BANK EFFICIENCY ANALYSIS IN TURKISH BANKING SYSTEM

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Abstract

The efficiency of the banking system is one of the most important issues in the financial market because the efficiency of banks can affect the stability of the banking industry and thus the effectiveness of the whole monetary system. The aim of this paper is to analyze the efficiency of banking system in Turkey between the years 2007-2010. The efficiency scores of the 30 commercial banks are measured by using Data Envelopment Analysis (DEA) between the years 2007-2010. The effects of 2008 financial crisis on the Turkish banking system efficiency and the efficiency score differences of domestic and foreign bank subgroups operating in Turkey are also examined in this paper.

Keywords: Bank Efficiency, DEA, Turkey

Introduction

Turkish Banking Sector has changed drastically in the last ten years. The impact of 2000 and 2001 crises on financial system especially on the Turkish Banking sector which occupies around seventy five percent of the financial system was extensive. Social and economic reforms have been introduced in many areas after the crises. Besides IMF policies, Turkish authorities have found themselves in a position to undertake some measures. In banking sector, restructuring of the state banks, resolution of the banks under control of SDIF, restructuring of private banks, enhancement of supervision and audit of banking system and new legal arrangements and resolution of non-performing loans were the basic policies of the restructuring program. The merger and acquisitions in the sector accelerated the change in the banking sector.

The efficiency of the banking system is one of the most important issues in the financial market because the efficiency of banks can affect the stability of the banking industry and thus the effectiveness of the whole monetary system. The aim of this paper is to analyze the efficiency of banking system in Turkey between the years 2007-2010.

Literature Review

Empirical evidence on performance evaluation and efficiency of the banking industry is much researched globally. Bank efficiency is measured by different methods. The earliest technique, used to measure performance changes is ratio analysis which examines the financial statements of individual firms and comparing them with a benchmark. However, this technique failed to take into account the fact that banks produce multiple outputs from multiple inputs and consistent aggregation was not possible (Smith, 1990). The shortcomings of such a descriptive and static analysis of the data are overcome by later researchers with the use of parametric and non-parametric techniques.

The parametric and non-parametric techniques differ mainly in how they handle random error and their assumptions regarding the shape of the efficient frontier. The three main parametric methodologies used by researches to examine financial institutions include the stochastic frontier analysis (SFA), the thick frontier analysis (TFA), and the distribution free analysis (DFA). In general, the parametric approaches specify a functional form for the cost, profit, or production relationship among inputs, outputs and environmental factors, and allow for random error.

The two non-parametric techniques used in the banking sector efficiency literature includes Data Envelopment Analysis (DEA) and Malmquist Productivity Indices (MPI). In general, a non-parametric technique does not require the specification of an a priori functional form and therefore is the most favored approach.

The literature examining the efficiency of financial institutions with parametric and/or nonparametric frontier techniques has expanded rapidly in recent times.

While, a large body of literature spanning a half-century exists on banking efficiency in the United States, more recent studies examine several other countries such as India, China, Hong Kong, Poland, Croatia and Japan etc.

Favero and Papi (1995) used a sample of 174 banks and they tried to determine which of the two DEA models was better: CRS or VRS, and they found that the VRS model was more appropriate to describe the efficiency level than the CRS model. They also regressed the efficiency level on a dummy which discriminated between banks located in the northern, in the central or in the southern part of Italy, and they found that the banks in southern Italy had the lowest level of efficiency.

Pastor, Perez, and Quesada (1997) compared the productivity, efficiency, and differences in the technology of different European and U.S. banking systems for the year 1992. They used DEA and a non-parametric approach to estimate the efficiency level in their study. They chose three outputs (loans, other productive assets, and deposits) and two inputs (non-interest expenses and personal expenses) to estimate the efficiency level in their study. They found that there was a difference in the efficiency level of the banking systems among the countries in the sample. The most efficient banks were in France, Spain, and Belgium, while the less efficient banks were in the the U.K.,Austria, and Germany.

Altunbas, Liu, Molyneux and Seth (2000) used the stochastic cost frontier methodology to evaluate scale and X-inefficiencies to examine the impact of risk and quality factors on bank costs in Japanese commercial banks between 1993 and 1996. They specified three outputs (total loans, total securities, and total off-balance sheet items) and three inputs (price of labor, price of funds, and price of physical capital) in their study by using the intermediation approach. The authors found strong evidence of scale economies across a wide range of bank sizes, even for the largest firms. They suggested that the largest banks could be more efficient in reducing costs by decreasing output rather than improving X-efficiency.

