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Impact of Trade Area Environment on Bank's Comparative Advantages

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Abstract

This paper analyzes the relationship between the comparative advantages of bank branches and the trade area environment. Bank branches are points of sale whose trade environment influences their activities and performance. Comparative advantages are defined, for each output mix, by the strict dominance of a production technology in a specific trade area over the production technologies of other environments. Using Shephard's output distance functions on a sample of 728 bank branches, we compare the production technologies for different output mixes and different trade environments. We show that none of the production technologies strictly dominates the others and none of them is strictly dominated. Therefore, each trade area benefits from comparative advantages that we try to highlight. Finally, we evaluate the performance of the central banks regarding their ability to provide the right incentives on output mixes to their bank branches so that the latter may benefit from their comparative advantages.

1. INTRODUCTION

The financial services industry is consolidating around the globe (English, Grosskopf, Hayes, Yaisarwang, 1993, Berger, Demsetz, and Strahan, 1999). For the past two decades in the United States and the last decade in France, banking consolidations have become a trend. The competition between the banks has become more intensive and international. To cope with the competitive pressure, banks and especially large banks born of consolidations must increase the proximity of banking services and focus on the customers as their largest source of revenue. Therefore, it is crucial that top bank managers provide the right incentives on output mixes to bank branches depending on their specific local characteristics, in particular their trade environment.

Several papers have analyzed the influence of the environment on the banks efficiency at a macro-level (Fecher and Pestiau, 1993, Allen and Rai, 1996, Berger and Humphrey, 1997, Pastor, Pérez, and Quesada, 1997, Dietsch and Lozano-Vivas, 2000). Here, we emphasize the impact of the trade area environment on a bank's comparative advantages at a micro-level. We analyze the bank across its network of branches. Berger, Leusner and Mingo (1997) have highlighted the significance of acquiring a good understanding of the efficiency of a bank branch for solving conceptual problems at the bank level. However, our focus is not to evaluate the individual branches and/or bank performance as did English, Grosskopf, Hayes, Yaisarwang, 1993. We focus on the identification and qualification of the comparative advantages resulting from the characteristics of the trade area environment. The environmental factors considered rely on marketing expertise to identify and capitalize on business opportunities. Recognizing the magnitude of the trade area's influence[1] on the activity of retail outlets in the banking sector ensures the mix of products that provide comparative advantages. A single bank that produces multiples types of products and services (traditional bank products, off-balanced-sheet activities, and other financial services) may receive extra revenues. They exist in cases where pairs of products require similar marketing strategies and can be sold to the same category of customers.

[1] The theme of the trade area's influence on the retail outlets' activities and performance has been largely studied (Applebaum, 1966; George and Ward, 1973, Ghosh and McLafferty, 1982, 1987; Ghosh and Craig, 1983; Achabal and alii., 1984, 1985; Banker and Morey, 1986a, 1986b, Dunne, Lusch and Gable, 1995; Donthu and Yoo, 1998; Grewal and alii., 1999), and specifically for the bank branches (Athanassopoulos, 1998).

The central bank management decides on both the resources and localization of branches. Hence, the amount of resources employed and the trade area's characteristics are factors that are uncontrollable by the branch managers. Bank branches are the points of sale of the bank. They are part of the bank, wholly owned entities. However, the tasks of the branches are not purely sales and advisory. They play a crucial role in the support of the information bank system by maintaining a direct relationship with local customers. Through an ongoing set of transactions and interactions, branch employees and managers acquire strategic information about local customers and local businesses, their needs, expectations and credit risk.

In this study, we conduct an analysis on a population of 728 mutual French bank branches. All of these branches are under the same brand, but are distributed among ten independent banks and six different types of trade areas. A central bank manages each branch on a regional level and is solely responsible for making the decisions for the branch network (branch localization, branch equipment and output mix) as well as for its policies and its future. It is important that central management of the bank indicate the targets that are adapted to the bank branches' trade environment.

This paper investigates the relationship between bank branch localization in a given and known area and the optimal mixes of outputs. Using Shephard's output distance functions[2], we compare the production technologies in different trade environments and for each trade environment, we explore the output mixes that result in comparative advantages in the sense that the related technology dominates all the technologies from the other environments. The research specifically addresses three questions: (Q1) Does a specific production technology exist for each trade area environment? (Q2) Which output mixes offer comparative advantages by trade area? (Q3) For each of the ten bank groups observed in the sample, are the branches given effective incentives by the central bank management and are the comparative advantages properly exploited by trade area?

