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THE NEXUS BETWEEN FOREIGN PORTFOLIO DIVERSIFICATION AND KINSHIP

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Abstract: This study seeks to understand the effect of kinship tightness of a society on foreign portfolio diversification. Using data for 42 home investor countries and 44 destination countries for the period of 2004-2021, it is found that investors from more tight-knit kinship societies tend to have smaller proportion of equities invested abroad, thus holding sub-diversified portfolios. The enforcement of these tight kinship societies is based on shame and communal values fostering local monitoring practices which leads to the absence of cooperation and trust, thus reducing stock market participation. It is further shown that kinship tightness can be shaped by enhanced financial literacy, which in turn fosters international diversification. On the other hand, loose kinship societies can be viewed as trust-promoting alternative mechanisms where formal institutions are less effective.

JEL classification: G15, G11, O16, Z10

Keywords: international portfolio diversification, kinship, trust, financial literacy

1. Introduction

It has been long acknowledged that investors diversify their portfolios with domestic and foreign assets to maximize expected returns (Markowitz, 1952). According to financial theory, with the rising financial globalization capital should be fully mobile across borders. However, when looking at the data on portfolio holdings, a contradiction called the equity home bias puzzle is seen, covering a high preference of individuals towards local stocks or bonds. Even if investors diversify their portfolios abroad, they tend to outweigh their portfolio holdings picking those investments which are “geographically close”, often referred as the “familiarity bias” (Karolyi et al. 2020).

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There is ample evidence in the literature associating cultural ties to foreign portfolio diversification (Beugelsdijk et al., 2010; Anderson et al., 2011; Siegel et al., 2011; Aggarwal et al, 2012). The aim of this study is to step forward from the culture-foreign bias association, primary focusing on analyzing foreign investment patterns from the point of view of family networks. It has been shown that in the absence of well-developed institutions, informal institutions such as extended family networks can cope with financial shocks and risk sharing (Fafchamps et al., 2007). In this way, family members can be considered as an "insurance policy" and are likely to play a role in the process by which households make decisions regarding investments. Tightly-knit kinship structure societies try to regulate behavior by emphasizing communal moral values, in-group favoritism, experiencing external shame and adopting the concept of purity and disgust. On the other hand, societies with more loosely connected kinship structures tend to promote cooperation through universal moral values, an internal sense of guilt and altruistic punishment (Enke, 2019). Put differently, loose kinship societies have a trust promoting attitude, and can be considered as a substitute for formal financial institutions, a finding that is consistent with prior research highlighting the significance of kinship networks (Cox et al., 2008).

On the other hand, there is sufficient evidence in the literature regarding the limited stock holding puzzle which is influenced by financial sophistication (Rooij et al., 2011). Hence, households shy away from stock market participation because they have limited domain knowledge. Guiso et al. 2003 argues that there exists an unsettled issue on the whether responsibility of providing this financial education should be placed on the market or should governments interfere by addressing specific financial educational programs. The missing puzzle of financial education causes a loss of welfare, since less financially educated individuals will be hesitant even in investing in foreign assets (Giofré, 2017). It is known that financial information spreads from informed consumers to uninformed ones within the same social circle. In this manner, financial literacy can be considered an important factor in reducing the effects of tight kinship structures on foreign portfolio diversification.

The study contributes to the existing literature in several ways. Firstly, it considers the growing number of studies assessing cooperation, trust and stock market participation (Guiso et al., 2008), stock market literacy and investment decisions (Ballock et al., 2014), investor protection rights and foreign portfolio diversification (Driessen et al., 2007). Secondly, it goes beyond the nexus of culture-foreign portfolio diversification by using an internally consistent moral system, kinship tightness that influences the preferences and constraints of individuals in stock picking strategies. Thirdly, the study analyzes the moderating effect of education, more specifically financial literacy over foreign bias (Giofré 2017; Rooij and Lusardi, 2011).

The remainder of this paper is classified as follows. The second part presents the literature review. The third section describes data and methodology. The fourth section presents the model set-up and main empirical results, as well as robustness checks. The final section contains concluding remarks.

2. Literature review

With the outset of the home versus foreign bias literature many studies have focused on explaining the phenomena from multiple angles ranging from: variables included in gravity models such as physical distance, shared common language,

common border (Portes and Ray, 2005), destination market size and characteristics (Chan et al., 2005), investor protection rights (Gianetti et al., 2010), financial literacy (Giofré, 2017), capital and trade flows as informational advantages (Karolyi et. al., 2020) and culture (Beugelsdijk and Frinjs, 2010). Going further in the literature of culture, kinship is often overlooked as an explanation in foreign capital allocations.

According to dictionary Merriam-Webster, the kinship system is "*the system of social relationships connecting people in a culture who are or are held to be related and defining and regulating their reciprocal obligations*". In the anthropological view, the kinship systems differ in their tightness, respectively how strongly people are embedded in very large extended family networks. In tight kinship societies people trust only those in their group, and cooperation takes place within in-groups, mistrust of those outside the group being high. In loosely kinship societies, people have greater generalized trust in out-groups and are more willing to cooperate and build productive relationships with strangers (Alesina and Giuliano, 2013). These variations in the structure of extended family relationships have led to heterogeneity of the moral systems that regulate people's behavior. The theoretical model developed by Enke (2019) predicts that in tight kinship systems, cooperation and trust is suppressed by communal moral values, emotions of external shame, notions of purity and disgust, and revenge taking. On the other hand, in loose kinship systems, cooperation and trust is strengthened through universal moral values, internalized guilt, altruistic punishment, and moralizing gods.

The societal trust is positively associated with financial development and stock market participation (Guiso et al., 2008) and with superior local and cross-country portfolio diversification (Drobetz et al., 2021). In a similar fashion, Niu et al., (2020) has shown in China that the increased number of brother is associated with a higher likelihood of participating in the stock market. It has also been conjectured that social capital and interactions affect stock market participation (Liu et al., 2014). Thus, the expectation is that investors from loose comparatively to tight kinship countries would invest more in foreign markets diversifying their portfolio internationally.

Moreover, the boundaries of tight kinship "limitations" could be reduced by education, being in line with Roger's (2003) terminology regarding that highly educated people are more open-minded being "innovators" and "early adaptors" of a society. As an illustration, individuals with higher literacy levels might have a greater tendency to select funds with lower fees and possess more knowledge about fund expenses (Hastings and Mitchell 2010). Thomas and Spataro 2018 have shown on a sample of European countries that the marginal effect of financial literacy considerably increases stock market participation. From the perspective of financial system's point of view, a greater participation rate could benefit in the development of capital markets, which is a significant factor in determining equity market premiums. Hence, financial education can act as an anchor in societies characterized by tight kinship values, enhancing foreign equity portfolio allocations.

3. Data and Summary Statistics

Our data is built up using a panel specification formed of 42 investor countries having foreign investments in 44 destination ones covering a period between 2004-2021. The range of countries has been selected in accordance with MSCI classification, while to determine the amount of foreign portfolio allocations for each country data from Coordinated Portfolio Investment Survey (CPIS, IMF) has been used.

3.1 Dependent variable

Following Chan et al. (2005), the foreign bias measure is calculated as a deviation from an optimal portfolio. The dependent variable is computed on annual basis as shown in the upcoming equation:

$$FB_{ij}=log\left(\frac{w_{ij}}{w_j}\right), \quad (1)$$

where w_{ij} is the weight of investor country i's stock holdings in the destination country j, and w_j represents destination country j in the world market capitalization. In most of the cases since countries usually underinvest in other markets, the value of the foreign bias is negative, lower values of foreign bias denoting less foreign investment. The equilibrium level (*i.e.*,w_j) is given by 0.

The CPIS (IMF) database does not provide information regarding domestic positions; the ratio of actual portfolio holdings is calculated in two steps. The overall portfolio of country *i* (w_{ij}) is equal to its market capitalization plus the total sum of foreign equities allocated to destination market j, less the whole amount of liabilities allocated by country *j* in the home market *i.* Then the foreign equities invested by country i into host market j is taken, relative to the overall portfolio holding computed in the previous step.

The denominator in equation (1) is determined using the International CAPM model, w_j is the weights of the stock market capitalization of destination country j relative to the total market capitalization of all countries in the sample. Following Dahlquist (2003) suggestion, the amount of home countries market capitalization is excluded from the total market capitalization, having at the end the weight that shows the relative attractiveness of foreign countries.

3.2 Independent variables

To measure kinship systems, the kinship tightness index developed by Enke (2019) is used. The aim of the index is to measure the level of interconnectedness within closely-knit, extended family systems. This index is constructed in two stages. In the first stage, an anthropological index of historical kinship systems was constructed using ethnographic data set from Ethnographic Atlas. It reflects the extent to which people were embedded in large, interconnected extended family networks in the pre-industrial period. It takes into consideration the family structure built up by the components of domestic organization, post weeding residence and descent system via the decedent lines and the degree of segmentation of a community. The anthropological index has been obtained as an average of four dummy variables associated to these four dimensions of kinship. In the second stage, the anthropological index was matched with countries combining ancestry-adjustment methods based on migration matrixes on one hand (Putterman and Weil, 2010) and language based matching methods on the other (Giuliano and Nunn, 2013).

Furthermore, the study uses the Standard & Poor's Rating Services Global Financial Literacy Survey (S&P Global FinLit Survey) which provides comprehensive financial literacy scores for a wide range of countries. The questions which were

conducted by the Gallup World Poll survey during 2014, addressing 150,000 individuals nationally, focused on four fundamental concepts in finance: risk-diversification, inflation, basic numeracy, and interest rate compounding. According to the survey, the variation of financial literacy scores between countries is widespread, and on average 1-in-3 adults is financially literate. Moreover, following Klapper et al. (2020) the gap for financial literacy is wide not only between developed and emerging markets, but also in the category of developed ones having rates between 37% for Italy and 68% for Canada. In this category, the average values for financial education and financial skills obtained from Giofré (2017) are also added. These indicators are derived from the IMD World Competitiveness Yearbook (WCY) addressing questions to senior executives regarding the importance of education in finance and financial abilities.

Moreover, in order to account for the conventional economic rationale behind preference for foreign and domestic investments we incorporate a set of control variables further used in the models. Thus, *home bias* represents the weight of domestic equities invested in the home market; host country attractiveness category is measured by *risk profile* (International Country Risk Guide) accounting for political risk in the host market. *Exchange rate regime* represents exchange rate arrangement classification from Reinhart and Rogoff (2019).Capital control measures is the *overall inflow restrictions index* obtained from Fernández et al. (2016). In addition the average values for withholding taxes in destination markets are from Kwabi et al. (2021).

The models contain destination country risk and return profile attributes, in addition to the aforementioned controls. *Turnover ratio* is calculated using the total value of shares traded on an exchange to the average stock market capitalization (DataStream). From the perspective of *stock market returns*, the one and five years lagged returns are computed using monthly data from DataStream. The destination market risk has been included using the measure of *volatility* computed over 5 years. To prevent the omitted variable bias, we also include a group of familiarity and gravity variables. Because foreign investments might be influenced by import-export relationships across countries, we assess the *Bilateral trade* measure which is the sum of import and exports between home and host countries relative to the home countries overall import and exports (IMF, Direction of Trade and Statistics). Moreover, values for *linguistic distance* have been obtained by Spolaore and Wacziarg (2009). In the distance variables set the log of *geographic distance* between country pairs (in kilometers) from the CEPII database is incorporated, together with the values for religious distance indicators from Spolaore and Wacziarg (2016). Besides distance and language variables, we include in the model dummy variables for *shared common law*, and a shared *common currency*. According to the finance and law literature, common law system typically have more robust investor protection regimes compared to French civil law systems (La Porta et al., 1998). Lastly, we add *zonal cluster* from Ronen and Shenkar (2013) to the model a as a dummy variable for country pairs belonging from the same cultural clustering.

Table 1: Summary statistics for dependent variable of foreign bias and the main variables of interest: kinship, financial literacy and home bias

Investor country	Average foreign bias	Average home bias	Kinship scores	Financial literacy scores
Argentina	-12.377	6.774	0.260	0.280
Australia	-5.700	3.554	0.082	0.640
Austria	-2.250	5.575	0.047	0.530
Belgium	-2.617	4.704	0.082	0.550
Brazil	-8.136	4.151	0.107	0.350
Canada	-1.929	2.945	0.126	0.680
Chile	-6.204	5.410	0.399	0.410
Colombia	-15.173	6.200	0.295	0.320
Czech Republic	-5.674	7.133	0.496	0.580
Denmark	-1.347	4.698	0.004	0.710
Egypt	-15.688	6.839	0.589	0.270
Finland	-5.166	5.009	0.063	0.630
France	-2.149	2.956	0.197	0.520
Germany	-2.247	3.162	0.014	0.660
Greece	-9.707	6.609	0.250	0.450
Hong Kong	-7.382	2.924	0.784	0.430
Hungary	-5.364	7.451	0.490	0.540
India	-12.961	3.719	0.776	0.240
Indonesia	-15.325	5.259	0.448	0.320
Israel	-9.529	5.437	0.657	0.680
Italy	-2.980	4.123	0.064	0.370
Japan	-3.066	2.351	0.576	0.430
Korea	-3.979	3.812	0.750	0.330
Malaysia	-7.859	4.999	0.477	0.360
Mexico	-13.139	4.984	0.315	0.320
Netherlands	-1.037	3.303	0.261	0.660
New Zealand	-13.330	6.305	0.614	0.610
Norway	-1.325	4.227	0.005	0.710
Pakistan	-17.800	7.027	0.809	0.260
Philippines	-15.070	5.932	0.076	0.250
Poland	-12.464	5.886	0.500	0.420
Portugal	-9.061	6.313	0.500	0.260
Russia	-12.503	4.554	0.327	0.380
Singapore	-8.366	4.125	0.631	0.590
South Africa	-6.824	4.123	0.694	0.420
Spain	-9.247	3.912	0.220	0.490
Sweden	-1.795	4.036	0.001	0.710
Switzerland	-2.066	3.418	0.000	0.570
Thailand	-11.095	5.226	0.287	0.270
Turkey	-13.182	5.641	0.711	0.240
United Kingdom	-1.304	2.363	0.023	0.670
United States	-1.293	0.937	0.158	0.570

Note: Foreign and home bias measures have been calculated in line with Chan et al. (2005) using data from CPIS (IMF) and DataStream. The values for Kinship scores are from Enke (2019), while scores for financial literacy are from Standard & Poor's Rating Services.

Table 1 provides summary statistics for the dependent variable of foreign bias, as well as for the key variable of interest: kinship index and financial literacy measure. In the first column of Table 1, we report the average values for the foreign bias from the perspective of the investor market. As we can observe the average values for the foreign portfolio allocations are negative as there is a tendency to underinvest in foreign markets relative to the benchmark predicted by the ICAPM model. The largest values for the foreign bias are observed for: Netherlands (-1.037), United States (-1.293), United Kingdom (-1.304) the results being in line with Beugelsdijk et al. (2010). On the other hand, the smallest values for the bias van be observed for mostly emerging markets: Indonesia (-15.325), Egypt (-15.688) and Pakistan (-17.800). Values for home bias, in all countries are positive since investors exhibit a preference for local stocks. The highest average values for the home bias are present primarily in emerging markets: Hungary (7.451), Czech Republic (7.133), and Pakistan (7.027). In parallel the lowest home biased countries are developed ones: United Kingdom (2.363), Japan (2.351) and United States (0.937). In the sample the kinship tightness index for investor countries varies between 0 for Switzerland, which is the loosest country, and 0.809 for Pakistan, which is the tightest country. Looking at the data on financial literacy, the highest scores are observed in northern Europe in Norway, Sweden, Denmark followed by countries like Israel and Canada. Moreover Figure 1 and 2 from the Appendix reveals more readily the association between kinship score, financial literacy and foreign bias.

4. Main results

4.1 Empirical design

I study the effect of kinship tightness over the foreign bias measure as follows:

$$FB_{ij}=f(KIN_i, HB_i, CV),$$

where FB_{ij} is the foreign bias measure; KIN_i is the kinship tightness index developed by Enke (2018); HB_i is the home bias; and CV accounts for the control variables presented in the previous section. Specifically, the data is constructed as a panel model having investor-destination country pair and year dimensions.

The data is formed of 32,508 country-pair observations, where 8,698 observations are 0 values, with the majority as true zeros (since investors choose not to invest in that target country). Moreover, amounts less than 500,000 dollars are set to zero in the CPIS dataset and there are country-pair investment information which are confidential. Assuming all this, the dependent variable of foreign bias is a truncated one; therefore, we choose a Tobit estimation, where all the foreign bias scores are censored on the left. Standard errors are clustered at country-pairs to account for within covariance, obtaining robust estimations (Petersen, 2009). All regressions are estimated with time fixed effects.

Table 2: The effect of kinship tightness on foreign bias

	Benchmark model	Base model	World benchmark portfolio	Excluding major financial centers
Kinship tightness		-7.5965***	-7.4605***	-8.3086***
		(-12.03)	(-11.87)	(-12.27)
Home bias	-2.5170***	-2.0300***	-2.0265***	-1.8715***
	(-21.35)	(-16.47)	(-16.53)	(-12.39)
Turnover ratio	0.7585***	0.7719***	0.7691***	0.8240***
	(3.25)	(3.36)	(3.36)	(3.34)
Risk profile	0.0594***	0.0622***	0.0618***	0.0637***
	(2.80)	(3.02)	(3.02)	(2.86)
Exchange rate regime	-0.2127***	-0.1266***	-0.1165***	-0.1460***
	(-6.75)	(-4.22)	(-3.91)	(-4.47)
Overall inflow restrictions	1.1491*	0.8608	0.8492	0.9613
	(1.72)	(1.36)	(1.35)	(1.38)
Withholding tax	-0.2193***	-0.2476***	-0.2477***	-0.2818***
	(-3.92)	(-4.67)	(-4.70)	(-4.86)
Return correlation	6.8306***	6.2131***	6.1834***	7.6827***
	(8.21)	(7.73)	(7.73)	(8.71)
5-year lagged volatility	-30.9099***	-27.4374***	-27.3372***	-29.9640***
	(-5.01)	(-4.64)	(-4.64)	(-4.64)
1-year lagged yearly return	-0.2640	-1.0529	-1.1323	-1.1932
	(-0.08)	(-0.34)	(-0.36)	(-0.34)
5-year lagged yearly return	-7.8089**	-7.6652***	-7.6759***	-8.4515***
	(-2.56)	(-2.59)	(-2.60)	(-2.60)
Bilateral trade	-5.3027*	-3.3389	-3.4232	-7.2109
	(-1.91)	(-1.06)	(-1.09)	(-1.43)
Linguistic distance	1.3411	-1.2144	-1.1917	-1.9741*
	(1.24)	(-1.19)	(-1.17)	(-1.89)
Geographic distance	-2.0598***	-1.9351***	-1.9338***	-2.0667***
	(-10.88)	(-10.47)	(-10.51)	(-10.24)
Common law	0.3399	-0.0316	-0.0291	-0.0388
	(0.84)	(-0.08)	(-0.07)	(-0.09)
Common currency	-0.0956	-0.0122	-0.0519	-0.5401
	(-0.19)	(-0.02)	(-0.10)	(-1.07)
Zonal cluster	1.7048***	1.7507***	1.7695***	2.0458***
	(2.98)	(2.95)	(2.99)	(3.08)
Religious distance	-2.6798**	2.3281**	2.3218**	2.1520*
	(-2.37)	(2.07)	(2.08)	(1.81)
Log-likelihood	-90938.362	-90219.668	-90113.967	-82986.254
Pseudo r-square	0.068	0.0754	0.0751	0.0725
N (left- censored obs.)	32508	32508	32508	30186
	(8698)	(8698)	(8698)	(8684)

Note: This table presents the foreign bias in international allocation from the view of kinship tightness index. The dependent variable of foreign bias is defined in Equation 1 representing the log ratio of foreign equity portfolio allocations from country *i* into country *j*. The models use left-censored Tobit regression results. Robust t-statistics clustered by home-destination countries are reported in brackets. *, **, and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

4.2 Baseline regression results

In Table 2 Tobit regression results of the equity foreign bias on kinship tightness are presented. To establish the benchmark for the study in the first column of Table 2 regression results are estimated using variables from Chan et al. (2005) and Giofré (2017). The obtained results are pretty much the same as the ones obtained by these studies. Furthermore, the coefficient of kinship tightness index is negative and statistically significant at 1% level in all our specifications. As one might anticipate, in tight kinship societies where individuals are more likely to rely on people within their own group, mistrusting those outside of the group, as a result, they will be less inclined to diversify their equity portfolios abroad. This is somehow anticipated as individuals belonging to these types of societies have a behavior regulated by communal values, revenge taking, emotions and external shame coupled with in-group favoritism.

Column 3 of Table 2 reconsiders the foreign bias measure by using the ratio of stock market capitalization of the 44 destination markets relative to the world market capitalization. Furthermore, in line with Poshakwale et al. (2011) in the last column the major financial centers like the United States, United Kingdom and Japan were excluded from the sample. Investors from these major financial centers besides being key players on international financial markets they also benefit from a better investor protection rights regulation giving them major advantages on foreign portfolio diversification. Even after the exclusion of the large markets from the sample, the coefficient of kinship remains significant and negative.

The compelling link between kinship tightness and foreign portfolio allocation presented before prompts to speculate between the association of kinship and education on one hand. In the upcoming table besides the index of kinship the measure of financial literacy from S&P Global FinLit Survey, Financial education and financial skills from Giofré (2017) have been considered. Given the results in Table 3, Columns 1-3, there is a positive effect of financial education, literacy on foreign portfolio allocations. By interacting kinship tightness with the measures of financial literacy and financial education (columns 4-5), we observe a diminishing effect of the product over the foreign bias measure. Consequently, we can view financial literacy and education as a channel through which the negative effect of kinship over international diversification can be decreased.

Table 3: Interaction between kinship tightness and foreign bias

	SP Financial literacy	**Financial education**	**Financial skills**	**Interaction with SP Financial literacy**	**Interaction with Financial education**
Kinship tightness	-5.4903*** (-7.50)	-7.7185*** (-11.56)	-7.7495*** (-11.56)	-5.3657*** (-7.43)	-8.1404*** (-12.41)
SP Financial literacy	0.2025*** (17.89)			0.2003*** (17.76)	
Financial education		1.5801*** (16.95)			1.6744*** (17.96)
Financial skills			1.4705*** (14.89)		
SP Financial literacy x Kinship tightness				-0.0326*** (-3.35)	

	SP Financial literacy	Financial education	Financial skills	Interaction with SP Financial literacy	Interaction with Financial education
Financial education x Kinship tightness					-1.1182*** (-3.29)
Financial skills x Kinship tightness					
Control variables	Yes	Yes	Yes	Yes	Yes
Log-likelihood		-90059.504	-90301.144	-89802.72	-89997.154
Pseudo r-square	-89868.16	0.077	0.0746	0.0797	0.0777
N (left-censored obs.)	32508 (8698)	32508 (8698)	32508 (8698)	32508 (8698)	32508 (8698)

Note: The models from (1)-(5) are Tobit regressions using the as main variables of interest the Kinship tightness, financial literacy from S&P FinLit Survey and Financial education and skills from Giofré (2017). Robust t-statistics clustered by home-destination countries are reported in brackets. *, **, and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

4.3 Robustness checks

4.3.1 Alternative Foreign Bias measure

Because the foreign bias measure shall account for the level of home bias in a particular country, Bekaert et al. (2009) has proposed a new way of measuring foreign portfolio allocations. We have seen that most of the literature accounts for the home bias to be a dominant phenomenon in relationship with the foreign bias, thus the measure adjusts the optimal weigh calculation by excluding the home markets capitalization. It assesses the overinvestment and underinvestment in a given country comparing it to the optimal portfolio allocation, where lower degrees of the value account for higher foreign investments whilst higher scores denote under-diversification in a particular target country. Similarly, to the results deployed in the main section Table 3, the relationship between kinship system and the foreign bias measure is being analyzed.

In Table 4 the results are being reported, where I exclude the home bias measure as a control variable. In the base setting we can observe the positive relationship between kinship tightness and foreign bias, where the opposite sign compared to the previous results is given by the scaling of the foreign bias measure. This positive relationship is maintained even after introducing the variables regarding financial literacy. In columns (4) to (5) I introduce one-by-one the variables used in the interaction terms. The magnitude and the sign of the variables is maintained in all the specifications.

Table 4: Robustness checks based on Bekaert et al. (2009) foreign bias measure

	Base model	SP Financial literacy	Financial education	Financial skills	Interaction with SP Financial literacy	Interaction with Financial education
Kinship tightness	0.4820*** (16.47)	0.1920*** (5.85)	0.3294*** (10.13)	0.3431*** (10.24)	0.1827*** (5.73)	0.3728*** (11.71)
SP Financial literacy		-0.0097*** (-19.67)			-0.0115*** (-18.92)	
Financial education			-0.0739*** (-12.06)			-0.0703*** (-14.64)
Financial skills				-0.0635*** (-8.07)		
SP Financial literacy x Kinship tightness					0.0058*** (3.52)	
Financial education x Kinship tightness						0.0948*** (6.28)
Financial skills x Kinship tightness						
Control variables		Yes	Yes	Yes	Yes	Yes
Log-likelihood	-14253.23	-12133.15	-11909.82	-12346.35	-12065.16	-12829.87
Pseudo r-square	0.4084	0.4964	0.4506	0.4304	0.4993	0.4675
N (left-censored obs.)	32,508 (8723)	32,508 (8723)	30,186 (6888)	30,186 (6888)	32,508 (8723)	32,508 (8723)

Note: This table reports the results of a right-censored Tobit model, using as a dependent variable the foreign bias measure introduced by Bekaert et al. (2009). The t-statistics using robust standard error clustered at home-destination country level are reported in parentheses. All the control variables used in the base model from Table 2 have been added for each model. Moreover, the interaction between financial literacy, financial education have been introduced. *, **, and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

4.3.2 Alternative estimation procedures

Similarly, to Beugelsdijk et al. (2010) the model is tested in various settings. Table 5 presents the results for the model as well as using control variables in supporting the main results. Primary, I re-assess the question of zero investment as a potential bias in CPIS (Coordinated Portfolio Investment), IMF database. So far to check the validity of the results, OLS regressions including and excluding zeros are run. As results show in Table 5, the coefficient of kinship is negative and statistically significant in all the specifications in relationship with foreign bias. Furthermore, a random effects model is being estimated to control for unobserved heterogeneity.

