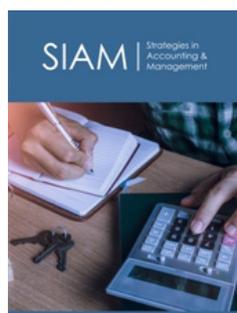


Efficiency in European Central Banks: The Role of Economic Freedom

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Abstract

The analysis of the efficiency of central banks has become a main topic of management and political strategies in the banking sector. This paper applies a non-parametric approach with random in order to analyze the efficiency of European central banks during the period 2010-2012. We analyzed the effect that the dimensions of the so-called Economic Freedom have in the sample of OCDE countries. The results show that central banks could increase their efficiency by enforcing policies to reduce the perception of corruption, the performance of an adequate regulatory financial system, the strengthening of rights and economic progress.

Keywords: Central banks; Efficiency; Economic freedom

Introduction

Since the origin of the recent global financial crisis, or even before, the main concern of most economic sectors in developed countries has been to facilitate the integration process to be able to successfully face potential competitors. In recent years, banking systems have increased their level of financial liberalization for multiple purposes such as economic growth and financial stability Sufian and Shah 2010, M Blau 2016. To achieve this goal, deregulation processes and technological changes have played a role as facilitating tools for the improvement of these levels, as well as the increase in competition between financial institutions. Due to the magnitude and depth of the impact on the economy of this crisis, as well as its simultaneity over time, the actions have been carried out both comprehensively, by supervisors and directors of financial policy (Central Banks), and individually in relation to the tasks and challenges imposed by the banks themselves, Gómez [1]. Among the extensive literature on these processes, there is a general consensus on the allocation of the development of a financial system and the growth of the global economy, as well as the strategies of financial institutions and their actions, in terms of efficiency, King and Levine [2], Berger et al. [3] as well as in other more recent works [4-7]. In reference to the EU, the different starting points of financial systems in terms of financing and liquidity needs, the simultaneity in the generation of global policies by most countries to reach levels of stability prior to the financial crisis has allowed concepts such as the degree of competition, prudential regulation and supervision among other variables classified as "environment" to have experienced a boom in their analysis and recent study as possible determinants of efficiency levels, which will allow the generation of economies of scale to achieve the aforementioned stability in the Eurozone. In this sense Chortareas et al. [6,7], Ayadi et al. [8] and Chortareas et al. [9] obtain negative relationships between the levels of banking supervision and regulation and the operational efficiency of the main European financial systems. Sassi [10] suggests the existence of a positive relationship between financial regulation and levels of bank inefficiency. However, banks that operate under conditions of greater economic freedom and a better level of governance show higher levels of operational efficiency.

A central bank is an institution, usually public, that is responsible for conducting the monetary policy of the country to which it belongs. Its main functions are the management of interest rates, sustainable growth and the maintenance of the stability of the financial system. It also helps to control inflation and avoid the generation of currency crises. Central banks are responsible for providing money to banks in their country that are experiencing financial difficulties, although this power may also extend to banks in other countries. The European

Central Bank (ECB) together with the national central banks (BCN), play various functions that are contained in the “Treaty on the functioning of the European Union and the statute of the European system of central banks and the European Central Bank “. In addition, the ESCB “shall support general economic policies in the Union in order to contribute to the achievement of the objectives of the whole Union outward in Article 3 of the Treaty on European Union” (European Central Bank). The recent financial crisis highlighted the need to improve regulation and supervision of the EU financial sector, especially in the euro area. So, the different national responses have highlighted the interdependence between banks and national governments. In addition, different national solutions have led to the fragmentation of the single market for financial services, which in turn has contributed to disruptions in lending to the real economy. For this reason, starting in 2012, EU leaders agreed that the Economic and Monetary Union (EMU) needed to be further strengthened and that part of this initiative would entail the creation of an integrated financial framework, which was later renamed ‘Bank Union’. The application of these measures began in 2013 and will continue progressively until 2019. Among them is the creation of a single supervisory mechanism, a system to guarantee new rules for the European banking sector that raises the minimum capital requirements (MUS). Taking in account this recent experience and the possible latent relationships between the different variables that, in the current panorama of the economic and financial markets of the EU, may affect the performance of banks through the efficient management of national regulators and supervisors, it is necessary to analyze the determinants of the effectiveness of these reception agencies in the transmission of the financial policies of the euro zone.

