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Research Article

THE MEASUREMENT OF BANK PRODUCTIVITY IN IRAN

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ABSTRACT
Today, productivity is discussed as a culture and perspective in all ranges of work and life of human and is origin of economical development and progress. This internal culture is in a way that , by organizing activity the best result is obtained. One of the subjects to organize it , it should be acted is banking industry that is regarded as one of pivotal activities in economical development of a country ,so that organizing this industry provides field for its promotion and optimal performance .Undoubtedly, any activity that needs capital and financial source , needs role of banks and financial institutions . So, due to effective role of them in economical activities , investigation of their productivity performance will be important . In this research, in view of statistical data of four private banks and four governmental banks ,by using panel data for period of 9-years time , 2001 to 2009 , estimation of productive function , productivity changes during two periods of time , 2001-2005 and 2005-2009 and comparison of total productivity level for productive factors of private and governmental banks have been provided by using econometric methods and in the following . Based on obtained results , total productivity level of governmental banks is more than total productivity level of private banks and productivity was improved along the time.

Keywords*: Productivity, Bank, Panel Data, Production*

INTRODUCTION
Productivity means effective and efficient use of sources in process of production, conceptually. Also, in discussion of productivity ,there is this belief that every day , works could be done better than previous day and as a result, there is possibility of increasing productivity. The concept of productivity that today , a century has passed from discussing it ,seriously , is spreading due to its increased concepts and applications in different aspects of life of human ,quickly. Based on this , productivity measurement that is part of main elements of productivity cycle , finds a special position in organizations , day after day since without suitable measurement of productivity , organizations cannot be controlled. Constant control of direction of goals in form of productivity measurement or assessment of performance . Unfortunately , most of managers of organization have not enough knowledge in regard to concept of productivity and its measurement methods as manager of Canadian Productivity Center, Bernolak , believes that most of mangers do not know real meaning of productivity and are not aware of that to what extent, this subject is vital for his/her organization and how they can improve it, they do not know that how they evaluate it and analyze it, too. Growth of communications in international financial space emphasizes on importance and necessity of attention to banking productivity more than before. In fact, decreasing productivity level in financial system , especially in a global process , will turn economical development in favor of societies that have more powerful superstructure and financial structure while productivity growth is done in light of developing financial markets and financial establishments like commercial banks, development banks, insurance companies , exchange and securities markets ,valid cooperatives and other financial establishments . Productivity is due to competitive and balanced development in any economical part and usually , the first realistic question in relation to productivity that takes directly its simple changes , investigates data. Banking industry is took into account as the

most important parts of any economy since banks as mediator of monetary sources beside the securities stock and insurance took as main pillars of financial markets . Banking is very important in Iranian economy because due to no required development of capital market , in practice , these are banks that are responsible for long-term financing . Also, in releasing process of financial markets and tie of global markets , productivity and efficiency is a required condition . At present , almost all developed countries and many successful developing countries, have invested many investments for promotion of productivity in national , regional level, agencies and even individuals and know their growths for correct attention and attitude to this problem. As per importance of productivity in the country , necessity of productivity has been recognized by the country legislators ,truly ,so that due to nota benne 35 of second program act of economical, social and cultural development , officials for the country economical parts have been obliged to calculate productivity and promotion of its level along the program. In many of articles of fourth program act of development , goal of productivity promotion has been pointed out . These articles can be pointed out such as articles of 5, 7, 10, 14, 17, 34, 37, 52, 88, 143, 102, 136 and 144. The general goals of this paper is to compare general level of productivity of private and governmental banks and investigating changes of productivity along time . Main questions of this paper include of :1) what is position of private banks in comparison with governmental banks from productivity view ? and 2) what has been banks productivity changed along time ? for responding to these questions , hypotheses are tested : 1- private banks have higher positions in comparison with governmental ones from productivity view. 2- banks productivity has improved along time . The type of this paper is based on goal from kind of practical kind and analytic-descriptive and deductive method.