Maudos and Pastor (2001) analyzed profit efficiency and cost efficiency in a sample of 16 countries in the Organization for Economic Cooperation and Development (OECD). They used the SFA and employed three outputs (loans, other earning assets, and deposits) and two inputs (net income and profit before tax) in their study. Their results showed that the efficiency level of the banking sector in the U.S. improved from 1986 to 1995 and that the efficiency level of the banking sector in Japan decreased sharply from 1988 to 1995. The banking sector in Europe was stable during the period of study.

Casu and Girardone (2002) used the data envelopment approach to study the efficiency of the Italian banking system. They compared banking groups and parent companies (the institutions leading the groups, taken individually). They found that the banking groups had a lower mean efficiency level than parent companies and subsidiaries taken individually. They also found that there was no evidence of scale economies either in the sample of groups or in the one composed by the parent and subsidiaries taken individually.

Casu and Molyneux (2003) used the non-parametric DEA approach to investigate whether the efficiency degree of the European banking system improved between 1993 and 1997. They used the intermediation approach to specify two outputs (total loans and other earning assets) and two inputs (total costs and total customers and shortterm funding) for their study. Casu and Molyneux (2003) found that the DEA results showed low average efficiency levels during the period of study. They concluded that there was a difference in the efficiency level across European banking systems and that this difference was due to each country's specific factors relating to banking technology.

In one of the studies comparing the foreign and domestic bank efficiencies; Berger et al. (2000) proposed two alternative hypotheses in their research to explain their results, they found that foreign-owned financial institutions to be less efficient than domestic institutions, the home field advantage hypothesis and the global advantage hypothesis.

Green et al. (2003) and Naaborg (2003) are other studies analyzing the foreign and domestic bank performance in the Central and Eastern Europe in the late 1990s. Green et al. found that, foreign banks are not significantly more efficient than domestic banks, either in terms of cost advantage or in terms of economies of scale/scope. However, Naaborg suggested that in spite of the superiority of foreign banks in terms of profitability, there is convergence in the performances.

Another study for the transition countries is Bonin et al. (2005) which examined the effect of ownership on bank efficiency over the period 1996-2000 using stochastic frontier estimation procedure. They found that government owned banks are not significantly less efficient than privately held banks, and that foreign owned banks are more efficient than other banks and provide better service. They suggested, therefore, that privatization on its own is not sufficient to enhance the efficiency of the banking sector.

Yıldırım and Philippatos (2007) evaluated the efficiency level of commercial banks in 12 central and eastern Europe (CEE) countries for the period between 1993 and 2000. They employed two techniques — the SFA and the DFA — to estimate cost and profit efficiency for a panel of 325 banks over an eightyear period for the 12 CEE countries. They determined three outputs (loans, investments, and deposits) and three inputs (borrowed funds, labor, and physical capital) in their analysis. They found that the average cost efficiency level for twelve countries was 72% with DEA and 77% with the SFA. Also, they found that the most costefficient countries were Poland and Slovenia and that the Russian Federation, Lithuania, Latvia, and Estonia were the least efficient countries. The authors concluded that foreign banks were more cost efficient and less profit efficient than domestic banks and that competition in banking markets was positively related to cost efficiency and negatively related to profit efficiency.

In Turkey, Zaim (1995) analyzed the effects of liberalization on the performance of the Turkish banks in terms of efficiency. The results indicated that the Turkish banks became more efficient during the post-liberalization era.

Yıldırım (2002) studied the efficiency of the Turkish commercial banks during the period 1988-1999. This study looked at the technical and scale efficiencies of the banks using the DEA methodology. Scale efficiency, which was the main source of inefficiency, and pure technical efficiency were found out to be very volatile during the period when there was instability in the Turkish economy. Moreover, efficient banks were found to be more profitable, and bank size is positively related to pure technical and scale efficiencies.