According to Dahlquist et al. (2003) this heterogeneity only affects the values of home bias, by accounting for the free-float market capitalization. In this manner, random effects with and without zeros and a random effects Tobit models are run. The results underline the negative effect of kinship on foreign bias. Thirdly, similarly to Beugelsdijk and Frinjs (2010) an OLS model with two-step Heckman sample correction is being estimated to account for the truncated dependent variable. Similarly, the same control variables as in Beugelsdijk et al. (2010) are introduced: GDP per capita for the home country, differences in capital controls, capital controls in the home market, differences in the size of the stock market, transaction costs at home, differences in transaction costs between home and host. Even in this setting, the results remain unchanged.

Table 5: Alternative estimation models

	Base model	**SP Financial literacy**	**Financial education**	**Financial skills**	**Interaction with SP Financial literacy**	**Interaction with Financial education**
OLS with zeros investments included	-5.9534*** (-12.81)	-2.7458*** (-5.51)	-4.4309*** (-8.42)	-4.7705*** (-8.91)	-2.7856*** (-5.61)	-5.1645*** (-10.56)
OLS with zeros investment excluded	-2.3024*** (-9.07)	-0.4433** (-2.00)	-1.4782*** (-5.10)	-1.8277*** (-5.95)	-0.4632** (-2.05)	-2.0266*** (-7.44)
Random effects with zeros investment included	-8.0235*** (-15.64)	-3.6191*** (-6.58)	-5.4677*** (-9.59)	-5.7757*** (-10.09)	-3.6251*** (-6.70)	-6.1029*** (-11.56)
Random effects with zeros investments excluded	-3.2309*** (-11.42)	-3.2309*** (-11.42)	-2.0499*** (-6.47)	-2.3076*** (-6.94)	-0.4569* (-1.90)	-2.6646*** (-9.15)
Tobit with random effects	-11.2299*** (-15.57)	-5.3321*** (-7.22)	-6.7478*** (-9.63)	-7.1380*** (-9.81)	-5.3202*** (-7.20)	-7.4172*** (-10.29)
OLS with Heckman control	-2.0795*** (-16.82)	-0.6295*** (-8.05)	-1.8450*** (-14.97)	-2.0349*** (-15.21)	-0.6287*** (-8.04)	-2.5110*** (-19.70)

Source: *Note:* This table presents robustness tests for our foreign bias measure. The dependent variable is the foreign bias measure calculated by Chan et al. (2005). In the table the values for kinship scores in different settings are reported. The t-statistics using robust standard error clustered at home-destination country level are reported in parentheses. *, **, and *** indicate statistical significance at 10%, 5% and 1% levels, respectively.

5. Conclusions

The influence of culture over external portfolio equity has been long acknowledged in the economics and financial literature. Besides culture, tightness of the kinship system influences individual's decision making and behavior. The study sheds light over the assumption that tight and loose kinship ties shapes financial decision making. The evidence suggests that tight kinship structures in a country disproportionally lower investors' tendency to participate in international markets. This pattern considers the mechanism that tight kinship societies rely on shame, communal values and the existence of localized monitoring, and in-group favoritism in economic decision making.

Furthermore, the impact of tight kinship systems on foreign portfolio diversification can be decreased by higher levels of education and more specifically by educational programs targeting financial literacy. Thus, highly literate individuals could make wise choices when investing in international markets. On the other hand, loose kinship societies can be considered as an alternative where formal institutions are weak and lax, by promoting values of trust and cooperation. In this way a loose kinship society, can be viewed as 'tool' which acts against unethical corporate decisions.

The findings have important implications for policymakers and researchers. Overall, the study supports the notion that kinship structures collectively influences investment behavior. The implication of policy holders in understanding and shaping the level of tightness kinship barriers of a society is essential. As foreign portfolio diversification can be enhanced by promoting the role of financial literacy among individuals, therefore reaching domain knowledge is necessary to make sound financial decisions. Moreover, kinship tightness or looseness might be another asset in explaining the enduring nature of equity home bias puzzle in the finance literature.

References

Alesina, A., & Giuliano, P. (2013). Family ties. In *Handbook of economic growth* (Vol. 2, pp. 177-215). Elsevier.

Anderson, C. W., Fedenia, M., Hirschey, M., & Skiba, H. (2011). Cultural influences on home bias and international diversification by institutional investors. *Journal of Banking & Finance*, *35*(4), 916-934.

Balloch, A., Nicolae, A., & Philip, D. (2015). Stock market literacy, trust, and participation. *Review of Finance*, *19*(5), 1925-1963.

Beugelsdijk, S., & Frans, B. (2010). A cultural explanation of the foreign bias in international asset allocation. *Journal of Banking & Finance*, 34(9), 2121-2131.

Chan, K., Covrig, V., & Ng, L. (2005). What determines the domestic bias and foreign bias? Evidence from mutual fund equity allocations worldwide. *The Journal of Finance*, 60(3), 1495-1534.

Cox, D., Fafchamps, M., (2008). Extended family and kinship networks: Economic in- sights and evolutionary directions. Handb. Devel. Econ. 4, 3711–3784.

Dahlquist, M., Pinkowitz, L., Stulz, R. M., & Williamson, R. (2003). Corporate governance and the home bias. *Journal of financial and quantitative analysis*, 38(1), 87-110.

Dichtl, H., Drobetz, W., & Wendt, V. S. (2021). How to build a factor portfolio: Does the allocation strategy matter?. *European Financial Management*, *27*(1), 20-58.

Driessen, J., & Laeven, L. (2007). International portfolio diversification benefits: Cross-country evidence from a local perspective. *Journal of Banking & Finance*, *31*(6), 1693-1712.

Enke, B. (2019). Kinship, cooperation, and the evolution of moral systems. *The Quarterly Journal of Economics*, *134*(2), 953-1019.

Ethan Ilzetzki, Carmen Reinhart and Ken Rogoff, Exchange Arrangements Entering the 21st Century: Which Anchor Will Hold? (2019). *Quarterly Journal of Economics,* 134(2), 599–646.

Fafchamps, M., Gubert, F., (2007). The formation of risk sharing networks. *J. Devel. Econ.* 83, 326–350 .

Fernández, A., Klein, M. W., Rebucci, A., Schindler, M., Uribe, M. (2016). Capital Control Measures: A New Dataset. *IMF Economic Review*, Palgrave Macmillan; International Monetary Fund, 64(3):548-574

Giannetti, M., & Koskinen, Y. (2010). Investor protection, equity returns, and financial globalization. *Journal of Financial and Quantitative Analysis*, *45*(1), 135-168.

Giofré, M. (2017). Financial education, investor protection and international portfolio diversification. *Journal of International Money and Finance*, 71, 111-139.

Giuliano, P., & Nunn, N. (2013). *The transmission of democracy: from the village to the nation-state* (No. w18722). National Bureau of Economic Research.

Guiso, L., Haliassos, M., & Jappelli, T. (2003). Household stockholding in Europe: where do we stand and where do we go?. *Economic Policy*, *18*(36), 123-170.

Guiso, L., Sapienza, P., & Zingales, L. (2008). Trusting the stock market. *the Journal of Finance*, *63*(6), 2557-2600.

Hastings, J. S., & Mitchell, O. S. (2010). How financial literacy and impatience shape retirement wealth and investment behaviors. *Michigan Retirement Research Center Research Paper*, (2010-233), 2018-10.

Karolyi, G. A., Ng, D. T., & Prasad, E. S. (2020). The Coming Wave: Where Do Emerging Market Investors Put Their Money? *Journal of Financial and Quantitative Analysis,* 55(4), 1369-1414.

Klapper, L., & Lusardi, A. (2020). Financial literacy and financial resilience: Evidence from around the world. *Financial Management*, *49*(3), 589-614.

Kwabi, F. O., Boateng, A. (2021). The effect of insider trading laws and enforcement on stock market transaction cost, *Review of Quantitative Finance and Accounting*, 56(3), 939–964.

Liu, Y. J., Meng, J., You, W., & Zhao, L. (2014). Word-of-mouth communication, observational learning, and stock market participation

Markowitz, H. (1952). Portfolio Selection *J Finan* 7:77–91.

Niu, G., Wang, Q., Li, H., & Zhou, Y. (2020). Number of brothers, risk sharing, and stock market participation. *Journal of Banking & Finance*, *113*, 105757.

Petersen, M.A., (2009). Estimating standard errors in finance panel data sets: Comparing approaches. *Rev. Financ. Stud*. 22 (1), 435–480.

Portes, R., & Rey, H. (2005). The determinants of cross-border equity flows. *Journal of international Economics,* 65(2), 269-296.

Poshakwale, S. S., & Thapa, C. (2011). Investor protection and international equity portfolio investments. *Global finance journal*, 22(2), 116-129.

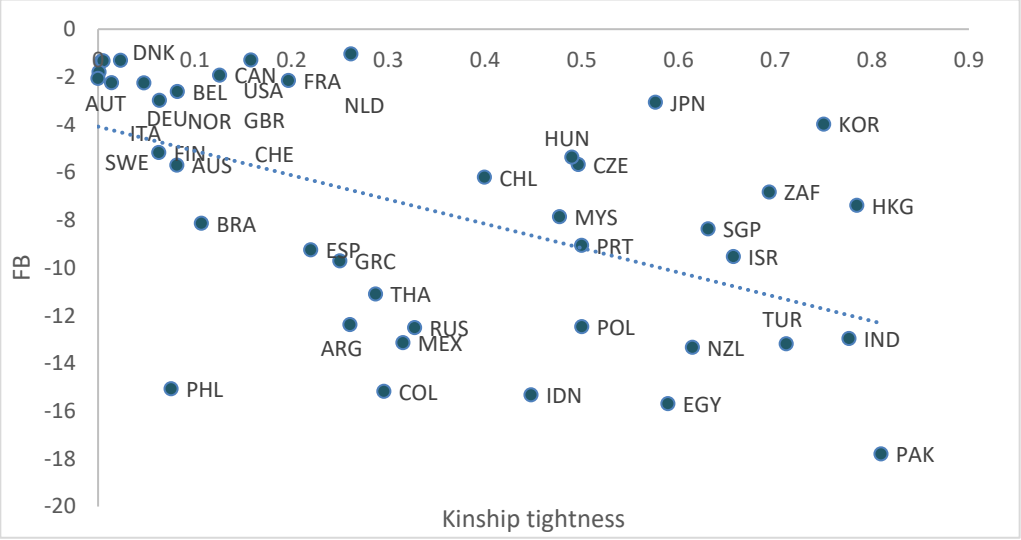
Putterman, L., & Weil, D. N. (2010). Post-1500 population flows and the long-run determinants of economic growth and inequality. *The Quarterly journal of economics*, *125*(4), 1627-1682.

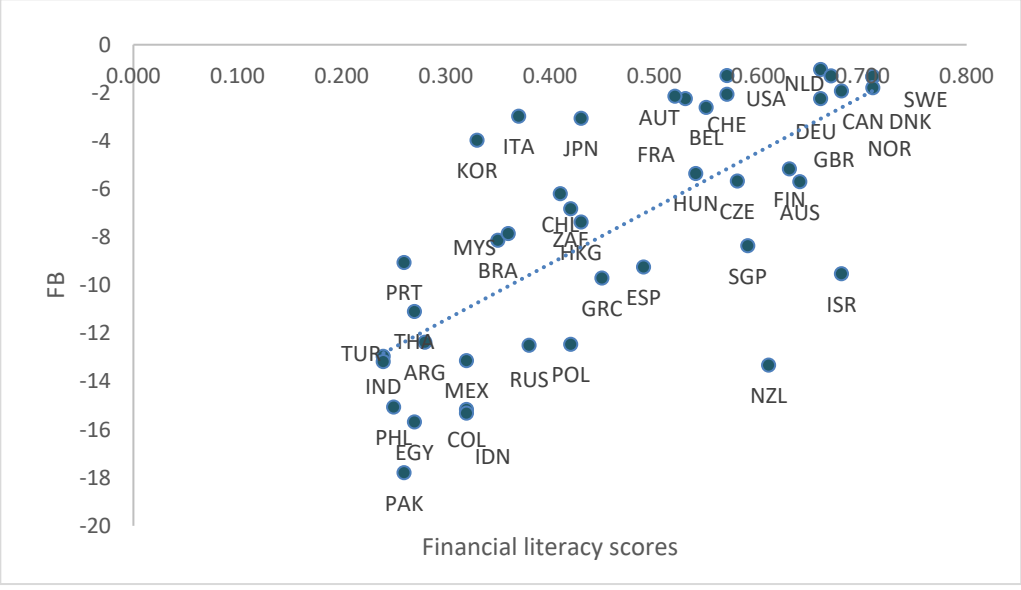
Rogers, Everett M. (2003). Diffusion of innovations, 5th ed. New York: Free Press.
Ronen, S., & Shenkar, O. (2013). Mapping world cultures: Cluster formation, sources and implications. *Journal of International Business Studies*, *44*, 867-897.
Siegel, J. I., Licht, A. N., & Schwartz, S. H. (2011). Egalitarianism and international investment. *Journal of Financial Economics*, *102*(3), 621-642.
Spolaore, E., & Wacziarg, R. (2009). The diffusion of development. The Quarterly journal of economics, 124(2), 469-529.
Spolaore, E., & Wacziarg, R. (2016). *Ancestry, language and culture*. Palgrave Macmillan UK, 174-211.
Van Rooij, M., Lusardi, A., & Alessie, R. (2011). Financial literacy and stock market participation. Journal of Financial economics, 101(2), 449-472

Appendix

Graph 1 and 2: Foreign bias and kinship tightness and financial literacy scores

Source: This figure presents the average values of foreign bias measure against the Kinship tightness and S&P Financial literacy index. The foreign bias measure has been calculated in line with Equation (1). Kinship scores are obtained from Enke (2019) while financial literacy index scores have been collected from Standard & Poor's rating services.





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UNCONVENTIONAL MONETARY MEASURES DURING THE COVID-19 PANDEMIC: A CASE STUDY FOR CENTRAL AND EASTERN EUROPEAN COUNTRIES

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Abstract: The COVID-19 pandemic had major negative repercussions on the countries from Central and Eastern Europe (CEE), which experienced almost similar declines in the economy in 2020. Against this background, central banks from CEE initiated unconventional monetary policy measures aimed at mitigating the economic and social effects of the pandemic. The purpose of this article is to analyse the CEE central banks' response to the pandemic crisis, i.e., the response of the Czech Republic, Hungary, Poland, and Romania, and to unveil the particularities of the unconventional monetary policy adopted by these states. To achieve this goal, the article presents a chronology of the main decisions adopted by CEE central banks during the pandemic and the dynamics of these central banks' assets. The main findings suggest that CEE monetary authorities, like major central banks, initiated the first measures to counter the negative effects of the pandemic on the economy in March 2020. All of them cut the key interest rate and injected liquidity through open market operations in order to support lending to the real economy. However, the magnitude of these measures was different depending on the economic and financial systems' peculiarities. Moreover, not all of them initiated purchases of assets or new lending facilities.

JEL classification: E50, E52, E58

Keywords: COVID-19 pandemic, Central and Eastern Europe, central banks, unconventional monetary policy

1. Introduction

The global financial crisis has had a major impact on financial markets, being considered at that time the most severe economic and financial meltdown since the Great Depression. It was followed by the Covid-19 pandemic, *"*a crisis like no other" (IMF, 2020), surpassing by its downturn the global financial crisis. At the centre of these crises, central banks were the main pillar of support, from the perspective of

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measures to temper tensions and mitigate negative effects. They responded in significant and innovative ways. As standard monetary policy instruments were limited to face these “exceptional times, exceptional measures were needed” (Lenza et al., 2010). And these measures were represented by a set of unconventional monetary instruments, which have become the new normal for reducing the negative effects of economic and financial turmoil.

The Covid-19 pandemic worked the other way that the global financial crisis did, i.e., the isolation measures firstly affected the real economy, and subsequently, the financial sector (BIS, 2020). Against this background, central banks acted differently this time, being focused primarily to cushion the contraction of the real economy, and later to stabilize financial markets. Lessons learned by central banks during the 2007-2009 period facilitated rapid market intervention, so as their response was swift and unprecedented.

At the beginning of the pandemic, central banks from developed countries aimed to prevent the transformation of the economic downturn into a financial crisis, intervening by purchasing assets and providing liquidity under favourable conditions to the banking system (Cavallino and De Fiore, 2020). As the incomes of the population and companies began to fall, the objective of the central banks was to cushion the contraction of economic activity, aiming to facilitate the granting of credits to the private sector. Interest rates were cut in less than a month, much faster than during the global financial crisis, by the Federal Reserve (Fed), the Bank of Canada and the Bank of England. While the European Central Bank (ECB) and the Bank of Japan no longer had this monetary policy tool, given that the interest rate was already close to zero, they committed to ensure favourable financing conditions, to provide liquidity and new credit facilities to the financial system (Niţoi et al., 2022). Also, as the need for liquidity in foreign currency increased, the ECB and the Fed concluded currency swap agreements with other central banks, in order to avoid increasing financial instability at the international level.

The response of the monetary authorities from emerging economies to the Covid-19 pandemic also differed from previous crisis. According to Aguilar and Cantú (2020), it was determined by the cyclical position of the emerging economies in the period preceding the pandemic. They were in the downswing of the business cycle, along with positive inflation gaps, unlike the 2007-2009 period, when most of them were in the expansionary phase. While their cyclical position opened space for monetary policy easing, significant improvements in the inflation control during the past two decades improved the anchoring of inflation expectations (Yetman, 2020). This group of countries implemented domestic lending operations and funding facilities to reduce liquidity risks. Moreover, some central banks started unprecedented asset purchase programmes of long-term government securities in the secondary market. Central and Eastern Europe (CEE), like major developed economies, initiated the first measures to counter the negative effects of the pandemic on the economy in March 2020. All of them reduced the key interest rate and injected liquidity through open market operations in order to support lending to the real economy. However, the magnitude of these measures was different depending on their economic and financial systems’ peculiarities. Moreover, not all of them initiated purchases of assets or new lending facilities.

Considering the specific of the Covid-19 pandemic crisis, but also the differences in monetary policy instruments used, this article has two aims. The first objective is to analyse the CEE central banks’ unconventional monetary measures

adopted during the pandemic crisis. We chose to analyze the four major central and eastern European countries that are non-euro area EU Member States, i.e., the Czech Republic, Hungary, Poland, and Romania. The second aim is to unveil the main particularities of the unconventional monetary decisions taken by these states.

The paper unfolds as follows. The second section provides a brief overview of relevant literature on unconventional monetary measures adopted during the pandemic crisis by different group of economies, the third section outlines the methodology employed to pursue the research, the fourth section provide the results of the study, and the last section presents the main conclusions.

2. Literature review

The global financial crisis highlighted the limitations of standard monetary instruments to contain the financial turmoil and stabilise the economy. According to Fawley and Neely (2013), these limitations come from the decisions taken by individuals, if they choose to hold cash over a bank deposit, reference interest rates cannot fall (much) below zero. Moreover, while policy rates approached the zero bound during the 2008-2009 period in major developed countries (United States, United Kingdom, Japan, and the euro area), their central banks had to be more inventive for stabilizing financial conditions and supporting aggregate demand. They started a series of less conventional instruments, including the purchases of government bonds with long-term maturities in order to reduce the long-term interest rate, broad liquidity provision to financial institutions, and direct and specific interventions on key credit markets (Klyuev et al., 2009). All these instruments, known as quantitative easing (QE) policies, determined the increase of the monetary base and the improvement in credit conditions. Also, forward guidance became one of the main tools to maintain well anchored inflation expectations during the global financial crisis. Although history shows that the use of QE policies preceded the global financial crisis, specifically, the central bank of Japan being among the first central banks to use quantitative monetary policy, the 2008-2009 period established the use on a broad scale of unconventional monetary policies.

Consequently, QE programmes have spurred an important body of research, investigating either the efficacy of unconventional tools and their impact on the financial markets, or the differences between the set of tools used by major central banks.

The most prominent studies analyze the efficacy of QE programs deployed by the Fed during the 2008-2009 period (Gagnon et al., 2011; Neely, 2012; Neely, 2015; Hesse, 2018; Swanson, 2020 etc.), or by the other major central banks, as ECB (Altavilla et al., 2015; Andrade et al., 2016; Bernoth et al., 2016; Bulligan et al., 2018;) or the Bank of England (Joyce et al., 2011). According to Gagnon et al. (2011) and Neely (2012), larges-scale asset purchases have determined a reduction in long-term yields in the US.

Given that the response of major central banks to the exceptional events differed both in the specifics of the measures adopted and, in their rhetoric, substantial research was conducted on the differences and common features of these measures (Klyuev et al., 2009; Trichet, 2009; Lenza et al., 2010; Fawley and Neely, 2013), etc. According to Lenza et al. (2010), the main differences between the unconventional tools used by the ECB, Fed and the Bank of England, during the global financial crisis, came from a different operational framework for implementing monetary policy

and a different structure of the financial systems in their countries. For instance, considering the major role of banks in financing the euro area economy, the ECB chose to extend its credit facilities to the banking system during the global financial turmoil rather than to other counterparties as the Fed. Moreover, the extent to which the ECB balance sheet have risen differed from other major banks, i.e., the Fed or the Bank of England.

The peculiarities of the Covid-19 crisis determined central banks to act faster and larger than they did during the global financial crisis, leading to unprecedented increase in central banks' balance sheet. Massive asset purchases aimed at mitigating the most negative feedback loops between financial markets and the real economy. The monetary response of central banks, from both developed and emerging economies, and their effectiveness were largely discussed by Beckmann et al. (2020), Cavallino and De Fiore (2020), Aguilar and Cantú (2020), Arslan, et al. (2020), Occhino (2020), Richard et al (2021) etc. Beckmann et al. (2020) analysed the effects of asset purchases in the euro area and concluded that QE is particularly effective during times of significant financial stress, losing its impact over time. According to Richard et al (2021), the policy response of Fed was decisive, it provided crucial support to the economy during the pandemic, by launching within weeks a series of innovative facilities to support the flow of credit to households and businesses. In emerging economies, asset purchases helped cushion the impact of portfolio outflows on local currency sovereign bond markets (Aguilar and Cantú, 2020). Moreover, they departed from their monetary policy playbook and cut rates even in the condition of currency depreciations and capital outflows. In addition, some central banks started unprecedented asset purchase programmes of long-term government securities in the secondary market, preventing fire sale spirals in emerging markets (Arslan, 2020).

Despite this profusion of research, there has been little attempt to describe and compare unconventional monetary policies across CEE central banks during the Covid-19 crisis. This article fills this gap by describing and comparing non-standard monetary tools in the Czech Republic, Hungary, Poland, and Romania. However, this article does not investigate the effectiveness of these instruments on the financial markets and the real economy.

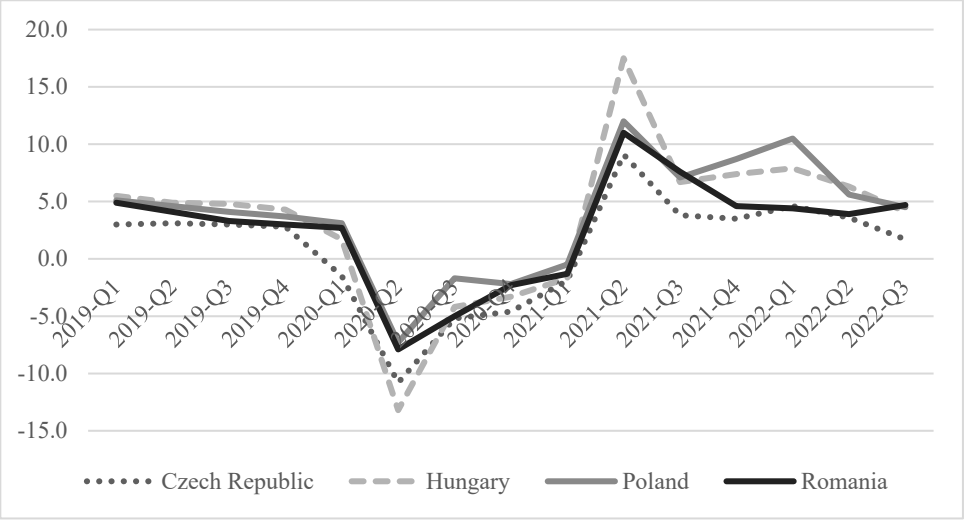
3. Methodology and data

The methodology employed to achieve the aims of the article consists in a chronological analysis of the main non-standard monetary measures in the Czech Republic, Hungary, Poland, and Romania, adopted between March 2020 - May 2021, along with the analysis of two important monetary policy indicators, i.e., the key interest rate and the central banks' assets, during the 2020-2022 period. The information on the unconventional monetary decisions was gathered from the official database of the Bank for International Settlements (BIS). According to the BIS database (2021), between March 2020 - May 2021, the Czech National Bank adopted six monetary policy decisions to counteract the negative effects of the Covid-19 crisis, the National Bank of Hungary adopted 28 monetary policy decisions, while the National Bank of Poland and the National Bank of Romania taken each 9 monetary policy decisions. The data for key interest rate was extracted from the official database of the BIS, while the central banks' assets were retrieved from the official databases of the central banks from the Czech Republic, Hungary, Poland, and Romania.

4. Results and discussion

The major countries from CEE, i.e., the Czech Republic, Hungary, Poland, and Romania, were severely affected by the pandemic and experienced almost similar declines in 2020. All recorded a drop in GDP for four consecutive quarters, except for the Czech Republic, which experienced an economic contraction starting from the first quarter of 2020 (Figure 1). The biggest GDP contractions took place in the second quarter, in all states, with Hungary being the most affected by the pandemic event. The Hungarian economy recorded a decrease of -13.2%, followed by the Czech Republic, Romania and Poland, whose GDP contracted by -10.8%, -7.9% and -7.3%, respectively.

