results showed that fMRI and fNIRS tools had been frequently used to study and understand consumer behaviors, including emotions and decision-making, toward marketing stimuli like advertising and branding. Figure no. 3 depicts these findings.

Figure no. 3 – Map of authors' keywords co-occurrence (with min. two occurrences)
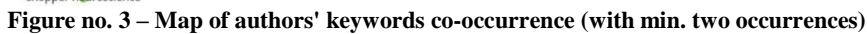
Table no. 4 provides an overview of the most frequently used keywords that have appeared at least four times in the data. The term "consumer neuroscience" has the highest frequency with 31 instances and 37 total-link-strength, followed by the term "neuromarketing". Both of these fields have utilized functional magnetic resonance imaging (fMRI) and functional near-infrared spectroscopy (fNIRS) techniques to investigate and comprehend consumer behavior, decision-making, and the prefrontal cortex's response to marketing stimuli such as branding. The term "consumer behavior" has been used four times with 12 total-link-strength, "decision-making" has been used five times with seven total-link-strength, and "prefrontal cortex" has been used four times with five total-link-strength. Similarly, the term "branding" has appeared four times with ten total-link-strength.

Table no. 4 – Top keywords by a minimum of four occurrences

#	Categories	Keyword	Occurrences	Total-link-strength
1	Field	Consumer neuroscience	31	37
		Neuromarketing	23	36
		Neuroscience	11	15
		Marketing	6	15
		Decision-making	5	7
		Consumer behavior	4	12
		Branding	4	10
		Neuroeconomics	4	8
		Prefrontal cortex	4	5
2	Methods	Functional magnetic resonance imaging/ fMRI	33	44
		fNIRS	9	13

3.1.5 Citation analysis

Analyzing citations is crucial for gaining insights into global trends in a specific research field, such as neuromarketing, as it provides valuable information about the most frequently cited papers. Future researchers or practitioners can use this information to identify impactful articles. In this study, we analyzed a total of 86 papers that used fNIRS and fMRI tools in neuromarketing research, and identified the most frequently cited articles in Table no. 5, with over 65 total citations (TCs), which investigated consumer behavior in response to marketing stimuli such as branding. Table no. 5 shows that one paper had over 200 TCs, and the article titled "Aesthetic package design: A behavioral, neural, and psychological investigation," which used fMRI tools and was published by the Journal of Consumer Psychology, was the most cited article with 281 TCs. The second most cited article was "A functional magnetic resonance imaging study of neural dissociations between brand and person judgments," published by the Journal of Consumer Research, with 193 TCs, which also used fMRI tools. Furthermore, four papers had between 150 and 100 TCs, while three articles had less than 100 TCs, with the least cited article being "Near-infrared spectroscopy (NIRS) as a new tool for neuroeconomic research," with 66 TCs.

Table no. 5 – The top cited document (minimum 65 citations)

Paper	Year	Journal	Tool	Type	TCs by the end of 2022
"Aesthetic package design: A behavioral, neural, and psychological investigation"	2010	Journal of Consumer Psychology	fMRI	A	281
"A functional magnetic resonance imaging study of neural dissociations between brand and person judgments"	2006	Journal of consumer research	fMRI	A	193
"How we relate to brands: Psychological and neurophysiological insights into consumer–brand relationships"	2012	Journal of Consumer Psychology	fMRI	A	147
"The neural mechanisms underlying the influence of pavlovian cues on human decision making"	2008	Journal of Neuroscience	fMRI	A	134
"Defining neuromarketing: Practices and professional challenges	2010	Harvard review of psychiatry	-	R	119

Paper	Year	Journal	Tool	Type	TCs by the end of 2022
Hypothetical and real choice differentially activate common valuation areas"		Journal of neuroscience	fMRI	A	106
"Applications of functional magnetic resonance imaging for market research"	2007	Qualitative Market Research: An International Journal	fMRI	A	88
"Consumer neuroscience for marketing researchers"	2018	Journal of Consumer Behaviour	-	R	74
"Near-infrared spectroscopy (NIRS) as a new tool for neuroeconomic research"	2014	Frontiers in human neuroscience	NIRS	A	66

4. DISCUSSION

Over time, there has been an increasing interest in utilizing neuroscience tools, such as fMRI and fNIRS, in marketing research to better understand consumer behavior toward advertising stimuli (Alsharif et al., 2021d). In line with this, the current study employed the PRISMA framework to identify pertinent articles that utilized fMRI and fNIRS tools to study consumer behavior in neuromarketing. Ultimately, eighty-six articles and reviews were extracted from the Scopus database using the established procedures. Additionally, bibliometric analysis was employed to reveal global academic research trends in neuromarketing activities, which facilitated the identification of the most productive countries, academic institutions, authors, journals/sources, and trend citations for future studies, ultimately saving researchers' time. Specifically, the analysis revealed the United States as the most productive country, with twenty-five papers utilizing fNIRS and fMRI tools in marketing studies, followed by Germany, Spain, and Australia.

Despite being ranked ninth on the list, the Copenhagen Business School, a Danish institute, published the paper with the second-highest number of citations. Furthermore, Reimann, M. and Kenning, P. were found to be the most productive authors, having published six papers with 468 and 266 TCS, respectively, followed by Krampe, C. and Casado-Aranda, L.A., who published four papers with 65 and 5 TCs, respectively. Analysis of the most prolific journals in neuromarketing revealed that while Frontiers in Human Neuroscience was the most productive journal, publishing five papers with 116 TCs, the European Journal of Marketing had the second-highest citations count with four papers and 101 total citations. This suggests that the number of publications does not necessarily reflect the number of citations. The study titled "Aesthetic package design: A behavioral, neural, and psychological investigation" by Reimann et al. (2010), which utilized the fMRI tool, was identified as the most cited article, with 281 total citations, published in the Journal of Consumer Psychology. The second most cited article was "A functional magnetic resonance imaging study of neural dissociations between brand and person judgments," published in the Journal of Consumer Research and also utilizing fMRI, with 193 total citations, written by Yoon et al. (2006).

In summary, it has been observed that emerging countries have not made significant contributions to neuromarketing research papers. Consequently, this paper calls upon scholars and researchers from these countries to investigate global academic trends in neuromarketing studies, as this can offer a comprehensive understanding of studies that can be explored in future research.

5. CONCLUSION

In marketing research, traditional self-report methods such as interviews, surveys, and focus groups have been used to better understand consumers' reactions toward marketing activities. However, these methods cannot accurately explain subconscious and unconscious behaviors. Therefore, researchers and marketers have turned to neuroscience tools such as fNIRS and fMRI to measure these concealed responses of consumers. The growing interest in using these tools in marketing research has led to increased academic publications, from one paper in 2002 to 17 papers in 2020, with a slight decline to eight papers in 2022. This study aims to present a comprehensive overview of the global academic trends in neuromarketing, including the leading country, top academic institutions, most prolific authors, most-cited paper, top journals, and a number of citations, with a focus on studies that have utilized fNIRS and fMRI in marketing research.

The study analyzed 86 papers that employed fNIRS and fMRI techniques in marketing research. The results showed that developed countries had the highest number of published papers, with the United States leading at 24 papers, followed by Germany (15 papers), Spain (7 papers), and Australia (6 papers). Most authors produced fewer than five papers, but Reimann, M. and Kenning, P. are the most prolific authors, each with six papers and 468 and 266 citations, respectively. The Frontiers in Human Neuroscience journal had the most publications, with five papers and 79 TCs, while the European Journal of Marketing had four papers and 96 TCs. The study found that the number of publications did not always reflect the number of citations. The paper with the highest number of citations was "Aesthetic package design: A behavioral, neural, and psychological investigation," with 285 citations, followed by "A functional magnetic resonance imaging study of neural dissociations between brand and person judgments" with 195 TCs.

6. LIMITATIONS AND FUTURE DIRECTIONS

The aim of the paper was to minimize methodological restrictions in the study, but some restrictions were still encountered, and suggestions were made for future research. The study focused solely on articles and reviews published in English language journals between 2002 and 2022, which were indexed in the Scopus database. This approach, however, ignored other documents such as conference papers, book chapters, short surveys, editorials, books, and notes, which could lead to bias in the study. To address this limitation, the authors recommend that researchers and marketers from emerging countries should publish their works in this field for future studies. The paper provides a comprehensive overview of the global academic trends of using fNIRS and fMRI tools in neuromarketing activities between 2002 and 2022, based on the analyzed publications.

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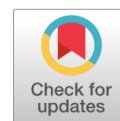
Government Support During COVID-19 and Corruption

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Abstract*:* We analyze the allocation and effectiveness of government support in response to the COVID-19 outbreak across a nationally representative sample of firms in 32 countries representing different levels of institutional transparency. The probability of receiving government support is higher for larger firms, firms belonging to business support groups and innovative firms in low corruption countries. In high corruption, countries firms competing against unregistered establishments, with lack of internationally recognized quality certification and no formalized business strategy are more likely to receive government support. Using the panel structure of the data to address reverse causality, selection bias and unobserved heterogeneity, we then find that government support improves firm-level outcomes more strongly in low corruption countries. Among different types of government support, we find wage subsidies to be more effective in high corruption countries while technical assistance for adoption of digital technologies in low corruption countries. In addition, social distancing and lockdown policies do not seem to be as effective in improving firm-level outcomes in high-corruption countries most likely because of weaker capacities to enforce such policies. These results show the importance of enhancing systems of accountability and enforcement procedures that will ensure that fiscal stimulus aid is deployed to benefit those who need it the most.