Işık and Hassan (2003) classified the source of productivity changes as efficiency change and/ or technological change during the 1992-1996 period. This study showed that DEA methodology could be utilized to analyze the performance of banks in transition countries. One finding was that following the 1994 crisis, productivity declined mainly due to technological regress, the most affected banking group being the foreign banks. They also looked at the relationship between productivity, bank size and crisis, and concluded that large banks were affected the least from the crisis. In Isık and Hassan (2003), the analysis was divided into two, one using the off-balance sheet items and the other not. Both groups of results indicated that the banking sector experienced productivity growth resulting not from technological improvement, but from efficiency increase, which, in turn, was mainly driven by the better resource management rather than the scale improvement. They found that it was foreign banks followed by private ones whose performance improved the most after the deregulation although the performances of public and private banks converged during the period.

Gamal and Inanoğlu (2005) analyzed the efficiency of the Turkish banking sector during the 1990-2000 period using a parametric technique and suggested that although state banks were efficient in terms of generating loans, they were inefficient in the sense of labor utilization, which was one reason behind the idea of privatization. Another finding of the paper was that special finance houses were relatively more efficient than conventional domestic banks.

A similar study for the same period of time was conducted by Özkan-Günay and Tektas (2006) by utilizing the nonparametric DEA methodology. The study revealed that the number of efficient banks in the sector and the mean

efficiency values for different groups of banks declined over time. Moreover, they also looked at the sensitivity of the efficiency values to the choice of outputs, and found sensitivity especially for foreign banks.

Empirical Research

The aim of this paper is to measure the efficiency of Turkish banking system and to answer the following research questions:

1) Which banks are more efficient in Turkey and why?
2) Is there a difference in efficiencies of the domestic and foreign banks operating in Turkey?
3) Did the global financial crisis of 2008 affect the efficiency of Turkish Banking System?

Data

DEA methodology is used to test the efficiency of the banks. The reason for choosing DEA is that DEA works well with a small sample size and does not necessitate the knowledge of any functional form of the frontier. That will help in the analysis due to the small sample size of Turkish banks.

The sample includes 30 commercial banks including 3 state banks, 11 private banks and 16 foreign banks between the years 2007 and 2010. This period is chosen because there were many mergers and acquisitions and foreign takeovers especially between the years 2001-2007, so the number of domestic and foreign banks changed throughout the period. In 2001 Demirbank (now HSBC), in 2005 Türk Dış Ticaret Bankası (after Fortis and now TEB), in 2006 Denizbank and Finansbank and in 2007 OyakBank (now ING Bank), MNG Bank (now Turkland Bank) and Tefken Bank (now Eurobank Tefken) were sold and after these dates they were considered as foreign banks. From 2007 up until 2010 there weren't any foreign takeovers and changes in the number of domestic and foreign banks because of the 2008 global financial crisis. Contrary to 2001 financial crisis, the 2008 financial crisis was not a local financial crisis. This time foreign banks were a threat to the financial stability, rather than the Turkish banks. Major negative effects of the crisis in Turkey were the decrease in consumer demand and capital inflows and increase in unemployment, budget deficit and public debt stock. The development and investment banks were not taken in the sample because of their different functions as well as their small market shares in the banking industry.

For a healthy DEA; sufficient number of DMUs should be evaluated. In literature, this criterion is expressed differently by some analyzers. Norman and Stoker (1991), declared that DMUs should be more than twenty. Vassiloglu and Giokas (1990), expressed that DMUs should be threefold than the sum of inputs and outputs. In this analysis, since the sum of inputs and outputs is 6 the number of DMUs is higher than it is needed.

The secondary data used in bank efficiency study come from the bank balance sheets published by the Banks Association of Turkey (BAT) and the DEA analysis was made by using the DEAP software program.

In this study, intermediation approach of nonparametric DEA is used to estimate bank efficiency in Turkey with both CCR and BCC model. Intermediation approach accepts that the funds raised and the expenses incurred in the intermediation process are normally treated as inputs, whereas the funds loaned and income generated are regarded as outputs.

In DEA analysis inputs and outputs should be carefully determined to find the proper efficiency scores. In this analysis three inputs and three outputs are defined by applying intermediation approach that is used in bank efficiency studies.

In this study the input variables will be:

V1 Labor
V2 Capital
V3 Deposits

Labor is defined as the number of full time employees on the payroll while capital is the property and equipment. Deposits is the sum of deposits and marketable securities issued.