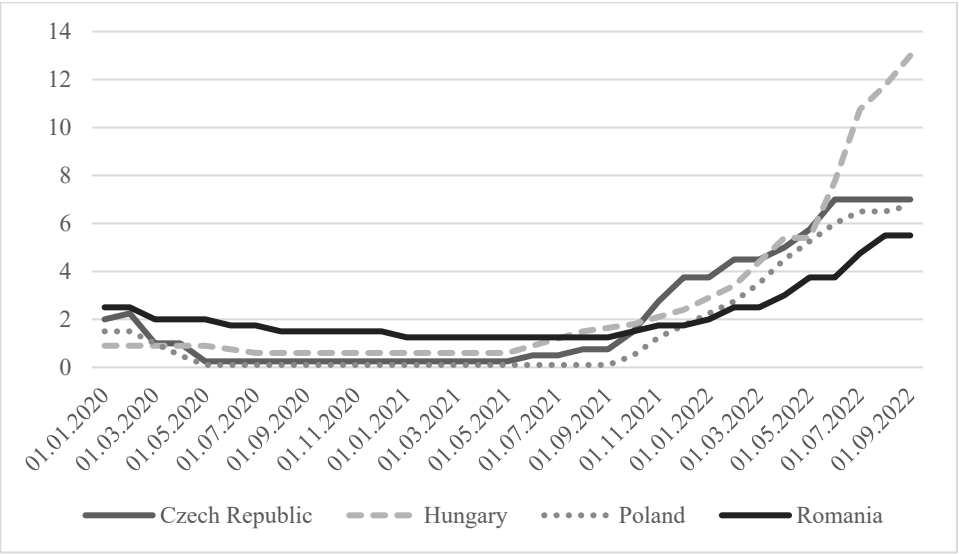
Figure 1: GDP growth rate in the Czech Republic, Hungary, Poland, Romania, during the 2019-2022 period (in %)



Source: author's representation based on Eurostat data (2022).

Against this background, central banks from CEE adopted a series of unconventional monetary policy decisions aimed at mitigating the economic and social effects of the pandemic. Thus, in March, the National Bank of the Czech Republic cut the reference rate twice, by 50 basis points and by 75 basis points, respectively (Figure 2). At the same time, the National Bank of Poland cut, for the first time since 2015, the interest rate by 50 basis points, decreased the required reserve ratio for banks by 300 basis points, initiated the injection of liquidity through repo operations and the purchase of government bonds on the secondary market. The National Bank of Romania reduced the interest rate by 50 basis points, lowered the interest on the credit facility, and initiated, for the first time, the purchase of government bonds on the secondary market (Clichici et al., 2020a).

Figure 2: Monetary policy interest rate in the Czech Republic, Hungary, Poland, Romania, during the 2020-2022 period (in %)



Source: author's representation based on BIS data (2022).

Only the National Bank of Hungary hesitated to cut the interest rate at the beginning of the pandemic, opting for this step only in June. Instead, it introduced a new instrument of unlimited bank lending at a fixed interest rate and postponed the application of the minimum reserve requirements, in order to make available financial resources and facilitate lending to the economy.

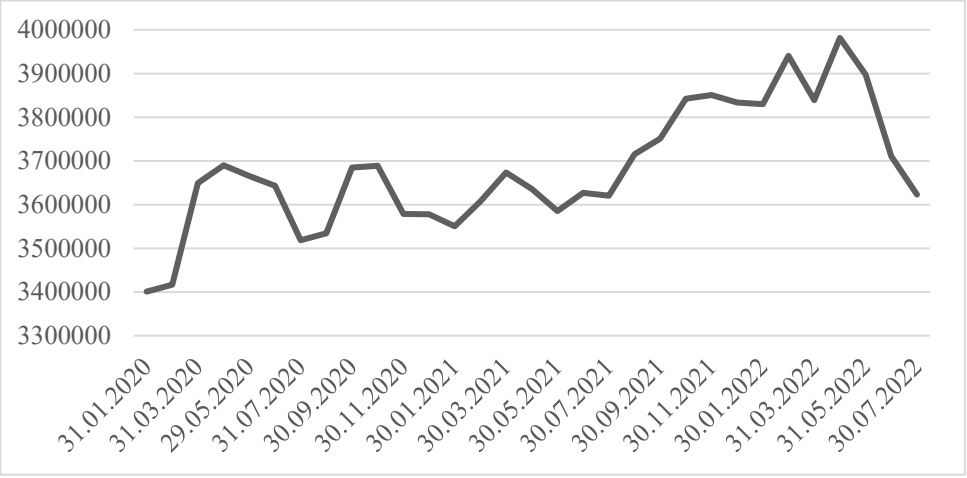
At the same time, CEE central banks recorded different growth rates of balance sheets during the pandemic, the highest growth being observed in Hungary and Poland, by 64.3% and 40%, respectively, while Romania and the Czech Republic used asset purchases to a significantly lesser extent. Thus, the assets of the National Bank of Romania increased by only 19% in 2020, while those of the Czech National Bank registered a marginal increase of only 4.9% compared to the previous year (Clichici et al., 2020b).

4.1. The unconventional monetary policy adopted by the Czech National Bank

Starting from March 12, 2020, the government of the Czech Republic declared a state of emergency in the context of the new coronavirus, which was later extended until May 17, 2020. During this period, a series of measures were taken to limit infections. In this context, aiming to mitigate the economic and social effects of the pandemic, in March the Czech National Bank cut interest rates by 125 basis points and initiated liquidity-providing repo operations three times a week. In addition, given the high uncertainty regarding the economic evolution, it advised banks to refrain from paying dividends or any other measures that could endanger the resilience of the banking system, until the consequences of the pandemic

disappear. In the same month, the assets of the central bank of the Czech Republic experienced a rate growth of 6.8% compared to the previous month, reaching the value of 3,649 billion Czech crowns (Figure 3).

Figure 3: Total assets of the Czech National Bank, during the 2020-2022 period (in millions of Czech crowns)



Source: author's representation based on the Czech National Bank data (2022).

Considering the economic decline recorded in the second quarter, of -10.8%, the monetary authorities decided in May 2020 to extend the maturity of repo operations to three months and the range of collateral eligible for them, cutting the interest rate with 75 basis points (Table 1).

Table 1: Monetary policy measures adopted by the National Bank of the Czech Republic, between March 2020 - May 2021

Month of adoption of the measure	Monetary policy measures
March 2020	• cut the key interest rate twice in March, by 50 basis points, and by 75 basis points, respectively, on March 16 and March 23; • stated that it is ready to react to any excessive fluctuations in the koruna exchange rate using its instruments on March 16; • initiated liquidity-providing repo operations three times a week at a fixed rate on March 16.
May 2020	• extended the maturity of repo operations to three months, the range of eligible guarantees, including mortgage bonds, and the list of entities that can have access to these operations (insurance companies, pension management companies and management companies licensed by the CNB) on April 7.

Month of adoption of the measure	Monetary policy measures
	• cut the key interest rate by 75 basis points on May 7.
May 2021	• decided to end the provision of liquidity through repo operations at three months, on May 6.

Source: author's representation based on the BIS data base (2021).

In order to maintain the stability of the financial sector, an amendment was made to the Law on the National Bank of the Czech Republic (CNB, 2020). It allowed the central bank to conduct open market operations without limits on the instruments used, maturities and market participants. A similar amendment was adopted in March 2021 (CNB, 2021), which expanded the range of open market operations carried out by the central bank, providing the possibility to execute operations with other financial market instruments and with all financial market participants. In the context in which credit institutions were no longer facing a liquidity deficit, in May 2021 the decision was taken to end repo operations at three months.

As the negative effects of the pandemic eased and the Czech Republic posted a spectacular second-quarter GDP growth of 9.1%, measures to withdraw monetary stimulus were initiated. Monetary conditions have been tightened since June 2021, when the benchmark interest rate was first raised by 25 basis points.

In conclusion, the Czech National Bank used a narrow range of monetary instruments to cushion the economic downturn, mostly limiting itself to reducing the reference interest rate and injecting liquidity through open market operations. Its balance sheet experienced the lowest growth rate among the states in central and eastern Europe during the pandemic, at only 4.9%, given the fact that the Czech National Bank did not initiate any asset purchase program.

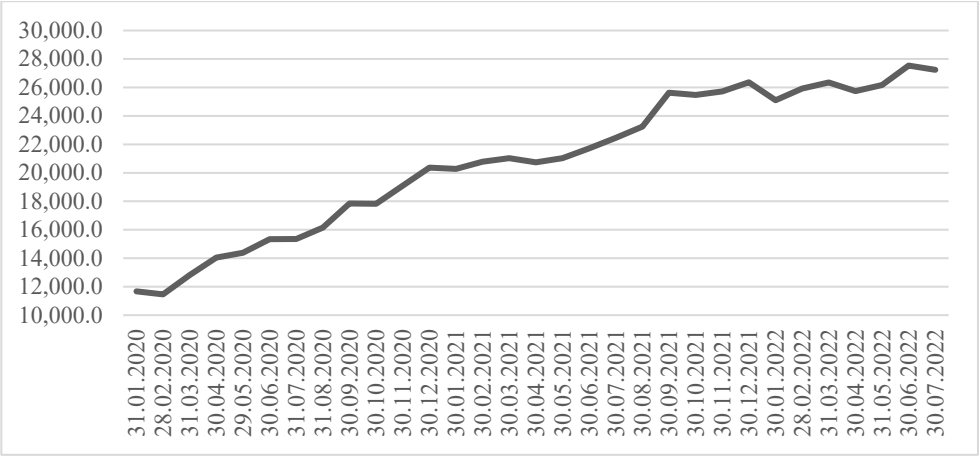
4.2. The unconventional monetary policy adopted by the National Bank of Hungary

The Hungarian government declared a state of emergency on 11 March 2020 and adopted the implementation of various containment measures. Consequently, in March and April 2020, the National Bank of Hungary took a series of decisions aimed at facilitating lending to the real economy by providing consistent liquidity to the banking system. It launched a new unlimited long-term credit facility and exempted banks from complying with reserve requirements. It also launched a new lending program aimed at stimulating the financing of SMEs, worth 2.5 trillion forints. In addition, it initiated daily one-week forint currency swap auctions to maintain adequate liquidity in the banking sector. As a result, in March, the total stock of central bank swap operations increased to 2.2 trillion forints (BIS, 2021).

Moreover, the central bank relaunched in April 2020 two bond purchase schemes previously adopted in 2018 and 2019, i.e., the *Mortgage Bond Purchase Programme*, to improve the provision of long-term funding to the banking sector, and the *Bond Funding for Growth Scheme*, to boost the development of Hungary's

corporate bond market. These decisions led to the growth of the assets of the National Bank of Hungary in March and April by 11.8% and 9.6%, respectively (Figure 4).

Figure 4: Total assets of the National Bank of Hungary, during the 2020-2022 period (in billions of Hungarian forints)



Source: author's representation based on National Bank of Hungary data (2022).

In addition, the monetary authority launched the *Government Security Purchase Program* on the secondary market, meant to maintain the liquidity of the government securities market. The most important monetary policy measures adopted by the National Bank of Hungary to overcome the pandemic crisis are presented in Table 2.

Table 2: Monetary policy measures adopted by the National Bank of Hungary, between March 2020 - May 2021

Month of adoption of the measure	Monetary policy measures
March 2020	• expanded the range of eligible guarantees for corporate loans; • exempted banks from complying with reserve requirements by suspending the sanctions on reserve deficiency; • initiated currency swap operations, to provide liquidity in forints; • launched the *Long-term Lending Facility*, with maturities of three, six and twelve months and three and five years, at a fixed interest rate.
April 2020	• launched the *One-week Deposit Facility*; • increased the interest rate on the credit facility by 95 basis points, and left the interest rate on the deposit facility to fluctuate depending on the liquidity situation on the market; • initiated the purchase of government bonds on the secondary market through the *Government Security Purchase Program*, in order to maintain a stable level of liquidity on the government securities market;

Month of adoption of the measure	Monetary policy measures
	• relaunched the *Mortgage Bond Purchase Program*; • launched the lending program aimed at stimulating SME financing, *Funding for Growth Scheme Go!*, worth 2.5 trillion forints; • relaunched the corporate bond purchases through the *Bond Funding for Growth Scheme*, increasing the ceiling to 450 billion forints and the maturity limit of bonds issued under the scheme from 10 years to 20 years; • gave the access of public mutual funds to the *Long-term Lending Facility* and the *Bond Funding for Growth Scheme*.
June 2020	• cut the key interest rate by 15 basis points.
July 2020	• relaxed the requirements for loans granted under the *Funding for Growth Scheme Go!* program, allowing the use of loans for investments abroad; • cut the key interest rate by 15 basis points; • the ECB and the National Bank of Hungary signed a repo line arrangement to provide 4 billion of euro liquidity to Hungarian financial institutions.
August 2020	• increased the value of weekly purchases of government bonds, from 15 billion forints to 40 billion forints, in order to expand the maturity structure of the public debt.
September 2020	• ended tenders with maturities of three, six and twelve months under the *Long-term Lending Facility* and ended public mutual funds' access to this facility; • restored the penalties related to the formation of the minimum required reserves; • reduced the remuneration of on the portion above the reserve requirement on reserve accounts, setting the interest rate related to this surplus at the overnight deposit rate; • initiated the currency swap facility, to provide foreign currency liquidity; • raised the value of the *Bond Funding for Growth Scheme* program to 750 billion forints;
October 2020	• the list of assets available under the *Government Security Purchase Program* was expanded.
November 2020	• increased the value of the *Funding for Growth Scheme Go!* by 1,000 billion forints.
December 2020	• announced the organization of currency swap auctions, to provide liquidity in euros.
January 2021	• increased the value of the *Bond Funding for Growth Scheme*, from 750 billion forints to 1,150 billion forints; • expanded the purchases of government securities, by including those with maturities of less than 10 years, thus ensuring continuous liquidity on the government securities market on the middle segment of the yield curve.
March 2021	• announced the organization of currency swap auctions, to provide liquidity in euros; • announced that it is ready to make purchases under the *Government Security Purchase Program* flexibly, without limits on individual series of securities.

Source: author's representation based on BIS data (2021).

Starting from the second quarter of 2021, Hungary's economy recovered strongly, reaching a growth rate of 17.5% compared to the previous quarter. Against this background, the central bank took steps towards the normalization of monetary policy. In June 2021, the monetary policy rate increased by 30 basis points, with further increases in the following months.

In conclusion, the National Bank of Hungary succeeded in supporting lending to the real economy, ensuring an adequate level of banking sector liquidity, and maintaining a stable level of liquidity on the government securities market. Moreover, foreign exchange swap lines were widely used to cover the liquidity requirement in forints, euros, and other currencies. Unlike the Czech Republic, due to extensive asset purchase programs, Hungary's central bank's balance sheet grew significantly in 2020, by 64%.

4.3. The unconventional monetary policy adopted by the National Bank of Poland

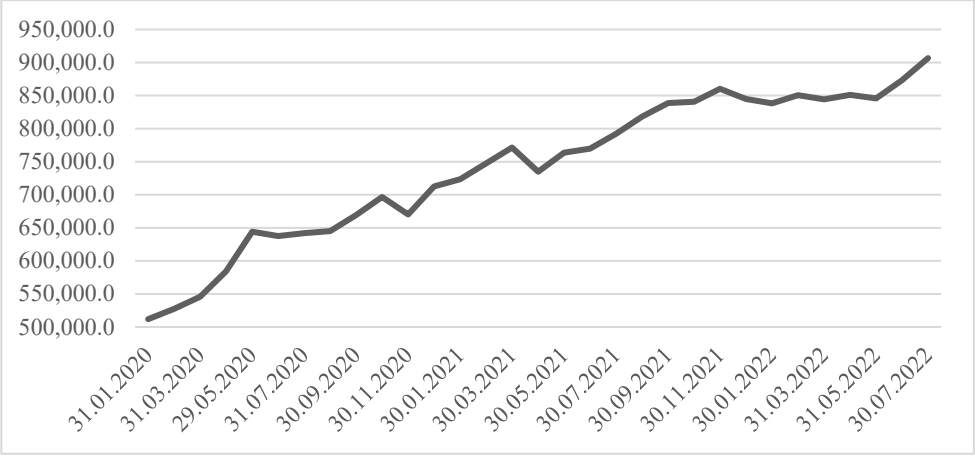
On 20 March 2020, the Minister of Health of Poland announced a state of epidemic threat in Poland, with containment measures imposed, including the closure of schools, universities, restaurants, and all non-essential retail outlets, as well as border controls and travel restrictions. Consequently, Poland recorded a substantial economic decline in the first quarter of 2020, of -7.3%.

In order to counteract the negative effects of the epidemiological situation on the economy, the National Bank of Poland took a series of decisions. Most of them were taken in the March meeting, it reduced the reference rate by 50 basis points and the minimum reserve requirement ratio for banks by 300 basis points, injected liquidity through repo operations and launched the government bonds purchases program on the secondary market. Through the large-scale purchase of government bonds as part of structural open market operations, the central bank aimed to change the long-term structure of liquidity in the banking sector, maintain liquidity in the secondary market for these securities and increase the impact of interest rate cuts on the economy real. Purchases of government bonds on the secondary market determined the growth of the central bank's assets in April and May 2020, by 7.1% and 10.3%, respectively. Under these conditions, the central bank's balance sheet grew by 40% in 2020 (Figure 5).

Also, to ensure accommodative financial conditions, the National Bank of Poland made three cuts in the monetary policy rate in 2020, namely in the March, April, and May meetings. The most important monetary policy decisions are presented in Table 3.

Unlike the central banks of the Czech Republic and Hungary, the National Bank of Poland adopted a relatively low number of decisions in the pandemic, focusing on purchases of government securities, reduction of the reference rate and repo operations, to supply liquidity of banks.

Figure 5: Total assets of the National Bank of Poland, during the 2020-2022 period (in millions of Polish zlotys)



Source: author's representation based on National Bank of Poland data (2022).

Table 3: Monetary policy measures adopted by the National Bank of Poland, between March 2020 - May 2021

Month of adoption of the measure	Monetary policy measures
March 2020	• initiated repo operations to supply banks with liquidity; • initiated the large-scale purchase of treasury bonds on the secondary market as part of structural open market operations; • cut the key interest rate by 50 basis points; • cut the minimum reserve requirement ratio of credit institutions by 300 basis points; • increased the remuneration of the required reserves from 0.5% to the level of the reference rate.
April 2020	• decided that it will purchase government securities and government-guaranteed debt securities on the secondary market, as part of structural operations; • cut the key interest rate by 50 basis points; • decided that it will offer discount loans, aimed at refinancing loans granted to businesses by banks.
May 2020	• cut the key interest rate by 40 basis points.

Source: author's representation based on BIS data base (2021).

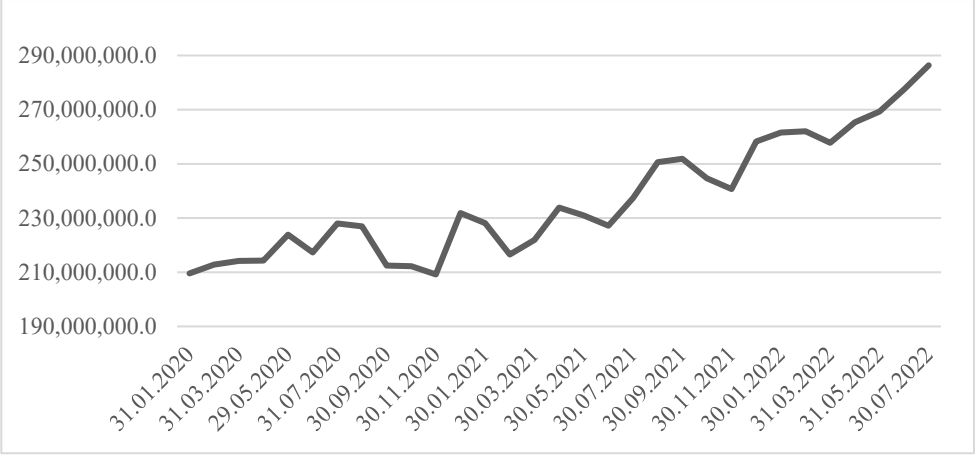
4.4. The unconventional monetary policy adopted by the National Bank of Romania

On March 16, 2020, the President of Romania signed the decree regarding the establishment of a state of emergency on the territory of Romania, with social distancing measures in place, including the closure of schools and entertainment activities, as well as travel and movement restrictions within the country. These restrictions have caused the economy to contract for four consecutive quarters, with the most severe drop recorded in March, by 7.9%.

In order to cushion the collapse of the economy, the first measures taken during the March meeting by the National Bank of Romania (NBR) aimed at reducing the reference rate by 50 basis points, initiating repo operations to supply banks with liquidity and initiating for the first-time purchases of state securities denominated in Romanian lei on the secondary market. This was followed by two further increases in the key interest rate in May and August by 25 basis points, but also in the minimum reserve requirements ratio for credit institutions' foreign currency liabilities by 100 basis points in November 2020. Also, to stabilize the foreign exchange market and to be able to have access to liquidity in euros, the NBR concluded a currency swap agreement with the ECB, in June 2020, in the amount of 4.5 billion euros.

The NBR's balance sheet grew the most in May, July, September, and December. December 2020 was the most productive in terms of purchases of government securities, increasing the NBR's assets by 10.8% compared to the previous month. The total value of the balance sheet in 2020 reached the level of 231 billion Romanian lei, increasing by 19% compared to the previous year (Figure 6).

Figure 6: Total assets of the National Bank of Romania, during the 2020-2022 period (in thousands of Romanian lei)



Source: author's representation based on National Bank of Romania data (2022).

Starting from March, the NBR injected monthly liquidity into the banking system, with the highest daily average value of the stock of repo operations reaching the level of 13,620.3 million lei, in April 2020, while the lowest average value was

observed in September, by 839.3 million lei (NBR, 2020). Through the adopted measures, the central bank of Romania sought to strengthen the structural liquidity in the banking system, ensure the proper functioning of the money market and contribute to better financing of the real economy and the public sector. Table 4 presents the most important measures adopted by the NBR during the pandemic, i.e., nine official decisions.

Table 4: Monetary policy measures adopted by the National Bank of Romania, between March 2020 - May 2021

Month of adoption of the measure	Monetary policy measures
March 2020	• cut the key interest rate by 50 basis points; • decided to provide liquidity to credit institutions through repo transactions, in order to ensure the smooth functioning of the money market; • initiated, for the first time, the purchases of government securities denominated in Romanian lei on the secondary market, in order to consolidate structural liquidity in the banking system.
May 2020	• cut the key interest rate by 25 basis points and the interest rate on the deposit facility and the lending facility by 25 basis points.
June 2020	• concluded a currency swap agreement with the ECB, through which it will benefit from liquidity in euros in the amount of 4.5 billion until the end of the year.
August 2020	• cut the key interest rate by 25 basis points, the deposit facility rate by 25 basis points and the lending facility rate by 25 basis points; • the ECB and the National Bank of Romania agreed to extend the agreement to provide liquidity in euros, through a repo line, until June 2021.
November 2020	• cut the minimum reserve requirement ratio on foreign currency-denominated liabilities of credit institutions by 100 basis points.
January 2021	• cut the key interest rate by 25 basis points.

Source: author's representation based on BIS data base (2021).

In conclusion, in the fight against the negative effects of the pandemic, the NBR mainly relied on repo operations, to supply banks with liquidity, and on the reduction of the reference interest rate, to ensure favourable financial conditions. Also, the NBR initiated purchases of government securities denominated in Romanian lei on the secondary market for the first time. The decisions taken promptly by the central bank contributed to the recovery of the Romanian economy, starting from the second quarter of 2021, with an 11% increase compared to the previous quarter.

5. Conclusions

The article pursued two objectives, firstly, to analyse the CEE central banks' non-conventional monetary measures adopted during the Covid-19 crisis, i.e., from the Czech Republic, Hungary, Poland, and Romania, and, secondly, to unveil the

specifics of monetary instruments used by these countries during this period. The main conclusions that emerge from this analysis are presented below.

The Czech National Bank has used a quite narrow range of monetary instruments to cushion the economic downturn, mostly limiting itself to reducing the monetary policy rate and injecting liquidity through open market operations. Its balance sheet experienced the lowest growth rate among the states in CEE during the pandemic, at only 4.9%, given the fact that the monetary authority did not initiate any asset purchase program.

Hungary used a wider set of measures than the Czech Republic, specifically, launched a series of new lending facilities, a government bonds purchase programme on the secondary market and relaunched corporate bonds purchase programmes. Moreover, it widely used foreign exchange swap lines to cover the liquidity demand in forints, euros, and other currencies. Thanks to extensive asset purchase programs, Hungary saw the largest increase in its central bank balance sheet among CEE states, at 64%.

Poland adopted a relatively low number of monetary decisions during the pandemic, focusing on the purchase of government securities, the reduction of the reference rate and on repo operations to supply banks with liquidity. Under these conditions, the central bank's balance sheet grew by 40% in 2020.

Romania mainly opted for repo operations, supplying banks with liquidity, and reducing the reference interest rate, in order to ensure favourable financial conditions. It also initiated purchases of government securities denominated in Romanian lei on the secondary market for the first time. Consequently, the NBR's assets increased by 19% in 2020.

This article definitely has limitations, it focuses only on the analysis of the unconventional monetary policy decisions taken by the central banks from the Czech Republic, Hungary, Poland and Romania between March 2020 - May 2021 and present the main differences between their set of tools. The paper does not investigate the effectiveness of this instruments on the financial markets and the real economy, which could become a target of further research.

References

Aguilar, A., Cantú, A. (2020) Monetary policy response in emerging markets: why was it different this time? *BIS Bulletin* No. 32 November

Altavilla, C., Carboni, G., Motto, R. (2015) Asset Purchase Programmes and Financial Markets: Evidence from the Euro Area, *ECB Working Paper* No. 1864

Andrade P., Breckenfelder, J., De Fiore, F., Karadi, P., Tristani, O. (2016) The ECB´s asset purchase programme: An early assessment, ECB Working Paper No. 1956

Arslan, Y, Drehmann, M., Hofmann, B. (2020) Central bank bond purchases in emerging market economies, *BIS Bulletin* No. 20 June

Beckmann, J., Fiedler, S., Gern, K.-J., Kooths, S., Quast, J. Wolters, M. (2020) The ECB Asset Purchase Programmes: Effectiveness, Risks, Alternatives, Study for the Committee on Economic and Monetary Affairs, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg

BIS (2020) A global sudden stop, Chapter I and Chapter 2, *Annual Economic Report* 2020 June

BIS (2021) A global database on central banks' monetary responses to Covid-19, *BIS Working Papers* No 934

Breedon, F., Chadha, J. S., Waters, A. (2012) The Financial Market Impact of UK Quantitative Easing, *SSRN Electronic Journal*

Bulligan, G., Delle Monache, D. (2018) Financial markets effects of ECB unconventional monetary policy announcements, *Bank of Italy Occasional Paper* No. 424

Cavallino, F, De Fiore, F. (2020) Central banks' response to Covid-19 in advanced economies, *BIS Bulletin* No. 21 June

Clichici, D., Niţoi, M., Pochea, M., Zeldea, C. (2020a) *The evolution of financial markets*, No. 1, February 2020*, Monthly Newsletter*, ISSN 2734 – 6579.