[2] See English, Grosskopf, Hayes, Yaisarwang (1993)

The rest of this paper is structured as follows. In Section 2, we present the model while section 3 introduces the data and the results. A final section provides the conclusion of the paper.

2. METHODOLOGY

We introduce the model through a graphical illustration prior to the formal presentation. Two different trade areas are considered (E1 and E2) with their own production technology for which a single input (x) is used to produce two outputs (y1 and y2). Figure 1 illustrates the production possibility sets for the two technologies in the output space. Without considering the extreme configuration where a production technology entirely and strictly dominates the other, the two technologies intersect. In this case, the output space is divided into two sub-spaces located on each side of an output mix for which no technology dominates the other. Therefore, above this output mix, i.e., for an output mix that is relatively intensive in y2, technology E1 dominates technology E2 and, naturally, this statement is reversed for the relatively intensive mix in y1.

- INSERT FIGURE 1 ABOUT HERE -

The dominance of one technology over another result in comparative advantages. For a specific output/input mix, a technology has a comparative advantage if a production plan with maximum productivity exists, i.e., the technology allows for producing a greater amount of both outputs from a fixed amount of inputs. Although our illustration gives a clear interpretation of the dominance in the two outputs/one input case, we must generalize this approach to the multi-input/multi-output case. Here, Shephard's output distance function is the most appropriate tool to estimate the production frontiers and to determine which technology dominates the other for each output/input mix.

The activity of the bank branches is formalized as follows: each branch uses an input vector $x=\left(x_1,x_2,...,x_I\right)\in R_+^I$ to produce an output vector $y=\left(y_1,y_2,...,y_M\right)\in R_+^M$. The technology of the bank branches is represented in the output space $P:R_+^I\rightarrow 2^{R_+^M}$. The production possibility set is defined as all possible output combinations that can be produced from the vector x:

$$P(x) = \{ y \in R_{+}^{M} \mid x \text{ can produce } y \} \quad (1)$$

The distance function is an equivalent representation of this multi-input/multi-output technology (Shephard, 1970):

$$D_o(x,y) = \underset{\gamma}{Min}\{\gamma \mid y/\gamma \in P(x)\} \quad \Leftrightarrow \quad P(x) = \{y \mid D_o(x,y) \le 1\} \qquad (2)$$

The distance function measures the gap between any observed production plan *(x,y)* and the frontier of the production possibility set. $D_o(x,y)$ equals one if and only if the production plan is on the frontier of the production possibility set P(x) ; in contrast $D_o(x,y)$ is strictly lower than unity if the production plan is in the interior of the production possibility set P(x) and $D_o(x,y)$ is strictly greater than unity if the production plan is outside P(x).

In our approach, we estimate a specific technology for each of the trade environments and we must determine the dominating technology for each output/input mix. The output distance function easily solves both problems. For each production plan (observed or not) and its associated output/input mix, we compute the distance function for each of the technologies considered and the greatest value indicates the dominating technology. Therefore, for this specific output/input mix the dominating technology has a comparative advantage over all the other technologies.

Although the production possibility sets of different technologies can widely differ, we impose some minimal properties: (i) free disposability of inputs and outputs, (ii) convexity and (iii) constant returns to scale (CRS). Properties (i) and (ii) are standard axioms in defining well-behaved production possibility sets. Property (iii) in this case presumably ensures that the dominating technology is independent of the level of input used. Since our main concern regards optimal mixes of outputs and not the efficiency of observed production plans, we find that the CRS assumption is not too stringent in our framework.