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1. INTRODUCTION

The role of government in the market economy has been the focus of many industrial policy and public policy debates. The basic justification for government assistance to the private sector is the existence of market failures (Greenwald & Stiglitz, 1986). Subsidies are seen as an appropriate response to activities that generate externalities. Furthermore, public subsidies may convey positive information to other potential investors thereby reducing information asymmetries associated with raising external capital (Stiglitz & Weiss, 1981; Myers & Majluf, 1984). In contrast, rent-seeking viewpoints argue that subsidies will be captured by groups that aim to maximize their own benefits (Stigler, 1971; Peltzman, 1976). In addition, the evolutionary view of market, argues that governments have no role to play in correcting information asymmetries as information costs are an integral part of the market and a necessary mechanism for selecting the best firms (Georghiou & Metcalfe, 1998).

The COVID-19 pandemic, and the resulting government response it triggered, have renewed interest in this debate. On the one hand, as argued by Stiglitz (2021), governments should take a more active role in order to correct different aspects of market failures such as: externalities created by the nature of the contagious disease, absence of the market for risk and compensation for firms in preparation for disaster. On the other hand, the large sums of funds required to deal with emergencies, the urgency of disbursing aid and economic stimulus packages create the perfect storm for corruption to occur which in turn makes government intervention ineffective, or even damaging (Vrushi & Kukutschka, 2021).

In this paper, we assess the impact of government support in response to the COVID-19 outbreak on various firm-level outcomes using the World Bank COVID-19 ES Follow-up Surveys. We initially investigate the allocation of government support to different types of firms to determine if there is significant association between certain firm characteristics and the probability of receiving government support. Exploiting the panel structure of the data to address reverse causality, selection bias and unobserved heterogeneity, we then examine the impact of government support on various financial and real firm-level outcomes such as: the probability of the establishment temporarily closing, of reporting a decrease in sales, a decrease in the number of temporary and full-time employees, a decrease in salaries, wages or benefits, a cash flow decrease, delayed payments to landlords, suppliers, tax authorities and financial institutions as well as the probability of the establishment filing for insolvency or bankruptcy. To gain more insights into the effectiveness of different forms of government support we differentiate between different types of government support received, namely, cash transfers, deferral of financial obligations, access to new credit, tax reductions or deferrals, wage subsidies, technical assistance, and other forms of government support. We estimate these relations separately for a subsample of low corruption and high corruption countries to investigate the role of corruption in the allocation and effectiveness of government support in response to the COVID-19 outbreak.

We find that there are substantial differences in the type of firms receiving government support in low corruption compared to high corruption countries. In low corruption countries factors such as firm size, being a member of a business support group and being an innovative firm have a significant positive impact on the probability of receiving government support. In contrast, firms that compete against unregistered establishments, firms with lack of internationally recognized quality certification and no formal business strategy with clear key performance indicators are found to be more likely to receive government support in high-

corruption countries. Furthermore, in these countries pandemic severity is negatively associated with the probability of receiving government support, unlike in the sample of low corruption countries where it has a positive effect. In terms of the effectiveness of government support, we find that government support as a response to the COVID-19 pandemic has a generally positive effect on firm-level outcomes, but that this effect is stronger in low corruption countries. Wage subsidies have the highest impact on firm-level outcomes in high-corruption countries, whereas technical assistance or subsidies for adoption of digital technologies have the highest impact in low corruption countries.

The results of this paper make several contributions. First, we contribute to the industrial policy literature and the general debate on governments' involvement in the private sector (Stigler, 1971; Stiglitz & Weiss, 1981) by showing that government interventions can be beneficial for firm-level outcomes in crisis times, such as the COVID-19 pandemic, but that this positive effect weakens in high corruption environments. Second, we contribute to the growing literature on the economic impact of the COVID-19 pandemic. Studies have found that the pandemic has affected different aspects of economic activity such as the labor market (Adams-Prassl et al., 2020; Alfaro et al., 2020a), the stock market (Albuquerque et al., 2020; Alfaro et al., 2020b; Baker et al., 2020a; Fahlenbrach et al., 2021), credit markets (Acharya & Steffen, 2020; Li et al., 2020; Norden et al., 2021; Beck & Keil, 2022; Berger et al., 2022), household consumption (Baker et al., 2020b; Coibion et al., 2020) and the overall macroeconomy (Ludvigson et al., 2020; Eichenbaum et al., 2021; Guerrieri et al., 2022). We contribute to this literature by revealing a channel through which the pandemic has impacted the private sector, namely the allocation of government support. Finally, we contribute to the literature on governments' disaster response in environments with weak institutions and high corruption. Corrupt governments are associated with high earthquake fatalities due to substandard construction practices (Anbarci et al., 2005; Escaleras et al., 2007). In such environments, politically connected firms can gain preferential treatment by governments through informal government-business relations (Fisman, 2001; Faccio et al., 2006) which in turn impacts governments' ability to respond to disasters. We contribute to this literature by analyzing the impact of different types of government support policies on firm-level financial and real outcomes (as opposed to stock market reactions) and by showing that the allocation of government support and its effectiveness in a time of economic distress varies in different institutional environments.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature. Section 3 presents the data, variables and discusses descriptive statistics. Section 4 presents the methodology. Section 5 presents and discusses the results. Section 6 provides the implications of the results while Section 7 discusses the limitations of the study and provides directions for future research.

2. LITERATURE REVIEW

Theoretically, there are opposing views on whether government involvement in the private sector is beneficial for firm-level outcomes. Market failures traditionally associated with asymmetric information being available to firms and imperfect markets leading to higher financial costs and more generally the problem of incomplete markets (Greenwald & Stiglitz, 1986) have been the main rationale for government interventions. On the one hand, government subsidies provide firms with additional sources of funding helping them survive

and grow. When investing in activities that generate externalities firms making the investment are unlikely to bear the entire cost or benefit of such investments, therefore they will tend to invest below or above the socially optimal level. Another rationale for public subsidies lies in the fact that they may convey information to other potential investors. Information asymmetries may make raising capital (equity and debt) expensive or even impossible for entrepreneurs (Stiglitz & Weiss, 1981; Greenwald *et al.*, 1984; Myers & Majluf, 1984). Government subsidies help reduce these information asymmetries by sending a positive signal to market-based financiers thereby serving as a catalyst for external investments. In contrast, an extensive political economy and public finance literature has emphasized the distortions that may result from a biased distribution of government subsidies based on the private benefits of interest groups or politicians. As pointed out by Stigler (1971) and formally modeled by Peltzman (1976), the theory of regulatory capture suggests that subsidies will be captured by groups that aim to maximize their own benefits and whose collective political activity is not too difficult to arrange. According to rent-seeking viewpoints government subsidies are distributed based on social networks or political connections rather than firms' prospects or social contribution and as such they do not contribute to firm performance. Furthermore, the evolutionary view of market (Metcalfe, 1994; Georghiou & Metcalfe, 1998) argues that information costs are an integral part of the market and are necessary as a selection mechanism – for promoting the best firms.

Empirically, studies have examined the effect of different public subsidization programs on firm-level outcomes. Lerner (1999), examining the US Small Business Innovation Research program shows that program awardees grew significantly faster than matched firms and were more likely to attract venture financing. This implies that public subsidization of small firms plays an important role in certifying firm quality. In contrast, Bergstrom (2000) examined the effect of public capital subsidies on total factor productivity for a sample of firms in Sweden. The author finds little evidence of subsidies affecting productivity. Similarly, Lee (1996) and Beason and Weinstein (1996) both suggest that government intervention have negative effects on productivity growth. The aim of this study is to test which of these two opposing views holds in times of crisis, such as the COVID-19 pandemic, and if the effect is homogeneous across countries with different levels of institutional transparency.

Our paper is also related to the growing literature analyzing the impact of COVID-19 on different aspects of economic activity such as the labor market, the stock markets, the credit markets, household consumption and the overall macroeconomy. Regarding the impact of COVID-19 on firm-level outcomes, Fairlie and Fossen (2021) using administrative data from the California Department of Tax and Fee Administration document average losses in sales of 17% in the second quarter of 2020 relative to the second quarter of 2019, with the largest losses occurring in businesses affected by mandatory lockdowns such as accommodations. Furthermore, there is evidence that the effect of the pandemic has not been equal across firms. Ding *et al.* (2021) find that firms with better pre-pandemic finances – more cash, less debt and larger profits, less exposed to global supply chains, with more corporate social responsibility activities and less entrenched executives experience a milder drop in stock returns due to the pandemic. Liu et al. (2021) find that during the COVID-19 pandemic, women-led businesses are more likely to close and for a longer time compared to men-led businesses. These differences widen in developing countries and in countries with high gender inequalities. Hu and Zhang (2021) find that the COVID-19 pandemic has had a negative effect

on firm performance and that this negative effect weakens in countries with better institutions, better healthcare systems and more developed financial systems.