Clichici, D., Niţoi, M., Pochea, M., Zeldea, C. (2020b) *The evolution of financial markets*, No. 2, February 2020, *Monthly Newsletter*, ISSN 2734 – 6579.

CNB – Czech National Bank (2020) Commentary on the passage of the amendment to the Act on the CNB by the Chamber of Deputies. Information accessed at https://www.cnb.cz/en/cnb-news/news/Commentary-on-the-passage-of-the-amendment-to-the-Act-on-the-CNB-by-the-Chamber-of-Deputies/

CNB - Czech National Bank (2021) Act on CNB passed by Chamber of Deputies and forwarded to Senate. Information accessed at https://www.cnb.cz/en/cnb-news/press-releases/Act-on-CNB-passed-by-Chamber-of-Deputies-and-forwarded-to-Senate/

CNB - Czech National Bank (2022) Balance sheet of the Czech National Bank. Database accessed at: https://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_SESTAVY?p_strid=AAAAA&p_sestuid=&p_lang=En

Eurostat (2022) GDP and main components (output, expenditure, and income). Database accessed at: https://ec.europa.eu/eurostat/databrowser/view/NAMQ_10_GDP__custom_4054883/default/table

Fawley, B. W., Neely, C. J. (2013) Four stories of quantitative easing*, Federal Reserve Bank of St. Louis Review*, 95(1), 51-88

Gagnon, J. E., Raskin, M., Remache, J., Sack, B. P. (2010) Large-Scale Asset Purchases by the Federal Reserve: Did They Work? *SSRN Electronic Journal*

Hesse, H., Hofmann, B., Weber, J. (2018) The Macroeconomic Effects of Asset Purchases Revisited, *SSRN Electronic Journal*

IMF (2015) Exceptional Times, Exceptional Action: Opening Remarks for Spring Meetings Press Conference by Kristalina Georgieva, IMF Managing Director Washington, DC, April 15

IMF (2020) The Great Lockdown: Worst Economic Downturn Since the Great Depression, Retrieved from: https://www.imf.org/en/Blogs/Articles/2020/04/14/blog-weo-the-great-lockdown-worst-economic-downturn-since-the-great-depression

Klyuev, V., De Imus, P., Srinivasan, K. (2009) Unconventional choices for unconventional times credit and quantitative easing in advanced economies, *IMF Staff Position Notes,* 2009(027)

Lenza, M., Pill., H., Reichlin, L. (2010) Monetary policy in exceptional times, *ECB Working Paper* No. 1253 October

NBH - National Bank of Hungary (2022) Press release - Magyar Nemzeti Bank. Database accessed at: https://sta.mnb.hu/Reports/powerbi/STA_MSO/MNBmerleg_EN?rs:embed=true

NBP - National Bank of Poland (2022) Balance sheet of Narodowy Bank Polski (monetary approach). Database accessed at: https://www.nbp.pl/homen.aspx?f=/en/statystyka/bilans_nbp_mon/bilans_nbp.html

NBR – National Bank of Romania (2020) *Monthly bulletin*, December 2020, Year XXVIII, nr. 326. Report accessed at: https://www.bnr.ro/PublicationDocuments.aspx?icid=1182

NBR - National Bank of Romania (2022) Monetary financial institutions (MFI) - Monetary balance sheet of the National Bank of Romania. Database accessed at: https://bnr.ro/Raport-statistic-606.aspx

Neely, Ch. (2015). Unconventional monetary policy had large international effects, *Journal of Banking & Finance*, Volume 52, 101-111

Nițoi, M., Clichici, D., Ciocîrlan, C.-O., Radu, Ș.-C., Nastase, A. (2022) Unconventional approaches of central banks in the pandemic crisis. The Financial and Economic Implications in Central and Eastern European States, The study of the IEM research plan for the year 2022

Occhino, F. (2020) Quantitative easing and direct lending in response to the COVID-19 crisis. *Federal Reserve Bank of Cleveland Working Paper,* No. 20-29 October

Richard, H. R., Duygan-Bump, B., Scotti, S. (2021) The COVID19 Crisis and the Federal Reserve's Policy Response, *Finance and Economics Discussion Series 2021-035,* Washington: Board of Governors of the Federal Reserve System

Swanson, E. T. (2021) Measuring the Effects of Federal Reserve Forward Guidance and Asset Purchases on Financial Markets, *Journal of Monetary Economics*, Volume 118, March, 32-53

Yetman, J (2020) Pass-through from short-horizon to long-horizon inflation expectations, and the anchoring of inflation expectations, *BIS Working Papers* no 895 October

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INVESTIGATING STUDENTS' BEHAVIORAL BIASES IN REGARD TO FINANCIAL DECISION-MAKING

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Abstract: The purpose of this paper is to examine the factors influencing the appearance of biases in the behavior of university students. The studied biases are herding behavior, overconfidence, mental accounting, loss-aversion, anchoring and introspection. Three main assumptions were formulated, one regarding the relationship between the biases and financial knowledge, another related to the impact of gender, and the third one presuming a possible explanatory power of the Cognitive Reflection Test results in relation with the heuristics. The findings present evidence regarding the significant influencing power of financial knowledge on the behavior of university students from Cluj-Napoca, suggesting that this aspect could be a possible solution in order to diminish the negative effects of some of the behavioral biases examined. Besides the importance of financial knowledge, the results emphasis the explanatory power of gender when considering the errors of herding, overconfidence, mental accounting and loss-aversion, showing that men tend to be more influenced by these errors. The third assumption proved to be false, indicating that the performance of students at the Cognitive Reflection Test does not have a great impact on the presence of the examined biases.

JEL classification: G00, G40, G41

Keywords: Herding behavior; Overconfidence; Mental accounting; Loss-aversion; Anchoring; Introspection; Financial knowledge

1. Introduction

The effects of different psychological elements on financial behavior of individuals is examined by a relatively new field of study, called Behavioral Finance (Shefrin, 2006).

The emerging science of Behavioral Finance arose as a solution to unexplainable issues between traditional finance theories and real-world finance problems (Branch, 2014). Deviations from rational choices and the urge to find a solution to them, were

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key factors in developing this science. It is believed that the irrational human behavior should be corrected, but in order to do so, an understanding of it and its limitations is needed (Frankfurter et al., 2004). A main difference between the traditional and behavioral approaches, is that behaviorists accept and use elements and ideas of another science, namely psychology, to explain the behavior of investors (De Bondt, 2004). Knowing the investor means knowing the market. Human behavior is reflected in everything we experience on the market. Individuals tend to make systematic errors when making decisions, causing deviations from rationality. The main issue in behavioral finance is to examine why these errors occur (Krishnamurti, 2009).

According to Traditional Finance, investors tend to be fully rational with an unlimited capability to process information. Besides these assumptions, a general market equilibrium is also presumed (Evstigneev et al., 2013). In a world with perfectly rational investors and efficient markets, behavioral finance introduced realism (Kliger, 2014). Almost every financial theory has as a root the assumption that investors are rational. They want to maximize utility and would keep this in mind whenever they act. In fact, with time, the opposite of this assumption has been proved. Individuals are not always rational. They do not always make rational choices, due to the presence of behavioral biases. Wealth can surely be maximized when individuals take rational decisions, but that is not how human nature works (Krishnamurti, 2009). It is said that these behavioral biases, patterns, are unavoidable elements of human behavior, they are somehow "written" in our actions and are difficult to change and overcome (Menkhoff and Nikiforow, 2009).

In order to see why the appearance of behavioral finance was inevitable, we have to understand what traditional finance is based on, what are its main objectives. Traditionalists assumed that our mind works as a computer and has a general problem-solving capacity. It can be thought how to make optimal decisions. Besides this assumption, they also considered emotions to be impedimental when referring to optimal decisions. Feelings, emotions were considered the exact opposite of rationality. Last, but not least, in their opinion, humans have a strain of selfishness in them, always acting to achieve personal gains (Olsen, 2008). Behavioral finance developed another perspective, with the help of psychology, and succeeded in explaining some behavioral patterns that make it impossible for individuals to act rationally. This way, they explained what was until then "unexplainable".

When talking about, and analyzing financial markets, human behavior is an unmissable factor (Van der Sar, 2004). In order to get answers for different anomalies, we have to understand how individuals process information and how they use it in order to make financial decisions (Garcia, 2011). Knowing ourselves, understanding our behavior, could result in the creation of our own individual system of decision-making, enabling us to overcome our behavioral errors and act in an efficient way (Montier, 2010). Behavioral finance does not abandon traditional approaches, on the contrary, it makes possible for them to "survive". With the help of this new science, traditional ways can be reconsidered and placed in a more proper position, in order for them to be applied more constructively (Shiller, 2006). Some elements of standard finance are kept, while others could be replaced with the purpose of providing a behavioral framework for investors (Statman, 2008).

This paper focuses on examining a few of these behavioral patterns, that will be detailed below, namely, herding behavior, overconfidence, introspection bias, anchoring, mental accounting and loss aversion. A survey was conducted on 85 university

students from Cluj-Napoca, taking into consideration whether they have or not, any financial education. The presence of these biases was tested, considering the gender, education level and employment status of the individuals. The initial assumption of the demographic data being significant when talking about cognitive errors, was questioned and in some cases the opposite was proven. In order to test the significance of these factors, a binary regression was run, the whole process being detailed in the methodology section of this paper.

2. Literature review

As briefly mentioned above, traditional theories of finance assume optimal decision-making, rational individuals and efficient markets (van der Sar, 2004). The assumption that people are rational and their expectations are of the same nature, can be further detailed. This rationality supposes that we are able to use all the information available to us and select what is relevant and what can be neglected. This way we could be able to formulate rational expectations and make also rational decisions (Garcia, 2011).

Each and every decision of individuals, according to this traditional view, is in correlation with any other, all having the purpose of maximizing utility. Another assumption of traditionalists states that all available information about the future cash-flows are reflected by the price. This means that every single time a new information gets to the investor, they rethink and reevaluate their expectations, causing this way changes in price (van der Sar, 2004). Investors, in a world ruled by traditional theories, are clever, completely rational, having the only goal to create wealth and market equilibrium (Evstigneev et al., 2013). When information is processed, they apply statistical elements, and apply them always in a correct way. With these theories and rules, a “homo economicus” was created, a rational, convenient, over-simplified version of individuals and human nature, who always acts to achieve greater wealth (Frankfurter et al., 2004).

Traditional view on finance states that for an individual to make good decisions, he/she has to be capable to forecast some variables, to have financial knowledge and to have the ability of processing relevant information (Garcia, 2011). What traditional models do not take in consideration, among other behavioral aspects, is the bad practice of individuals, analyzing every situation and event separately and not trying to find a correlation between them. They do not take in consideration the possibility of a united out-turn. Separate accounts are created in our mind for every event, taking no notice of possible links (van der Sar, 2004).

When the basics of traditional finance were developed, the economy was in an elementary phase, compared to its current state. More plain and uncomplicated rules were enough to explain financial decision-making (Garcia, 2011). Rational investors/individuals are able to make use and evaluate every piece of information that they possess, in order to maximize utility, and they are risk-averse (Matsumoto et al., 2013).

Regarding risk, traditional finance says that every possible outcome and consequence of an event should be examined and carefully analyzed, including risk in a systematic way. The most popular model used for this purpose is the one proposed by Von Neumann and Morgenstern in 1947, called “expected utility model of choice under risk” (van der Sar, 2004).

Various theories of traditional finance exist, having as base some assumptions that do not match with the available scientific evidence. In the opinion of traditionalists, human brain is similar to a computer. It focuses on problem-solving in a most efficient way possible. According to them, risk is perceived as a combination of variance and returns, and rational investors manage to use this information in a way that benefits them the most, without letting their emotions to dictate. In real life, as research shows, this is not attainable (Olsen, 2008). Capital Asset Pricing Model is also a pier of traditional finance, having as a base the assumption that prices are efficient (Shefrin, 2001).

What traditional finance presumed, did not always occur in reality. The theories did not create an accurate picture of how individuals make their decisions. The unexplainable issues led to the creation and manifestation of behavioral finance. (van der Sar, 2004)

Behavioral finance offers an understanding of how individuals process available information and shows how this information is implemented in their decision-making process. What earlier was mentioned, regarding the aim of individuals to use all available information in order to maximize utility, is now questioned and repelled by behavioral studies (Garcia, 2011).

Around the 1980's a behavioral revolution in the field of finance occurred. Existing anomalies, deviations from standard approaches needed an explanation (Shiller, 2006). These studies examine how, and why, the behavior of individuals deviates from rational expectations. They focus not only on the outcome of events and decisions, but also on the process that led to a particular outcome. When analyzing the process of decision-making, behaviorists do it with the help of different psychological elements and aspects (van der Sar, 2004). They acknowledge that people do not always act rationally. They are influenced by a lot of different aspects, all having an impact on how they make their decisions (Ritter, 2003).

What was in the past assumed, when markets and the economy were way more uncomplicated, is now too simple. In order to understand current decisions and events, a multidimensional view is required (Branch, 2014). Behavioral finance studies examine the real behavior of individuals, corporations. They do not assume particular outcomes, rather keep a close watch on what is happening in reality (De Bondt, 2004).

What this new field of study has shown, is the fact that emotions and cognitive errors have a great impact on the decisions of investors. It presents and examines the biases that control us when we make these decisions (Matsumoto et al., 2013). What traditionalists denied and avoided, is the importance of emotions and feelings. They have a significant impact on how people act, regardless if we neglect them or not. Emotions are inevitable components of human nature and their adequate understanding could lead to better decisions.

Knowing ourselves is the first step in overcoming our boundaries (Olsen, 2008). When trying to explain why a particular event occurred or why a decision was not made rationally, behavioral theories and assumptions step in (van der Sar, 2004). Key assumptions of behavioral finance state that people are loss averse; they can be influenced by how problems are framed; in possession of more information, regardless if it is relevant or not, they become overconfident; and they constantly try to ease decision-making (Shefrin, 2001). Regarding the phenomena of framing, we can state that people are influenced by the way a problem or an event is presented to them and react according to this (Ritter, 2003). The framing of information can have a significant impact on the preferences of individuals, while these are pliable and context-specific (Di et al., 2013).

While previously, in case of traditional views, the relevance of more information was emphasized, behavioral studies suggest that more information does not necessarily lead to a better, more rational decision. It is proven by behavioral research, that plus information, even if irrelevant, causes individuals to be overconfident when analyzing a problem or making decisions. When there is too much information available, the studies show, people become confused and perform worse when making financial decisions (Garcia, 2011). What they also try to examine is the amount of irrationality that can be tolerated and if it is possible for rational investors to reestablish the equilibrium on the market (van der Sar, 2004). Until now, they managed to prove that, when the number of irrational investors and decisions becomes considerable, the remaining rational ones are not able to correct them and set back the efficiency and equilibrium (Branch, 2014).

According to the ideas that behavioral finance examines and bolsters up, risk cannot be perceived in a simple way. It is multi-dimensional and a number of influencing factors should be taken into consideration in order to estimate it. Even if risk can be computed in a rational way, emotions will always have an influence on how we perceive it and will not let us act reasonably. In contrast with what was until now assumed, people are not always risk-averse (Shefrin, 2006). Risk cannot be explained only with mathematical formulas. It is more complex than that, involving the attitude of the investor (Statman, 2008).

Behaviorists state that in real life, the CAPM model is not always accurate (Shefrin, 2001). A “behavioral asset pricing model”, BAPM, was developed, where the expected return is a function of many variables, including “social responsibility factor”, “status factor”, etc. (Statman, 2008).

While traditional theories could not explain some anomalies in the behavior of investors, behavioral studies showed that with the help of other sciences we can be able to understand why and how individuals process information and how does that influence the decision-making process (Garcia, 2011).

Behavioral approaches are criticized for their ad hoc nature. After an event occurred, they say it is not hard to name the bias that influenced investors behavior. Predicting which one will be influential in a future event, on the other hand, is not that simple (Ritter, 2003) Another aspect that raised questions about behavioral approaches is the lack of a model that could replace the traditional one (Branch, 2014).

Despite the fact that many studies in the field of behavioral finance were conducted, solutions for different anomalies proposed, behavioral finance should not and cannot be separated from traditional finance. It was not developed to disagree or run against traditional approaches. It appeared in order to complete and upgrade it (van der Sar, 2004).

2.1. Heuristics and biases

When individuals face difficult problems, controversary thoughts, they instinctively try to simplify the situation, by searching for shortcuts, timesaving methods. These are the so-called heuristics and biases. In these cases, people do not act rationally. They trust the information that is plainer and understandable, trying to connect what they hear/see to something that they already know. Coming from our human nature, we tend to assign more relevance to information that confirms our views and acquired knowledge, and ignore those that contradict them (Garcia, 2011). In these

situations, that require a great amount of thinking and analyzing, heuristics, or the so-called “rules of thumb”, step in to simplify the process (Ritter, 2003). When these controversial thoughts are present, the easing of the decision making can also lead to changes in what we believe is true. The phenomena describing these confusions, is called cognitive dissonance (Garcia, 2011).

Long time ago, when the only purpose of humans was to survive, the instinct of acting quickly was developed. This instinct of finding a quick solution did not disappear with time. Even if today we do not face the same dangers and we have time to think rationally and more detailed, we tend not to do so (Evstigneev et al., 2013). If we could understand how we act, what are our limitations, we could be able to understand also the forces that influence our behavior (Statman, 2014).

Among the behavioral errors and psychological elements that influence our decisions and cause deviations from rationality, we can enumerate herding behavior, mental accounting, loss-aversion, overconfidence, anchoring and introspection bias (Algalith, 2012).

As mentioned above, this paper focuses on examining the presence of the enumerated biases. Alongside with other influencing factors, namely, financial knowledge, the above-mentioned cognitive errors will be tested and analyzed.

Herding behavior

As the results of many experiments show, individuals, even if they are almost sure of something, or possess relevant information and evidence, tend to act irrationally, changing, or completely neglecting their views, just to adapt to the opinion of the crowd. An experiment that clearly reflects this idea was conducted, where individuals had to estimate the length of different lines. When their answers did not match with what others estimated, the majority of the subjects changed their numbers to adapt (Garcia, 2011). Even if useful information is in our possession, the majority of us follows the crowd, in order to avoid the feeling of missing out (Menkhoff and Nikiforow, 2009).

Another behavioral bias, closely related to herding, is excessive, unexplainable loyalty. This phenomenon is often present in groups. A further and more severe form of herding is the phenomenon of groupthink (Morck, 2008). Individuals often tend to neglect their own forecasts, in order to fit into a group (Olsen, 2008).

Herding behavior, groupthink and also the exaggerated loyalty, even if it is hard to understand in this modern era, contributed to the well-being and survival of people throughout history (Morck, 2008).

Mental accounting

When we do not try to find links between the information that we use in order to make decisions and we assign different “parts” of our mind to each of them, another behavioral bias is present, the one, called mental accounting. When this cognitive error dominates, we neglect the fact that problems analyzed together could lead to more optimal decisions (Ritter, 2003).

In case of the acquisition of goods, services, for example, we tend to associate their value with the purchase price, even if it is not appropriate anymore. Until the point that we sell the good, or cannot use it anymore, we assign a mental account for it, where the initial information is stuck (Statman, 2008).

Loss-aversion

Deriving from our human nature, we are terrified of losses. Loss scares individuals, it is perceived way differently than gains, even if it is the same amount (Krishnamurti, 2009). People value losses more than gains. Approximately two and a half times is higher the influence of losses. While, as evidence shows, we are more sensitive to losses, the theory of investors being risk-averse and this driving their actions and attitude, could be questioned. Loss-aversion has greater impact on how we perceive risk (Shefrin, 2001). Due to human nature, reduction of our wealth, well-being, influences more our decisions than the increase of it. Renouncing to something can be far harder to process than acquiring (Benartzi and Thaler, 1993).

Overconfidence

Instinctively, when facing difficult situations, our brain is engaged in finding quick solutions, rather than analyzing the details. One of the heuristics that contributes to finding these shortcuts is overconfidence (Alsabban and Alarfaj, 2020).

When possessing more information, the unambiguous assumption is that it will help us make better decisions and have a clearer view about a particular subject. In real life, often the exact opposite happens. We become more confident with each additional information and in the meantime less precise and accurate. We fall into the trap of the “illusion of knowledge” (Hall et al., 2007). Most people are willing to pay for additional information, even if it is not relevant, with the purpose of boosting their confidence level (Eliaz and Schotter, 2010).

Often, positive past events, gains, inevitably influence us to be overconfident. We stop relying on facts and do not engage our mind in analyzing the situation (Alsabban and Alarfaj, 2020). We tend to follow what we trust to be true and assume that we for sure know it better. This often happens is case of individuals that are experts in a field. This cognitive error makes people feel too optimistic when they should not and they do not use the available information in an efficient way. They tend to reject any help and trust only the ideas of their own. These investors/individuals assign too much importance and correctness to the information they possess (Garcia, 2011). Trusting what we are familiar with and thinking our abilities are superior to others, are the piers of this bias (Ritter, 2003). Those investors that tend to be more confident, usually are less risk-averse (Shefrin, 2001).

Overconfidence is a bias that could be individual or even a common phenomenon within a group of individuals (Garcia, 2011). It has three different levels, namely “illusion of control”, “better-than -average effect” and “miscalibration” (Menkhoff and Nikiforow, 2009).

Anchoring

When investors are indecisive, when they face unpredictability, they decide based on previous, not necessarily useful information, in order to reach to a solution. This destructive habit is called anchoring. It is an initiative to reduce the effort of finding answers and analyzing situations (Matsumoto et al., 2013). As research shows, a possible reason behind under-reaction on the markets, is anchoring. Individuals tend to be too conservative and this is reflected in the decision they make (van der Sar, 2004).

Introspection bias

When talking about and examining the behavior of others, people can observe the presence of biases instantaneously. When they should identify these biases in their own decision-making process, they are in denial (Garcia, 2011). This is the so-called introspection bias. The results of experiments show, that when it comes to success, individuals attribute it to their own abilities. In contrast, when failures are considered, external factors are said to dominate (Alsabban and Alarfaj, 2020).

2.2. Conclusion on heuristics and biases

The aim of behavioral studies is to observe what are the causes of deviations from the rational assumptions, what patterns of behavior influence the investors and how these can be "remedied" (Frankfurter et al., 2004). While these biases can lead us to shortcuts and sometimes are useful when we face difficult problems, they usually influence our decisions in a negative way. Behaviorists suggest that knowing ourselves is a key factor in overcoming bad habits. Maybe it is not part of our human nature to act rationally, but we can minimize the impact of these ruinous habits in order to maximize utility (Krishnamurti, 2009). Even if the biases are identified, these contagious habits are very hard to overcome. These errors require great effort and devotion to be defeated (Menkhoff and Nikiforow, 2009). It is believed that these behavioral biases and psychological aspects contributed to the conformation of different market disasters or crisis (Di et al., 2013). What surely cannot be stated is that all anomalies and mistakes are caused by these bad habits, but they are surely present and influence human behavior (Ritter, 2003). A term exists for the action of reducing the impact of these biases, eliminating or controlling them when decisions are made, called "debiasing" (Shefrin, 2006).

3. Methodology

The usage of questionnaires, interviews, in order to collect information is the simple definition of survey methodology. It requires great attention and planning, from the point we start formulating the questions until the end of the evaluation and presentation of collected data. This method assumes that all subjects process the questions in the same way. If changes, deviations, in answers exist, that is attributed to the difference in opinion or views. What conducting a survey requires from the subject, is to understand the questions and provided answers; to be able to recall information and do it accurately; and most importantly the willingness to do it. Without the willingness of the subject to take the survey, both understanding and ability requirements are useless (DeMarris and Lapan, 2003).

3.1. Planning and purpose

The purpose of this paper is to monitor the presence of six different behavioral biases in the decision-making process of university students from Cluj-Napoca. Both undergraduate and master's degree students were taken into consideration. The majority of articles and papers I have read before constructing my survey, mainly focused on the presence of one or two biases and their analysis. Experiments were

conducted to test excessive loyalty, herding behavior, overconfidence, etc., mostly in case of the behavior of active investors. Some questions from these articles were combined and reformulated in order to inspect the presence of the six chosen cognitive errors in the behavior of university students. The questions will be further detailed in this chapter.

While the field of behavioral finance is relatively new and still in the developing phase, lot of unanswered questions still exist. The reason why I have chosen to include more biases in my study, is to see which one dominates in case of my population, which ones need more attention and effort to overcome. University students were selected, because being a student myself, I consider that our way of thinking has more in common and I can understand better what influences them. This helped me when selecting and reformulating the questions. I took in consideration what I found to be interesting and what I would be willing to spend 10-15 minutes of my time with.

Another reason why students were chosen is that they are still in an early phase of their life-cycle. If behavioral biases are present and dominate their actions, they are easier to overcome and work on, in this earlier phase. They could be able to build habits that offer help in eliminating or at least minimizing the impact of these errors. This is why financial knowledge of individuals is also included in the research. To see whether this has a positive effect on the behavior of students. Positive effect meaning that they are less influenced by these errors when making decisions. If financial knowledge diminishes the impact of these contagious habits, its usage could provide a possible solution.

3.2. Questions included

The questions included in the survey can be divided into three groups. The first group contains those that examine the presence of herding behavior, introspection bias, mental accounting, loss aversion, overconfidence and anchoring. The questions from the second group are related to financial literacy. They serve the purpose of testing if the subjects have any kind of financial knowledge. Last, but not least, the remaining questions compose together the Cognitive Reflection Test (CRT) (Toplak et al., 2011).

Besides these three groups, general questions, demographic data, are also included. These are the gender of the subject, its current level of university education and employment status. I wanted to examine the significance of these demographic data on each of the biases.

The questions from the three above mentioned groups (not including the ones regarding general information about the subject), are mixed up, in order for the individuals not to detect any correlation. The subjects were informed, that they are required to provide quick answers, without hesitating and thinking too much. They were told that the survey examines financial decision-making. Despite the fact that they did not understand why and how some questions examine their behavior in this field, the general feedback was great. They found it interesting and enjoyable.

3.3. Survey data analysis

My research focuses, as above mentioned, on how students from Cluj-Napoca make financial decisions, what biases are present and dominate their decision-making process.

