Economics Bulletin

Volume 40, Issue 1

Impact of Political Uncertainty on Banking Productivity: Investigating the Jasmin Revolution Effect on the Tunisian Banking System

Mohamed El Fodil Ihaddaden
National Higher School of Statistics and Applied Economics ENSSEA

Abstract

Following the Arab Spring, many researchers investigated the impact of political uncertainty on the financial system. Nonetheless, they mostly focused on the stock market, neglecting the banking sector which may be the core structure of financing. Our study seeks to strengthen the literature on the relationship between political instability and banking performance by investigating the impact of the Jasmin revolution on the Tunisian banking industry's productivity. To that aim, we employ the DEA-based Malmquist Productivity Index on the 18 most important commercial banks in Tunisia over the period 2007-2017 which includes an ante and a post revolution era. Our results indicate that the Tunisian revolution has a lasting negative impact. Furthermore, we observe that political transition did not succeed in achieving productivity recovery. Finally, mixed banks are particularly affected by the political turbulence induced by the revolution.

Citation: Mohamed El Fodil Ihaddaden, (2020) "Impact of Political Uncertainty on Banking Productivity: Investigating the Jasmin Revolution Effect on the Tunisian Banking System", *Economics Bulletin*, Volume 40, Issue 1, pages 437-447
Contact: Mohamed El Fodil Ihaddaden - ihaddaden.fodeil@gmail.com.
Submitted: April 24, 2019. **Published:** February 07, 2020.

1 Introduction

Many studies formalized a positive linkage between financial development and economic growth under an adapted regulatory environment and effective governance (De Gregorio & Guidotti 1995). Indeed, financial institutions may enhance growth by rising the quantity of capital available to entrepreneurs, improving the quality of investment and increasing the efficiency of intermediation (Fohlin 1998). The Tunisian economy relies heavily on its financial system to stimulate economic development. Nevertheless, following the Jasmine revolution, Tunisia encountered a significant level of instability and political uncertainty which may have impacted significantly its financial industry.

It is well established that political uncertainty resulting from upheaval, social unrest and revolution affects economic growth. As property rights become doubtful, private and foreign direct investment shrank (Darby et al. 2004). In addition, many studies find political uncertainty to have a negative effect on the financial system. Chan & Wei (1996) analyzing the Hang Send Index in Hong Kong, point out that unfavorable political news is correlated with negative returns. Jeribi et al. (2015) demonstrate that the Tunisian revolution has affected the volatility of major sectorial stock indices in the Tunisian Stock Exchange. Furthermore, Soltani et al. (2017) state that during the period of political instability in Tunisia, investor sentiment impacted negatively the market return and volatility. Thus, although the uprising of Arab countries provides an opportunity to unleash their economic potential by enhancing their transparency and governance, important financial costs have been incurred Chau et al. (2014). While several studies focused on the stock market, researches on the impact of the Arab Spring on the banking industry are scarce. To the best of our knowledge, only one recent study conducted by Ghosh (2016) tackled that issue. The author concludes that the Arab Spring has lowered profitability and raised bank risk in MENA countries.

We've decided to focus on the banking industry because Tunisian banks represent the main sources of funds for the corporate sector. Indeed, according to the World Bank (Data.worldbank.org 2019*a*), by the of 2016 the ratio of Private Credit by Deposit Money Banks to GDP for Tunisia reached 73.45%, significantly higher than the values observed regionally (22.06%, 63.17% and 28.10% respectively in Algeria, Morocco and Egypt). In comparison, the stock market depth as measured by the ratio of Stock Market Capitalization to GDP didn't exceed 20% in the same period (Data.worldbank.org 2019*b*). paradoxically, as mentioned before, most studies examined the stock market. Our research aims to fill this gap by contributing to a more thorough understanding of the relationship between political instability and banking performance. To achieve that purpose, we analyze the 18 most important commercial banks' productivity change between 2007 and 2017 which includes an ante and post revolution era.