According to postulates (i) to (iii) and a set of N observed production plans, P(x) can be defined as:

$$P(x)=\left\{y \mid x \geq \sum_{n=1}^{N} z_n x_n,\ y \leq \sum_{n=1}^{N} z_n y_n,\ z_n \geq 0\ \forall n \in N\right\} \qquad (3)$$

From (3), the output distance function can be estimated by a linear programming problem for any given output/input mix represented by the production plan *(x_o,y_o)*. Only the branches that belong to a considered trade environment can define its corresponding technology. We therefore evaluate the production plan *(x_o,y_o)* for each of the trade environments. This is presented in the following program P1.

$$\begin{aligned} &\underset{\theta_o^r, z_n}{Max}\ \theta_o^r \\ &\text{s.c.}: \sum_{n \in E(r)} z_n \mathrm{x}_{in} \leq \mathrm{X}_{io} \quad i=1,\cdots,I \\ &\sum_{n \in E(r)} z_n \mathrm{y}_{mn} \geq \theta_o^r \quad \mathrm{Y}_{mo} \quad m=1,\cdots,M \\ &z_n \geq 0 \quad n=1,\cdots,N \end{aligned} \qquad \text{P1}$$

E(r) is the set of branches that belong to the trade environment r

Note that program P1 results in the opposite of Shephard's output distance function, thus $D_o^r\left(x_o, y_o\right)=\frac{1}{\theta_o^r}$ and the dominating technology is given by r*=argmin{ $D_o^r\left(x_o, y_o\right)$ }.

Table 1 and Figure 2 present the results obtained by comparing the two trade environments. For any given mix of outputs, the values of the distance function computed for the two technologies allow to situate one technology in relation to the other.

- INSERT TABLE 1 ABOUT HERE -

- INSERT FIGURE 2 ABOUT HERE -

3. DATA AND RESULTS

The bank's top management has collected detailed data on 728 bank branches of anonymous large French mutual banks for the year 2001. The data targets the local level of the bank branches analyzed. The branches were located in different environments. The input-output set used to assess their technical inefficiency is presented in Table 2. Literature contains many discussions on banking production technology. There is much disagreement regarding the production methods of banks and the methods for measuring output (Berger and Humphrey, 1992, 1997; Colwell and Davis, 1992; Miller and Athanasios, 1996). This fact is even more accurate since branches are banking retailers and not banking producers.

3.1. DESCRIPTION OF THE SAMPLE

The input-output adopted variables are the result of deliberation and consultation with the bank's top management. The bank branches include three types of resources: human resources, operating capital, customer sales base. The customer base is a specific banking resource considered as the necessary funds to allow the bank branch to be a retailer for credit and liquidity services. The six outputs proposed and sold by the bank branches are measured in Euros. The outputs are: deposits, personal loans and mortgages, commercial loans and mortgages, special services (issuing of credit cards and ATM cards), insurance and securities, life insurance and financial capital (equity). Descriptive statistics are presented in Table 3.

- INSERT TABLE 2 ABOUT HERE -

- INSERT TABLE 3 ABOUT HERE -

Despite the homogeneity of the activities of bank branches, they have been determined according to their location, and more precisely according to the commercial features of their trade environment. There are six distinct trade environments (E1-E6): rural area, residential area, mid-area, urban area (a), peripheral area, urban area (b). Table 4 provides information on the categorization of these six environments and the distribution of the bank branches across these environments. Experts determine the classification of the 728 branches throughout the six trade area environments. Our objective is not to check this classification, but to answer a primary question (Q1) and to test the existence of a particular production technology by trade area environment.

- INSERT TABLE 4 ABOUT HERE -

3.2. SIMILARITY TEST OF THE SIX PRODUCTION TECHNOLOGIES

We first propose to test the similarity of the production technologies of the bank branches across the six different trade area environments. We use two non-parametric tests[3]: (i) a Friedman test to verify that the technologies of production are globally distinct; (ii) a Wilcoxon signed ranks test to verify that the technologies of production are different by pairs. We apply the same process for these two tests. The six production technologies are compared for each observed output mix. The objective of these two tests is to find out if the value of the output distance function (computed by the linear program P1) of an observed output mix is significantly different from one technology to another. The Friedman two-way analysis of variance by rank is used to test the null hypothesis H_0 which assumes that the samples have been drawn from the same population regardless of the production technologies of areas E1, E2, E3, E4, E5 or E6. On the one hand, if the values of the output distance function are not significantly different, H_0 is accepted and the technologies of production are considered identical. On the other hand, if the values of the output distance function are significantly different, H_0 is rejected and the production technologies are considered as specific to each trade area environment.