The key research questions include:

- What is the relation between demographic data and the examined biases? Do these demographic data have any significance when examining these cognitive errors?
- Does financial literacy have any impact on the level of influence of the biases?
- Is it true that those individuals that manage to answer correctly to all three questions of Cognitive Reflection Test are less likely to be influenced by these errors?

The three main ideas of which validity is tested in this research paper are formulated below:

H1. Financial literacy is a significant factor influencing the presence of behavioral biases.

Di et al. (2013) found that, the lack of knowledge in a topic, the absence of experience in a field, leads to the habit of procrastination and the urge to find quick, understandable solutions without properly examining in details the given issue. Following these assertions, the first assumption that I made is the one formulated as Hypothesis 1.

H2. Women tend to be less overconfident than men.

As Ritter (2013) concludes in his article, women are less likely to let themselves to be influenced by overconfidence bias. They do not overvalue their abilities and the knowledge that they have, in such a great degree as men. This hypothesis is also tested in our research to examine whether this is true or not in case of university students in Cluj-Napoca.

H3. Those individuals that manage to answer correctly to the CRT questions, are less likely to fall victims of behavioral biases.

In the first part of data analysis, the presence of the six biases will be detailed. Which are the ones that have the greatest influence on the whole sample. In the second part of the analysis, binary probit regressions will be run to see how the presence of the heuristics are explained by the available personal characeristics/ demographic data of the subjects (Menkhoff and Nikiforow, 2009).

For this purpose, and also in the first part the counting to be easier, dummy variables were created for each bias and also for demographic data. If the answer of the subject indicates the presence of the bias, the value taken is 1, otherwise it is 0. In case of gender, the value is 1, if the individual is a man. Also 1 is the value taken in case of undergraduate and employed individuals.

A dummy variable for CRT was also created, it takes the value 1 if the individual managed to answer all 3 questions of the test correctly.

In case of financial literacy, the three big questions of testing it, were included, and surprisingly none of the subjects managed to answer correctly to all of them. This is why I chose to create a dummy that takes the value 1 if the individual answered correctly for at least two questions, and 0 otherwise. The individuals that answered correctly for at least two, were considered having a bit of financial knowledge.

A binary choice model, in our case, binary probit regression, is used in case of categorical variables. The probit model uses the normal distribution of the errors of forecasted probabilities.

I had a dataset of 85 individuals, more precisely, university students, and I gathered data on their financial decision-making, how different behavioral biases affect the way they perceive different problems. These behavioral biases were used as dependent variables, one by one, and demographic data alongside with CRT results and financial literacy were used as explanatory ones.

The regressions were realized starting with considering the coefficient of each explanatory variable and also the constant to be equal with 0. This means that initially I did not assume any predictive power of the variables. In the probit model, the main variable of interest, from which the probabilities are derived, is z-stat. Z-stat is written as the combination of the coefficients and the values of the explanatory variables. Initially it equaled 0. From z-stat I got to the probability of default, by plugging in the z-stat in the standard normal distribution formula. The probability of default I got this way equaled 0.50. In order to optimize the coefficients, to arrive to an optimal value of the parameters, so they would maximize potential explanatory power, the log-likelihood function needed to be maximized. In order to do this, I used the following formula:

$$\log L = \sum_{i=1}^{n} (y_i \log \hat{y}_i + (1 - y_i) \log \hat{y}_i) \quad (1)$$

where: y_i -dependent variable

$\hat{y}_i$ -estimated y_i (estimated probability)

Following this step, the total log-likelihood was calculated, over the 85 students. Then I specified my optimization task in order to reach the best values of my coefficients.

After calculating the coefficients, in order to determinate the standard errors, I had to use a weight matrix. In binary models, this weight matrix is needed to arrive at the covariance matrix results. The covariance matrix was then used to determine the standard errors.

The weighted matrix is a diagonal one, meaning that all values besides the diagonal, are equal to 0. The formula used to calculate the values on the diagonal is the following:

$$W = diag\left(\frac{\varphi^2(\bar{b}\ X)}{\hat{y}_i(1-\hat{y}_i)}\right) \quad (2)$$

where: $\varphi^2(\bar{b}\ X)$ -standard normal distribution function of Z-stat

$\hat{y}_i$ -estimated probability

After having the weight matrix, I was able to create the covariance matrix. This started with the calculation of the transposed matrix of the explanatory variable values and the multiplication of the weight matrix with the explanatory variable values. After calculating these two, the product of them was determined. Last but not least, the inverse of their product or the so-called covariance matrix was created. The formula of the above described process is shown below:

$$V(\hat{b}) = (X^T W X)^{-1} \qquad (3)$$

The values appearing on the diagonal of the covariance matrix were used further, in order to determine standard error. I calculated it as the square root of those particular values. Further, z-stat was determined. It is the ratio between the coefficient and standard error. For the p-value the standard normal distribution of the absolute value of z-stat was used, in the following way:

2*(1-standard normal distribution of the absolute value of z-stat)

After getting the results, I analyzed the magnitude of the coefficients, and their statistical significance.

4. Results

The key questions I wanted to answer with conducting a survey on students, were mentioned above, in the “Methodology” chapter. Many of my general assumptions were cast-off after processing the survey data, because sometimes the exact opposite of them has been proved.

A few general assumptions that I made after reading about the experiments of others, about surveys that were conducted, were that men tend to be more overconfident than women, individuals that have better results at the cognitive reflection test are less influenced by the biases, etc. The results in this chapter will reveal whether these assumptions were proved to be true or not in case of the students that took my survey.

As mentioned before, this study is based on a survey, that addressed university students from Cluj-Napoca. 85 individuals completed it and the below presented table shows their personal characteristics.

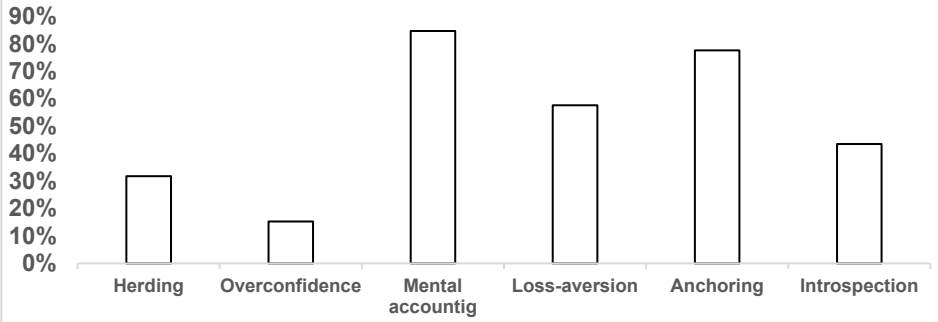
Table 1: Demographic data of the subjects

Gender	Male: 46	Female: 39
Education Level	Undergrad.: 62	Master's: 23
Employment Status	Employed: 37	Unemployed: 48

As we can see in Table 1, 46 men and 39 women took the questionnaire, which means that approximately 54,12% of the individuals were of male gender. In case of education level, the difference is higher. Only 27% of them are at master’s level of education currently. Regarding employment status, we can say that more than half of the individuals are unemployed. This was the brief presentation of the personal data of the subjects.

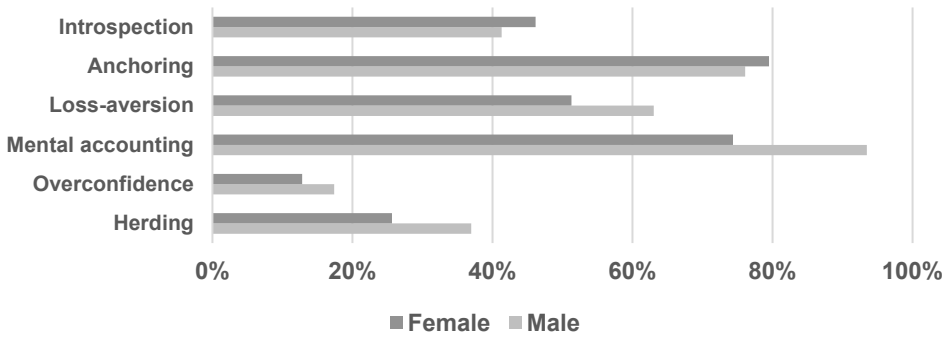
Further on, Figure 1 shows the presence of the biases based on the answers of the individuals, regardless of their demographic data.

Figure 1. The presence of the behavioral biases taking into consideration the whole sample



According to the above presented figure, the bias that has the greatest influence on the behavior of the subjects is mental accounting. 85% of the individuals are victims of this heuristic. They create special accounts in their mind for every situation, information, and show a resistance to analyzing everything as a whole and observing possible links. Anchoring, the urge to rely on past results/events and refusing to change or rethink new information, is the second in our list. Approximately 78% of the students are influenced by this error. Anchoring is then followed by loss-aversion, introspection and herding. Surprisingly, only 15% of the subjects fell victims of overconfidence, this bias achieving this way the less influential status.

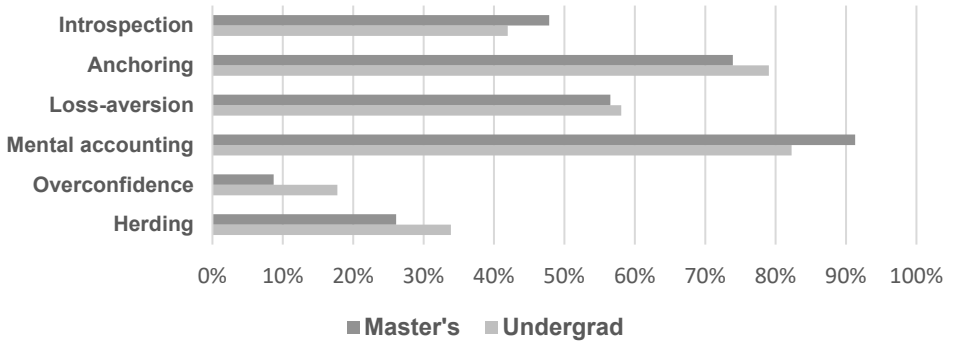
Figure 2. Presence of biases regarding the gender of the subjects



Matsumoto et al. (2013), concluded that men and women present in the same amount the “symptoms” of anchoring bias. In case of our sample, Figure 2 shows, that the percentages in which anchoring is present in the decision-making process of men and women is almost the same. Regarding overconfidence, we

already concluded that it is the least influential bias among the six examined ones. The other aspect of interest when taking into consideration overconfidence, is whether men are more overconfident than women or not. Even if the difference is not that high, we can clearly observe that more men tend to overestimate their abilities and accumulated knowledge than women. What Ritter (2003) concluded in his article regarding investors and overconfidence, proved to be true in case of students too.

Figure 3. Presence of biases regarding the education level of the subjects



First thing that can be observed after analyzing the above presented chart, is that education level does not cause great fluctuations in the presence of behavioral biases when considering the decision-making process of individuals. A higher amount of difference can be noticed in case of overconfidence, undergraduate students are more likely to be overconfident.

Figure 4. Presence of biases regarding the employment status of the subjects

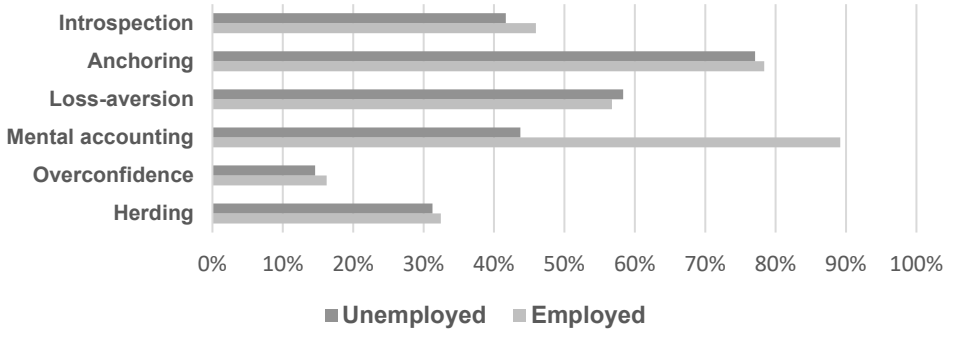


Figure 4 presents the degree in which the analyzed behavioral biases influence the decision-making process of employed and unemployed individuals. The highest and most outstanding discrepancy occurs in case of mental accounting. Approximately half of the unemployed individuals are influenced by this bias, while in case of employed students, this percentage reaches 89%. This may occur due to the complexity of tasks individuals face when working and studying in parallel, so they need to find a way in order to simplify problems. Creating a separate account for all of their tasks may seem a good solution but it balks them from having a holistic picture of their duties. In case of all other biases, the differences between employed and unemployed individuals is pretty much non-existent.

As mentioned in the methodology section, a binary regression was run in order to test the significance of demographic data on the examined heuristics. Not only personal information, but also the results from CRT and financial literacy questions were included as explanatory variables. The results of the regressions are shown in the tables below.

Table 2 contains the results of the binary probit regression having herding behavior as dependent variable. Gender, education level, employment status, the CRT results and Financial literacy being the explanatory elements. The table indicates which explanatory variables are significant and the magnitude of each. The sign of the coefficient suggests a positive or negative relationship between the dependent variable and independent ones.

Table 2: Variables explaining herding behavior

Herding behavior	*Coefficient*	*Z-stat*
Gender	0.340056***	3.089205
Education level	-0.737007	-0.186039
Employment status	0.533737	1.377620
CRT	-0.765670	-0.193547
Financial literacy	-2.362320***	-4.071249

Note: ***, **, * denote statistical significance at the 1%, 5%, and 10% level

When analyzing the results of the above-presented table, we can clearly observe that two explanatory variables are significant when examining the presence of herding behavior. These variables are gender and financial literacy. Both of these explanatory variables have a significance level at 1%. The sign of each coefficient shows whether the variable is positively related to the dependent one or not. As we can observe, gender has a positive relationship with herding behavior, meaning that it is more likely for a male student to fall into the mental trap of herding behavior. In case of financial literacy, as explanatory variable of herding behavior, a negative relationship can be noticed. This buttress up the findings of Sekita (2022), stating that financial literacy has a great impact on the presence of behavioral biases in the decision-making process of individuals. It proves to be true, that in case of herding, the more financial knowledge a student has, the less likely it is for him/her to present the “symptoms” of herding behavior when making financial decisions.

Table 3: Variables explaining overconfidence

Overconfidence	*Coefficient*	*Z-stat*
Gender	0.351707**	3.069360
Education level	-1.025717	-0.249729
Employment status	0.550321	1.305144
CRT	-0.987288	-0.240742
Financial literacy	-3.369879***	-5.302230

Note: ***, **, * denote statistical significance at the 1%, 5%, and 10% level

Going further to the analysis of overconfidence bias, looking at the table, we can state that education level, employment status and the results from the CRT do not show any significance. Until now, the assumption that those individuals who perform better at the CRT are less likely to be influenced by the biases, did not prove to be significant. The sign of the coefficient indicates a negative relationship, but it did not turn out to be significant. On the other hand, gender and financial knowledge are both influential elements regarding examined bias. As Garcia (2011) explained, overconfidence has a non-negligible impact on how individuals process information and what they consider significant. As we can observe, gender influences the presence of overconfidence in a noteworthy manner. What Ritter concluded, proved to be true in case of students. He said, as previously mentioned, that men tend to be more overconfident than women when making financial decisions. The positive coefficient, significant at 5%, indicates that it is more likely for a male student to be influenced by overconfidence than a female one. Just as in case of herding, financial literacy has a significant impact on the presence of overconfidence bias. Those individuals that managed to answer to at least two of the three financial literacy questions correctly, are less likely to be overconfident when making decisions. This can be due to the fact that they possess more information regarding financial aspects which makes them evaluate finance related problems more rationally.

Table 4: Variables explaining mental accounting

Mental accounting	*Coefficient*	*Z-stat*
Gender	0.233525**	2.010799
Education level	-1.355775	-0.200247
Employment status	0.796644**	2.007164
CRT	-1.210282	-0.178866
Financial literacy	-3.033730***	-4.883931

Note: ***, **, * denote statistical significance at the 1%, 5%, and 10% level

The three variables that have a significant impact on the appearance of mental accounting bias in case of university students, are gender, employment status and financial literacy. So far, gender and financial literacy turned out to have a significant explanatory power when talking about behavioral biases influencing

financial decision-making. Employment status is the third aspect that has a significant impact when mental accounting is analyzed. As we can see, from the sign of the coefficient, this explanatory variable has a positive relationship with the examined bias. This positive relationship indicates that it is more likely for an individual who is employed to create separate accounts for different tasks in his/her mind in order to ease the decision-making process. Even if this seems to be a great solution when problems are complicated, it does not allow the individual to observe possible links and correlations. CRT as explanatory variable turned out to be insignificant, just as in case of herding and overconfidence, proving the assumption of Toplak (2011) false in case of university students from Cluj-Napoca. The assumption that those individuals that perform better on CRT are less likely to be influenced by behavioral biases, so far turned out to be insignificant, meaning that it is not a great predictor of heuristics.

Table 5: Variables explaining loss-aversion

Loss-aversion	*Coefficient*	*Z-stat*
Gender	0.349524**	2.934902
Education level	-0.534417	-0.120155
Employment status	0.228338	0.546351
CRT	-0.597408	-0.134545
Financial literacy	-1.001627	-1.596309

Note: ***, **, * denote statistical significance at the 1%, 5%, and 10% level

Surprisingly, in case of loss-aversion, which, as Menkhoff and Nikiforow (2009) said, is one of the most common behavioral biases influencing the decision-making process of individuals, the only category that turned out to have a significant impact, is gender. What we could observe so far regarding the influence of gender on the presence of behavioral biases, is true in case of loss-aversion too. When considering male students, the likelihood of being loss-averse is higher. The significance level of the coefficient, indicates a relatively strong explanatory power. The insignificance of the other dependent variables, when considering loss-aversion, may be due to the fact that fear from the unknown and from loss is a key aspect of human nature, instinctively influencing all of our decisions, regardless how educated we are, etc. As Evstigneev et al. (2013) said, fear from danger, fear from losses is an instinct that appeared and developed when the only purpose of humans was to survive. This is written so deeply in our behavior and human nature that regardless of how educated we are it always influences our decision-making.

Table 6: Variables explaining anchoring

Anchoring	*Coefficient*	*Z-stat*
Gender	0.041948	0.125433
Education level	0.065897	0.169640
Employment status	0.115097	0.313516
CRT	-0.831392**	-2.236171
Financial literacy	-0.206071	-0.580430

Note: ***, **, * denote statistical significance at the 1%, 5%, and 10% level

Going further, another purpose of this paper is to analyze the presence and influencing factors of anchoring bias. When making decisions, regardless of the field in which we operate, we tend to rely on information that we first received and adjust the new data to this initial knowledge. It is a habit that first seems to ease complicated decision-making processes. Matsumoto et al. (2013) concluded that in case of investors, gender is not an influential factor when considering the presence of anchoring bias. Men and women tend to rely on this mental shortcut in approximately in the same amount. According to the findings of my study, this turned out to be true in case of students too. As it appears, gender is not a great predictor of anchoring bias. On the other hand, first so far, CRT turns out to have a significant impact on the presence of the analyzed heuristic. The minus sign indicates that the better a student performed at the CRT, the less likely it is for him/her to rely on past information, on an anchoring point, and manages to analyze problems and new data more rationally.

Table 7: Variables explaining introspection

Introspection	*Coefficient*	*Z-stat*
Gender	-0.156000	-0.5902
Education level	-0.095864	-0.283234
Employment status	0.114028	0.356030
CRT	-0.016086	-0.051866
Financial literacy	-0.016086	-0.051866

Note: ***, **, * denote statistical significance at the 1%, 5%, and 10% level

Introspection bias is the mental shortcut present when we attribute success to our own abilities, and failures to external influencing factors. We fail to recognize our own faults, but tend to observe them instantaneously when analyzing others. As the above presented table shows, we cannot conclude that any of the explanatory categories have a significant impact on the appearance of this heuristic. Nor gender or financial literacy, the two variables that so far turned out to have a pretty great explanatory power, are significant predictors of introspection bias. Deriving from these results, we can conclude in case of this bias, that its appearance does not follow any pattern taking into consideration the gender, education level etc. of the subjects.

5. Conclusion

Being a relatively new approach, behavioral finance has many unanswered questions, many unexplored areas that provide great opportunities for researchers. It appeared as a response to unexplainable anomalies, errors which occurred in the usage of traditional finance models and assumptions. It provided and continues to provide answers and solutions to these problems, by examining human behavior with the help of psychology and other social sciences. Behaviorists observed that traditional assumptions do not stand a chance in this fast-evolving world. They distinguished many forms and types of behavioral biases, six of them were analyzed in this paper.

After creating a survey that was distributed to university students from Cluj-Napoca, answers were gathered and analyzed. The results of this are shown in this study. After analyzing these results, we can conclude, first of all, that behavioral biases do have a great impact on individuals, in case of these university students, mental accounting having the greatest influence. Some personal factors do have an impact on the presence of these biases, but there is not a single personal data used as explanatory variable, that could be considered significant for all the examined cognitive errors.

One of the purposes of this paper was to see, whether financial knowledge has an impact on the presence of these biases or not. It turned out that the first hypothesis, mentioned in the "Methodology" section regarding the influence of financial literacy proved to be true. Even if, according to my analysis, it is not a great predictor of all biases, it has a significant impact on the presence of herding behavior, overconfidence and mental accounting. This way, the findings of Di et al. (2013) proved to be true in case of my sample, stating that financial knowledge could help in overcoming mental errors. What Hall et al. (2007) concluded, was cast-off in case of university students, proving that the more knowledge they have in the field of finance the less likely it is for them to follow the crowd, to create separate accounts in their mind for different problems and to overestimate their own abilities.

Regarding the next initial assumption, stating that those individuals that perform better at CRT are less likely to fall into the trap of introspection, herding, mental accounting etc., did not proved to be true when considering my subjects. Even if they managed to answer all three questions of the test correctly, it did not protect them from the negative effects of heuristics and biases.

In addition to the findings of Ritter (2003), regarding the presence of overconfidence bias in case of men and women, which turned out to be true in my analysis too, men tend to also be more influenced by the urge to follow the crowd, to separate their decisions and tasks into different accounts and to be more loss-averse. Gender, this way, turns out to be a great predictor not just in case of overconfidence but in case of other biases too.

This paper can provide an introspection for any individual working with students, showing which are the influencing factors when considering the decision-making process of the young individuals they work with. Identifying these errors in an early phase and creating "remedies" for them could result in a more rational, less pliable generation. As we could see, providing financial knowledge and information to students is one of the solutions that could lead to a positive outturn.

Bibliography

Alghalith, M., Floros, C. and Dukharan, M. (2012), Testing dominant theories and assumptions in behavioral finance, *The Journal of Risk Finance*, 13, pp. 262 – 268

Alsabban, S. and Alarfaj, O. (2020), An Empirical Analysis of Behavioral Finance in the Saudi Stock Market: Evidence of Overconfidence Behavior, *International Journal of Economics and Financial Issues,* 10, pp. 73-86

Benartzi, S. and Thaler, R.H. (1993), Myopic Loss Aversion and the Equity Premium Puzzle, Working Paper No. 4369, National Bureau Of Economic Research, 1050 Massachusetts Avenue Cambridge, MA 02138 May 1993

Branch, B. (2014), Institutional economics and behavioral finance, *Journal of Behavioral and Experimental Finance*, 1, pp. 13-16

De Bondt, W. (2004), Introduction to the special issue on behavioral finance, *Journal of Empirical Finance,* 11, pp. 423 – 427

DeMarris, K. and Lapan, S.D. (2004), *Foundations for research Methods of inquiry in Education and the Social Sciences,* Lawrence Erlbaum Associates, Publishers, Mahwah, New Jersey

Di, W., Eckel, C., Murdoch, J. (2013), Introduction to Special Issue on Behavioral Consumer Finance, *Journal of Economic Behavior & Organization*, 95, pp. 126-129

Eliaz, K. and Schotter, A. (2010), Paying for confidence: An experimental study of the demand for non-instrumental information, *Games and Economic Behavior*, 70, pp. 304-324

Evstigneev, I.V., Schenk-Hoppé, K.R., Ziemba, W.T. (2013), Introduction: behavioral and evolutionary finance, *Ann Finance*, 9, pp 115–119

Frankfurter, G.M., McGoun, E.G., Allen, D.E. (2004), The prescriptive turn in behavioral finance, *Journal of Socio-Economics*, 33, pp. 449–468

Garcia, M.J.R. (2011), Financial education and behavioral finance: new insights into the role of information in financial decision, *Journal of Economic Surveys,* 00, pp. 1–24

Hall, C.C., Ariss, L., Todorov, A. (2007), The illusion of knowledge: When more information reduces accuracy and increases confidence, *Organizational Behavior and Human Decision Processes,* 103, pp. 277–290

Ritter, J.R. (2003), Behavioral Finance, *Pacific-Basin Finance Journal,* 11, pp. 429 – 437

Kliger, D., van der Assem, M.J., Zwinkles, R.C.J. (2014), Empirical behavioral finance, *Journal of Economic Behavior & Organization,* 107, pp. 421-427

Krishnamurti, C. (2009), *Investment Management A modern guide to security analysis and stock selection,* Chapter 8, pp 627–634, Springer-Verlag, Berlin Heidelberg

Matsumoto, A.S., Fernandes, J.L.B., Ferreira, I.K.L., Chagas, P.C. (2013), Behavioral Finance: A study of affect heuristic and anchoring in decision making of individual investors, Available at SSRN: https://ssrn.com/abstract=2359180 or http://dx.doi.org/10.2139/ssrn.2359180

Menkhoff, L. and Nikiforow, M. (2009), Professionals' endorsement of behavioral finance: Does it impact their perception of markets and themselves, *Journal of Economic Behavior & Organization*, 71, pp. 318–329

Montier, J. (2010), *The Little Book of Behavioral Investing: How not to be your own worst enemy,* Published by John&Sons Inc., Hoboken, New Jersey

Morck, R. (2008), Behavioral finance in corporate governance: economics and ethics of the devil's advocate, *J Manage Gov*, 12, pp. 179–200

Olsen, R.A. (2008), Cognitive Dissonance: The Problem Facing Behavioral Finance, *Journal of Behavioral Finance*, 9:1, 1-4, DOI: 10.1080/15427560801896552

Sekita, S., Kakkar, V., Ogaki, M. (2022), Wealth, Financial Literacy and Behavioral Biases in Japan: the Effects of Various Types of Financial Literacy, *Journal of the Japanese and International Economies,* 64, 101190

Shefrin, H. (2001), Behavioral corporate finance, *Journal of Applied Corporate Finance,* 14, pp. 113-124

Shefrin, H. (2006), The Role of Behavioral Finance in Risk Management, *Risk Management A Modern Perspective***,** Chapter 29, pp. 653-676

Shiller, R.J. (2006), Tools for Financial Innovation: Neoclassical versus Behavioral Finance, *The Financial Review*, 41, pp. 1-8

Statman, M. (2008), What is behavioral finance, adapted with permission from Handbook of Finance, Vol. II, Chapter 9, Edited by Frank J. Fabozzi, Hoboken: John Wiley & Sons, Inc.: 79-84

Statman, M. (2014), Behavioral finance: Finance with normal people, *Borsa Istanbul Review*, 14, pp. 1-9

Toplak, M.E., West, R.F., Stanovich, K.E. (2011), The Cognitive Reflection Test as a predictor of performance on heuristics-and-biases tasks, *Mem Cogn*, 39, pp.1275–1289

Van der Sar, N.L. (2004), Behavioral finance: How matters stand, *Journal of Economic Psychology*, 25, pp. 425–444

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THE EFFECTS OF GOVERNMENT EXPENDITURE ON THE OUTPUT: A REAL BUSINESS CYCLE ANALYSIS FOR THE ROMANIAN ECONOMY

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Abstract: One of the most researched topics in macroeconomics is the development and implementation of Real Business Cycle models. This article presents a small Real Business Cycle model, which is built for the Romanian economy, with data from the 2nd quarter of 1995 through the 3rd quarter of 2022. The main aim of this analysis is to assess the historical influence of exogenous and government spending shocks on economic growth. In order to obtain accurate results, we implemented a Bayesian estimation technique for calculating the parameters of the model. The main findings indicate the significant exogenous shocks effect on the Romanian economy, and the way in which government spending had a positive effect on increasing economic growth for the period between the 1st quarter 2000 and the 3rd quarter of 2022.