Furthermore, there is evidence suggesting that in high corruption environments public procurement contracts are more likely to have cost overruns, be awarded to campaign donors and exhibit inefficiencies (Gallego *et al.*, 2021). Kubinec *et al.* (2021) show that in countries with weak rule of law where politically connected firms are able to circumvent restrictions, policies designed to mitigate COVID-19 are ineffective. The effectiveness of government policies aimed at mitigating the negative consequences of COVID-19 has been mainly analyzed from the perspective of stock market reactions to different policy announcements. Shanaev *et al.* (2020) examining 51 national stock markets show that the direct effect of the pandemic on the financial markets is relatively low, while the most significant drivers of negative stock returns are policy interventions. Ashraf (2020) using daily data on stock market returns for 77 countries find that announcements of government social distancing measures have a direct negative effect on stock market returns whereas government announcements regarding public awareness programs, testing policies and income support packages result in positive market returns. Kong and Prinz (2020) using Google search data combined with data on the announcement dates of non-pharmaceutical interventions (NPIs) in US states between march 14 and march 28, 2020, find that restaurant and bar limitations and non-essential business closures can explain only 6% and 6.4% of unemployment claims implying that other factors are responsible for the increase in unemployment claims during the pandemic such as declines in consumer demand or local policies. To the best of our knowledge our paper is the first to test the allocation and effectiveness of different types of government support policies (wage subsidies, deferrals, subsidized credit, technical assistance, etc.) for a large cross-section of countries.

3. DATA

In order to test the two opposing views on governments' involvement in the private sector during times of economic distress such as the COVID-19 pandemic, we combine several data sources. The first data source is the most recent EBRD-EIB-WB Enterprise Survey which is a joint initiative of the European Bank for Reconstruction and Development (EBRD), European Investment Bank (EIB) and the World Bank Group (the World Bank). This survey was conducted in 2018-2020 and makes the sixth round of the Business Environment and Enterprise Performance Surveys (BEEPS)[1] covering almost 28,000 enterprises in 41 economies. The purpose of the survey is, through interviews with firms in the manufacturing and services sectors, to obtain feedback from enterprises in EBRD countries of operation (and beyond) on their perceptions of the environment in which they operate as well as the biggest obstacles to enterprise growth[2].

The second data source are the COVID-19 ES Follow-up Surveys. As part of the efforts of the World Bank Group to understand the impact of COVID-19 on the private sector, the Enterprise Analysis unit has conducted follow-up surveys on recently completed Enterprise Surveys (ES) in several countries. The follow-up surveys re-contact all establishments sampled in the standard ES and are designed to provide quick information on the adjustments brought about by COVID-19 in the private sector. The process of survey implementation is ongoing at the time of writing this paper. Table no. A1 lists the countries used in the sample, the number of follow-up surveys completed (out of three planned) and the date of their

completion. Out of the 41 countries in the baseline survey, 32 have at least one COVID-19 follow-up survey wave completed.

We supplement this data with the Oxford COVID-19 Government Response Tracker (OxCGRT) data introduced in Hale *et al.* (2021). This data collection effort provides a systematic way to track government responses to COVID-19 across countries over time. The data is combined in a number of indices that aggregate various measures of government responses. To account for the severity of the pandemic in different countries and over time we use the Johns Hopkins University Center for Systems Science and Engineering (JHU CSSE) database. Finally, the Transparency International Corruption Perception Index is used to categorize countries into the subsample of low and high corruption countries[3].

3.1 Pre-covid firm-level characteristics

To construct pre-COVID firm-level variables we use BEEPS VI. As we want to assess which type of firms are more likely to receive government support, we construct several firm variables such as: Firm size, Firm age, Foreign firm, Capital city, Political, Membership, Certified, KPI, Website, Manager experience, Informal competition and Innovative. The definition of all the variables is given in Table no. A2. Table no. 1 shows descriptive statistics for the whole sample (columns 1-5), as well as for the sample of low corruption countries (columns 6-7) and the sample of high corruption countries (columns 8-9), separately. The last column (10) reports mean differences of variables for the two subsamples of countries and their significance. Around 16% of firm observations in our sample are located in the capital city, have a mean age of 21 years and around 7% are foreign owned. Only 4.7% of firms have someone appointed to a political position in the country whereas 44% are members of a business support group.

3.2 Post-covid firm-level variables

As our goal is to assess the extent to which government support in response to the COVID-19 pandemic has impacted firm-level outcomes we construct several dependent variables using the ES COVID-19 Follow-up Surveys. As can be seen from Table no. 1, about 23.6% of firm observations in our sample have temporarily closed due to the COVID-19 outbreak. Table no. 2 shows mean values by countries. On average, Russia, Albania and Azerbaijan have the highest percentage of firms that closed temporarily due to the COVID-19 outbreak, 62.4%, 59.3% and 57.6%, respectively, whereas countries with the lowest percentage of temporarily closed firms are Hungary (6.6%), Latvia (7.1%) and Belarus (8.4%). Table no. 3 shows mean values by industries. Hotels and Restaurants and Air Transport industries have the highest percentage of firms that have closed temporarily, 50.4% and 45.5%, respectively. Industries which have the lowest number of temporarily closed firms are Recycling (13.5%), Radio, Television and Communication Equipment (14.1%) and Food Products and Beverages (14.4%). On average, 55% of firm observations report a decrease in their sales, about 16% report a decrease in the number of temporary workers and about 10% of firm observations report a reduction in sales, wages or benefits due to the COVID-19 outbreak. When looking at mean differences we find that the pandemic has had a stronger effect on firms in high corruption countries as indicated by significantly worse firm financial indicators in the sample of high corruption countries compared with the sample of low corruption countries.

Table no. 1 – Descriptive statistics[4]

| | All countries | | | | | Low-corruption | | High-corruption | | Low-High Corruption |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Obs	Mean	Mean Diff
Government support	30,691	0.324	0.468	0	1	13,844	0.387	16,847	0.271	0.116***
Government support: Cash	30,691	0.117	0.321	0	1	13,844	0.168	16,847	0.075	0.093***
Government support: Deferral	30,691	0.091	0.288	0	1	13,844	0.099	16,847	0.085	0.014***
Government support: Credit	30,691	0.055	0.227	0	1	13,844	0.062	16,847	0.049	0.013***
Government support: Tax	30,691	0.109	0.312	0	1	13,844	0.096	16,847	0.119	-0.023***
Government support: Wage	30,691	0.254	0.435	0	1	13,844	0.290	16,847	0.225	0.066***
Government support: Digital	30,691	0.012	0.111	0	1	13,844	0.018	16,847	0.008	0.009***
Government support: Other	30,691	0.012	0.109	0	1	13,844	0.020	16,847	0.006	0.014***
Close temporarily	30,259	0.236	0.425	0	1	13,359	0.176	16,900	0.284	-0.108***
Sales decrease	30,672	0.555	0.497	0	1	13,836	0.485	16,836	0.612	-0.127***
Temporary workers decreased	29,896	0.159	0.366	0	1	13,592	0.124	16,304	0.188	-0.064***
Laid off (ln)	22,770	0.261	0.755	0	7.601	10,169	0.219	12,601	0.294	-0.075***
Salary reduced	19,132	0.104	0.305	0	1	9,019	0.088	10,113	0.118	-0.031***
Cash flow decreased	28,649	0.517	0.500	0	1	12,504	0.434	16,145	0.581	-0.147***
Delay landlords	28,497	0.134	0.341	0	1	12,861	0.113	15,636	0.152	-0.039***
Delay suppliers	30,995	0.249	0.432	0	1	13,848	0.214	17,147	0.277	-0.063***
Delay tax	30,982	0.130	0.337	0	1	13,838	0.094	17,144	0.160	-0.066***
Overdue	29,879	0.090	0.286	0	1	13,612	0.067	16,267	0.110	-0.043***
Insolvency	31,021	0.015	0.122	0	1	13,863	0.014	17,158	0.016	-0.002
Firm age (ln)	43,485	2.817	0.738	0	5.323	19,594	2.901	23,891	2.749	0.153***
Capital city	44,042	0.160	0.367	0	1	19,792	0.145	24,250	0.172	-0.027***
Firm size	43,713	1.740	0.778	1	3	19,580	1.713	24,133	1.762	-0.049***
Foreign firm	43,167	0.069	0.253	0	1	19,478	0.076	23,689	0.062	0.014***
Political	40,484	0.047	0.211	0	1	19,634	0.043	20,850	0.050	-0.007***
Membership	40,448	0.441	0.497	0	1	19,626	0.355	20,822	0.523	-0.168***
Manager experience (ln)	42,635	2.856	0.731	0	4.248	19,199	2.950	23,436	2.779	0.171***
Website	43,927	0.673	0.469	0	1	19,771	0.721	24,156	0.633	0.088***
KPI	40,397	0.457	0.498	0	1	19,606	0.446	20,791	0.467	-0.021***
Certified	42,918	0.304	0.460	0	1	19,456	0.316	23,462	0.294	0.022***
Competition informal	41,046	0.309	0.462	0	1	18,817	0.272	22,229	0.341	-0.068***
Innovative	43,704	0.270	0.444	0	1	19,696	0.312	24,008	0.235	0.077***
Exporter	31,056	0.133	0.340	0	1	13,492	0.152	17,564	0.119	0.033***
Online sales	29,764	6.075	16.370	0	100	13,100	6.484	16,664	5.753	0.731***
Remote work	30,956	4.777	14.639	0	100	13,605	5.848	17,351	3.936	1.911***
Female employees	30,229	38.204	28.643	0	100	13,131	38.597	17,098	37.903	0.694**
Pandemic severity	32	195.078	165.517	5.603	883.498	12	252.493	20	160.628	91.864***
Stringency index	29	58.894	11.327	31.48	77.439	12	57.207	17	60.086	-2.879***

Note: * indicates significance at the 10% level, ** at the 5% level and *** at the 1% level.