Theoritical and Experimental Bases

In economical texts, different definitions have provided for productivity that all of them point out a type of correct and efficient use of sources to meet determined goals .Indeed, productivity is a criterion and means for assay for measurement of efficiency of economical activities in society. The simplest definition of productivity in culture of economical idioms is " ratio among certain amount of product and certain amount of one or several production factors"(Farhang, p 1725). General definitions regulated by any of international organizations, are not different together so much , conceptually. The history of scientific ordered researches regarding productivity has not so much distance. Francois Quesney provided a theory for productivity in his book under title of historical view for economical theories. In this theory , land and agriculture was took as sources of real wealth. The first statistical research in field of productivity attributes to Wright,too. The Wright's research findings that he was aware of evaluating productivity related to manual work and work with machine, basically , published in annual report of ministry of work of U.S. in 1898 . After it, many researches were done in field of types of productivity (Zara'nejad , 2007). Specialists of different fields have applied different methods for productivity measurement . Economists have used Index Approach , Product Function Approach, Input – Output method. Productivity index is ratio among volume or output value of goods and services to volume or value of one or several input factors. Based on this, different indices and models have provided such as total productivity model , Elementary Index , Kendrick Index, Divisia index, and Tornquist index. Productivity indices , economy net in costs of product production in periods of sequential time have been measured but they have various deficiencies ,too. Many of economists and researches of practical economy , measure and analyze productivity through function of production . The basis of work is in a way that based on function of production , making mathematical relations to show production as a function from production factors. This work is done through combining observations, economical theories , mathematics, and statistical and econometric methods. The intention of production function is technical relation among used inputs in a production unit and input-output with product of that productive unit. In this method, average productivity of a productive factor , is the same average production of production factor and final productivity of a production factor is the same final production of that factor. Economical theory for evaluating productivity is rooted in theories of Jan Tinbergen (1942) and Solow (1957). They have discussed productivity indices in form of concept of

production function and tied it with analysis of economical growth. Since that time, evaluating productivity developed ,especially in following of studies of Jorgenson ,Zvi Griliches and Erwin Diewert, significantly. Today, method of production theory in evaluating production , provides a consistent and integrated method in mixing agency theory ,index number theory , and national accounts. Methods for evaluating productivity are classified in both parametric methods (econometric methods) and non-parametric ones. Non parametric methods include accounting method of growth and number index method. (Khaki, 1997). In opinion of some thinkers , productivity is problematic in some different economical part in view of its experimental and conceptual concepts to some extent. This problem becomes more complicated in relation to banking to some extent since in banking ,there is no still unanimous definition in relation to banking input-output. Usually, methods that can be emphasized to examine banking productivity more, include traditional method of financial accounting, method for function of banking production and financial method. (Heshmati Moulaie , 2002). Due to importance of banking productivity in several recent decades, various studies have done in field of banks productivity that a summary of it has provided in table 1 :

Table1: Summary of Studies on bank productivity

Study	Country	Period	Inputs	Outputs	Results
Berg et al (1992)	Noryway	1980-89	Labour hours, Operational expenses deflated by materials price index	Short-term loans, long-term loans, deposits and loan losses treated as negative output	Low TFP growth but strong catch up following deregulation. Bigbanks had stronger productivitygrowth than smaller banks .
Alam (2001)	USA	1980-89	Two categories of deposits, other purchased funds, capital, labour, equity	Securities, three categories of loans	Lag in effect between regulatory reform and growth in productivity. Improvements in productivity obtained from technical innovation rather than efficiency gains.
Drake (2001)	UK	1984-95	Physical capital, labour, (deposits)	Loans, Other investments, oninterest income,(deposits)	Uses both intermediation and production methods. Productivity growth driven by technical progress. Slower TFP under the intermediation approach
Canhoto and Dermine (2003)	Portugal	1990-95	Labour, Physical capital	Loans, deposits, securities,interbank assets/liabilities	Strong technological progress following deregulation Catch up weakened as benchmark banks grew strongly.
Isik and Hassan (2003)	Turkey	1981-90	Labour,physical capital, deposits	Short-term loans, long-term loans, otherearning assets, non-interest	Productivity loss 1982-86 . Productivity growth 1987-90. Strong catch-u in 1987-90 following deregulationbut low technical progress.
Ni and Wan (2006)	China	1998-02	Labour, physical assets, branches, op expenses	Deposits, loans, op revenue	Positive TFP. Joint stock banks more productive than SOB. Productivity growth driven by technical progress
Tan and Wang (2006)	China	1997-03	Labour, physical assets, deposits	Profit, gross income	TFP growth negative until final year, driven by technological regress. Efficiency