JEL classification: E32, E60

Keywords: economic growth, real business cycle model, Romanian economy

1. Introduction

An interesting topic in economic research is the way in which shocks have an effect on the principal macroeconomic variables. The study of this topic has been a staple of scientific research in the last decades, with highly influential papers (such as Hansen et al., 1985, and Evans, 1989) dealing among other topics with the effect of shocks on the economic growth. However, in the present time, economists are still debating the effect and the particular way in which shocks affect an economy.

In the last decades, the study of the effect of shocks on macroeconomic variables for the countries in Central and Eastern Europe has seen an increased interest from the scientific community (Copaciu et al., 2015; Vasilev, 2018 and Sueppel, 2003). Generally, the literature agrees that shocks determine in a significant manner the evolution of the economy. A specific shock, which we consider of great interest is the government spending shock. This shock has been studied extensively

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in the scientific literature (for example in Ravn et al., 2007 and in Gali et al., 2007), due to its implications on the development of economic growth and its relation to the Keynesian economic theory[1].

The real business cycle (RBC) methodology (developed in papers such as Kydland and Prescott, 1982) provides an interesting way to analyse the relation between the government spending and economic growth. This methodology allows for the historic decomposition of the output by using the economic shocks, in this way we are able to observe the evolution of the economy and the relation of the government spending shock to economic growth. In the development of other models presented in the scientific literature (Copaciu et al., 2015) a historic decomposition of the output was included, and the effect of a government spending shock was positive on increasing economic growth for the first five quarters in the case of the Romanian economy. While offering numerous examples for the study of the relation between government spending and economic growth, the research literature presents conflicting views regarding their relation. The stated Keynesian approach is in direct conflict with the neo-classical view that government spending generates a decrease of the resources in the market, and can have negative effects on the output for a medium and long period of time (Carboni and Medda, 2011). This research gap is even more significant in the case of the Romanian economy, where except for a few number of papers (such as Copaciu et al., 2015 and Caraiani, 2007) the real business cycle methodology has not been extensively studied. In order to address the knowledge gap stated before, we aim to answer the following research question: What is the relation between government expenditure and economic growth in the case of the Romanian economy?

To answer this research question, we present the following research hypothesis from which we have started: A government spending shock promotes economic growth in the case of the Romanian economy.

This hypothesis was shaped by previous studies on the Romanian economy (Copaciu et al., 2015 and Caraiani, 2007) which have found a significant positive influence on the economy of government spending shocks. Our research makes several noteworthy contributions regarding the application of the RBC methodology for the Romanian economy and the study of the relation between economic growth and government spending. Firstly, we develop an RBC model with variable capacity utilization that contains a government spending shock. This model is implemented for the case of the Romanian economy and is Bayesian estimated using real time series. It should be noted that the present article is one of the few examples of the application of the RBC methodology for the Romanian economy.

Secondly, our analysis indicates the way in which the government spending shock has had an influence on economic growth for the Romanian economy for the period between the 1st quarter of 2000 and the 3rd quarter of 2022. We find that there is a strong positive historic effect of the government spending shocks on promoting economic growth for the case of the Romanian economy. These findings underscore the significant role that economic policy through government spending has on the economic growth and the subsequent development of a country.

[1] Acording to Keynes (1936), a government spending shock can boost economic growth by promoting employment.

Thirdly, the Bayesian estimation of the economic parameters for the Romanian economy leads to a better fit of the model on the real economic data. This is an interesting development due to the implications it has for future models that analyse the Romanian economy (it allows for comparing results and assessing the state of the economy). The results of the model indicate that for the period between the 1st quarter 2000 and the 3rd quarter of 2022. In line with the existing research literature, the present article provides an interesting view on the dynamics of economic growth and could be used as an analysis tool for decision makers and researchers. The following part of the paper is grouped in five sections: Literature review, Methodology, Results and discussions, Conclusion and References.

Literature review

In the present section we will present the most relevant ideas of the scientific literature regarding the role of government spending and the way to implement RBC models in order to quantify the influence of the government spending shock.

The effect of government spending on economic growth has been a topic of interest in economics since the work of Keynes (1936), which argued that the increase of government spending can promote economic growth by reducing the rate of unemployment and increasing the aggregate demand in the economy. In order to better test this hypothesis in the context of the Romanian economy, we decided to use a simplified RBC methodology. The framework of the RBC models has been developed in the paper written by Kydland and Prescott (1982) which created the first real business cycle model as a response to what is now known as the Lucas critique (Lucas, 1976) to traditional macroeconomic modelling (the critique is mainly related to the lack of a microeconomic basis in economic modelling).

The use of RBC models has seen a continued interest ever since the paper written by Kydland and Prescott (1982). In the article the authors made the use of a microeconomic basis for developing a macroeconomic model, this development being considered a step in the right direction for developing a better understanding of macroeconomics through econometric models. The model developed by Kydland and Prescott (1982) and other similar ones (i.e., Long and Plosser, 1983) explained the business cycles as being generated by exogenous shocks sustained by the production function. These approaches indicate that investment is influenced by the change in the Gross Domestic Product of the economy. This approach is however in conflict with the view proposed by Keynes (1936) according to which the marginal efficiency of investment is responsible for generating an increase in the output of the economy. An interesting development of the real business cycle framework is the adding of the capacity utilization for the capital by Greenwood et al (1988). By adding the possibility of measuring the utilization rate of the capital, the model describes with a larger accuracy the business cycle phenomenon. Due to the way in which it provides a channel for investment shocks and the mechanism through which they can have an effect on labour productivity allows for the creation of the Keynesian type of equilibrium (model equilibrium with less than full employment). The paper written by Greenwood et al (1988) proposes a model which matches a majority of the business cycle facts of the US economy for the period between 1948 and 1985.

In more recent studies, the idea of capital utilisation has been most notably treated in Duarte et al. (2019), Vasilev (2018), and Garlappi and Song (2017). Duarte et al. (2019) argue that capital utilisation and the short-term debt of the economy are

cyclical with the output of the economy. In this paper, the authors implement a Dynamic Stochastic General Equilibrium (DSGE) model that when accounting for capital utilisation and subjected to positive and financial shocks will determine the companies to increase their dependence on short term debt. The authors conclude that at company level the implications of a model without the use of capital utilisation can lead to the lack of understanding regarding the short-term debt of companies and their attitude to undertaking leverage.

Vasilev (2018) uses a standard RBC model in which it introduces an endogenous capital utilisation rate that is considered cyclical. The data for the model is from 1999 and 2016 by taking into account the period after the inauguration of the currency board. The author also includes the possibility of an energy shock which is implemented as a negative technological shock. The model performance for Bulgaria is improved by the presence of the features mentioned previously and helps to make a better framework for prediction than the standard real business cycle model.

Another interesting study is the one developed by Garlappi and Song (2017). The authors develop a general equilibrium model with two sectors in order to study the impact of capital utilisation and the evolution of the market on asset prices. The two sectors of the economy in which companies operate are the investment sector and the consumption sector. The results indicate that the consumption in the economy decreases when subjected to a positive investment shock, this being explained by the workers switching from the consumption sector to the investment sector of the economy.

The papers described have been of great influence in deciding to implement a real business cycle model to study the dynamics of economic growth in the Romanian economy. In order to answer the research question, we decided to implement a model similar to the one described by Greenwood et al (1988) but to which we added the government and for which we approximated parameters using a Bayesian estimation. The main difference between the model developed in this paper and the developments described above sits in the approach and the research question which is related to the effect of government spending on the economic growth.

The use of models for the Romanian economy has been a developing research topic in the last years. Some noteworthy approaches regarding the use of the real business cycle and dynamic stochastic general equilibrium models have been by Caraiani (2007) and Copaciu et al. (2015).

In the paper written by Caraiani (2007), the authors implement an RBC model for the Romanian economy for the period between 1991 and 2002 using quarterly data. The results obtained are of interest due to the fact that the author states that the real business cycle model developed in the paper can be a viable and useful starting point for the simulation of the complex dynamics in the Romanian economy. The implemented model can be used to calculate good predictions of the output and of the interest rate. Also, the results of the model indicate a failure in replicating specific business facts of the Romanian economy such as the fact that the capital is cyclical in a moderate manner and that the level of consumption is more volatile than the Gross Domestic Product for the analysed period. These failures can be since in part the consumption is financed by increasing the debt through the increase of imports for the analysed period, and the model being less complex cannot estimate these influences. Nevertheless, we consider the contribution made by Caraiani (2007) noteworthy and of interest in the history of the development of real business cycle models for the Romanian economy.

The model implemented by Copaciu et al. (2015) is a more complex model which is part of the Dynamic Stochastic General Equilibrium (DSGE) class of models. This class of models is developed from the real business class (RBC) of models but includes the non-neutrality of money on the short term. This change is interesting since in the standard RBC model (such as the one implemented in this paper) money are neutral and the monetary policy does not play a significant role, this however is not the case in DSGE models. The DSGE model presented by Copaciu et al. (2015) is based on the work of Christiano et al. (2011) and models the Romanian economy as a small open economy with a partial euroization present in the financial sector. The model estimates using Bayesian methods the parameters to better fit the data. Also, the model stands out by the depiction of the way in which a shock in the Euro area has a direct impact on the Romanian economy due to the credits denominated in foreign currency when compared to the effects of a similar shock in the US economy on the Romanian economy.

When compared to the models from the articles presented in the previous paragraphs the model that we constructed in this paper is based on the methodology of Greenwood et al. (1988) and employs a more simplified methodology then Copaciu et al. (2015). This is due to the scope of the present scientific research, as stated in the research question we aim to observe the interesting relation between government spending and economic growth. Also, this approach allows for a more focused view regarding the research gap (the conflict between the Keynesian and neo-classical views regarding the effect of government spending). In this way our model does not use the external market or the monetary policy in the way that the model employed by Copaciu et al. (2015) does, or the interest rate as in Caraiani (2007). Instead, our model employs a variable utilisation capacity in order to analyse the dynamics of the economy and is tailored to answer the research question stated in the introduction of this paper.

2. Methodology

In order to model the Romanian economy, we implemented the following equations, based on the work of Greenwood et al. (1988). The model has three main sections: the consumer, the firm and the government. In the following paragraphs we will present the equation block for the consumer in the economy. The optimisation problem for the consumer is summed up by the following equation:

$$\max_{C_t, H_t} U_t = \log C_t + \beta \mathrm{E}_t[U_{t+1}] + \psi \log (1 - H_t)$$

where U_t is the maximum utility of the consumer obtained by the substitution between consumption (C_t) at this moment and leisure time, calculated by the following part: $\log (1 - H_t)$ where H_t is the number of hours worked. Also in the utility equation we have the expected utility of consumption at a later date ($\mathrm{E}_t[U_{t+1}]$). The equation of optimisation of the consumer is subject to the following mathematical restriction:

$$C_t + T_t = \Pi_t + H_t W_t(\lambda_t^c)$$

Which presents the idea that the sum of the consumption (C_t) and taxes (T_t) at moment t are equal to the sum of the profit generated by the companies (Π_t) and the product between the hours worked and the wages paid in the economy ($H_t W_t$). The first order condition for the existence of the utility of the consumer, the consumption and the hours worked in the economy are the following:

$$\beta - \lambda_t^{\mathrm{U}} = 0(U_t)$$
$$-\lambda_t^{\mathrm{c}} + {C_t}^{-1} = 0(C_t)$$
$$\lambda_t^{\mathrm{c}} W_t - \psi(1 - H_t)^{-1} = 0(H_t)$$

In order to portray the behaviour of the companies in the market, we implemented the following equation block, in which the problem of optimisation for the companies is modelled by the next equation:

$$\max_{K_t, H_t^{\mathrm{d}}, Y_t, I_t, \Pi_t, CapUt_t} V_t = \Pi_t + \lambda_t^{\mathrm{c}-1} \mathrm{E}_t[\lambda_{t+1}^{\mathrm{U}} \lambda_{t+1}^{\mathrm{c}} V_{t+1}]$$

The management of the company wants to maximize its value (V_t) by making taking into account the current profit (Π_t) and the expected future value of the company ($\mathrm{E}_t[\lambda_{t+1}^{\mathrm{U}} \lambda_{t+1}^{\mathrm{c}} V_{t+1}]$). This equation is subject to the following restrictions.

$$Y_t = {H_t^{\mathrm{d}}}^{1-\alpha} (e^{Z_t})^{1-\alpha} (K_{t-1} CapUt_t)^{\alpha} (\lambda_t^{\mathrm{FIRM}^1})$$
$$K_t = I_t + K_{t-1}(1 - \delta {CapUt_t}^{\omega})(\lambda_t^{\mathrm{FIRM}^2})$$
$$\Pi_t = -I_t - H_t^{\mathrm{d}} W_t + P_t Y_t (\lambda_t^{\mathrm{FIRM}^3})$$

Also, the utilized capital (K_t^{ut}) at moment t is calculated using the following formula:

$$K_t^{\mathrm{ut}} = K_{t-1} CapUt_t$$

The first order conditions for the equation of the company are the following:

$$-\lambda_t^{\mathrm{FIRM}^{\mathrm{V}}} + {\lambda_{t-1}^{\mathrm{c}}}^{-1} \lambda_t^{\mathrm{U}} \lambda_t^{\mathrm{c}} = 0(V_t)$$
$$-\lambda_t^{\mathrm{FIRM}^2} + \mathrm{E}_t[\lambda_{t+1}^{\mathrm{FIRM}^{\mathrm{V}}} (\lambda_{t+1}^{\mathrm{FIRM}^2} (1 - \delta {CapUt_{t+1}}^{\omega})$$
$$+\alpha \lambda_{t+1}^{\mathrm{FIRM}^1} CapUt_{t+1} {H_{t+1}^{\mathrm{d}}}^{1-\alpha} (e^{Z_{t+1}})^{1-\alpha} (K_t CapUt_{t+1})^{-1+\alpha})] = 0(K_t)$$
$$-\lambda_t^{\mathrm{FIRM}^3} W_t + \lambda_t^{\mathrm{FIRM}^1} (1 - \alpha) {H_t^{\mathrm{d}}}^{-\alpha} (e^{Z_t})^{1-\alpha} (K_{t-1} CapUt_t)^{\alpha} = 0(H_t^{\mathrm{d}})$$
$$-\lambda_t^{\mathrm{FIRM}^1} + \lambda_t^{\mathrm{FIRM}^3} P_t = 0(Y_t)$$
$$\lambda_t^{\mathrm{FIRM}^2} - \lambda_t^{\mathrm{FIRM}^3} = 0(I_t)$$
$$1 - \lambda_t^{\mathrm{FIRM}^3} = 0(\Pi_t)$$
$$-\delta \omega K_{t-1} \lambda_t^{\mathrm{FIRM}^2} {CapUt_t}^{-1+\omega} + \alpha K_{t-1} \lambda_t^{\mathrm{FIRM}^1} {H_t^{\mathrm{d}}}^{1-\alpha} (e^{Z_t})^{1-\alpha} (K_{t-1} CapUt_t)^{-1+\alpha} = 0(CapUt_t)$$

After reduction these conditions can be written as follows:

$$-\lambda_t^{\mathrm{FIRM}^{\mathrm{V}}} + {\lambda_{t-1}^{\mathrm{c}}}^{-1} \lambda_t^{\mathrm{U}} \lambda_t^{\mathrm{c}} = 0(V_t)$$
$$-1 + \mathrm{E}_t[\lambda_{t+1}^{\mathrm{FIRM}^{\mathrm{V}}} (1 - \delta {CapUt_{t+1}}^{\omega} + \alpha \lambda_{t+1}^{\mathrm{FIRM}^1} CapUt_{t+1} {H_{t+1}^{\mathrm{d}}}^{1-\alpha} (e^{Z_{t+1}})^{1-\alpha} (K_t CapUt_{t+1})^{-1+\alpha})] = 0(K_t)$$
$$-W_t + \lambda_t^{\mathrm{FIRM}^1} (1 - \alpha) {H_t^{\mathrm{d}}}^{-\alpha} (e^{Z_t})^{1-\alpha} (K_{t-1} CapUt_t)^{\alpha} = 0(H_t^{\mathrm{d}})$$
$$-\lambda_t^{\mathrm{FIRM}^1} + P_t = 0(Y_t)$$
$$-\delta \omega K_{t-1} {CapUt_t}^{-1+\omega} + \alpha K_{t-1} \lambda_t^{\mathrm{FIRM}^1} {H_t^{\mathrm{d}}}^{1-\alpha} (e^{Z_t})^{1-\alpha} (K_{t-1} CapUt_t)^{-1+\alpha} = 0(CapUt_t)$$

At equilibrium the values of the prices (P_t) in the economy and those of the hours worked (H_t). Are the following:

$$P_t = 1$$
$$H_t = H_t^{\mathrm{d}}$$

Where H_t^{d} measures the hours demanded to be worked by the company in order to attain its goals.

For the government the model has the following identities:

$$T_t = G_t$$
$$G_t = \epsilon_t^{\mathrm{G}} + \phi^{\mathrm{G}} G_{t-1}$$

The exogenous shock, which is represented by external factors that are not accounted in the model is calculated using the following model:

$$Z_t = \epsilon_t^{\mathrm{Z}} + \phi^{\mathrm{Z}} Z_{t-1}$$

At equilibrium the mathematical relations described become as follows:

$$-1 + \beta C_t \mathrm{E}_t[{C_{t+1}}^{-1}(1 - \delta {CapUt_{t+1}}^{\omega} + \alpha CapUt_{t+1} {H_{t+1}}^{1-\alpha}(e^{Z_{t+1}})^{1-\alpha}(K_t CapUt_{t+1})^{-1+\alpha})] = 0$$
$$-K_t^{\mathrm{ut}} + K_{t-1} CapUt_t = 0$$
$$-W_t + (1-\alpha){H_t}^{-\alpha}(e^{Z_t})^{1-\alpha}(K_{t-1} CapUt_t)^{\alpha} = 0$$
$$-Y_t + {H_t}^{1-\alpha}(e^{Z_t})^{1-\alpha}(K_{t-1} CapUt_t)^{\alpha} = 0$$
$${C_t}^{-1} W_t - \psi(1 - H_t)^{-1} = 0$$
$$-\delta\omega K_{t-1} {CapUt_t}^{-1+\omega} + \alpha K_{t-1} {H_t}^{1-\alpha}(e^{Z_t})^{1-\alpha}(K_{t-1} CapUt_t)^{-1+\alpha} = 0$$
$$\epsilon_t^{\mathrm{Z}} - Z_t + \phi^{\mathrm{Z}} Z_{t-1} = 0$$
$$\epsilon_t^{\mathrm{G}} - G_t + \phi^{\mathrm{G}} G_{t-1} = 0$$
$$I_t - K_t + K_{t-1}(1 - \delta {CapUt_t}^{\omega}) = 0$$
$$U_t - \log C_t - \beta \mathrm{E}_t[U_{t+1}] - \psi \log(1 - H_t) = 0$$
$$-C_t - G_t + SPI_t + H_t W_t - \beta C_t \mathrm{E}_t[{C_{t+1}}^{-1} SPI_{t+1}] = 0$$
$$-I_t - SPI_t + Y_t - H_t W_t + \beta C_t \mathrm{E}_t[{C_{t+1}}^{-1} SPI_{t+1}] = 0$$

The RBC model presented in this article is implemented with the use of the gecon.estimation package for R, and the model is based on the DSGE estimation of the package.

3. Results and discussions

By using time series for the Gross Domestic Product of the Romanian economy and the government expenditure for the period between the 2nd quarter of 1995 and the 3rd quarter of 2022, we estimated the following values for the parameters of the model. The estimation was done using Bayesian econometrics, this method of estimation allows for a better fit of the model by taking into account prior information regarding the variables. The values for the model's parameters are the following:

$$\alpha = 0.33$$
$$\beta = 0.99$$
$$\delta = 0.0265$$
$$\omega = 1.6058486$$
$$\phi^{G} = 0.7024123$$
$$\phi^{Z} = 0.83515855$$
$$\psi = 1.75$$

Where α is the share of the capital in total output of the companies in the economy, β is the discount factor, δ is the rate of depreciation for the capital, the capital utilization parameter notated with ω, which has been set using Bayesian econometrics and ψ the labour disutility parameter. The parameters for the shocks of the model ϕ^{G} (the shock of government spending) and ϕ^{Z} (the exogenous shock) were calibrated using Bayesian econometrics and the time series for the Gross Domestic Product and the government expenditure.

In Table 1 we present the steady state values of the variables in the model.

Table 1. Steady state values of the variables[2]

	Steady-state value	Std. dev.	Variance
C	0.7723	0.0025	0
G	0	0.0114	0.0001
I	0.1997	0.1107	0.0123
K	11.9805	0.0045	0
W	2.0027	0.0083	0.0001
Y	0.972	0.0219	0.0005

In order to promote economic growth the taxes (T_t) at steady state are 0 (in order to promote economic growth). As we can observe due to the fact that the taxes are equal to the government spending ($T_t = G_t$) government expenditure is also 0 at steady state. This helps the model describe in a more accurate way the evolution of the economy for the analyzed period as we will see in figures 5 and 6.

In Table 2, we can observe the correlation matrix of the variables in the model. The relation between private consumption and government expenditure is inverse proportional (as consumption increases the rate of government expenditure decreases), this is due to the consumption reducing the available resources in the economy. Also we can observe a positive correlation between the Gross Domestic Product (Y) and all the variables in the economy: consumption (C), government expenditure (G), investment (I), capital (K) and the hourly wages paid in the economy (W).

[2] Where C is consumption, G is government expenditure, I is investment, K represents capital, W is the hourly wages paid in the economy and Y is the Gross Domestic Product

Table 2. Correlation matrix[3]

	C	G	I	K	W	Y
C	1	-0.372	0.716	0.815	0.748	0.635
G		1	-0.424	-0.124	-0.024	0.06
I			1	0.181	0.898	0.877
K				1	0.334	0.196
W					1	0.988
Y						1

In Table 3, we present the autocorrelations of the variables in the model. In the case of the capital we can see the largest autocorrelation with past values, this can be explained by the nature of the capital stock. We also consider of significant interest the fact that the consumption has also a positive and significant autocorrelation. Consumption has the 1st lag determining with a degree of 0.787 the value of the current consumption. This meaning that in theory, the consumption of the last quarter influences in a significant and positive way (almost 79%) the value of consumption in the present.

Table 3. The autocorrelations of the variables[3]

	Lag 1	Lag 2	Lag 3	Lag 4	Lag 5
C	0.787	0.582	0.393	0.226	0
G	0.551	0.248	0.048	-0.077	-0.151
I	0.632	0.352	0.145	-0.004	-0.107
K	0.941	0.81	0.638	0.451	0.265
W	0.661	0.393	0.186	0.03	-0.083
Y	0.651	0.378	0.169	0.014	-0.096

The variance decomposition of the shocks used in the model is presented in Table 4. With the help of the variance decomposition we can see the way in which the two shocks (exogenous shock and government expenditure shock) have an influence on the macroeconomic variables in the model. As we can see the evolution of the variance of consumption is explained in a greater measure by the exogenous shock then by the government spending shock. Also the variance decomposition of the level of investment in the economy is explained by the exogenous shock in proportion of 0.819 and the government spending shock in proportion of 0.181. In the case of the variance of the capital for the Romanian economy, the exogenous shock explains 0.788 of the government spending shock explains 0.212. For the variance of the hourly wages rate, the exogenous shock explains 0.997 and the government spending shock has an influence of 0.003.

[3] Where C is consumption, G is government expenditure, I is investment, K represents capital, W is the hourly wages paid in the economy and Y is the Gross Domestic Product

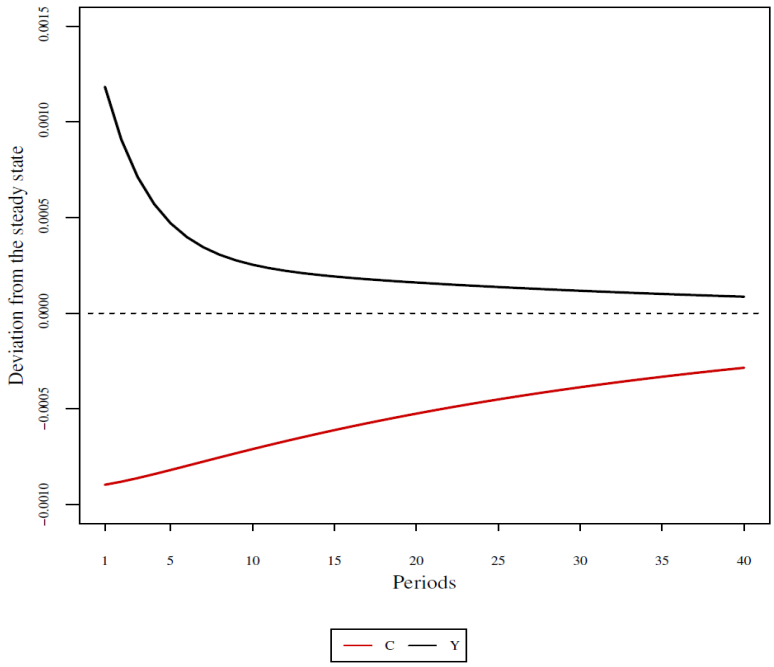
The variance decomposition for the analyzed variables shows that the government spending shock is the most explicative for the case of consumption, followed by the capital for both explaining over 20% of the variance.