Determinants of Bank Efficiency

As ECB operates within each national economy, with a particular policy and a group of environment variables that, although they may coincide between countries in the euro zone, start from different levels, it is interesting to consider the effects that a specific institutional environment can have in bank efficiency [11-13]. Thus, the differences between countries in relation to the economy, regulation, and institutions explain differences in levels of banking efficiency. There is an extensive literature on the effects of regulation and supervision on banking behavior. The results do not reflect a general consensus regarding the sign and importance of these effects and may vary in different periods and country samples. Some authors analyze the relationship between normative restriction and banking efficiency with different approaches [6,14-16] show that banking regulation and banking supervision vary according to the type of regulation. In the banking sector, in general [11] explain that regulatory restrictions cause higher interest rates in commercial banks in the EU. Miklaszewska et al. [17] suggest that post-crisis regulation in the EU will have a negative long-term impact on the growth of European banking. In contrast, some studies find that greater economic openness, in terms of foreign bank penetration, will produce a decrease in bank margins and improve the efficiency of banking systems [18,19].

Financial development and growth have shown to have a strong relationship in developed countries. Notably Ayadi et al. [8] shows that the development of the financial sector is not negatively related to growth. The improvement of financial institutions and economic systems is a key factor in growth, although a developed financial sector is not enough to contribute significantly to economic growth, a series of reforms and a higher level of supervision and regulation are necessary. High is important for maintaining and improving levels of bank efficiency, at least in Mediterranean countries. Other contributions suggest the existence of a positive relationship between economic growth and financial development [20-24]. Some contributions related to financial development and efficiency use the proxy variable “financial freedom”, applied to different banking systems, as in the North African countries [6,9,10], whose results show that the effects of financial freedom on banking efficiency are more pronounced when economies are developed and have a high level of governance quality [8]. Conclude that development indicators such as market size and liquidity play an important role in growth, especially when entities are managed efficiently. Another feature to take in account in the analysis of the determinants of efficiency is the degree of corruption, a variable that has a recent but extensive body of doctrine, different methodological approaches and therefore relationships with economic growth, freedom and efficiency of financial institutions. On the concept of corruption, some economists have argued that the absence of competition increases corruption. One perspective to achieve a high level of the first is liberalization and democratization by regulatory and/or political entities and the other is economic decentralization. The former includes political rights and civil liberties, while the latter extols economic liberalization that is reflected in the degree of government intervention in a country. Larrain & Tavares [25] show that foreign direct investment, used as a proxy measure of economic freedom, positively affects the reduction of corruption [26]. Observe a negative correlation between the level of corruption and economic factors such as foreign investment per capita, this relationship remaining stable for different periods of time. Méon & Weill [27] tests whether corruption can be an efficient lubrication in the wheels of a deficient institutional scheme, finding, for a panel of 54 countries and using three types of approach to the concept of corruption, sufficient evidence that such corruption is correlated negatively with development in countries whose institutions are ineffective. Hodge et al. [28] shows, with panel data from 81 countries, that the negative effect of corruption on growth decreases in economies with low levels of governance or high levels of regulation. Ugur & Nandini [29] analyze the impact of corruption on economic growth in a theoretical and empirical way, showing that corruption has a negative impact on economic growth, but this relationship is not uniform between countries and is not maintained over time. These effects are mediated through factors such as the level of development, well-being and the quality of governance of the institutions. Kumar [30] explains that although the relationship intuitively appears to be negative, empirical research shows that the relationship is not linear not linear at all. Saha Sharabani et al. [31] shows that democracy increases corruption when the level

of financial freedom is very low, in a sample of 100 countries. More recently Bai et al. [32] conclude, for a sample of Vietnamese companies, that economic growth could be a predictor variable for corruption or institutional bribery.

A variable of the particular bank function is BNPL. The determinants are structural, institutional and macroeconomic. Institutional or structural indicators correspond to financial regulation and supervision and the incentive structure therein. Intuitively, differences in financial regulation and supervision affect behavior and risk management practices of banks and are important in explaining differences between countries in BNPL. The macroeconomic environment influences borrowers' balance sheets and their ability to service debt. The finding of a negative relationship between economic growth and the BNPL is a common thread among the studies. Among the most recent literature on the treatment of this variable there are contributions, such as Mohd et al. [33] which shows that lower bank efficiency levels increase doubtful. The result also supports the mismanagement hypothesis proposed by Berger & DeYoung [34] that mismanagement in banking institutions results in poor quality loans and therefore

increases the level of not making loans. Nkusu [35] attributes to bad loans a central importance between market frictions and macro-financial vulnerability. Klein [36] finds that the NPL level can be attributed to two factors, macroeconomic conditions and specific bank factors, through which other factors are encompassed but with little individual explanatory power [37]. While NPLs do respond to changes in macroeconomic conditions, others such as GDP growth, unemployment and inflation, the analysis also indicates that there is a strong feedback effect from the banking system to the real economy, suggesting that a high level of NPL could cause a greater difficulty in the recovery of economies in a situation of economic crisis [38].