Hou (2006)	China	1996-02	Deposits, physical assets, op. expenses	Interest earnings, noninterest earnings	Declining trend in technical efficiency. TFP driven by technological progress
Sun and Fang (2007)	China	1996-04	Interest expenses, other expenses, operating expenses, total assets	Interest earnings, other earnings, profit before tax	From 1996u till 2001, TFP was less than 1. Foreign banks entry ha no significant impact on Chinese banking efficiency improvement. 2001-04, TFP, TE is positive greater than 1. As China joined WTO, foreign entry has limited impact on Chinese banking
Pasiours and Sifodaskalakis(2007)	Greece	2000-05	Fixed assets, Labour,	Liquid assets, loans, investments	7 percent increase in total factor productivity growth
Yan (2008)	China	1995-04	Op. expenses, deposits, number of staff	Loans, profits	Banking market concentration is declining, which caused bank efficiency improvement. Competition level is positively correlated with efficiency
Sofian (2008)	Malaysia	1998-03	Fixed assets, Deposits	Loans Facilities	Reduce Productivity of production factors over time
Zou (2008)	China	1996-05	Deposits, net fixed assets , Op.expenses	Investments, loans	FTP driven by technical progress. Listed banks are more efficient than nonlisted. The latter is better than SOB. Ownership is the key factor. Bank size is positive correlated to technical progress and efficiency catch-up.
Fiorentino (2009)	Italy and Germany	1994-04	fixed assets, labor, deposits and bonds	interbank and customer loan, investments in stocks and bonds,	Italy's growth has been significantly higher than Germany's. In both countries most of the productivity growth is due to improvements in the banking technology, potentially reflecting strong IT progress
Kent Matthews and Nina Zhang(2009)	*China*	1997–07	bank deposits and borrowed funds, fixed assets and operational costs	total loans, other earning assets, and non-interest income	Average total factor productivity for the joint-stock banks was better than that of the state-owned banks for some models of measurement and individual state-owned and joint-stock banks did improve their productivity growth and defined an improving production frontier

Introduction and Estimate of Model

In view of that goal of the paper has been to compare productivity level of all private and governmental banks and how productivity process of studies banks during period of clear time , in order to examine total productivity of production factors , Kab Douglas' production function has been used that by applying modifications on it,it is as follows:

$$\log Y = a + \alpha \log K + \beta \log L + \gamma \log E + U \qquad (1)$$

Y is bank production ;**a** ,natural logarithm of total productivity level of production factors; **K**, capital stock ;**L**, work force; **E**, electronic banking ; and α,β,γ , are constant quantities that choose values among zero and one. In this study, total logarithm of bank assets has taken as production of bank , work force includes sum of practitioner work force in bank based on gender, service years, and educations for end of any year and next variable is exploitation rate of banks from electronic banking that includes number of swift branches , number of ATM devices , number of PIN PAD devices , ONLINE branches , number of issued bank cards and number of POS devices at the end of any year and the last variable is capital stock. Statistical data have extracted from formal references of the country and for gathering data related to banks production , work force , electronic banking, and capital stock ,books for report of banks performance in any year and website of Central Bank of Islamic Republic of Iran have been used . At first, it is necessary that investigated sample would be introduced. Sample member banks include private banks as follows: Parsian, Saman, Karafarin, and Eqtesad Novin and governmental banks are Saderat, Melli, Mellat, and San'at and Ma'dan. In this part , firstly we estimate production function for both private and governmental banks by using data panel method , separately and then, we estimate it for all banks in both period of time , 2001-2005 and 2005- 2009 and compare results together.