Table 4. Variance decomposition[3]

	Exogenous shock	Government spending shock
C	0.775	0.225
G	0	1
I	0.819	0.181
K	0.788	0.212
W	0.997	0.003
Y	0.996	0.004

In the following we will present the impulse response functions for the shocks of the model. In Figure 1 we can observe the impulse and response function in the case of a shock of government spending for the consumption and the output.

Figure 1. Impulse response function to a government spending shock for C, Y[4]

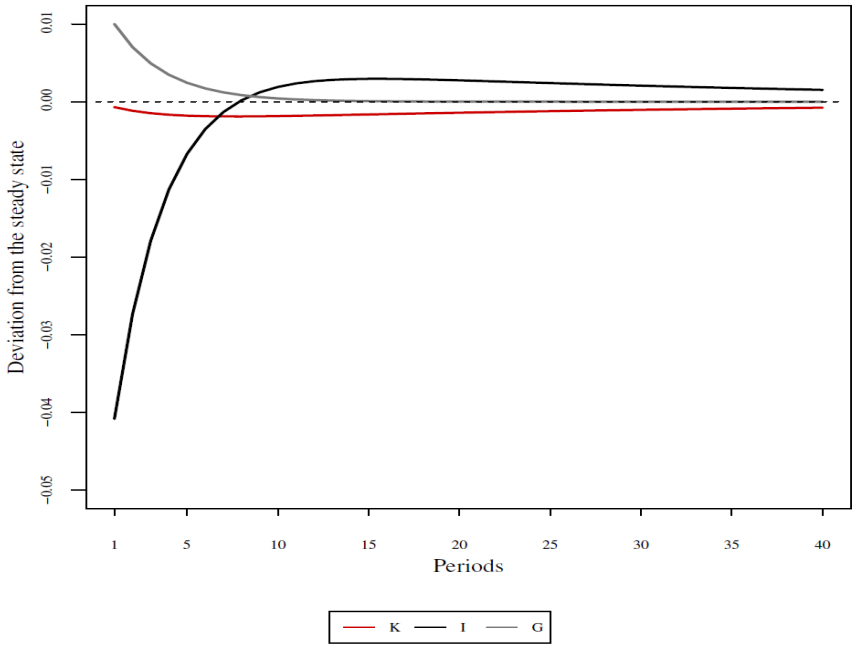


[4] Where C is consumption and Y is the Gross Domestic Product

As we can observe from Figure 1, an increase in government spending leads to a marginal increase in the output due to the inherent effect on the economic activity, but it also leads to a decrease in consumption. This effect is explainable, through the idea that consumption is discouraged by the decrease in resources generated by the increase in government spending. These results are in line with observations made in Copaciu et al. (2015) for the Romanian economy, according to which consumption decreases and the GDP increases when the economy faces a government expenditure shock.

In Figure 2, we present the impulse response function for the capital, the investments and government spending when the economy is subjected to government spending shocks.

Figure 2. Impulse response function to a government spending shock for K, I, G[5]



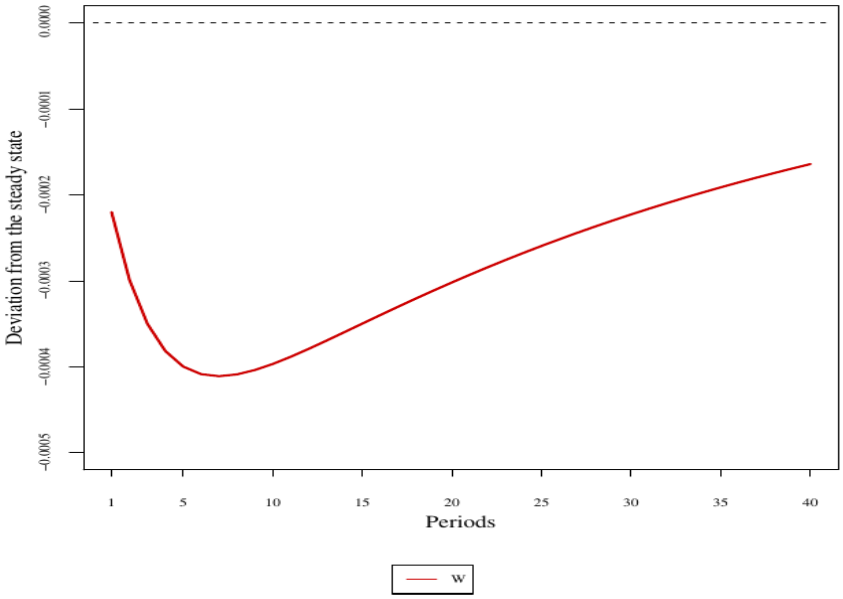
From Figure 2, we can observe the negative effect of government spending on investment and capital for the Romanian economy. A similar result has been obtained in Copaciu et al. (2015) regarding the effect of the government expenditure on investments. The economic reason behind the mechanism that discourages the investment rate during the government spending shock, is that the government consumes more of the available resources. This effect is connected with the money markets and the banking system. By increasing spending, the government increases the rate of borrowing from the money markets and the banks, this leads to less

[5] Where K is capital, I is investment and G is the government expenditure

resources available on the market for investments. An observation can be made regarding the persistence of the effects of the shock, for the investments the effect is observable and negative for the approximatively 10 quarters, after that the effect of the government spending shock is slightly positive.

In Figure 3 we can observe the response of the hourly wages in the economy to a shock of the government spending shock. The effect is small but significant; a government expenditure shock can lead to a decrease in the hourly wages of the workers.

Figure 3. Response of W to a government spending shock[6]



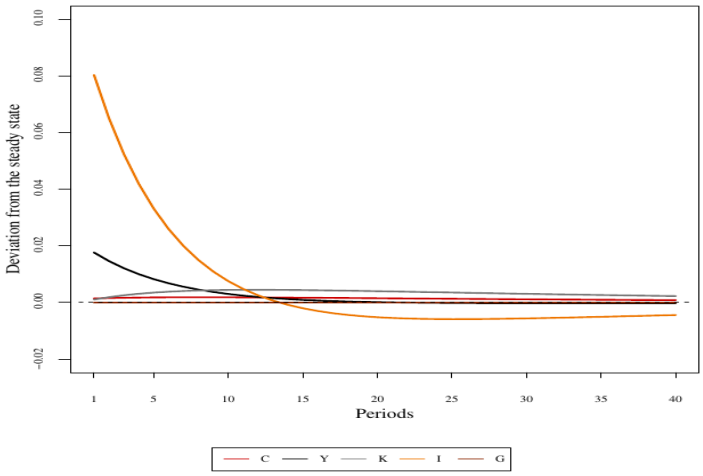
The decrease in wages as an effect to a government expenditure shock is also observed for the Romanian economy in the paper written by Copaciu et al. (2015). This effect leads to the conclusion that an increase in government spending can lead to a decrease in wages. The effect on wages seems to be constant and persistent for the next 40 quarters (when not taking into account counter measures).

The effect of the government spending shock on the principal macroeconomic variables present in the model, indicates the idea that by increasing government spending the policy makers may discourage investment, consumption and reduce the wages in the economy. These implications lead to the conclusion that government spending may not be the best economic growth driver when taking into account long term development goals.

[6] Where W represents the hourly wages paid in the economy

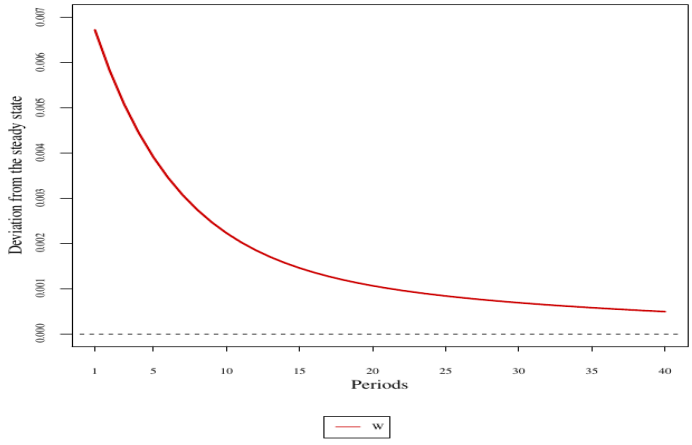
In Figure 4, we present the response of the main macroeconomic variables to an exogenous shock. The exogenous shock is represented by the shocks not taken into account in the model. As we can see the shock is significant and has important effects on investments and the Gross Domestic Product.

Figure 4. Impulse response function to an exogenous shock for C, Y, K, I, G[7]



By analyzing Figure 4 we can conclude that the exogenous shock represents an overall positive influence on the economy, when taking into account the analyzed variables. In Figure 5 we depicted the response of the hourly wages paid in the economy to an exogenous shock.

Figure 5. Response of W to an exogenous shock[8]



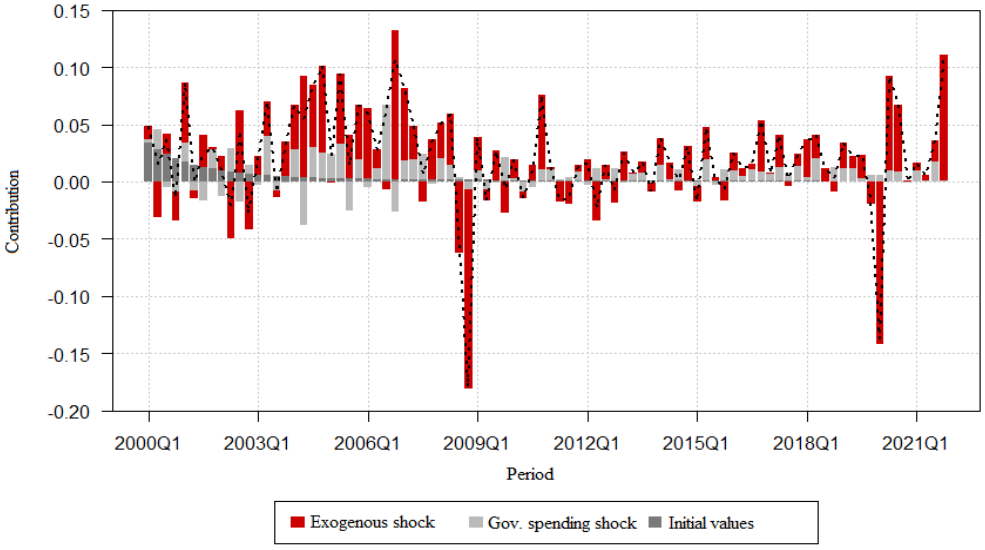
[7] Where C is consumption, G is government expenditure, I is investment, K represents capital, W is the hourly wages paid in the economy and Y is the Gross Domestic Product

[8] Where W represents the hourly wages paid in the economy

As we can observe the exogenous shock has a positive impact on the wages level of wages in the Romanian economy, for the analyzed period. This observed positive impact of the exogenous shocks seems to underline the fact that government spending has not been the most relevant driver of economic development for the Romanian economy (taking into account data for the period between the 2nd quarter of 1995 through the 3rd quarter of 2022).

In Figure 6, we present the historical shock decomposition of the Gross Domestic Product by taking into account the government expenditure shock and the exogenous shocks in the economy, for the period between the 1st quarter 2000 and the 3rd quarter of 2022. As we can observe, the government expenditure shocks have been a significant and positive influence on the economic growth. Promoting economic growth through government spending has been more significant in the period before the 2009 economic crisis and in the period between 2015 and 2019. Also the historical decomposition shows the strong effect of exogenous shocks in the generation of the 2009 crisis and the 2020 COVID-19 pandemic crisis.

Figure 6. Gross Domestic Product historical shock decomposition



We consider the results in Figure 6 of interest in their relation with the previous findings regarding the effect of the government spending shock on the main macroeconomic variables in the model. Summing up the results, the model indicates a significant positive and historic relation between government spending and economic growth and a significant negative relation between the government spending and consumption, investments and wages. In the scientific literature similar results regarding the effect of government spending on the economic growth have been seen in Ravn et al. (2007) with the exception that in the case of the data used

for a panel of countries (USA, UK, Canada and Australia), the government spending shock was positively correlated with consumption. This result could indicate that the analyzed period in Ravn et al. (2007) (between 1975 and 2005) includes a series of measures that increased government spending for welfare purposes. Another study that deals with the relation between government spending and consumption is the one written by Gali et al. (2007) which concludes that for the US economy consumption is positively correlated with the government spending. The difference in the results of the Romanian economy could be from the fact that the government spending that has been seen in the first period of the interval was caused by the subsidizing of the industry during the transition towards the market economy.

4. Conclusion

In conclusion we can observe the fact that government expenditure has a significant role in promoting economic growth. This fact is in line with the assumptions stated by Keynes (1936), that the increase in government spending leads to the increase in economic growth. Even if this is the case the model indicates a negative relation between government spending and consumption, investment and wages, these relations have been also observed in Copaciu et al. (2015). This can lead to the idea that, even though government spending promotes economic growth, it might hinder economic development on the long term by discouraging investments and consumption (which are two of the main drivers of economic development). An interesting feature of our model is the existence of a government In other papers that implement variable capital utilization for companies (Greenwood et al., 1988 and Duarte et al., 2019) the government is not introduced in the model. We consider the presence of the government to be of interest and that its inclusion can lead to a better depiction of the analyzed economy.

The results of the current paper confirm the research hypothesis stated in the introduction, but they also lead to the idea stated before, that encouraging economic growth only through government spending may lead to negative effects on the medium and long term. In order to offer an answer to the research question we can state that for the Romanian economy an increase in the government spending will lead to an increase in the economic growth, but policy makers should take into account the implications that such an increase has on the level of investment and consumption.

An interesting finding is that of the way in which the government spending influences the investment and the capital. By increasing the spending the government leads to a decrease in investment and in the evolution of the stock of capital in the Romanian economy. But the government spending is slightly positively correlated with the output, and historically has determined a positive deviation from the steady state for the Gross Domestic Product. This leads to the conclusion that the influence of government expenditure on the output even though marginally positive has a negative influence in the long run by discouraging investment, the growth of the stock of capital and consumption.

These results are interesting and seem to offer a synthesis of both the Keynesian and the neo-classical point of view. Government spending can be a historically positive influence and can also hinder potential development through discouraging the evolution of other main macroeconomic variables (such as

consumption, investment and capital). For future research, an interesting study could be the investigation regarding the effect of government spending on consumption in other countries that have seen a transition from a centralized to a market economy.

We conclude by stating that the increase in government spending seemed to have a significant positive effect on the economy, but its prolonged use could lead to a decrease in output due to negative effects on investment, capital and consumption.

Bibliography

Caraiani, P. (2007). An Analysis of the Fluctuations in the Romanian Economy using the Real Business Cycles Approach. Romanian Journal of Economic Forecasting, 4, 76-86.

Carboni, O.A., & Medda, G. (2011). Government spending and growth in a neoclassical model. Mathematics and Financial Economics, 4, 269-285. https://doi.org/10.1007/S11579-011-0045-2

Christiano, L. J., Trabandt M., & Walentin K. (2011). Introducing financial frictions and unemployment into a small open economy model. Journal of Economic Dynamics and Control, 35, 1999–2041.

Copaciu, M., Nalban, V., & Bulete, C. (2015). R.E.M. 2.0, An estimated DSGE model for Romania. https://www.dynare.org/wp-repo/dynarewp048.pdf

Data base for the Romanian economy: https://ec.europa.eu/eurostat/databrowser/view/NAMQ_10_GDP__custom_5007304/default/table?lang=en

Duarte, D., Galindo, H., & Montecinos, A. (2019). Leverage and capital utilization. The European Journal of Finance, 28, 801 - 824. https://doi.org/10.1080/1351847X.2021.1924215

Evans, G.W. (1989). Output and unemployment dynamics in the United States: 1950–1985. Journal of Applied Econometrics, 4, 213-237. https://doi.org/10.1002/JAE.3950040302

Fisher, J.D., & Peters, R.H. (2009). Using Stock Returns to Identify Government Spending Shocks. Macroeconomics: Monetary & Fiscal Policies eJournal. https://doi.org/10.1111/j.1468-0297.2010.02355.x

Galí, J., López-Salido, D., & Vallés, J. (2007.).Understanding the Effects of Government Spending on Consumption, Journal of the European Economic Association, 5, 1, 227–270, https://doi.org/10.1162/JEEA.2007.5.1.227

Garlappi, L., & Song, Z. (2017). Capital utilization, market power, and the pricing of investment shocks. Journal of Financial Economics, 126, 447-470. https://doi.org/10.1016/J.JFINECO.2016.11.006

Gecon Package for R: https://gecon.r-forge.r-project.org/

Gecon.estimation library for R: https://gecon.r-forge.r-project.org/ext_estim.html

Greenwood, J., Hercowitz, Z., & Huffman, G.W. (1988). Investment, Capacity Utilization and the Real Business Cycle. The American Economic Review, 78, 402-417.

Hansen, G.D. (1985). Indivisible Labor and the Business Cycle. Journal of Monetary Economics, 16, 309-327. https://doi.org/10.1016/0304-3932%2885%2990039-X

Keynes, J . M . (1936). The general theory of employment, interest and money. London :Macmillan

Kydland, F.E., & Prescott, E.C. (1982). Time to Build and Aggregate Fluctuations. Econometrica, 50, 1345-1370. https://doi.org/10.2307/1913386

Long, J., & Plosser, C.I. (1983). Real Business Cycles. Journal of Political Economy, 91, 39 - 69. https://doi.org/10.1086/261128

Lucas, R.E. (1976). Econometric policy evaluation: A critique. Carnegie-Rochester Conference Series on Public Policy, 1, 19-46. https://doi.org/10.1016/S0167-2231%2876%2980003-6

Ravn, M.O., Schmitt-Grohé, S., & Uribe, M. (2007). Explaining the Effects of Government Spending Shocks on Consumption and the Real Exchange Rate. International Finance eJournal. https://doi.org/10.3386/W13328

Sueppel, R. (2003). Comparing Economic Dynamics in the EU and CEE Accession Countries. European Central Bank Research Paper Series. https://doi.org/10.2139/ssrn.457535

Vasilev, A. (2018). The Role of Energy in a Real Business Cycle Model with an Endogenous Capital Utilization Rate in a Government Sector: Lessons from Bulgaria (1999–2016). Central European Economic Journal, 5, 130 - 141. https://doi.org/10.1515/ceej-2018-0011

Appendix

Steady state relations for the model

$$-1+\beta(1-\delta CapUt_{ss}{}^{\omega}+\alpha CapUt_{ss}H_{ss}{}^{1-\alpha}(e^{Z_{ss}})^{1-\alpha}(CapUt_{ss}K_{ss})^{-1+\alpha})=0$$
$$-K_{ss}^{ut}+CapUt_{ss}K_{ss}=0$$
$$-W_{ss}+(1-\alpha)H_{ss}{}^{-\alpha}(e^{Z_{ss}})^{1-\alpha}(CapUt_{ss}K_{ss})^{\alpha}=0$$
$$-Y_{ss}+H_{ss}{}^{1-\alpha}(e^{Z_{ss}})^{1-\alpha}(CapUt_{ss}K_{ss})^{\alpha}=0$$
$$C_{ss}{}^{-1}W_{ss}-\psi(1-H_{ss})^{-1}=0$$
$$-\delta\omega K_{ss}CapUt_{ss}{}^{-1+\omega}+\alpha K_{ss}H_{ss}{}^{1-\alpha}(e^{Z_{ss}})^{1-\alpha}(CapUt_{ss}K_{ss})^{-1+\alpha}=0$$
$$-Z_{ss}+\phi^{Z}Z_{ss}=0$$
$$-G_{ss}+\phi^{G}G_{ss}=0$$
$$I_{ss}-K_{ss}+K_{ss}(1-\delta CapUt_{ss}{}^{\omega})=0$$
$$U_{ss}-\log C_{ss}-\beta U_{ss}-\psi\log(1-H_{ss})=0$$
$$-C_{ss}-G_{ss}+SPI_{ss}-\beta SPI_{ss}+H_{ss}W_{ss}=0$$
$$-I_{ss}-SPI_{ss}+Y_{ss}+\beta SPI_{ss}-H_{ss}W_{ss}=0$$

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THE IMPACT OF GOVERNANCE UPON SUSTAINABLE DEVELOPMENT. EMPIRICAL EVIDENCE

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Abstract: This study assesses the effect of governance upon sustainable development. The trends of the Worldwide Governance Indicators (WGI) and the Sustainable Development Index (SDI) are analysed for the 2005 - 2021 period for 161 countries by using Pooled Ordinary Least Squares (OLS) estimations for panel data, the multiple regression modelling. The results emphasize the significant effect of regulatory quality, government effectiveness, political stability, rule of law, control of corruption and voice and accountability on SDI. The results of the research show that governance is a variable that should be taken into consideration for explaining sustainable development level each country may achieve.

JEL Classification: C23, Q1

Keywords: sustainable development, Governance, the Sustainable Development Index, World Governance Indicators

1. Introduction

Sustainable development (SD) is at the core of all concerns in this century. Assessing it, monitoring its progress, finding links that connect it with other fields and major themes of interest, have become a usual thing among scholars in the attempt of better understanding its complexity.

Sustainable development, as defined by the World Commission of Environment and Development (1987) represents the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Also called sustainable lifestyle, SD attempts to achieve the ideals of humanism and harmony between Men and Nature with the goal of finding the balance between people's rights and obligations towards Nature (Vavrousek, 2000).

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The present study contributes to the literature with findings which relate governance to sustainable development. The purpose of this research is to fill the research gap in studies that use governance in establishing the type of relationship with sustainable development. Kwatra et al. (2020) have showed the existence of various indices that are available at the global scale to assess sustainable development. Most studies (Maccari, 2014; Mombeuil and Diunugala, 2021; Gellers, 2016; Khalifa and Connelly, 2009) use the Human Development Index (HDI) for this matter. Our study tries to connect governance (measured by The World Governance Indicators (WGI)) with sustainable development (measured by the Sustainable Development Index (SDI)). Until present, no studies have been identified to focus strictly on this aspect. Moreover, there are very few studies (Bell et al., 2023; Nchofoung and Simplice, 2021; Neagu, 2020) that use the SDI (Hickel, 2020), since it is a relatively newly created index.

After the introduction, the "Literature Review" section discusses the literature review focusing on the relationship between governance and sustainable development and methodological approaches to SD measurement. The data used for the present study are presented in the section "Data and data sources". In the fourth section, the "Research methodology" section, tests are applied to determine the presence of associations between the studied variables. The results are presented in the fifth section. The last section "Conclusion" presents the importance of the study and future research directions.

2. Literature Review

The relationship between governance and sustainable development

The multitude of literature that connects governance to sustainable development, shows its great importance in this field. There are numerous studies that approach governance under different aspects such as: its interaction with natural resources (Nchofoung and Ojong,, 2023), its effect on the quality of life (Sarpong and Bein, 2022), the measure sustainable development goals are reached (Mombeuil and Diunugala, 2021), its role in the connection between sustainable development and financial development (Dutta and Saha, 2023) and many more.

Governance is defined as "the manner in which power is exercised in the management of a country's economic and social resources for development" (World Bank, 1992). Kaufmann et al. (2011) define governance in their study as "the traditions and institutions by which authority in a country is exercised."

In relation to SD the term "good governance" is being used. Good governance is represented by "a set of qualitative characteristics relating to processes of rulemaking and their institutional foundations. It encapsulates values such as enhanced participation, transparency, accountability, and public access to information. Also, it also helps to combat corruption and secures both basic human rights and the rule of law" (UNU-IAS, 2015). A good governance is vital to improving environmental and socio-economic aspects of a country (Asongu and Odhiambo, 2019) and it represents the foundation of sustainable development measures (Leal Filho et al., 2021).

In the present paper good governance is represented using Worldwide Governance Indicators (WGI).

Methodological approaches to SD measurement

To measure the progress of SD over the time, different set of indicators have been developed by various organizations: The Commission of Sustainable Development (2001), World Bank (2000), United Nations Development Programme (1990), The World Resource Institute (2000), World Health Organization, OECD. There is the need of measurements and indicators capable of assessing changes that might not be compatible with the ecological limits of the planet. (Moran et al., 2008). Developing integrated sustainable development indicators seemed to be the challenge that measuring SD has faced.

Gross Domestic Product (GDP)

The most used measure for wealth is GDP. According to Daly and Cobb (1989), GDP reflects services, industrial production, the capital the resources and agricultural product. Even if it is a very popular indicator, there are also criticisms of GDP such as the fact that wealth distribution, the household value and environmental issues are not properly taken into consideration (Mederly et al., 2003).

The Human Development Index (HDI)

Since GDP was not able to adequately reflect the human and social dimension of development (Anand and Sen, 1994), The Human Development Index (HDI) was developed in 1990. HDI is supposed to express the national and individual level of growth and development that is why it is often used to measure the progress in attaining the Millennium Development goals. HDI is often used to help GDP to better represent the human development and it comprises four sub-indicators: GDP per capita, life expectancy at birth, gross school enrolment ratio, and adult literacy rate (UNDP, 2004). The problem with the HDI is that all the top performers register unsustainable and high levels of ecological impact (Hickel, 2000) meaning that even though HDI is one of the most used measures of well-being it does not take into consideration sustainability since environmental aspects are missing (Maccari, 2014).

Sustainable Development Index (SDI)

Since HDI is difficult to universalize and has encountered problems in measuring empirically ecological stability, Hickel (2020) has proposed an alternative index: the Sustainable Development Index (SDI). “The SDI is an indicator of strong sustainability that measures nations’ ecological efficiency in delivering human development” (Hickel, 2000). In contrast to HDI, SDI comprises elements belonging to all three pillars (Basiago, 1999; Gibson 2006; Boyer et al., 2016) specific to SD (Hacking and Guthrie, 2008) because the domains are interrelated requiring thus a simultaneous and integrated consideration (e.g., Costanza et al., 2016).