Table no. 2 – Descriptive statistics by countries[5]

	(1)	(2)	(3)	(4) Baseline ES	(5) Follow-up Wave 1	(6) Follow-up Wave 2	(7) Follow-up Wave 3
Countries	Corruption index	Government support	Close temporarily	Nr of firms	Nr of firms	Nr of firms	Nr of firms
Albania	35	0.391	0.593	377	344	/	/
Armenia	42	0.594	0.572	546	462	/	/
Azerbaijan	30	0.628	0.576	225	101	/	/
Belarus	45	0.053	0.084	600	563	/	/
Bosnia and Herzegovina	36	0.517	0.236	362	290	/	/
Bulgaria	43	0.184	0.143	772	673	630	596
Croatia	47	0.370	0.111	404	348	360	372
Cyprus	58	0.432	0.360	360	303	298	327
Czech Republic	56	0.470	0.147	502	439	472	475
Estonia	74	0.233	0.118	360	287	291	276
Georgia	56	0.358	0.282	581	501	482	/
Greece	48	0.553	0.144	600	575	565	584
Hungary	44	0.242	0.066	805	660	753	702
Italy	53	0.400	0.263	760	655	538	609
Jordan	48	0.157	0.536	601	498	448	368
Kazakhstan	34	0.125	0.463	1,446	961	/	/
Latvia	56	0.156	0.071	359	256	290	184
Lebanon	28	.	0.489	532	446	401	/
Lithuania	60	0.462	0.245	358	213	228	233
Malta	54	0.634	0.128	242	231	237	222
Moldova	32	0.037	0.275	360	284	291	246
Mongolia	35	0.184	0.494	360	284	235	/
Montenegro	45	0.526	0.296	150	136	/	/
Morocco	41	0.245	0.353	1096	810	762	774
North Macedonia	35	0.364	0.219	360	292	246	/
Poland	58	0.395	0.112	1,369	975	1018	983
Portugal	62	0.280	0.125	1,062	823	889	915
Romania	44	0.260	0.113	814	599	611	600
Russian Federation	28	0.100	0.624	1,323	1161	/	/
Serbia	39	0.843	0.176	361	345	/	/
Slovak Republic	50	0.468	0.232	429	372	352	355
Slovenia	60	0.561	0.250	409	269	287	234

Our main independent variable is Government Support which takes the value 1 if establishments answered yes to the question "Has this establishment received any national or local government support in response to the crisis?" On average, 32% of firm observations in our sample have received government support. There is a large cross-country variation, with firms in Serbia, Malta and Azerbaijan having the highest percentage of firms receiving government support, 84.3%, 63.4% and 62.8%, respectively, whereas firms in Moldova and Belarus having the lowest percentages, 3.7% and 5.3%, respectively. In terms of the prevalence of government support by industries, Table no. 3 shows that the highest percentage of firms receiving government support is in the Air Transport industry (which is also the industry that was hit the hardest by the COVID-19 pandemic as shown by the percentage of firms temporarily closed) where about 73% of firms received government support, followed by the Hotels and Restaurants industry with 56%.

In order to better understand the type of government support received, we decompose the Government Support variable into the type of support received, namely: Cash if the support involved cash transfers for businesses, Deferral if the support involved deferral of credit payments, utility bills, rent or mortgage, suspension of interest payments or rollover of debt, Credit for access to new credit, Tax for tax reductions or tax deferrals, Wage if government support was in the form of wage subsidies, Digital if the support involved technical assistance or subsidies for adoption of digital technologies and Other for all remaining forms of government support measures such as childcare support, compensation for rent, vouchers, sick leave, downtime allowance for employees, and other similar forms of assistance. As can be seen from Table no. 1, the most prevalent form of government assistance is in the form of wage subsidies (25% of firm observations report receiving this type of government support), followed by cash transfers (with 12%) and tax reductions or deferrals (with 11%). When looking at the differences between high and low corruption countries we find that in low corruption countries a higher percentage a firms receive government support.

Table no. 3 – Descriptive statistics by industries[6]

Industry	(1) Government support	(2) Close temporarily	(3) Laidoff
Air transport	0.727	0.455	38.250
Basic metals	0.390	0.202	6.930
Chemicals and chemical products	0.275	0.218	1.570
Coke, refined petroleum products and nuclear fuel	0.217	0.227	1.435
Computer and related activities	0.312	0.171	1.598
Construction	0.247	0.240	3.173
Electrical machinery and apparatus	0.329	0.192	2.076
Fabricated metal products	0.320	0.160	1.605
Food products and beverages	0.282	0.144	2.405
Furniture, n.e.c.	0.369	0.276	3.837
Hotels and restaurants	0.560	0.504	4.680
Land transport	0.323	0.182	3.379
Machinery and equipment	0.309	0.165	2.444
Medical, precision and optical instruments	0.343	0.188	1.895
Motor vehicles, trailers and semi-trailers	0.425	0.199	4.671
Office, accounting and computing machinery	0.294	0.316	4.294
Other non-metallic mineral products	0.234	0.341	2.184

Industry	(1) Government support	(2) Close temporarily	(3) Laidoff
Other transport equipment	0.324	0.191	2.297
Paper and paper products	0.373	0.188	1.765
Post and telecommunications	0.203	0.213	1.284
Publishing, printing and reproduction of recorded media	0.437	0.307	2.054
Radio, television and communication equipment	0.380	0.141	4.058
Recycling	0.329	0.135	1.551
Retail trade	0.315	0.269	2.493
Rubber and plastics products	0.317	0.194	2.630
Sale, maintenance and repair of motor vehicles	0.323	0.212	1.145
Supporting and auxiliary transport activities	0.464	0.221	3.654
Tanning and dressing of leather	0.405	0.423	13.224
Textiles	0.372	0.248	8.175
Tobacco products	0.231	0.385	0.000
Water transport	0.381	0.250	2.450
Wearing apparel	0.326	0.363	11.339
Wholesale trade and commission trade	0.301	0.249	3.124
Wood	0.305	0.198	1.728
Total	**0.324**	**0.236**	**3.231**

The ES COVID-19 Follow-up Surveys also asked firms a number of questions regarding their sales, production, labor force and finances. We construct a number of control variables that are expected to influence our dependent firm-level outcomes, such as Exporter, Online sales, Remote work and Female employees. About 13% of firm observations in our sample are categorized as exporters. On average, only 6% of firms' total sales are online sales, 4.7% of firms' workforce work remotely and about 38% of full-time employees of a firm are female. These variables vary by survey waves and can therefore be included in the fixed effects regressions described in the following section.

3.3 Country-level variables

We use the Stringency Index from the Oxford COVID-19 Government Response Tracker (OxCGRT). This index is comprised of nine component indicators including: school closing, workplace closing, cancelling public events, restrictions on gatherings, closing of public transport, stay at home requirements, restrictions on internal movement, restrictions on international travel and the presence of public info campaigns. The index is calculated as simple average of the individual component indicators. Because the individual indicators have different maximum values they are rescaled to create a score between 0 and 100. These scores are then averaged to get the composite index. The indices should not be interpreted as a measure of the effectiveness or appropriateness of a government's response rather a way for simple and efficient cross-national comparisons of government interventions. We lag the Stringency Index by one period (wave) to allow for government responses to affect firm behavior.

The variable Pandemic severity is from the JHU CSSE database and represents the number of new confirmed COVID-19 cases per day per million people. It is important to note that due to delays in reporting the reported case figures on a given date do not necessarily show the number of new cases on that day. As this data is reported daily, we match by date

with the ES COVID-19 Follow-up Surveys which also record the day the interview was conducted. As with the Stringency Index variable we lag this variable by one period (wave) in the regression analyses.

As our goal is to evaluate the relation between government support and firm-level outcomes in countries with different levels of corruption we use the 2019 Transparency International Corruption Perception Index to categorize countries into the sub-sample of low-corruption and high-corruption countries. The index ranges from 0 to 100 with higher values indicating less corrupt countries. Among the countries included in our sample, countries like Estonia, Portugal, Lithuania, have the lowest level of perceived corruption, with scores of 74, 62 and 60 respectively. Whereas countries with the highest level of perceived corruption are Russia (28), Lebanon (28) and Azerbaijan (30).