Calculating Total Productivity of Production Factors of Private Banks

In view of that for experimental test of model , compound data are used ,so variables of model should be tested from durability view . Hence, unit root test has been done for all variables in level by using Dickey Fuller sectional tests and Fischer test that results are provided in table 2. The test of unit root test of variables show that most of variables were in constant level and supposition of existence of unit root is rejected. Method for estimating model has been done by using estimate method for compound data. At first, to determine existence of ordinate from separate origin , it was done for any of banks by using Limer F and since rate of calculable statics was more than statics of table, thus result indicates rejection of zero supposition (using least usual squares method) and useful regression (least usual squares method) has no validity and ordinate from different origins(fixed or random effects) should be taken in model and Hasman test should be used to choose among fixed or random effect that zero supposition has been rejected for using random effects method and fixed effects method and generalized least squares one have been approved and used for estimate of model. Results of all tests, estimated coefficients and coefficient for determining model are provided in table 2:

Table 2: The model results of the private banks(2001-2009)

Variable	ADF-Fisher	Prob	PP-Fisher	Prob	Coefficient	t-Statistic
Logy	49.83	0.0000	58.11	0.0000	-	
Logk	27.10	0.0007	29.99	0.0002	0.38	5.96
Logl	25.82	0.0011	38.08	0.0000	0.72	5.31
Loge	25.27	0.0014	31.72	0.0001	0.11	2.23
a	-	-	-	-	0.53	3.31
R^2	0.97					
Hausman test	21.558(p-value=0.0001)					
F Limer	7.19(p-value=0.0009)					

Source: Research findings

Calculation of Total Productivity for Production Factors of Governmental Banks

At first, constant tests of variables were done and then, F-test and Hasman one were investigated . Results for constant tests showed that almost all variables were in constant level and result of F-test and

Hasman one showed that in estimating model , we should fixed effects method . Results of constant tests , F-test and Hasman test and results of model are provided in table 3:

Table 3: The model results of the governmental banks(2001-2009)

Variable	ADF-Fisher	Prob	PP-Fisher	Prob	Coefficient	t-Statistic
Logy	16.37	0.0037	38.78	0.0000	-	-
Logk	24.66	0.0018	27.40	0.0001	0.07	2.94
Logl	44.09	0.0000	13.43	0.0093	0.028	2.43
Loge	27.86	0.0005	21.59	0.0057	0.19	14.43
a	-	-	-	-	3.91	50.81
R^2	0.98					
Hausman test	443.70(p-value=0.0000)					
FLimer	147.90(p-value=0.0000)					

Source: Research findings

Calculating Total Productivity of Production Factors of All Banks for Period of Time , 2001-2005
As before, both Fischer test and Dickey Fuller one have been done to examine statics of variables . Results of Dickey Fuller test and Fischer one show that these variables are in static level and supposition of existence of unit root rejected. Results of both Hasman test and F-test show that fixed effects method and generalized least squares method should be used in comparison with random effects method and least usual squares method . Results are provided in table 4:

Table 4: The model results for all banks in the period 2001-2005

Variable	ADF-Fisher	Prob	PP-Fisher	Prob	Coefficient	t-Statistic
Logy	41.48	0.0005	63.46	0.0000	-	-
Logk	14.001	0.08	17.65	0.06	0.51	8.71
Logl	33.36	0.0066	24.39	0.018	0.46	3.55
Loge	26.34	0.049	27.40	0.030	0.04	5.59
a	-	-	-	-	0.93	3.93
R^2	0.97					
Hausman test	7.90(p-value=0.04)					
FLimer	3.50(p-value=0.006)					