It is worthwhile to note that several studies examined the banking industry's performance in Tunisia though neglecting the revolution context. For example, Nouaili et al. (2015) find a positive relationship between bank performance, capitalization, privatization and quotation. Naceur & Goaied (2001) show that labor productivity, bank portfolio's composition, capital productivity and bank capitalization are the principal determinants of productivity. Ameur & Mhiri (2013) considering the main 10 commercial Tunisian banks during the 1998-2011 period, state that bank capitalization and managerial efficiency have a positive and significant effect on banking performance.

2 Methodology

In our study, we evaluate Tunisian banks' performance evolution using the DEA-based Malmquist Productivity Index (MPI). The Data Envelopment Analysis (DEA) is a non-parametric linear programming technique that measures the relative efficiency of a set of homogeneous Decision-Making Units (DMUs) that use an identical variety of inputs to produce an identical variety of outputs. While its application is not limited to banking, it is the most widely used operational research technique to assess banking performance Fethi & Pasiouras (2010). It is worth noting that DEA approaches differ whether we're considering banking institutions or bank branches as DMUs. Due to the easier availability of data, the majority of studies focus on banks at the institutional level. Paradi & Zhu (2013) find that among 257 DEA applications in the banking industry between 1985 and 2011, 195 evaluated performance at the institutional level.

Several DEA models have been applied in the banking sector, nonetheless three main approaches appear most often Paradi et al. (2011):

- The production model
- the profitability model
- the intermediation model

The production and the intermediation model capture the two banks' primary roles within the financial system Tam et al. (2018). The production approach measures how banks produce transactions and related services for customers based on the use of capital and labor whereas the intermediation approach focus on the bank as a financial intermediary that transfers funds from savers with surplus to investors with shortage. In other words, the intermediation model measures how banks make loans and investments based on the monetary assets they gather Paradi et al. (2011), Tam et al. (2018). Finally, the profitability approach evaluates how banks maximize their revenues and minimize their expenses. According to Berger et al. (1997), the production approach is more suitable for measuring the efficiency of branches while the intermediation approach is preferred when comparing banks as financial institutions. Finally, due to a greater difficulty in obtaining the transaction flow required to examine production efficiency, the intermediation approach has been more widely applied (Fethi & Pasiouras 2010).

The Data Envelopment Analysis provides several interesting properties. First, unlike parametric models, DEA doesn't assume any production technology. It measures efficiency from the observed historical or cross-sectional data on reel production activities (Bogetoft & Otto 2010). In addition, unlike regression, DEA optimizes on each individual DMU with an objective of calculating a discrete piecewise frontier determined by a set of Pareto-efficient DMUs (Charnes et al. 2013). Finally, using DEA one can analyze organizations with multidimensional processes that include several inputs against several outputs. Since the Tunisian banks are relatively homogeneous in terms of size and banking activities, we've decided to employ a DEA model with Constant Returns to Scale (CCR). We also make the hypothesis that Tunisian banks have a better control over their inputs. As such, our DEA model is input-oriented.

The CCR model initially developed by Charnes et al. (1978) considers the $i-th$ DMU and seeks as much as possible to radially contract its inputs while still remaining within the feasible production set. Suppose we have m input variable with a marginal weights vector $v_i (i = 1, ..., m)$, s output variables with a marginal weights vector $u_r (i = 1, ..., s)$ and n DMUs. The envelopment form of the input-oriented model is given as:

$$min_{\theta,\lambda}\theta \tag{1}$$

Subject to

$$\begin{aligned} \theta x_0 - X\lambda &\geq 0 \\ Y\lambda &\geq y_0 \\ \lambda &\geq 0 \end{aligned}$$

where x_0 and y_0 the column vectors of inputs and outputs respectively for DMU_0. X and Y are the matrices of input and output respectively for all DMUs. λ is the column vector of intensity variables denoting linear combinations of DMUs. Finally, the objective function θ is a radial contraction factor that can be applied to DMU_0's inputs. The optimal value of θ, denoted θ^* is the efficiency score. Due to the model's constraints, the value of θ will always range between 0 and 1, included.