4. METHODOLOGY

We start the empirical analysis by examining if some types of firms are more likely to receive government support compared to others, by estimating the following equation:

$$
\begin{aligned}
Government\ support_{ijkt} \\
= \alpha_1 + \beta_1 Firm\ type_{ijk} + \beta_2 L.Pandemic\ severity_{kt} + \varepsilon_{ijkt}
\end{aligned} \quad (1)
$$

where, $ijkt$ denote firm, country, industry and time (month-year), respectively. *Government support* is the dummy variable indicating whether the firm received government support at time t. *Firm type* are firm characteristics such as *Firm size, Firm age, Foreign firm, Capital city, Political, Membership, Certified, KPI, Website, Manager experience, Informal competition* and *Innovative*. The definition of all the variables is given in Table no. A2. These variables are constructed from the baseline ES (BEEPS VI) and capture firm characteristics before the start of the pandemic. As such, they do not vary across the three follow-up waves therefore do not carry the time (month-year) subscript. *Pandemic severity* as measured by the number of new confirmed COVID-19 cases per day per million people accounts for the severity of the pandemic across countries and over time. We lag this variable by one period (survey wave). By including country and industry fixed effects in equation (1) we compare firms from the same country and industry to determine which firm characteristics are significantly correlated with the probability of receiving government support. In addition, time fixed effects control for trends or factors common to all firms that evolve over time. We estimate the equation using OLS and cluster the standard errors by industry[7].

Next, we evaluate the impact of government support on various firm-level outcomes. We exploit the panel structure of the data to isolate more precisely the effect of government support on various firm-level outcomes by estimating a fixed effect model. In addition, we allow for a one period (wave) time-lag in determining the effect of receiving government support. The specification we test is the following:

$$
\begin{aligned}
Firm-level\ outcome_{ijkt} \\
= \alpha_1 + \beta_1 L.Government\ Support_{ijkt} + \beta_2 Firm\ controls_{ijkt} \\
+ \beta_3 L.Pandemic\ severity_{kt} + \beta_4 L.Stringency\ index_{kt} + \varepsilon_{ijkt}
\end{aligned} \quad (2)
$$

where, *Firm-level outcome* of firm i, in country j, industry k and time (month-year) t, is one of the outcome variables described above: *Close temporarily, Sales decrease, Temporary workers decreased, Laidoff, Salary reduced, Cash flow decrease, Delay suppliers, Delay landlords, Delay tax, Overdue* and *Insolvency*. *Government support* is the dummy variable indicating a firm that received government support in response to the COVID-19 crisis. Using the lag of this variable addresses the potential reverse causality problem. However, there may still be an endogeneity concern coming from selection bias. Government support may not be randomly allocated across firms, which may bias the results we find. Indeed, from estimating equation (1) we find that certain firm characteristics are significantly associated with the probability of receiving government support. The panel structure of the data allows us to use firm fixed effects, thereby absorbing all time-invariant firm heterogeneity. As the time period we are analyzing is relatively short, the within-firm heterogeneity is likely to be time-invariant. By comparing the same firm over time, we help to alleviate endogeneity concerns coming from selection bias. To absorb any remaining time varying heterogeneity within firms we include *Firm controls* which are time-varying firm characteristics. Specifically, we include the variables *Exporter, Online sales, Remote share* and *Female employees*. There is evidence that exporting firms have been disproportionately hit by the pandemic through disruptions in global supply chains and export demand shocks (Bosio *et al.*, 2020; Dai *et al.*, 2021; Liu *et al.*, 2021a). Furthermore, firms in industries more suitable for remote work report less productivity loss (Bartik *et al.*, 2020) and are less likely to cut jobs (Alfaro *et al.*, 2020a). Research also shows that women are more affected by the COVID-19 pandemic (Adams-Prassl *et al.*, 2020; Fairlie, 2020; Liu *et al.*, 2021b). *Pandemic severity* represents the number of new confirmed cases per million people. The coefficient of this variable is intended to capture the direct impact of the pandemic on firm-level outcomes. *Stringency index* measures government policies with regards to social distancing measures and lockdown policies. These variables are also lagged by one period (survey wave).

To understand the effect of corruption on the relation between government support and firm-level outcomes we estimate the equations above separately for the subsample of low-corruption and high-corruption countries[8]. Furthermore, in equation (2) we decompose the *Government Support* variable into types of government support received, namely, cash transfers (*Cash*), deferral of financial obligations (*Deferral*), access to new credit (*Credit*), tax reductions or deferrals (*Tax*), wage subsidies (*Wage*), technical assistance (*Digital*) and other forms of government support (*Other*). We estimate the equation using OLS with standard errors clustered by industry.

5. RESULTS AND DISCUSSION

5.1 Which firms are more likely to receive government support?

Table no. 4 presents the results from estimating equation (1). Columns 1-3 restrict the sample to low corruption countries, whereas columns 4-6 show the results for the sample of high corruption countries. In low corruption countries, larger firms, firms that are member of a business support group and innovative firms are 3.2, 3.9 and 1.8 percentage points (p.p.) more likely to receive government support, respectively. These factors do not seem to be as important for the sample of high corruption countries. Instead, in these countries firms that

compete against unregistered establishments, those with lack of internationally recognized quality certification and no formal business strategy with written key performance indicators are more likely to receive government support. Finally, pandemic severity as measured by the number of new confirmed COVID-19 cases per million people positively affects the probability of receiving government support in the sample of low corruption countries but has a negative and significant effect on the sample of high corruption countries.

Table no. 4 – Determinants of government support[9]

Dep. Var.: Government support	(1)	(2)	(3)	(4)	(5)	(6)
	Low-corruption countries			High-corruption countries		
Firm age	0.008	0.008		-0.007	-0.011	
	(0.009)	(0.012)		(0.006)	(0.011)	
Capital city	0.021	0.033		0.005	0.016	
	(0.024)	(0.026)		(0.015)	(0.020)	
Firm size	0.039***	0.032***		0.019*	0.004	
	(0.008)	(0.009)		(0.011)	(0.014)	
Foreign firm	0.011	-0.004		-0.017	0.020	
	(0.023)	(0.026)		(0.040)	(0.050)	
Political	0.002	-0.012		0.017	0.039	
	(0.014)	(0.019)		(0.020)	(0.025)	
Membership	0.038***	0.039***		0.014	0.030**	
	(0.012)	(0.013)		(0.009)	(0.013)	
Manager experience	-0.002	0.005		0.000	-0.009	
	(0.011)	(0.013)		(0.007)	(0.008)	
Website	0.023*	0.019		0.018*	0.019	
	(0.013)	(0.013)		(0.009)	(0.012)	
Key Performance Indicators	-0.008	-0.005		-0.013**	-0.012	
	(0.015)	(0.017)		(0.006)	(0.013)	
Certified	-0.027*	-0.032		-0.034***	-0.035**	
	(0.014)	(0.019)		(0.009)	(0.016)	
Competition informal	0.013	0.015		0.028***	0.034**	
	(0.014)	(0.013)		(0.009)	(0.013)	
Innovative	0.017*	0.018**		0.012	0.003	
	(0.010)	(0.008)		(0.009)	(0.014)	
L.Pandemic severity		0.000**	0.000		-0.000	-0.000***
		(0.000)	(0.000)		(0.000)	(0.000)
Constant	0.115*	0.069	0.380***	0.234***	0.241***	0.249***
	(0.066)	(0.089)	(0.033)	(0.056)	(0.033)	(0.021)
Country FE	yes	yes	no	yes	yes	no
Industry FE	yes	yes	no	yes	yes	no
Time FE	yes	yes	yes	yes	yes	yes
Firm FE	no	no	yes	no	no	yes
Observations	12100	6806	7779	12626	5204	7260
R-sq	0.111	0.099	0.014	0.213	0.188	0.028

Note: * indicates significance at the 10% level, ** at the 5% level and *** at the 1% level.

5.2 The impact of government support on firm-level outcomes

In this section we discuss the results from estimating equation (2). In general, Table no. 5, shows that the effect of receiving government support is more positive in low-corruption countries (Panel A), compared to the effects found in high-corruption countries (Panel B). In terms of types of government support received we find that technical assistance or subsidies for adoption of digital technologies have a greater impact on firm-level outcomes in low corruption countries, whereas wage subsidies have a greater impact in high-corruption countries. Firms receiving government support for the adoption of digital technologies in the current period are 36.6 percentage points (p.p.) less likely to temporarily close their business in the subsequent period in low-corruption countries compared to a 18.6 p.p. probability reduction in high-corruption countries. In addition, these firms are 19.4 p.p., 21.3 p.p. and 15.3 p.p. less likely to reduce the number of temporary workers, to lay off workers and reduce the salary, wage or benefit of existing permanent full-time employees, respectively. These coefficients are insignificant for the sample of high-corruption countries. Furthermore, firms receiving technical assistance are 38.9 p.p., 52.2 p.p. and 37.1 p.p. less likely to delay payments to their landlords, suppliers and tax authorities, respectively, and 19.5 p.p. less likely to file for insolvency or bankruptcy. Again, these coefficients are insignificant (or are positive) for the sample of high corruption countries. In contrast, wage subsidies are the most effective type of government support in high corruption countries. In these countries firms receiving wage subsidies are 3 p.p. less likely to temporarily close, and 5.7 p.p. and 4.4 p.p. less likely to report a decrease in sales and in the number of temporary workers, respectively. In addition, these firms are 5.7 p.p., 2.9 p.p. and 2.3 p.p. less likely to report a decrease in liquidity or cash flow, to delay payments to tax authorities and to become overdue on financial obligations, respectively. The least effective forms of government assistance are tax reductions or deferrals and access to credit. With regards to cash transfers and deferrals of obligations we find that in high corruption countries firms that received cash transfers had a higher probability of closing temporarily, of delaying payments to landlords and of being overdue on its obligations to financial institutions but less likely to report a decrease in the number of temporary workers. In addition, firms that received government support in the form of deferral of financial obligations are less likely to temporarily close but more likely to report a decrease in sales and delays in payments towards tax authorities. In low corruption countries the effects of cash subsidies and subsidies in the form of deferral are generally positive and never worsen firm-level outcomes as is the case in high corruption countries.