Data and Variables

The database is the World Bank, for OECD countries. The information is completed with the Heritage Foundation and the web addresses of the central banks of the respective countries for the period 2010-2012 [39]. The software used for the analysis has been the FEAR package, in R. Table 1 shows the variables considered as input and output for estimating efficiency.

Table 1: Definition of inputs and outputs.

Inputs	Debts	Debts or other kinds of obligations contracted by the CB
	Fixed assets	Computer equipment, buildings, material and software
	Staff costs	Salaries, Social Security contributions and pension expenses
Outputs	Securities Portfolio	Financial instruments for purchase and sale in financial markets. Examples: bonds, stocks, options...
	Loans	Debts offered by a CB in exchange for an interest rate and maturities

Unit: Million euros

Results

Efficiency analysis

Table 2: Shows the definitions of the variables that, according to the aforementioned literature and the availability of the databases, have been selected as potential determinants of efficiency.

Macro-Economic Variables	
GDP growth (GDPG)	Annual percentage growth rate of GDP at market prices based on constant local currency. GDP is the sum of the gross value added of all resident producers in the economy plus any taxes on the product and less subsidies not included in the value of the products.
Population (POP)	The total population is based on the de facto definition of the population, which includes all residents regardless of their legal status or citizenship, except refugees who are not permanently in the country of asylum, who are generally considered part of the population. from your home country. The values shown are estimates of half a year.
Environment Variables	
Strength of legal rights index (SLRI)	This index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and therefore facilitate loans. The index ranges from 0 to 12, with higher scores indicating that these laws are better designed to expand access to credit.
Corruption (CORR)	It captures insights into the extent to which public power is exercised for private gain, including both small and large forms of corruption, as well as the "capture" of the state by elites and private interests. The estimate provides the country's score on the aggregate indicator, in units of a standard normal distribution, ranging from -2.5 to 2.5

Financial Freedom Index	
Financial Freedom Index (FFREE)	It is a measure of independence from government control and interference in the financial sector. State ownership of banks and other financial institutions, such as insurers and capital markets, reduces competition and generally reduces the level of services available. An overall score on a scale of 0 to 100 is given to the financial freedom of an economy through deductions from the ideal score of 100.
Banking Features	
Doubtful loans / total loans (%) (BNPL)	It is the value of non-performing loans divided by the total value of the loan portfolio (including non-performing loans before deducting specific provisions for losses and loans). The loan amount recorded as non-performing should be the gross value of the loan as recorded on the balance sheet, not just the past due amount

Table 2 shows descriptive statistics of input and output and the following environmental variables: GDP growth, index of strength of the population of legal rights, estimate of control of corruption, index of financial freedom and non-operating bank loans to the total of gross loans. Efficiency scores are estimated with a DEA model geared towards variable performance and production at scale. Tables 3-5 present the efficiency scores of the Central Banks

in all the countries in the period 2010. The second column in Table 3 provides estimated results in initial DEA [40]. The fourth column presents the estimate of bias with 2000 iterations and the third column shows the corrected estimates for bias [41]. At the end, the variance estimates and the lower and upper limits of the 95% confidence intervals are detailed [42].

Table 3: Description of output, input and environment variables.

2010		2011			2012		
Variables							
S	Max	Min	Mean	Std	Average		
S. Portfolio	233213	619.6	47382.6	55814.1	41994.52	49921.49	50231.72
Loans	674607	0	29295.44	114108.4	18887.88	28368.72	40629.71
Deposit	710094	2055.7	155136	175348.9	114055.62	165357.69	185994.66
Fixed assets	3361.35	22.29	405.1	716.88	411.94	404.67	398.68
Staff Costs	3361.35	7.7	324.76	632.54	437.09	224.62	312.58
GDPG	8.28	-8.86	1.01	2.94	1.76	1.79	-0.53
POP	8.18E+07	506953	2.00E+07	2.38E+07	19988600	20051090	20016647
SLRI	10	3	6.6	2.08	6.6	6.6	6.6
CORR	2.5	-0.3	1.26	0.86	1.27	1.29	1.24
FFREE	90	50	70.17	11.12	70.5	70	70
BNPL	25	1	7.93	6.07	7.11	7.73	8.85

Table 4: Efficiency scores (2000 reps) 2010.