2.1 The Malmquist Productivity Index

The Malmquist Productivity Index (MPI) measures DMUs' performance evolution over time according to the observed technological progress and technical efficiency's improvement. In our research we present the MPI's theoretical framework based on the development of Bogetoft & Otto (2010). Let $E(s,t)$ be a measure of DMU_0 performance in period s against the technology in period t. To measure DMU_0 improvement from period s to period t, we can look at the changes in efficiency compared to a fixed technology. If we use time s technology as our benchmark, we have:

$$M^s = \frac{E(t,s)}{E(s,s)} \tag{2}$$

If the DMU_0 has improved from period s to t, then $E(t,s) \geq E(s,s)$. M^s is larger than 1 when the DMU_0 improves and smaller than 1 if it moves away the frontier over time. M^s measures the improvement relative to the technology s, we might alternatively have used technology at time t as the fixed technology, in which case we get:

$$M^t = \frac{E(t,t)}{E(s,t)} \tag{3}$$

Because there is no reason to prefer one to the other, the Malmquist Productivity Index is simply the geometric average of the two:

$$M(s,t) = \sqrt{M^s M^t} = \sqrt{\frac{E(t,s)}{E(s,s)} \frac{E(t,t)}{E(s,t)}} \tag{4}$$

We can decompose the Malmquist measure into two counteracting factors which are the technological and the efficiency change by rewriting M as follows:

$$M(s,t) = \sqrt{\frac{E(t,s)}{E(t,t)} \frac{E(s,s)}{E(s,t)} \frac{E(t,t)}{E(s,s)}} = TC(s,t)EC(s,t) \tag{5}$$

Technological change (TC) evaluates the productivity gain or loss that is attributable to a technological evolution in the industry between the two periods. A value of TC superior to 1 represents technological progress in the sense that more can be produced using fewer resources. On the other hand, efficiency change (EC) measures the catch-up relative to the present technology. An EC greater than 1 means for a given DMU that it has moved closer to the frontier.

Using the MPI, we investigate the average productivity's change between 2007 and 2017 for each bank. Then we analyze the productivity's evolution according to each year. Finally, we slice our overall period into four phases, each phase considers a sub-period as follows:

- $PhaseI$ [2007 – 2010]
- $PhaseII$ [2011 – 2012]
- $PhaseIII$ [2013 – 2015]
- $PhaseIV$ [2016 – 2017]

The Phase I includes the ante revolution era as the Tunisian revolution began in December 18th 2010 and ended in January 14th 2011.

2.2 Variables selection

Our data set encompass annual observations of the 18 most important commercial banks in Tunisia for the period between 2007 and 2017 (198 rows). Islamic banks are excluded from the scope of the analysis due to a different financing mechanisms. From the banks' financial statements we define our input and output variables as follows:

- inputs
  - Staff expenses
  - General operational expenses
- outputs
  - Net banking product
  - Customer total deposit

The specification of the outputs was a challenging task nevertheless as the Tunisian Banking System is highly competitive, the net banking product and the total customer deposits variables represent strategic objectives to maximize. Finally, our calculations are executed in the open-source free software R. We rely on the `Benchmarking` package developed by Bogetoft & Otto (2010).

3 Findings

Table 1: Evolution of the MPI, TC and EC for the Tunisian banking industry over the period 2007-2017.

Year	MPI	TC	EC
2007	-	-	-
2008	1.0476	1.1029	0.9499
2009	0.9687	0.9997	0.9690
2010	1.0222	1.0849	0.9422
2011	0.9637	0.9288	1.0376
2012	1.0591	0.9224	1.1482
2013	0.9906	1.0623	0.9325
2014	0.9641	0.9646	0.9995
2015	0.9843	0.9787	1.0057
2016	0.9724	1.0256	0.9482
2017	0.9849	0.9872	0.9976
Mean*	**0.9952**	**1.0040**	**0.9913**

* All indexes are geometric averages

According to table 1, we observe that over the period of 2007-2017, the overall productivity of the Tunisian banks decreased (mean MPI = 0.9952).