Table no. 5 – The impact of government support on firm-level outcomes [10]

Panel A: Low-corruption countries

Dependent variable:	(1) Close temporarily	(2) Sales decrease	(3) Temporary workers decreased	(4) Laidoff	(5) Salary reduced	(6) Cash flow decrease	(7) Delay landlords	(8) Delay suppliers	(9) Delay tax	(10) Overdue	(11) Insolvency
L.Government support: Cash	0.005	-0.036*	-0.011	-0.023	-0.015	-0.018	-0.017	-0.051**	0.001	-0.017*	0.004
	(0.015)	(0.018)	(0.015)	(0.014)	(0.014)	(0.015)	(0.016)	(0.020)	(0.012)	(0.008)	(0.003)
L.Government support: Defferal	0.004	-0.003	-0.007	-0.036	0.005	0.013	-0.049**	-0.019	-0.053***	-0.026*	-0.025***
	(0.019)	(0.021)	(0.018)	(0.040)	(0.013)	(0.025)	(0.020)	(0.022)	(0.009)	(0.014)	(0.009)
L.Government support: Credit	-0.023	-0.042	-0.029	0.024	-0.012	-0.025	0.003	0.015	-0.005	-0.001	-0.012
	(0.016)	(0.031)	(0.022)	(0.039)	(0.030)	(0.046)	(0.030)	(0.032)	(0.013)	(0.014)	(0.009)
L.Government support: Tax	-0.002	-0.026	0.002	0.013	0.004	0.007	-0.001	0.014	-0.013	0.011	0.017*
	(0.027)	(0.038)	(0.023)	(0.030)	(0.022)	(0.027)	(0.020)	(0.033)	(0.017)	(0.019)	(0.009)
L.Government support: Wage	-0.082***	-0.032	0.003	0.022	0.009	-0.057**	-0.024**	-0.019	-0.007	-0.006	0.005
	(0.023)	(0.026)	(0.019)	(0.018)	(0.007)	(0.022)	(0.011)	(0.016)	(0.013)	(0.006)	(0.004)
L.Government support: Digital	-0.366***	0.030	-0.194***	-0.213*	-0.153***	-0.142	-0.389***	-0.522***	-0.371***	-0.102	-0.195***
	(0.055)	(0.111)	(0.062)	(0.122)	(0.053)	(0.101)	(0.073)	(0.057)	(0.075)	(0.070)	(0.058)
L.Government support: Other	-0.011	0.014	-0.008	0.053	0.077**	-0.023	-0.074*	-0.097	-0.066**	-0.033	-0.011***
	(0.039)	(0.069)	(0.044)	(0.071)	(0.033)	(0.054)	(0.041)	(0.064)	(0.029)	(0.024)	(0.004)
Exporter	0.011	-0.072*	0.008	-0.014	0.007	-0.030	-0.036	-0.012	-0.000	-0.014	0.008
	(0.027)	(0.040)	(0.024)	(0.046)	(0.027)	(0.040)	(0.052)	(0.047)	(0.010)	(0.014)	(0.006)
Online sales	-0.001***	-0.000	0.000	0.002***	0.001***	0.000	0.000	-0.000	-0.000	0.000	0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Remote work	0.000	0.000	-0.000	0.001	-0.000	-0.000	-0.000	-0.001	0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
Female employees	0.001**	0.000	0.000	0.002**	0.001**	-0.000	0.000	-0.001	0.000	0.000	-0.000
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.000)
L.Pandemic severity	-0.000	0.000	0.000	0.000	0.000	0.000	0.000***	0.000	0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
L.Stringency index	-0.002***	0.002*	0.001	-0.000	-0.001**	0.001	0.001**	0.002***	-0.000	-0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)
Constant	0.273***	0.141	0.099**	0.020	0.074	0.200	-0.039	0.026	0.022	-0.010	0.007
	(0.046)	(0.141)	(0.039)	(0.121)	(0.054)	(0.135)	(0.043)	(0.080)	(0.032)	(0.034)	(0.008)
Firm FE	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	6722	6899	6852	6669	6880	6914	6193	6915	6908	6817	6905
R-sq	0.101	0.180	0.028	0.022	0.065	0.148	0.090	0.062	0.092	0.016	0.114

Note: * indicates significance at the 10% level, ** at the 5% level and *** at the 1% level.

Table no. 5 – The impact of government support on firm-level outcomes (*continued*)

Panel B: High-corruption countries

Dependent variable:	(1) Close temporarily	(2) Sales decrease	(3) Temporary workers decreased	(4) Laidoff	(5) Salary reduced	(6) Cash flow decrease	(7) Delay landlords	(8) Delay suppliers	(9) Delay tax	(10) Overdue	(11) Insolvency
L.Government support: Cash	0.052* (0.028)	0.014 (0.035)	-0.081*** (0.018)	-0.061 (0.037)	-0.022 (0.022)	0.014 (0.035)	0.043** (0.018)	-0.048 (0.029)	-0.014 (0.022)	0.060*** (0.020)	0.001 (0.004)
L.Government support: Defferal	-0.039** (0.018)	0.084** (0.024)	0.018 (0.029)	-0.075 (0.069)	-0.023 (0.026)	0.042 (0.027)	-0.034 (0.033)	0.032 (0.027)	0.046* (0.024)	0.011 (0.016)	-0.000 (0.001)
L.Government support: Credit	0.029 (0.030)	-0.017 (0.042)	0.021 (0.020)	-0.045 (0.051)	-0.015 (0.032)	-0.013 (0.050)	-0.001 (0.022)	0.052** (0.025)	-0.010 (0.029)	0.021 (0.020)	0.001 (0.001)
L.Government support: Tax	-0.018 (0.025)	0.019 (0.039)	0.023 (0.027)	0.067 (0.053)	0.019 (0.018)	0.031 (0.037)	0.004 (0.021)	0.012 (0.041)	-0.053** (0.021)	-0.015 (0.021)	0.000 (0.001)
L.Government support: Wage	-0.030** (0.011)	-0.057** (0.024)	-0.044*** (0.014)	-0.017 (0.031)	0.013 (0.012)	-0.057* (0.029)	-0.011 (0.011)	-0.019 (0.025)	-0.029** (0.012)	-0.023** (0.010)	-0.000 (0.002)
L.Government support: Digital	-0.186** (0.086)	0.137 (0.166)	-0.083 (0.082)	0.006 (0.108)	-0.117 (0.081)	0.049 (0.167)	0.128* (0.069)	0.109 (0.086)	0.148 (0.089)	-0.275** (0.127)	0.000 (0.001)
L.Government support: Other	-0.052 (0.036)	0.041 (0.058)	0.058 (0.078)	-0.003 (0.075)	-0.012 (0.060)	-0.044 (0.054)	-0.009 (0.024)	0.042 (0.051)	-0.000 (0.046)	0.004 (0.017)	0.001 (0.001)
Exporter	0.004 (0.021)	-0.008 (0.028)	0.029 (0.021)	0.041 (0.060)	0.017 (0.022)	0.025 (0.030)	0.010 (0.025)	0.004 (0.025)	0.040 (0.027)	0.022 (0.025)	-0.008 (0.006)
Online sales	0.000 (0.001)	-0.001 (0.001)	-0.003*** (0.000)	-0.005*** (0.002)	-0.001** (0.000)	0.001* (0.001)	-0.000 (0.001)	-0.002*** (0.000)	-0.002** (0.001)	-0.001*** (0.000)	-0.000 (0.000)
Remote share	0.000 (0.000)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	0.002* (0.001)	-0.001 (0.001)	0.001 (0.001)	0.002** (0.001)	0.000 (0.001)	0.000 (0.001)	-0.000 (0.000)
Female employees	0.000 (0.000)	0.000 (0.001)	-0.001** (0.001)	-0.003* (0.002)	-0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.001 (0.001)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
L.New cases	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000* (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	-0.000** (0.000)
L.Stringency index	0.001* (0.001)	0.002 (0.001)	0.001** (0.001)	-0.003* (0.002)	-0.001 (0.001)	0.003*** (0.001)	0.002*** (0.000)	0.001 (0.001)	0.003*** (0.001)	0.001 (0.001)	0.000 (0.000)
Constant	0.206* (0.102)	0.619*** (0.156)	-0.051 (0.098)	0.843*** (0.167)	0.288*** (0.068)	0.406*** (0.145)	-0.074 (0.079)	0.141 (0.093)	-0.236** (0.106)	-0.033 (0.069)	0.005 (0.010)
Firm FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Time FE	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	6475	6672	6560	6657	6668	6668	6284	6693	6693	6509	6650
R-sq	0.033	0.129	0.049	0.031	0.018	0.099	0.041	0.024	0.053	0.042	0.006

Note: * indicates significance at the 10% level, ** at the 5% level and *** at the 1% level.