Country	Efficiency	Corr. Eff.	Bias	STD	L. B.	U. B.
Austria	0.435	0.365	0.07	0.001	0.349	0.427
Belgium	0.473	0.384	0.089	0.003	0.365	0.465
Czech Republic	0.72	0.616	0.104	0.004	0.572	0.712
Denmark	0.976	0.737	0.239	0.018	0.726	0.952
Estonia	1	0.591	0.409	1.062	0.55	0.97
Finland	0.462	0.4	0.062	0.001	0.37	0.452
France	1	0.724	0.276	0.034	0.703	0.975
Germany	1	0.718	0.282	0.057	0.674	0.985
Greece	0.291	0.23	0.061	0.001	0.226	0.284
Hungary	1	0.666	0.334	0.067	0.665	0.979
Ireland	0.487	0.409	0.078	0.002	0.382	0.477
Italy	1	0.753	0.248	0.024	0.725	0.976

Latvia	0.782	0.662	0.119	0.005	0.616	0.767
Luxembourg	0.18	0.141	0.038	0.001	0.134	0.177
Holland	0.352	0.288	0.065	0.001	0.279	0.344
Poland	0.91	0.697	0.213	0.016	0.684	0.897
Portugal	0.351	0.302	0.049	0.001	0.282	0.343
Slovenia	1	0.653	0.347	0.113	0.638	0.972
Spain	1	0.755	0.245	0.015	0.75	0.973
Sweden	1	0.76	0.24	0.014	0.755	0.974

Table 5: Efficiency scores efficiency (2000 reps) 2011.

Country	Efficiency	Corr. Eff	Bias	STD	L. B.	U. B.
Austria	0.414	0.359	0.055	0.001	0.335	0.406
Belgium	0.426	0.357	0.07	0.001	0.339	0.416
Czech Republic	0.63	0.548	0.082	0.003	0.504	0.622
Denmark	1	0.72	0.28	0.029	0.717	0.973
Estonia	1	0.579	0.421	1.045	0.551	0.975
Finland	0.388	0.325	0.063	0.002	0.303	0.382
France	1	0.657	0.343	0.087	0.652	0.979
Germany	1	0.644	0.356	0.109	0.643	0.977
Greece	0.382	0.299	0.083	0.004	0.274	0.376
Hungary	1	0.689	0.311	0.088	0.651	0.977
Ireland	0.472	0.398	0.074	0.002	0.371	0.466
Italy	0.999	0.813	0.186	0.017	0.743	0.976
Latvia	0.845	0.707	0.138	0.008	0.654	0.831
Luxembourg	0.25	0.205	0.046	0.001	0.189	0.246
Holland	0.376	0.272	0.104	0.004	0.27	0.368
Poland	1	0.749	0.251	0.018	0.749	0.974
Portugal	0.339	0.287	0.051	0.001	0.27	0.332
Slovenia	1	0.556	0.444	0.977	0.551	0.978
Spain	1	0.689	0.311	0.045	0.687	0.978
Sweden	1	0.735	0.265	0.031	0.71	0.977

The DEA estimation scores allow evaluating whether the countries considered use inputs to obtain results efficiently in relation to the theoretical frontier of the best observed practices [43]. The average uncorrected efficiency in the period offers a result of 0.720, however, the average efficiency corrected for bias 0.529, describing a lower efficiency result in central banks [44]. In other words, if bias is considered as a factor to eliminate, generated by a particular sample, a less optimistic development and evolution is observed in all cases [45]. Figure 1 represents the efficiency scores of the Central Banks for the three years of the period, in the cases that have proven to be inefficient, including the average general efficiency per year [46].