We notice that Tunisian banks achieved the highest productivity improvement in 2012 after experiencing the sharpest loss in 2011 due to a tremendous technology retrogression. Indeed, in 2011 the MPI and TC exhibit respectively a value of -3.36% and -7.12%. This is not really surprising as 2011 corresponds to the year that followed the revolution. Hence, our results are in line with the idea that the Tunisian revolution has had a direct negative impact on banking performance. In addition, table 1 shows that between 2013 and 2017, Tunisian banks encountered a continuous loss in productivity even after the adoption of the new constitution and the election of a new president, respectively on 26th January and 23rd November 2014, suggesting that political transition did not succeed in achieving banking productivity recovery.

Table 2: MPI, TC and EC average change for each bank over the post revolution era. (from 2011 to 2017).

Bank	MPI	TC	EC
CITI	1.1119	1.0378	1.0714
UIB	1.0401	0.9834	1.0576
BTS	1.0398	0.9837	1.0570
BIAT	1.0287	0.9907	1.0383
BH	1.0255	0.9859	1.0402
BNA	1.0225	0.9763	1.0473
QNB	0.9945	1.0047	0.9898
UBCI	0.9866	0.9659	1.0213
Attijari	0.9801	0.9434	1.0389
Amen	0.9774	0.9774	1.0000
BT	0.9697	0.9697	1.0000
STB	0.9672	0.9692	0.9979
ATB	0.9589	0.9648	0.9939
ABC	0.9570	0.9950	0.9619
BTL	0.9518	0.9939	0.9577
STUSID	0.9336	0.9668	0.9657
BTE	0.9322	0.9539	0.9773
BTK	0.9256	0.9866	0.9382

* All indexes are geometric averages

Furthermore, from table 2 we remark that the bank which improved the most in terms of productivity during the post revolution period is Citibank.

On the other hand, the bank which deteriorates the most is BTK. Its productivity decreased at an average rate of -7.44%. We also observe that the four most negatively affected banks are mixed banks: BTE, BTK, BTL, and STUSID.

Figure 1: Tunisian banking industry productivity change according to the temporal phases defined in *Section 2.1*.

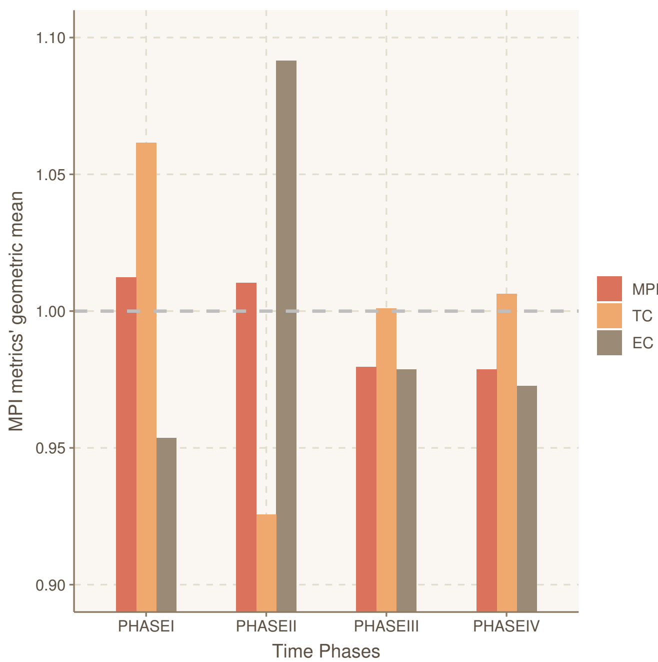

Figure 1 exhibits the Tunisian banking industry's productivity development according to the temporal phases defined in *Section 2.1*. We observe that during Phase II which corresponds to the average banking productivity shortly after the revolution, Tunisian banks experienced a significant technological retrogression. On the other hand, the technical efficiency improved. This dual effect led to a slight decrease in the overall productivity. Nevertheless, In phase III we detect an important drop in the average MPI, induced by a technological and an efficiency loss. Finally, Phase IV behaves approximately the same as phase III.

4 Conclusion

In this paper we examine Tunisian banks productivity's change in the light of the Jasmin revolution using the DEA-based Malmquist Productivity Index. We consider the global period 2007-2017 which encompasses an ante and a post revolution era. Our sample includes the 18 most important commercial banks operating in the country. Dividing our global period into four time phases, we find that shortly afterwards the revolution, Tunisian banks have seen a tremendous drop in technology compensated by a strong improvement in technical efficiency. Moreover, in the medium and long-term they experienced a negative productivity growth even after the adoption of the new constitution and the presidential election. Finally, our results show that banks with a mixed capital structure are the most negatively affected. Our findings are in line with previous researches that point out a negative relationship between political instability and banking productivity.