There are also important differences with regards to lockdown and social distancing policies and the direct effect of the pandemic on firm-level outcomes in the two subsamples of countries. In low corruption countries stricter social distancing policies decrease the probability of the establishment temporarily closing, whereas in high corruption countries this probability increases. Furthermore, in high-corruption countries stricter social distancing policies increase the probability of firms reporting a decrease in temporary workers. Whereas, in both sample of countries, a negative effect is found on financial outcomes such as delaying payments towards landlords, suppliers, or tax authorities. It seems like social distancing policies have a relatively more positive effect on firm-level outcomes in low corruption countries most likely because the enforcement of these measures is stricter in these countries. With regards to the coefficients on the pandemic severity they are generally positive and significant indicating an adverse direct impact of the pandemic on firm-level outcomes, more so for high-corruption countries. In these countries, which generally have less effective systems in place to manage crisis and a weaker health system, unable to deal with the increasing number of emergencies, firms are more affected in the form of hours lost due to workforce exposure to the pandemic or a general decline in the propensity to consume by customers (and an increase in precautionary savings) which is reflected in firm financial outcomes such as delay in payments to landlords, suppliers, tax authorities or financial institutions. What is interesting to note here is that the probability of firms temporarily closing and filing for insolvency or bankruptcy decreases with the pandemic severity in high corruption countries which is not the case in the sample of low corruption countries. This, coupled with the results of worsened financial outcomes as a direct impact of the pandemic points to undue forbearance and evergreening in high-corruption countries by allowing unviable firms extend their life beyond what is economically feasible.

With regards to control variables, we find that the *Exporter* variable does not enter significantly in any of the regressions. The *Online sales* variable generally improves firm-level outcomes in high corruption countries while for low corruption countries the effect is less conclusive. *Remote share* worsens firm outcomes in high corruption countries whereas it is insignificant in the sample of low corruption countries. The variable *Female* enters negatively and significantly in the regressions of high corruption countries for the outcome variables *Temporary workers decreased* and *Laidoff* indicating that in these countries firms with a higher percentage of permanent full-time employees are less likely to reduce the number of temporary and full-time workers. In contrast, for the sample of low corruption countries the coefficient of *Female* on the outcome variable *Laidoff* is positive and significant.

Overall, these results point to a differential effect of government support on firm-level outcomes in different institutional environments. The positive effect of government support policies is more pronounced in low-corruption countries. Furthermore, the type of government support received is important for determining the effectiveness of policies. Measures aimed at improving the liquidity of firms produce better results in high corruption countries, whereas those intended to provide technical and digital assistance are more effective for firms in low corruption countries. With regards to lockdown and social distancing policies, results show that they produce relatively better results in low corruption countries with stronger systems in place to ensure enforcement of such policies. Finally, the direct impact of the pandemic is stronger and more negative in high-corruption countries whose health systems are generally less able to respond in a timely and effective manner to emergencies arising from the rapid spread of the contagious disease.

6. IMPLICATIONS

The COVID-19 pandemic, which started as a health crisis but quickly turned into an economic crisis, triggered widespread reactions from governments around the world. The results of this paper support theories predicting a positive effect of governments' involvement in the private sector in times of economic distress such as the COVID-19 pandemic. Our findings echo the argument put forward by Stiglitz (2021) that pure market forces cannot address problems created by the nature of the contagious disease such as externalities and the absence of markets for risk. Our findings are in line with previous empirical studies which find a positive effect of various subsidy programs on firm-level outcomes in normal times (Lerner, 1999; Moffat, 2014; Criscuolo *et al.*, 2019). In times of crisis, when the need for social protection and regulation grows, this involvement becomes even more valuable. However, our results also support studies which find that in environments with weak institutions and high corruption governments' ability to respond to disasters is diminished due to inefficient practices (Anbarci *et al.*, 2005; Escaleras *et al.*, 2007; Gallego *et al.*, 2021) and giving preferential treatment to politically connected firms (Fisman, 2001; Faccio *et al.*, 2006; Kubinec *et al.*, 2021).

Our findings have important policy implications. During a global pandemic when there is an urgent need for investing public funds in sectors that have suffered the most from the COVID-19 outbreak and for undertaking other closure and containment measures, special attention should be paid to the institutional context of disbursing aid and implementing these policies. Not all types of government support measures and stringency levels of social distancing policies are effective in every institutional environment. Wage subsidies, for instance, were found to be more effective for improving firm-level outcomes in the sample of high-corruption countries whereas technical assistance or subsidies for adoption of digital technologies were found to be more effective in the sample of low corruption countries. To the best of our knowledge, the results of this paper provide the first evidence on the impact of different types of government subsidies on firm-level financial and real outcomes for a large cross-section of countries during a global pandemic. We believe these results will help policymakers respond more effectively to mitigate the economic consequences of the pandemic by tailoring specific policies depending on the institutional context of implementing them. The results of the paper also call for a coordinated effort to maintain and enhance control and accountability systems in times of crisis if subsidies are to be allocated to its most productive uses.

7. LIMITATIONS AND FUTURE RESEARCH

The results of this paper should be interpreted having some caveats in mind. First, as with every cross-country study, establishing causality is difficult as countries differ on a number of different dimensions, some of which difficult to quantify. While the empirical analysis ensures accounting for problems such as reverse causality, selection bias and unobserved heterogeneity at the firm level, we are careful not to make any causal statements regarding corruption driving the differences we find between the subsample of low and high corruption countries. Our results provide suggestive evidence that the effect of government subsidies on firm-level outcomes is not homogeneous across groups of countries which share similar institutional characteristics such as the level of transparency, as measured by the Corruption Perceptions Index. Second, using survey data raises the question of the bias caused by self-reporting. Concerns regarding the quality of data can never be completely eliminated in empirical work. Accounting data for instance, also suffer from quality issues due to the quality of the auditing process which can vary across countries. We

do not believe self-reporting to be a major problem with our analysis as the questions we use are not of a sensitive nature. Third, attrition rate can be another source of bias in empirical work using panel data. To this end we have presented the number of firms participating in the baseline survey and the follow-up surveys to give a picture of the extent of this bias. As can be seen from Table no. 2 (columns 4-7) the response rate varies by countries, however on average about 75% of firms from the baseline survey were followed up in the first round of the COVID-19 Follow-up surveys.

The results of this paper could be extended in several directions. First, as more data become available it would be informative to go beyond examining the incidence of receiving government subsidies. Namely, examining how the quantity of subsidies received impacts firm-level outcomes would allow gaining insights on the optimal amount of government subsidies and any non-linear relations that may exist between government subsidies and firm performance measures. Second, the richness of the survey data could be further explored by analyzing if the effect of government subsidies on firm performance varies by different types of firms such as family businesses, foreign firms, certified, innovative or other firm types. This would allow fine-tuning government support policies depending on the structure of the firm population and facilitate the post-pandemic economic recovery. We leave these questions for future research.

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ANNEXES

Table no. A1 – Date of completion of ES COVID-19 Follow-up Surveys

Countries	ES Follow-up Survey COVID-19 Impact		
	Round 1	Round 2	Round 3
Albania	June 2020	/	/
Armenia	June 2020	/	/
Azerbaijan	April-May 2021	/	/
Belarus	August 2020	/	/
Bosnia and Herzegovina	February-March 2021	/	/
Bulgaria	July-September 2020	November-December 2020	April-May 2021
Croatia	September 2020	December-January 2020-2021	May-June 2021
Cyprus	June 2020	November-December 2020	April 2021
Czech Republic	September-October 2020	January-February 2021	May-June 2021
Estonia	October 2020	February 2021	July-August 2021
Georgia	June 2020	October-November 2020	
Greece	June-July 2020	November 2020	April-May 2021
Hungary	September 2020	January-February 2021	May-June 2021
Italy	May-June 2020	November-December 2020	April-May 2021
Jordan	July-August 2020	November-January 2020-2021	June-July 2021
Kazakhstan	January-March 2021	/	/
Latvia	October-November 2020	February 2021	July-August 2021
Lebanon	November-December 2020	May-June 2021	/
Lithuania	October 2020	February 2021	July-August 2021
Malta	September-October 2020	January 2021	May-June 2021
Moldova	May 2020	October-November 2020	May-June 2021
Mongolia	August 2020	February 2021	/
Montenegro	February 2021	/	/
Morocco	July-August 2020	February 2021	May-June 2021
North Macedonia	October-November 2020	May-June 2021	/
Poland	July-August 2020	November-December 2020	May-June 2021
Portugal	September-October 2020	January-February 2021	May-June 2021
Romania	August-September 2020	November-December 2020	April-June 2021
Russian Federation	June 2020	/	/
Serbia	February 2021	/	/
Slovak Republic	September-October 2020	January-February 2021	May-June 2021
Slovenia	July-August 2020	November-December 2020	May-June 2021