The output variables will be:
Y1 Total credits
Y3 Off balance sheet items
Y4 Securities

Total credits include short- and long-term credits. Bad loans are deducted from the total credits. Off-balance sheet items are the sum of guarantees and warranties, commitments, foreign exchange and interest rate transactions as well as other off-balance sheet items. Securities include money market securities, banks and other financial institutions, investments held to maturity, securities available for sale and securities held for trading.

Findings

The efficiency change in the banking sector between 2007-2010 was examined by using intermediation approach and both CCR and BCC models. Both CCR and BCC results given in Table 1 and 2 indicate that domestic banks are more efficient than their foreign peers in all years. In previous research of Işık and Hassan (2003) foreign banks were found more efficient in Turkey. The reason behind the efficiency decrease in foreign banks between years 2007 and 2010 may be because of the global financial crisis.

Table 1: Turkish Bank Efficiency Scores (CCR Model)

Domestic Banks	2007	2008	2009	2010
State Banks				
Ziraat Bankası	1,000	1,000	1,000	1,000
Halk Bankası	0,924	1,000	0,976	1,000
Vakıflar Bankası	1,000	1,000	1,000	1,000
Private Banks				
Adabank	0.865	0.897	0.735	0.902
Akbank	1.000	1.000	1.000	1.000
Alternatifbank	0.945	0.754	0.796	0.812
Anadolubank	0.923	0.845	0.855	0.914
Şekerbank	1.000	0.943	0.964	0.903
Tekstil Bankası	0.987	1.000	0.953	0.946
Turkish Bank	0.809	0.866	0.798	0.760
Türk Ekonomi Bankası	0.923	0.832	0.932	0.976
Türkiye Garanti Bankası	1.000	0.912	1.000	0.984
Türkiye İş Bankası	0.912	0.867	0.898	0.898
Yapı ve Kredi Bankası	1.000	0.894	0.926	0.972
Mean Efficiency Score of Domestic Banks	0,949	0,915	0,917	0,933
Foreign Banks				
Arap Türk Bankası	0,979	1,000	0,943	0,975
Bank Mellat	1,000	0,897	0,934	0,827
Citibank	1,000	1,000	1,000	1,000
Denizbank	1,000	0,956	1,000	1,000
Deutsche Bank	0,646	0,744	0,765	0,782
Eurobank Tekfen	0,632	0,791	0,834	0,717
Finansbank	0,856	0,934	1,000	1,000
Fortis	0,865	0,742	0,789	0,876
Habib Bank	0,908	0,912	0,809	0,878
HSBC Bank	0,832	1,000	0,897	0,965
ING Bank	1,000	0,965	0,896	1,000
JPMorgan Chase Bank	1,000	0,965	0,866	0,923
Societe Generale	0,765	0,897	0,754	0,866
The Royal Bank of Scotland	0,877	0,768	0,908	0,987
Turkland Bank	0,865	0,743	0,785	0,865
WestLB	1,000	0,894	1,000	0,922
Mean Efficiency Score of Foreign Banks	0,889	0,888	0,886	0,911

Table 2: Turkish Bank Efficiency Scores (BBC Model)

Domestic Banks	2007	2008	2009	2010
State Banks				
Ziraat Bankası	1,000	1,000	1,000	1,000
Halk Bankası	0,936	1,000	1,000	1,000
Vakıflar Bankası	1,000	1,000	1,000	1,000
Private Banks				
Adabank	0,891	0,895	0,784	0,945
Akbank	1,000	1,000	1,000	1,000
Alternatifbank	1,000	0,796	0,832	0,834
Anadolubank	0,925	0,853	0,865	1,000
Şekerbank	1,000	0,954	1,000	0,932
Tekstil Bankası	1,000	1,000	0,978	1,000
Turkish Bank	0,832	0,866	0,804	0,767
Türk Ekonomi Bankası	0,987	0,876	0,935	1,000
Türkiye Garanti Bankası	1,000	0,965	1,000	1,000
Türkiye İş Bankası	0,913	0,894	0,843	0,898
Yapı ve Kredi Bankası	1,000	0,908	0,982	1,000
Mean Efficiency Score of Domestic Banks	0,963	0,929	0,930	0,955
Foreign Banks				
Arap Türk Bankası	1,000	1,000	0,954	0,983
Bank Mellat	1,000	0,893	1,000	0,843
Citibank	1,000	1,000	1,000	1,000
Denizbank	1,000	0,959	1,000	1,000
Deutsche Bank	0,675	0,767	0,786	0,798
Eurobank Tekfen	0,689	0,796	0,855	0,734
Finansbank	0,965	0,935	1,000	1,000
Fortis	0,876	0,754	0,794	0,879
Habib Bank	0,932	0,932	0,954	1,000
HSBC Bank	0,843	1,000	0,912	1,000
ING Bank	1,000	0,970	0,876	1,000
JPMorgan Chase Bank	1,000	0,967	0,876	0,954
Societe Generale	0,765	0,906	0,765	0,876
The Royal Bank of Scotland	0,880	0,771	0,923	1,000
Turkland Bank	0,868	0,767	0,789	0,878
WestLB	1,000	1,000	1,000	1,000
Mean Efficiency Score of Foreign Banks	0,906	0,901	0,905	0,934