References

Ameur, I. G. B. & Mhiri, S. M. (2013), 'Explanatory factors of bank performance evidence from tunisia', *International Journal* **2**(1), 1–11.

Berger, A. N., Leusner, J. H. & Mingo, J. J. (1997), 'The efficiency of bank branches', *Journal of Monetary Economics* **40**(1), 141–162.

Bogetoft, P. & Otto, L. (2010), *Benchmarking with Dea, Sfa, and R*, Vol. 157, Springer Science & Business Media.

Chan, Y.-c. & Wei, K. J. (1996), 'Political risk and stock price volatility: the case of hong kong', *Pacific-Basin Finance Journal* **4**(2-3), 259–275.

Charnes, A., Cooper, W. W., Lewin, A. Y. & Seiford, L. M. (2013), *Data envelopment analysis: Theory, methodology, and applications*, Springer Science & Business Media.

Charnes, A., Cooper, W. W. & Rhodes, E. (1978), 'Measuring the efficiency of decision making units', *European journal of operational research* **2**(6), 429–444.

Chau, F., Deesomsak, R. & Wang, J. (2014), 'Political uncertainty and stock market volatility in the middle east and north african (mena) countries', *Journal of International Financial Markets, Institutions and Money* **28**, 1–19.

Darby, J., Li, C.-W. & Muscatelli, V. A. (2004), 'Political uncertainty, public expenditure and growth', *European Journal of Political Economy* **20**(1), 153–179.

Data.worldbank.org (2019*a*), 'Private credit by deposit money banks to gdp (%)', *https://datacatalog.worldbank.org/private-credit-deposit-money-banks-gdp* .

Data.worldbank.org (2019*b*), 'Stock market capitalization to gdp (%)', *https://datacatalog.worldbank.org/stock-market-capitalization-gdp* .

De Gregorio, J. & Guidotti, P. E. (1995), 'Financial development and economic growth', *World development* **23**(3), 433–448.

Fethi, M. D. & Pasiouras, F. (2010), 'Assessing bank efficiency and performance with operational research and artificial intelligence techniques: A survey', *European journal of operational research* **204**(2), 189–198.

Fohlin, C. (1998), 'Banking systems and economic growth: lessons from britain and germany in the pre-world war i era', *Federal Reserve Bank of St. Louis Review* **80**(May/June 1998).

Ghosh, S. (2016), 'Political transition and bank performance: how important was the arab spring?', *Journal of Comparative Economics* **44**(2), 372–382.

Jeribi, A., Fakhfekh, M. & Jarboui, A. (2015), 'Tunisian revolution and stock market volatility: evidence from fiegarch model', *Managerial Finance* **41**(10), 1112–1135.

Naceur, S. B. & Goaied, M. (2001), 'The determinants of the tunisian deposit banks' performance', *Applied Financial Economics* **11**(3), 317–319.

Nouaili, M. A., Abaoub, E. & Anis, O. (2015), 'The determinants of banking performance in front of financial changes: Case of trade banks in tunisia', *International Journal of Economics and Financial Issues* **5**(2), 410–417.

Paradi, J. C., Rouatt, S. & Zhu, H. (2011), 'Two-stage evaluation of bank branch efficiency using data envelopment analysis', *Omega* **39**(1), 99–109.

Paradi, J. C. & Zhu, H. (2013), 'A survey on bank branch efficiency and performance research with data envelopment analysis', *Omega* **41**(1), 61–79.

Soltani, H., Aloulou, A. & Abbes, M. B. (2017), 'The impact of political instability on investor sentiment and market performance: Evidence from tunisian revolution.', *IUP Journal of Applied Finance* **23**(4).

Tam, F. K., Paradi, J. C. & Sherman, H. D. (2018), 'Data envelopment analysis in the financial services industry'.