It is noted that Greece, Ireland and Portugal improve their efficiency scores in the period and on the other hand, the Czech Republic and, with less intensity, Finland reduce their levels of

efficiency [47]. In the Figure 1, efficient Central Banks are ignored, such as Denmark, Estonia, France, Germany, Hungary, Italy, Poland, Slovenia, Spain and Sweden. In Figure 2 efficiency scores have been classified into three groups: (0 to 50), (51 to 80) and above 80 [48]. This classification corresponds to the criteria of low, intermediate and high efficiency [49]. The more intense the color, the more efficient the country's central bank presents. In the three years of the period, Austria, Belgium, Finland, Ireland, Netherlands and Portugal are maintained in the group of low efficiency [50]. Greece reaches a score of 0.767 in 2012, so moves to the group of intermediate efficiency [51]. Developments in the three years of the period are represented in Figure 2, where the lighter colour represents the group of low efficiency and the darker the higher efficiency [52]. It should be noted that globally there is stability in the efficiency among the years, with averages of 0.720 (0.303),

0.726 (0.304) and 0.713 (0.292), respectively [53]. This stability is maintained in the three categories: high efficiency with average

0.987 (0.002), intermediate efficiency with 0.691 (0.061) and low efficiency 0.376 (0.006).

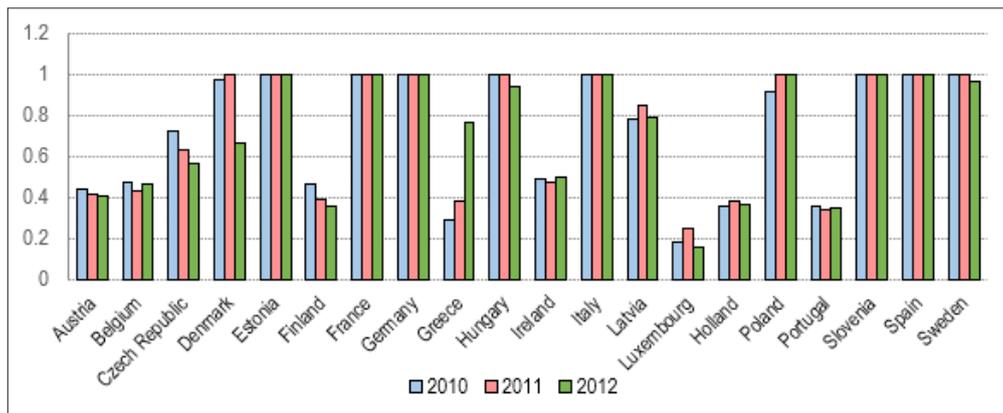


Figure 1: Efficiency scores of CB in the period 2010-2012.

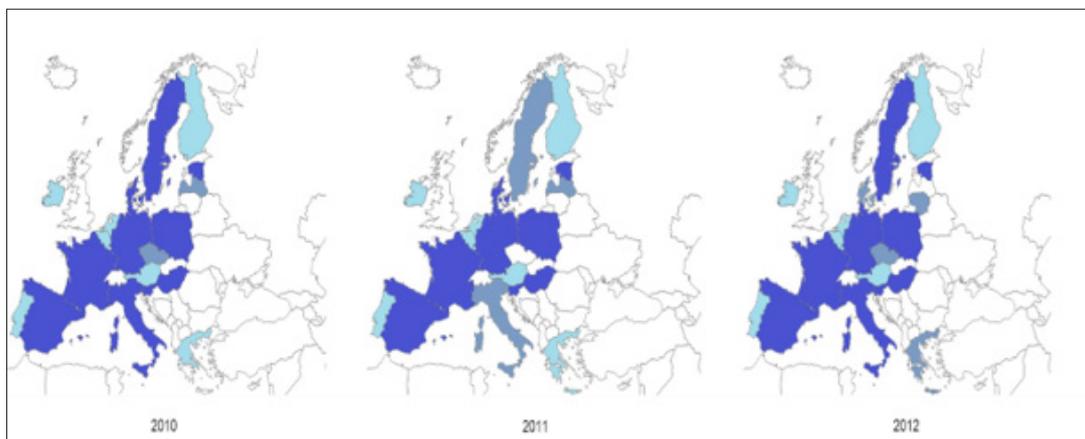


Figure 2: Efficiency of ECB in 2010-2012 period.

Second stage analysis

The results shown in Table 6 indicate that the coefficients of GDPD, POP, CORR, SLRI and FFREE are significant at a level of at least 0.009. The results imply a positive relationship runs from GDPD, POP, FFREE and SLRI in the efficiency scores [54]. This indicates that the economic and legal evolution of the country, especially in financial terms, is important determinants of BCN’s efficiency results. Table 6 shows significant effects of the variables GDPG, POP, CORR, SLRI and FFREE, (adjusted R2 = 0.205). The growth of a country’s GDP predicts a greater efficiency of its Central Bank, the same effect occurs with the variables SLRI and POP. However, the corruption index has a negative effect on the efficiency score, that is, a country with a high rate of corruption, (which has low levels of corruption), predicts low levels of efficiency. Variable BNPL, coefficient of 0.002 (0.545), presents a positive sign [55].