Table no. A2 – Variable definitions

Variable name	Definition
BEEPS VI	
Firm size	Permanent, full-time workers at the end of last fiscal year, 1=small (<20), 2=medium (>=20 & <100), 3=large (>=100).
Firm age	Year of survey minus year establishment began operations.
Foreign firm	=1 if the percentage of the firm owned by private foreign individuals, companies or organizations is greater than 50
Capital city	=1 if the firm is located in the capital city
Political	=1 if the owner, CEO, top manager or any of the board members of this firm has ever been elected or appointed to a political position in the country

Variable name	Definition
BEEPS VI	
Membership	=1 if the firm is part of business membership organization, trade association, guild, chamber of commerce or other business support group
Certified	=1 if establishment has an internationally recognized quality certification
KPI	=1 if the firm has formalized, written business strategy with clear key performance indicators
Website	=1 if establishment has its own website
Manager experience	Years of experience of the top manager working in the sector
Informal competition	=1 if establishment competes against unregistered establishments
Innovative	=1 if during the last three years, the establishment has introduced new or improved products or services
ES COVID-19 Follow up surveys	
Close temporarily	=1 if establishment closed temporarily (suspended services or production) due to the COVID-19 outbreak
Sales decrease	=1 if establishment's sales for last completed month decreased compared with the same month in 2019/2020
Temporary workers decreased	=1 if the total number of this establishment's temporary workers decreased since previous round month
Laidoff	How many workers have been laid off due to the COVID-19 outbreak?
Salary reduced	=1 if establishment reduced the salary, wages or benefits of permanent full-time employees due to the COVID-19 outbreak
Cash flow decrease	=1 if establishment's liquidity or cash flow has decreased since previous round month due to the COVID-19 outbreak.
Delay landlords	=1 if establishment delayed payments due to the COVID-19 outbreak for more than one week (excluding payments postponed following current regulation) to its landlords
Delay suppliers	=1 if establishment delayed payments due to the COVID-19 outbreak for more than one week (excluding payments postponed following current regulation) to its suppliers
Delay tax	=1 if establishment delayed payments due to the COVID-19 outbreak for more than one week (excluding payments postponed following current regulation) to the tax authorities
Overdue	=1 if establishment has been overdue on its obligations to any financial institution
Insolvency	=1 if establishment has filed for insolvency or bankruptcy
Government support	=1 if establishment has received national or local government support in response to the crisis
Government support: Cash	=1 if the government support involved cash transfers for businesses
Government support: Deferral	=1 if government support involved deferral of credit payments, utility bills, rent or mortgage, suspension of interest payments or rollover of debt
Government support: Credit	=1 if government support involved access to new credit
Government support: Tax	=1 if government support involved tax reductions or tax deferrals
Government support: Wage	=1 if government support involved wage subsidies

Variable name	Definition
BEEPS VI	
Government support: Digital	=1 if government support involved technical assistance or subsidies for adoption of digital technologies
Government support: Other	=1 if government support involved all remaining forms of assistance such as childcare support, compensation for rent, vouchers, sick leave, downtime allowance for employees, and other similar forms of assistance
Online sales	Percentage of firm's online sales out of total sales
Remote share	Percentage of firm's workforce working remotely
Exporter	=1 if firm's sales are more than 50% exports (direct and indirect)
Female employees	Percentage of permanent, full-time employees that are female
JHU CSSE database	
Pandemic severity	Number of new COVID-19 cases per day per million people.
Transparensy International	
Corruption	Corruption Perceptions Index 2019.
OxCGRT	
Stringency index	Index measuring government policies on social distancing measures.

Notes

[1] The survey was first undertaken in 1999-2000, and subsequently in 2002, 2005, 2008-2009, 2011-2016, and the most recent sixth round in 2018-2020.

[2] The survey universe consists of commercial, service or industrial business establishments with at least five full-time employees in the non-agricultural economy. This definition excludes: financial intermediation, real estate and renting activities and all public or utilities sectors. Government departments (including military, police, education, health and similar activities) as well as primary industries such as agriculture, mining etc. were also excluded. For most countries two sampling frames were used: an official frame of establishments supplied by the national statistical office of the country and the sampling frame consisting of establishments that participated in BEEPS V. The sample was selected using stratified random sampling. Three levels of stratification were used in all countries: industry, establishment size and region.

[3] For robustness we also use the Control of Corruption index from the World Governance Indicators database to classify countries into low and high corruption countries and results do not materially change.

[4] Table no. 1 reports descriptive statistics for the variables used in the analyses. Obs. denotes the number of observations, Std. Dev. the standard deviation, Min. and Max. the minimum and maximum values, respectively. Summary statistics are shown for the whole sample (columns 1-5), for the sample of low corruption countries as defined by those countries who score above 50 in the 2019 Transparency International Corruption Perceptions Index (columns 6-7) and high corruption countries as defined by countries that score below 50 in the same index (columns 8-9). The last column (10) shows mean differences between low and high corruption countries. Mean difference tests are based on the t-test with equal variances. The definition of all the variables is given in the Annexes, Table no. A2.

[5] Table no. 2 shows mean values by countries of the 2019 Transparency International Corruption Perceptions Index (column 1), Government support - a dummy variable indicating firms that received national or local government support in response to the crisis (column 2) and Close temporarily - a dummy variable indicating firms that closed temporarily (suspended services or production) due to the COVID-19 outbreak (column 3). Column 4 shows the number of firms participating in the baseline BEEPS VI survey by countries. Columns 5,6 and 7, show the number of firms participating in the COVID-19 Follow-up surveys. These are firms with eligibility codes: 1- Eligible establishment (correct name and address), 2- Eligible establishment (different name but same address- the new establishment bought the original establishment), 3- Eligible establishment (different name but same address- the establishment changed its name) and 4- Eligible establishment (moved and traced). Cells with / indicate that the follow-up round has not been conducted yet, at the time of writing the paper.

[6] Table no. 3 shows mean values by industries of Government support - a dummy variable indicating a firm which received national or local government support in response to the COVID-19 crisis (column 1), Close temporarily - a dummy variable indicating firms that closed temporarily (suspended services or production) due to the COVID-19 outbreak (column 2), Laid off - the average number of workers a typical firm in the industry has laid off due to the COVID-19 outbreak (column 3). Industries are classified according to the two-digit International Standard Industry Classification Rev. 3.1 of all economic activities.

[7] For robustness we have also estimated the equation with a non-linear probit model and confirm the same results. Due to the large number of fixed effects we prefer the OLS regression model and report those results throughout the paper.

[8] In addition, to mitigate concerns that the results are influenced by the variation in the number of firms present in each country (as presented in Table no. 2), we re-estimate our model excluding the countries with the largest number of firms i.e. those with over 1,000 firms in the baseline survey (Russian Federation, Kazakhstan, Morocco, Poland and Portugal) and find that the main results do not materially change.

[9] Table no. 4 presents OLS regression results. The dependent variable is Government support, a dummy variable indicating a firm which received national or local government support in response to the COVID-19 crisis. In columns (1)-(3) the sample is restricted to low-corruption countries as defined by those countries who score above 50 in the 2019 Transparency International Corruption Perceptions Index, whereas in columns (4)-(6) the sample is restricted to high-corruption countries i.e. countries that score below 50 in the same index. The definition of all variables is given in Table no. A2. Country, industry, time (month-year) and firm fixed effects are used as indicated in the table. Standard errors are clustered by industry and appear in brackets.

Overall, results in this section show that the probability of receiving government support in response to the pandemic situation is driven by different considerations in low- compared to high-corruption countries. In high-corruption countries factors such as firm size, being a member of a business support group or being an innovative firm have less bearing on the probability of receiving government support. Instead, factors such as informal competition, management and firm quality have a greater impact. As informal competition is more prevalent in the sample of high corruption countries it puts formal businesses at a disadvantage by having to pay taxes or abide regulations which informal businesses are able to evade. In times of crisis, however, formal businesses can benefit from government support to mitigate the adverse effects of the crisis. In addition, membership to a business organization provides firms with a network of support and information facilitating access to government aid. In fact, research shows that information frictions can act as a barrier to accessing government support (Custodio et al., 2022). In the sample of high corruption countries this mechanism of support that membership to a business organization provides does not seem to be as effective in facilitating access to government aid as in the subsample of low corruption countries. Finally, it may seem counterintuitive that in high corruption countries pandemic severity has a negative association with the probability of receiving government support. This could be explained by the fact that limited resources in times of crisis are prioritized for more urgent investments in health care systems, diverging funds away from economic support measures..

[10] Table no. 5 shows OLS regression results. The dependent variables are indicated in each of the columns (1)-(11). Government support is decomposed into types of government support received in response to the COVID-19 crisis. The definition of all the variables is given in Table no. A2. In Panel A the sample is restricted to low-corruption countries as defined by those countries who score above 50 in the 2019 Transparency International Corruption Perceptions Index, whereas in Panel B the sample is restricted to high-corruption countries i.e. countries that score below 50 in the same index. Time (month-year) and firm fixed effects are used as indicated in the table. Standard errors are clustered by industry and appear in brackets.