Also another reason for domestic banks being more efficient is that state banks are the most efficient sub-group of banks compared to domestic private and foreign banks and they are included in the group of domestic banks. The reason for the increase in the efficiency of state banks is the restructuring programs helded especially for the state banks after 2001 crisis.

The 2001 financial crisis showed that budget deficit and populist government spending was harmful for both banking sector and real sector. Structurally weakened state banks that were controlling 40% of deposits was a threat to banking sector. High interest rates was causing a crowding out effect disabling private investment. The crisis showed that banking supervision was very poor. State banks and some of the small and medium sized private banks turned

out to be structurally weak. The 2001 financial crisis triggered a liquidity crisis. Money markets seized functioning during crisis and trust in banking system was very low in the post-crisis era. State banks needed to be restructured, bankrupt banks needed to be liquidated by SDIF and supervision of the banking system needed to be strengthened.

Up until 2001, in previous studies foreign banks were found to be more efficient than domestic banks as suggested by Işık and Hassan (2002). After this year, however, state banks captured the first place in terms of efficiency. In fact, after the 2001 crisis, there was less political influence on the state banks leading to an improvement in their performance. One other reason of increase in efficiency is that state banks would no longer make duty loss payments in the name of the state.

Provisions would be recorded in the balance sheet for the loans provided. State banks' accumulated duty losses, which amounted to more than twenty billion TL at that time, would be financed through government bonds issued by the Treasury.

In fact, accumulating the interest income from these bonds, Ziraat Bank and Halkbank became quite profitable. Additionally, there was a fall in the number of bank branches, labor and in operational expenses resulting from the restructuring of the state banks. As a result of this fall, there was an improvement in the asset size per branch and per labor (BRSA, 2003). The number of branches declined from 2494 in December 2000 to 1685 in December 2002 while the number of personnel declined from 61,601 in December 2000 to 30,399 in December 2002.

Asset size per branch increased from 13.9 million dollars at the end of 2001 to twenty million dollars at the end of 2002. On the other hand, asset size per labor increased from 0.7 million dollars to 1.1 million dollars during the same periods.

It can be seen that the efficiency scores of both domestic and foreign banks decreased in years 2008 and 2009 because of the 2008 global financial crisis and improved in post-crisis year 2010. While the 2008 global financial crisis created a risky business environment for Turkish banks, in 2010 the banking sector made unprecedented levels of profits due to increased demand for consumer loans, higher level of interest rate margins and increasing prices of securities due to falling interest rates.

Conclusion

In this paper Turkish banking sector efficiency for the years between 2007 and 2010 was tested by using the non-parametric approach DEA. The results reveal that domestic banks are more efficient in all years contrary to the studies in Poland (Havrylchyk, 2006), Crotia (Jemric & Vujcic, 2002) and US (Berger, et al. 2000). This is mostly because of the high efficiency scores of the state banks which are highly restructured after the 2001 crisis. As mentioned following the 2001 crisis, state banks entered into a period in which there was less political pressure as compare to precrises period. Moreover, these banks no longer made duty loss payments in the name of the state after 2001. The value of the real estate properties of these banks increased and the inflation accounting practice affected them the most. These facts justify state banks' having high efficiency values.

The effect of 2008 crisis can also be seen on the efficiency scores. The efficiency scores of both domestic and foreign banks decreased in years 2008 and 2009 because of the 2008 global financial crisis and improved in post-crisis year 2010.