The results in previous literature are consistent with the relationship of the environment variables. About the macroeconomic situation of the country, other studies like [20,22,24,56] found a positive relationship between GDP growth and banking efficiency

and [57] considers the positive influence of population. In financial economics, the indices of economic freedom have been used as explanatory variables in financial economics [6,58,59]. About legal and regulation environment, Fernández & González [60] argues that banks with low legal restrictions have higher risks and Pasiouras et al. [61] believes that this index has a positive impact on cost efficiency and negative one on efficiency profits.

Sure enough, this study reports that the level of corruption of the country has to be considered as determinant of NCB’s efficiency. Table 7 shows a negative and significant association between efficiency and the perceptions of the extent to which public power is exercised for private gain in the country, so public power behavior has to be taken into account to manage NCB’s efficiency. In this line [6] argues that monitoring too much can be a sign of corruption or obstruct banking operations which causes lower efficiency. Higher values of this variable indicate that government officials are less likely to demand illegal payments. Chortareas et al. [9] suggests that banks operating under more open institutional frameworks are more likely to achieve greater efficiency.

Table 6: Efficiency estimates efficiency (2000 reps) 2012

Country	Efficiency	Corr. Efficiency	Bias	STD	L. B.	U. B.
Austria	0.406	0.352	0.054	0.001	0.328	0.397
Belgium	0.463	0.383	0.079	0.002	0.363	0.455
Czech Republic	0.56	0.475	0.085	0.002	0.443	0.55
Denmark	0.661	0.485	0.175	0.012	0.481	0.646
Estonia	1	0.56	0.44	0.859	0.557	0.972
Finland	0.352	0.294	0.057	0.001	0.275	0.346
France	1	0.657	0.343	0.085	0.65	0.975
Germany	1	0.607	0.393	0.257	0.605	0.978
Greece	0.767	0.506	0.261	0.048	0.505	0.757
Hungary	0.941	0.651	0.29	0.052	0.635	0.917
Ireland	0.498	0.414	0.084	0.002	0.391	0.489
Italy	0.995	0.772	0.224	0.023	0.718	0.969
Latvia	0.785	0.669	0.115	0.005	0.619	0.776
Luxembourg	0.155	0.126	0.029	0	0.117	0.153
Holland	0.36	0.284	0.077	0.002	0.269	0.352
Poland	1	0.748	0.252	0.018	0.747	0.973
Portugal	0.35	0.293	0.057	0.001	0.277	0.344
Slovenia	1	0.578	0.422	0.571	0.577	0.977
Spain	1	0.727	0.273	0.039	0.7	0.982
Sweden	0.96	0.744	0.217	0.014	0.723	0.938

Table 7: Second stage variables.

Variables	Coeff.	SD	P> z	[95% Conf. Interval]	
GDPG	0.016	0.006	0.009	0.004	0.028
POP	5.03E-09	7.08E-10	0	3.64E-09	6.41E-09
CORR	-0.013	0.023	0	-0.159	-0.068
SLRI	0.039	0.009	0	0.022	0.056
FFREE	0.007	0.002	0.001	0.003	0.011
BNPL	0.002	0.004	0.545	-0.005	0.009
c	-0.19	0.157	0.224	-0.497	0.116

Conclusion

Firstly, temporal stability is observed in the average efficiency levels of NCBs. However, each year the behavior of Central Banks is heterogeneous. Thus, more than a half of Central Banks could improve at least 40%. On average, the result obtained with the bias-corrected efficiency indicates that the potential outcomes improvement could be a 19.10% higher than with the non-corrected efficiency, given the existing level of inputs. The effort of generating higher efficiencies should be lighter in NCBs of France, Germany, Hungary, Italy, Latvia, Poland, Spain and Sweden. In this line, the second stage of the analysis allows to conclude that efficiency differences could be due to economic and legal developments of the country, focusing in financial terms. In addition, public power behavior for private gain is considered a determinant of NCB's

efficiency. Therefore, the Central Banks of inefficient countries should consider as improvement strategies the promotion of policies oriented to reduce the corruption perception of the population, the performance of an adequate regulatory financial system, the strengthening of legal rights and the economic progress.

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