In the attempt of finding the perfect indicator to best represent the meaning of SD other indicators have been developed, each of them trying to best fit the requirements. The Hong Kong Sustainable Development Index (HKSDI) for example is used as a tracking mechanism on the state of affairs (TSO, 2011). The roots index developed by Hoffman (2000) is used to measure sustainable development in New

York City. Herrera-Ulloa et al. (2003) have developed a regional-scale SDI for Baja California Sur of Mexico, considering four aspects: the environmental one, the economic one, the social one, and the institutional one. Another SD index proposed by Tarabusi and Palazzi (2004) is used to analyse and compare the level of SD in 126 countries based on the principal component analysis. The Multilevel Sustainable Development Index (MLSDI) was applied to 62 industries from Germany (Lemke and Bastini, 2020). Some SD indicators adopted by European Commission are presented in the work of Ledoux et al. (2005).

3. Data and data sources

This study explores the trends of the Worldwide Governance Indicators (WGI) and SDI from 2005 to 2021 for 161 countries based on the availability of the data at the time of this study. Data about unemployment and urbanization rates provided by World Bank (2023) are also taken into consideration for the same period of analysis.

The Sustainable Development Index (SDI)

The Sustainable Development Index developed by Hickel (2000), comprises five indicators: life expectancy, income, education, material footprint and CO_2 emissions.

Life expectancy

Life expectancy at birth reflects the quality of life for a country's people. The impact of health quality and efficiency is often evaluated through a patient's "quality of life" (Carr, 2001). In addition, the quality of life might also be determined by the subjective perception of the life conditions, relationships and social life, apart from education and wealth (Maccari, 2014)

Education

In the education index, the Mean Years of Schooling Index (MYSI) and The Expected Years of Schooling Index (EYSI) were taken into consideration. It seems that for higher education is easier to emphasize the importance of SD in the context of the global sustainability agenda (Cicmil et al., 2017) influence. Since education for sustainable development has started to gain increased attention in tertiary education Gatti et al., 2019), models for education that allows students to gain sustainability competencies should be developed Faham et al., 2017).

Income

Gross national income (GNI) is used in studies to measure national wealth and reflects all income earned in a country, even if it was earned outside the country. According to Hickel (2000), The Income Index used in SDI differs from that used in HDI in that it incorporates a sufficiency threshold below the HDI's maximum value incompatible with planetary boundaries (www.sustainabledevelopmentindex.org).

CO_2 emissions

CO_2 emissions per capita (tonnes) are important in the context of the Kyoto protocol (Unfccc, 1998) where targets for greenhouse gas emission reduction were established for 192 countries. CO_2 emissions and material footprint account for international trade (see more at https://www.sustainabledevelopmentindex.org/methods).

Material footprint

The material footprint indicator reflects the total weight of a nation's material extraction and consumption, including biomass, minerals, fossil fuels and construction materials (Hickel, 2000). The problem with our society is that the planet converts much slower waste into resources than we are transforming resources into waste. Moran et.al. (2008) talk about the regenerative capacity of the planet that influence the development and use of resources.

Overall, the SDI is based on a "development index" calculated as the geometric mean of the education index, the life expectancy index, and the modified income index; and an "ecological impact index" calculated as the average overshoot of CO_2 emissions and material footprint vis-à-vis their per capita planetary (Hickel, 2020). More insights on SDI are available at https://www.sustainabledevelopmentindex.org/about.

Studies (Bell et al., 2023) have shown that success in terms of SDI imply efforts both for the poor and rich nations. The poor nations must attend a higher degree of growth and development at the same time with maintaining ecological boundaries while more developed countries need to improve their growth and development reducing at the same time the ecological problems.

The Worldwide Governance Indicators (WGI)

WGI is composed of aggregate and individual governance indicators that measure a country's level of governance for six key variables: regulatory quality, government effectiveness, political stability and absence of violence, rule of law, voice and accountability and control of corruption. The scale of measurement ranges from -2.5 (highly underperformed governance to +2.5 (excellent governance) (Mombeuil and Diunugala, 2021).

4. Research Methodology

Using multivariate research approach, we propose that SDI is influenced by the levels of government effectiveness, regulatory quality, rule of law, political stability and absence of violence, control of corruption, and voice and accountability, controlling for unemployment and urbanisation. Once our data have been examined and the basic assumptions checked, we use simple and multiple regression modelling of our unbalanced panel data set, to evaluate the impact of governance upon sustainable development. Unemployment and urbanisation rates are used as control variables.

Table no.1: Variables used and their descriptive statistics

Variable	Explanations	Obs.	Mean	Std. dev.[$]	Min	Max
CC	**Control of corruption** captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.	2729	-0.0927	0.9913	-1.7819	2.45911
GE	**Government effectiveness** captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.	2729	-0.0428	0.9564	-2.3485	2.42602
PS	**Political Stability** and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism.	2728	-0.1561	0.9520	-3.0059	1.6393
RQ	**Regulatory quality** captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	2729	-0.0397	0.9543	-2.3660	2.2553
RL	**Rule of law** captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.	2729	-0.1035	0.9690	-2.3315	2.1247
VA	**Voice and accountability** captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.	2729	-0.1193	0.9719	-2.2591	1.7517
Unempl	Unemployment refers to the share of the labor force that is without work but available for and seeking employment.	2718	7.6432	5.6027	0.1	37.32

Variable	Explanations	Obs.	Mean	Std. dev.$	Min	Max
Urban	Urban population ((% of total population) refers to people living in urban areas as defined by national statistical offices.	2737	58.2340	22.175	9.375	100
SDI	The Sustainable Development Index (SDI) measures the ecological efficiency of human development, recognizing that development must be achieved within planetary boundaries. Lower SDI stands for a higher sustainable development.	2371	0.5711	0.1740	0.085	0.85
Footprint	Material footprint pcap. (tones) represents the total weight of material extraction and consumption, including biomass, minerals, fossil fuels and construction materials.	2385	12.8327	12.125	0.29	78.19
CarbonD	CO_2 emissions per capita (tonnes)	2377	5.2701	6.1707	0.02	52.71

For a closer look on the evolution of worldwide sustainable development, the average SDI within the period was 0.5711 and it ranged from 0.085 to 0.85. At the beginning of the analysed period (see Figure no.1), SDI has recorded increasing trends especially in the period of the economic crisis in 2008. In the 2010-2014 period SDI remained relatively constant then it registered a decreasing trend until 2019. An upward trend began to appear again in the last two years of the analysed period.

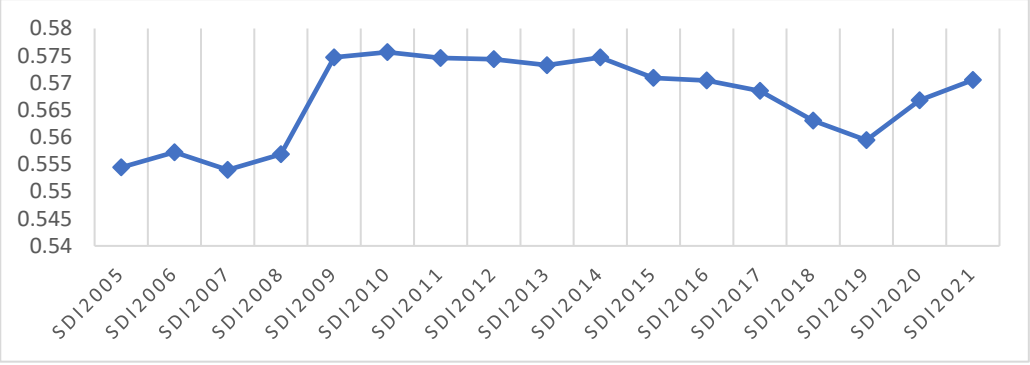

Figure no.1: The evolution of SDI in the analysed period

Furthermore, Table no.2 contains the correlation matrix between SD and its explanatory variables, for n=2365 perfectly matching observations. We thus expect governance proxies to have a direct impact upon sustainable development: the better the governance is, thus higher governance proxies, the lower the SDI is, thus improved SD.

Table no. 2: Correlation matrix

	SDI	CC	GE	PS	RQ	RL	VA
SDI	1						
CC	-0.4551	1					
GE	-0.3806	0.9278	1				
PS	-0.2947	0.7431	0.7137	1			
RQ	-0.3637	0.8643	0.9203	0.6628	1		
RL	-0.433	0.9491	0.9489	0.7567	0.9195	1	
VA	-0.1863	0.756	0.7402	0.6117	0.7909	0.7876	1

The present study uses a baseline regression model as follows:

$$SDI_{it} = a_1 + b_1CC_{it} + c_1Unempl_{it} + d_1Urban_{it} + \varepsilon_{it} \quad \text{Equation (1)}$$

$$SDI_{it} = a_2 + b_2GE_{it} + c_2Unempl_{it} + d_2Urban_{it} + \varepsilon_{it} \quad \text{Equation (2)}$$

$$SDI_{it} = a_3 + b_3PS_{it} + c_3Unempl_{it} + d_3Urban_{it} + \varepsilon_{it} \quad \text{Equation (3)}$$

$$SDI_{it} = a_4 + b_4RQ_{it} + c_4Unempl_{it} + d_4Urban_{it} + \varepsilon_{it} \quad \text{Equation (4)}$$

$$SDI_{it} = a_5 + b_5RL_{it} + c_5Unempl_{it} + d_5Urban_{it} + \varepsilon_{it} \quad \text{Equation (5)}$$

$$SDI_{it} = a_6 + b_6VA_{it} + c_6Unempl_{it} + d_6Urban_{it} + \varepsilon_{it} \quad \text{Equation (6)}$$

Equation (1) estimates the effects of control of corruption as a governance proxy, and that of unemployment rates and urbanization rates as control variables upon the SDI of worldwide countries. Furthermore, Equation (2) uses Government Effectiveness as a governance proxy, Equation (3) uses Political Stability as a governance proxy, Equation (4) uses Regulatory Quality as a governance proxy, Equation (5) uses Rule of Law as a governance proxy and Equation (6) uses Voice and Accountability as a governance proxy, respectively, controlling for unemployment and urbanisation as well. The notations used are presented below:

SDI_{it} – sustainable development index of country i in year t;
$a_{1,2,3,4,5,6}$ – constants;
$b_{1,2,3,4,5,6}$ – linear effects' parameters;
CC_{it} – control of corruption of country i, year t;
GE_{it} – government effectiveness of country i, year t;
PS_{it} – political stability of country i, year t;
RQ_{it} – regulatory quality of country i, year t;
RL_{it} – rule of law of country i, year t;
VA_{it} – voice and accountability of country i, year t;
ε_{it} – the residual.

5. Results and Discussions

The methodology employed is that of Pooled Ordinary Least Squares (OLS) estimations for panel data, the multiple regression modelling, a combinatorial approach. As such, Table no. 3 contains the coefficients of multiple OLS regressions, considering the six World Governance Indicators, on turn, as explanatory variables, and controlling for unemployment and urbanisation. Our data are structured as unbalanced panel data for 161 countries, covering the 2005-2021 period (17 years), the most recent data available at the time of constructing our database.

Table no. 3: Main results of SDI as a function of various WGI determinants

OLS regression modelling of SDI_{it}						
	Eq(1)	Eq(2)	Eq(3)	Eq(4)	Eq(5)	Eq(6)
CC	-0.0841***					
GE		-0.0688***				
PS			-0.0461***			
RQ				-0.0653***		
RL					-0.0788***	
VA						-0.0269***
Unempl	0.0067***	0.0066***	0.0074***	0.0071***	0.0068***	0.0079***
Urban	0.0003*	-0.00002	-0.0009***	-0.0002	0.00003	-0.0012***
const	0.4958***	0.5218***	0.5619	0.5298***	0.5119***	0.5842***
R^2	0.2583	0.1898	0.1472	0.1843	0.2366	0.1141
Adj R^2	0.2574	0.1888	0.1461	0.1832	0.2356	0.113
No obs	2350	2350	2350	2350	2350	2350

Note: *,**,*** Statistically significant at 10%, 5% and 1% levels.
Source: Author's processings

The interpretations of the estimated coefficients from Table no 3, through equation (1) show that one quarter of the variation in SDI is captured by CC as a governance proxy and the two control variables (its Adjusted R^2 is of 25.74%). The interpretation of the estimated coefficient for CC is the folllowing: at a one unit increase in CC, the SDI decreases on average with 0.0841 units, everything else unchanged.

Then, Equation (2) has an explanatory power, given by its Adjusted R^2, of 18.88%, so one fifth of the variation in SDI is captured by GE as a governance proxy and the two control variables. The interpretation of the estimated coefficient for GE is that at a one unit increase in GE, the SDI decreases on average with 0.0688 units, ceteris paribus.

Moreover, Equation (3) has an explanatory power, given by its Adjusted R^2, of 14.61%, while the interpretation of the estimated coefficient for PS is that at a one unit increase in PS, the SDI decreases on average with 0.0461 units, everything else unchanged.

Furthermore, Equation (4) has an explanatory power, given by its Adjusted R^2, of 18.32 %, so almost a fifth of the variation in SDI is captured by RQ as a governance proxy and the two control variables. The interpretation of the estimated coefficient for RQ is the following: at a one unit increase in RQ, the SDI decreases on average with 0.0653 units, everything else unchanged.

To continue, the interpretation of the estimated coefficient for RL from Equation (5) is the following: at a one unit increase in RL, the SDI decreases on average with 0.0788 units, ceteris paribus. This model has an Adjusted R^2 of 23.56%.

Nonetheless, Equation (6) has the smallest explanatory power of all models, revealing the variation in SDI captured by VA as a governance proxy and the two control variables. The interpretation of the estimated coefficient for VA is that at a one unit increase in VA, the SDI decreases on average with 0.0269 units, ceteris paribus.

The results of present study have revealed that the higher the WGI the better the governance and as a result SDI decreases leading thus to a greater sustainable development. This is in accordance with De Jesus (2012) which states that improvement in country's governance is associated with sustainable development.

In the SDI corruption has a strong impact especially on the income indicator. So, the higher the CC is in a country the lower the corruption phenomena is, meaning that governance is effective, which leads to a greater SD. Moreover, some authors (Hope, 2017a, 2017b; Rose-Ackerman and Palifka, 2016) believe that SD is constrained by corruption. Therefore, sustainable development will be elusive (Labelle, 2009) if corruption prevails. At the same time, the likelihood of achieving SD for the analysed countries increases if GE and PS are improved. This has also been confirmed in the study of Mombeuil and Diunugala (2021). The state is considered a failure (Akiwumi, 2014) if the government is ineffective, there is a poor regulatory quality and it lacks a strong and independent judicial system (Mombeuil and Diunugala, 2021). Being able to participate in selecting the government together with the freedom of expression and association also leads to better governance and thus to a higher SD.

Therefore, the higher each component of the WGI the better the governance and there are more chances to an improved sustainable development. Worldwide countries should design their national policies to attain better governance, with a direct relationship upon sustainable development.

6. Conclusions

In this study the relation between governance and sustainable development has been analysed. Based on the estimated on the linear regression modelling of panel data, the results have shown that higher levels of governance are associated with a higher sustainable development. This is also confirmed by the results of other studies (Dhaoui, 2022) that used different measures instead of SDI. These findings are important in the context that a good governance may contribute in attaining the 2030 Sustainable Development Goals (SDGs) set by the United Nations (Glass and Newig, 2019).

Our approach contributes to identifying and focusing on improving the required conditions to build effective governance systems, in order to obtain a greater sustainable development and thus it builds up to the literature on the determinants of sustainable development.

Future directions of research might focus on adding the concepts of peace and conflict to sustainable development, that have not been taken into consideration (Fisher and Rucki, 2017). Another future research area might focus on replicating this study by using the newer versions of SDI (according to its creator (Hickel, 2020) the SDI "understates the overshoot of richer nations and overstates the overshoot of poorer nations"). Subsampling of nations and cluster analysis might also be helpful in proving new insights on this subject.

References

Akiwumi F. A. (2014) Strangers and Sierra Leone mining: Cultural heritage and sustainable development challenges, *Journal of Cleaner Production*, 84, 773–782

Anand S. and Sen A. (1994) Human Development Index: Methodology and Measurement, HDR Occasional Papers, Human Development Report Office (HDRO), United Nations Development Program (UNDP)

Asongu S. A. and Odhiambo N. M. (2019) Inclusive development in environmental sustainability in sub-Saharan Africa: Insights from governance mechanisms, *Sustainable Development*, 27(4), 713-724

Basiago A.D. (1999) Economic, social, and environmental sustainability in development theory and urban planning practice, *Environmentalist* 19:145-161

Bell K., Hickel J., Arbon R. and Zoomkawala H. (2023) Which direction for sustainable development? A time series comparison of the impacts of redistributive versus market policies in Bolivia and South Korea, *Sustainable Development*,1–20

Best R., Burke P.J. (2017) The importance of government effectiveness for transitions toward greater electrification in developing countries, *Energies* 10

Boyer R., Peterson N. and Caldwell A. (2016) Five approaches to social sustainability and an integrated way forward, *Sustainability* 8:1–18

Carr A.J., Gibson B. and Robinson P.G. (2001) Is quality of life determined by expectations or experience? *BMJ*, vol. 322 (7296), 1240–1243

Cicmil S., Gough G., and Hills S. (2017) Insights into responsible education for sustainable development: The case of UWE, Bristol, The International *Journal of Management Education*, 15 (2, Part B), 293–305

Costanza R., Fioramonti L. and Kubiszewski I. (2016) The UN Sustainable Development Goals and the dynamics of well-being, *Frontiers in Ecology and the Environment.,*14, 59

Daly H.E. and Cobb B.J. (1989) For the Common Good, Beacon Press, Boston

De Jesus Lameira V., Harris J., Quelhas L.G. and Pereira R.G. (2012) A study of the relationships among three variables: Character of governance, sustainable growth and energy management, *Management of Environmental Quality,* Vol. 23 No. 1, 68-81

Dhaoui Y. (2022) E-Government for Sustainable Development: Evidence from MENA Countries, *Journal of the Knowledge Economy*,13, 2070–2099

Dutta K.D and Saha M. (2023) Role of governance in the nexus between financial development and sustainable development, *Journal of International Development*

Faham E., Rezvanfar A., Mohammadi M. and Rajabi Nohooji, M. (2017) Using system dynamics to develop education for sustainable development in higher education with the emphasis on the sustainability competencies of students, *Technological Forecasting and Social Change*, 123, 307–326

Filho W.L., Lange Salvia A., Frankenberger F., Mohammed Akib N.A., Sen S.K, Sivapalan S., Novo-Corti I., Venkatesan M. and Kay Emblen-Perry K. (2021) Governance and sustainable development at higher education institutions, *Environment, Development and Sustainability,* 23, 6002–6020

Fisher J. and Rucki K. (2017) Re-conceptualizing the Science of Sustainability: A Dynamical Systems Approach to Understanding the Nexus of Conflict, Development and the Environment, *Sustainable Development*, 25, 267–275

Gatti L., Ulrich M., and Seele P. (2019) Education for sustainable development through business simulation games: An exploratory study of sustainability gamification and its effects on students' learning outcomes, *Journal of Cleaner Production,* 207, 667–678

Gellers J.C. (2016) Crowdsourcing global governance: sustainable development goals, civil society, and the pursuit of democratic legitimacy, *International Environmental Agreements: Politics, Law and Economics*, Springer, vol. 16(3), 415-432

Gibson R.B. (2006) Beyond the pillars: sustainability assessment as a framework for effective integration of social, economic and ecological considerations in significant decision-making, *Journal of Environmental Assessment Policy and Management,* 8:259–280

Glass L. M., and Newig J. (2019) Governance for achieving the sustainable development goals: How important are participation, policy coherence, reflexivity, adaptation and democratic institutions? *Earth System Governance,* 2

Hacking T., Guthrie P. (2008) A framework for clarifying the meaning of triple bottom-line, integrated, and sustainability assessment, *Environmental Impact Assessment Review*, 28, 73-89

Herrera-Ulloa A. F., Charles, A. T., Lluch-Cota, S. E., Ramirez-Aguirre, H., Hernandez-Vazquez, S., and Ortega-Rubio, A. F. (2003) A regional-scale sustainable development index: The case of Baja California Sur, *International Journal of Sustainable Development and World Ecology*, 10, 353–360

Hickel J. (2020), The Sustainable Development Index: Measuring the Ecological Efficiency of Human Development in the Anthropocene, *Ecological Economics,* Vol. 167

Hoffman J. (2000) The roots index: Exploring indices as measures of local sustainable development, New York City: 1990–95, *Social Indicators Research*, 52(2), 95–134

Hope K. R. (2017a) Corruption and governance in Africa: Swaziland, Kenya, Nigeria
Hope, K. R. (2017b) Fighting corruption in developing countries: Some aspects of policy from lessons from the field, *Journal of Public Affairs*, 17(4)
Kaufmann D., Kraay, A. and Mastruzzi M. (2011) The worldwide governance indicators: methodology and analytical issues, *Hague journal on the rule of law, 3*(2), 220-246
Khalifa M. and Connelly S. (2009) Monitoring and guiding development in rural Egypt: local sustainable development indicators and local Human Development Indices, *Environment Development ad Sustainability*, 11:1175–1196
Kwatra S., Kumar A., Sharma P. (2020) A critical review of studies related to construction and computation of Sustainable Development Indices, *Ecological Indicators,* Vol. 112
Labelle H. (2009) Address to the ADB-OECD anti-corruption initiative for Asia and the Pacific regional seminar on political economy of corruption, retrieved from www.oecd.org/site/adboecdanti-corruption initiative/meetingsandconferences/ 44442140.pdf
Lawn P. A. (2003) A theoretical foundation to support the index of sustainable economic welfare, Genuine progress indicator (GPI), and other related indexes, *Ecological Economics*, 44(1), 105–118
Leal Filho W. et. al. (2021) Governance and Sustainable Development at Higher Education Institutions, Environment, *Development and Sustainability*, vol. 23, 6002–6020
Ledoux L., Mertens, R. and Wolff, P. (2005) EU sustainable development indicators: An overview, *Natural Resources Forum*, 29(4), 392–403
Lemke C. and Bastini K. (2020) Embracing multiple perspectives of sustainable development in a composite measure: The Multilevel Sustainable Development Index, *Journal of Cleaner Production*, Vol. 246
Maccari N. (2014) Environmental Sustainability and Human Development: A Greening of Human Development Index available at SSRN: https://ssrn.com/abstract=2426073 or http://dx.doi.org/10.2139/ssrn.2426073
Mederly P., Novacek P. and Topercer J. (2003) Sustainable development assessment: quality and sustainability of life indicators at global, national and regional level, *Foresight*, Vol. 5 No. 5, 42-49
Mombeuil C. and Diunugala H.P. (2021) UN sustainable development goals, good governance, and corruption: The paradox of the world's poorest economies, *Business and Society Review*, Vol.126, 3
Moran D., Mathis W., Kitzes J., Goldfinger S.H. and Boutaud A. (2008) Measuring sustainable development- Nation by nation, *Ecological Economics* 64, 470-474
Morita K., Okitasari M., Masuda H. (2020) Analysis of national and local governance systems to achieve the sustainable development goals: case studies of Japan and Indonesia, *Sustainability Science* 15:179–202
Nchofoung T.N. and Simplice A. (2021) ICT for sustainable development: Global comparative evidence of globalization thresholds*, AGDI Working Paper*, No. WP/21/061, African Governance and Development Institute (AGDI), Yaoundé
Nchofoung T.N and Ojong N. (2023) Natural resources, renewable energy, and governance: A path towards sustainable development, *Sustainable Development*, 31 (3), 1553-1569

Neagu O. (2020) Does Globalization Promote Sustainable Development and an Equal Distribution of Income around the World? An Econometric and Ethical View. in Grigorescu A. and Radu V. Lumen Proceedings: Vol. 11. 1st International Conference Global Ethics - Key of Sustainability (GEKoS) (pp. 56-64),Iasi, Romania: LUMEN Publishing House.

Nordhaus W. D. and Tobin, J. (1973) Is growth obsolete. *Studies in Income and Wealth,* 38, 509–532

Rose-Ackerman S. and Palifka B. J. (2016) Corruption and government: Causes, consequences, and reform (2nd ed.), Cambridge: Cambridge University Press

Sarpong S.Y. and Bein M.A (2022) Effects of good governance, sustainable development and aid on quality of life: Evidence from sub-Saharan Africa, *African Development Review*, Vol. 33, Issue 1

Tarabusi E. C., and Palazzi, P. (2004) An index for sustainable development, *Banca Nazionale del Lavoro Quarterly Review*, 57(229), 185–206

Tso G.K.F., Yau K.K.W. and Yang, C.Y. (2011) Sustainable Development Index in Hong Kong: Approach, Method and Findings, *Social Indicators Research,* 101, 93–108

UN Commission for Sustainable Development (2001) Highly Aggregated Sustainable Development Indices, Consultative Group on Sustainable Development Indicators, IISDnet, available at http://esl.jrc.it/envind/dashbrds.htm

UN (1998) Kyoto protocol to the United Nation Framework Convention on Climate Change, http://unfccc.int/resource/docs/convkp/kpeng.pdf

UNU-IAS (2015) Integrating governance into sustainable development goals. UNU-IAS Policy Brief no 3

UNDP (1990-2001) Human Development Report, United Nations Development Program, New York

UNDP (2004) Note on statistics in the human development report, United Nations Development Program

UNFCC (1998) available at https://unfccc.int/kyoto_protocol?gclid=EAIaIQobChMI9IewiuGBgAMVH0VBAh31iQaAEAAYASAAEgITnvD_BwE

Vavrousek J. (2000) Searching for human values compatible with the sustainable ways of living, in Huba M. and Novacek P. (Eds), The World perceived by the heart of Europe, Palacky University Press, Olomouc, Czech Republic

World Bank (2023) available at https://databank.worldbank.org

World Bank (2000) World Development Report 2000/2001, Washington, DC

World Bank (2018a) Combating corruption. Retrieved from http://www.worldbank.org/en/topic/governance/brief/anti-corruption

World Bank (1992) Governance and Development, Washington, DC: The World Bank

World Commission of Environment and Development (1987) Our Common Future, Oxford University Press, Oxford

World Resource Institute (2000) World Resources 2000-2001, Washington, D.C

https://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS (2023)

https://info.worldbank.org/governance/wgi

https://www.sustainabledevelopmentindex.org