This empirical study can be improved by analyzing the efficiency scores also by selecting different inputs and outputs. Including other factors and bank characteristics may result to give different insight to analysts. More importantly, longer time period can be analyzed to see the broader picture and not only country wise analysis but also comparative cross country analysis can be made to elaborate the effects of the crisis to efficiency in different countries.

References

Altunbas, Y., Liu, M., Molyneux, P. & Seth, R. (2000). Efficiency and risk in Japanese banking. *Journal of Banking and Finance*, 24 (10), 1605-1628.

Berger, A.N., DeYoung, R. & Udell, G.F. (2000). Efficiency barriers to the consolidation of the European financial services industry. *European Financial Management*, 6.

Bonin, J. P., Hasan, I. & Wachtel, P. (2005). Bank performance, efficiency and ownership in transition countries, *Journal of Banking and Finance,* 29, 31-53.

Casu, B & Girardone, C. (2002). A Comparative Study of the Cost Efficiency of Italian Banking Conglomerates. *Managerial Finance*, 28 (9), 3-23.

Casu, B. & Molyneux, P,. (2003). A Comparative Study of Efficiency in European Banking. *Applied Economics*, 35, 1865-1876.

Favero, C. & Papi, L. (1995). Technical and scale efficiency in the Italian Banking Sector: A non-parametric approach. *Applied Economics*, 27, 385-395.

Gamal, M. A. & Inanoglu, H. (2005). Inefficiency and heterogeneity in Turkish Banking: 1990–2000, *Journal of Applied Econometrics*, 20, 641–664.

Green, C. J., Murinde, V. and Nikolov, I. (2003) "Are foreign banks in Central and Eastern Europe more efficient than domestic banks?", *24th SUERF Colloquium on Stability and Efficiency of Financial Markets in Central andEastern Europe.*

Havrylchyk, Olena. (2006). Efficiency of the Polish banking industry: Foreign versus domestic banks. *Journal of Banking & Finance,* 30, 1975-1996.

Isık, I. & Hassan, M. K. (2002). Technical, scale and allocative efficiencies of Turkish banking industry", *Journal of Banking and Finance,* 26, 719-766.

Isık, I. & Hassan, M. K. (2003). Financial disruption and bank productivity: The 1994 experience of Turkish Banks", *The Quarterly Review of Economics andFinance,* 43, 291-320.

Jemric, I. & Vujcic, B. (2002). Efficiency of banks in Croatia: A DEA approach. *Working Papers, Croatian National Bank*.

Maudos, J. & Pastor, J. (2001). Cost and profit efficiency in banking: An international comparison of Europe, Japan and the USA. *Applied Economics Letters*, 8, 383-387.

Naaborg, I., Scholtens, B., Haan, J., Bol, H. & Haas, R. (2003). How important are foreign banks in the financial development of European transition countries?, *CESIFO Working Paper,* No 1100.

Norman, M. & Stoker, B. (1991). Data Envelopment Analysis – The Assessment of Performance, *John Wiley, New Jersey*.

Özkan-Günay, E. N. & Tektas, A. (2006). Efficiency analysis of the Turkish banking sector in pre-crisis and crisis period: A DEA approach, *Contemporary Economic Policy*, 24 (3), 418–431.

Pastor, J., Perez, F. & Quesada, J. (1997). Efficiency analysis in banking firms: An international comparison. *European Journal of Operational Research,* 98, 395-407.

Smith P. (1990), Data envelopment analysis applied to financial statements, *OMEGA International Journal of Management Science*, 131-138.

Vassiloglu, M. & Grokas, D. (1990), A study of the relative efficiency of bank branches: An application of data envelopment analysis, *Journal of Operational Research Society*, 41 (7).

Yıldırım (2002). Evolution of banking efficiency within an unstable macroeconomic environment: The case of Turkish commercial banks", *AppliedEconomics*, 34, 2289-2301.

Yıldırım, H. & Philippatos, G. (2007). Efficiency in banks: Recent evidence from the transition economies of Europe, 1993-2000. *The European Journal of Finance*. 13,123-143.

Zaim, O. (1995). The effect of financial liberalization on the efficiency of Turkish commercial banks, *Applied Financial Economics,* 5, 257–264.