Source: Research findings

Calculating Total Productivity of Production Factors for All Banks for Period of Time, 2005-2009
Results of static tests of variables , Limer F-test, Hasman test and coefficients and t-statics for all banks for period of time , 2005-2009 are provided in the following table 5:

Table 5: The model results for all banks in the period 2005-2009

Variable	ADF-Fisher	Prob	PP-Fisher	Prob	Coefficient	t-Statistic
Logy	68.61	0.0000	79.83	0.0000	-	-
Logk	46.54	0.0001	57.64	0.0000	0.44	11.67
Logl	28.79	0.0042	42.16	0.0000	0.47	9.96
Loge	49.78	0.0000	48.66	0.0000	0.02	2.90
a	-	-	-	-	1.28	11.76
R^2	0.99					
Hausman test	96.007(p-value=0.007)					
FLimer	41.55(p-value=0.0000)					

Source: Research findings

CONCLUSION AND PROVIDING SUGGESTIONS

Results for estimating model for private banks are provided in table 2 . In view of obtained results for private banks , coefficients of model are positive and meaningful and rate of total productivity of production factors are equal to 53%. Results for estimating model for governmental banks are provided in table 3 that all of coefficients are positive and meaningful and rate of productivity level of all production factors have been estimated equal to 3/91. Comparing rate of productivity level of private and governmental banks in period of time, 2001-2009 shows that governmental banks have higher position from productivity level rate view in comparison with private banks and therefore , zero supposition deals with that private banks have higher position from productivity view , is rejected and its opposite supposition , i.e. being higher of productivity of governmental banks than private banks is accepted.

Being higher of productivity of governmental banks than private ones in a period of studied time is for that reason that in this research, effective variables on productivity include number of practitioner force in banks, capital stock and electronic banking that include number of swift branches, number of ATM devices , number of POS devices at the end of any year, have taken and since some existing private bank in the sample have been developed from 2003 and have triggered and provided electronic services from 2004 and also, number of practitioner human force in private banks are less than governmental banks, so they have reached to a little development in productivity . Also, since in our country , there is no still required supportive space for real presence of private sector and being less of control and supervision on behavior of private banks for confidence to continue keeping employment and investment has caused that productivity has been considered, less. Because that goals of private institutions like banks is to reach maximum profit too, so for this , it is necessary that number of staff is in the least possible case ,therefore decreasing number of work force leads to decrease of productivity and since in developing countries , a high percentage of banks shares is under ownership of government ,so there is no privatization in real meaning that leads to decrease of productivity of private banks .

In this part, we compare productivity level of all banks in two periods of time, 2001-2005 and 2005-2009. In view of results of estimated models in both tables 4 and 5 , we see that productivity for years of 2001-2005 is equal to 0.93% and for years of 2005- 2009 equal to 1.28% and indeed, for second period of time , productivity level has been estimated more and it can be concluded that total productivity level has increased during time and zero supposition that deals with total productivity level of banks , can be accepted during time. Being high of productivity level in period of time, 2005-2009 is for that reason that since in all banks , number of work force and rate of exploitation of electronic banking technology has increased by passing time, so productivity has improved along time.

As a general conclusion, to provide effective operational solution on promotion of efficiency and productivity of bank system , the following policy recommendations are suggested :

1-Attention to human capital as one of key and strategic factors to promote efficiency and productivity of bank system.

2- Using educated work force to promote quality of human force.

3- In order to go up banks productivity , program to attract customer and use all capacity of supervisions should be taken in order to increase volume to provide services like attraction of deposit and provide facilities .

4- Reaching high productivity needs using new bank technology to facilitate bank affairs and increase volume and quality of services.

5- Developing electronic banking in order to economy in costs, economy in time and availability to various channels to do bank operations.

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