We supplement the Friedman test that allows a global comparison with a Wilcoxon signed ranks test for each pair of technologies. The Wilcoxon signed ranks test is more powerful than the sign test since it considers both the direction and the magnitude of the differences within pairs. This test is used to compare the six different production technologies by pairs. The results are presented by the significance level probabilities on Table 5.

- INSERT TABLE 5 ABOUT HERE -

[3] See Siegel and Castellan (1988).

The H_0 hypothesis is rejected for all the cases by the Friedman test and for 26 cases (on 30) by the Wilcoxon test. We therefore consider that a specific technology of production exists for each trade area even if, for the Residential Area (E2) technology production, we cannot reject the null hypothesis as compared to the E3 technology. Nevertheless, the Friedman test indicates that E2 is globally different from other trade areas and we note that the E3 (Mid-Area) production technology is significantly different from the E2 technology.

Using a given set of data on the output mix that results in comparative advantages (determined thanks to the Mann-Whitney test[4]), the median output mix for each trade area is statistically described. They are different from an environment to another. We can then suppose that the comparative advantages by trade area environment will be different too.

3.3. IDENTIFICATION OF COMPARATIVE ADVANTAGES BY TRADE AREA ENVIRONMENT

This section provides a descriptive analysis of the comparative advantages by trade area environment. We first present the dominance results for each technology. Table 6 gives the percentage of observed dominated output mixes among the six trade environments. For example, 45% of the branches observed in trade area E2 are dominated by the production technology of environment E5. Therefore, for these observed output mixes, the Peripheral Area (E5) has a comparative advantage over the Residential Area (E2). Conversely, the E2 technology dominates 67% of the observed branches in E5. Therefore, for the associated output mixes, the E2 trade shows a relative comparative advantage over E5.

The last row of Table 6 gives the percentage of branches that dominates all other environments. For example, 33% of bank branches in the E2 trade area dominate all other technologies. Therefore, for the corresponding mixes of output, environment E2 has an absolute advantage over all the other trade areas.

- INSERT TABLE 6 ABOUT HERE-

[4] See Siegel and Castellan (1988).

Beyond these global results, our model can provide the trade area with the competitive advantage for any (observed or not) output mix or test for any observed branch in a given environment if its output mix allows for a comparative advantage over the branches with the same output mix but situated in a different trade area.

In order to specify the nature of comparative advantages by trade areas, we define, from the outputs presented in Table 2, five specific indicators of output mixes as follows:
1) R1 = personal loans and mortgages / deposits;
2) R2= commercial loans and mortgages/ deposits;
3) R3 = special services / deposits;
4) R4 = insurance and securities / deposits;
5) R5 = equity / deposits.

The amount of deposits has been chosen as the denominator because it is the main as well as the traditional banking activity. These five indicators reflect the relative output mix for each bank branch and Table 7 presents the median and the quartiles [Q25%-Q75%] for the five indicators by area. Bold figures indicate the salient values for each trade environment.

- INSERT TABLE 7 ABOUT HERE -

We now relate these output mixes to the absolute dominance of branches, situated in a given environment, over all the other trade areas. For each environment, we compare the output mix of the branches with an absolute comparative advantage to the output mix of dominated branches. We perform a Mann-Whitney test to gauge if specific output mixes are associated with the dominating branches. The results are presented in Table 8.

- INSERT TABLE 8 AROUND HERE-

For each trade area, the comparative advantages are identified by the significant differences among output mixes. Comparative advantages for Rural Areas (E1) are characterized by lower ratios of personal loans and mortgages and special services but a higher ratio of commercial loans and mortgages over deposits. The main comparative advantage of Residential areas (E2) relies on a high ratio of insurance and securities over deposits. Mid-Areas (E3) are characterized by higher values of personal loans and mortgages and equity over deposits while the main comparative advantage of the Urban Areas (E4) with a high unemployment rate relates to a low ratio of commercial loans and mortgages over deposits. Peripheral Areas (E5) show higher ratios of personal loans and mortgages, special services and insurance and securities over deposits but a lower ratio of equity over deposits. Finally, Urban Areas (E6) with a high executive employment rate acquire a comparative advantage from higher personal loans and mortgages and higher equity over deposits ratios.

3.4. BRANCHES WITH EFFECTIVE INCENTIVES, BY BANKING GROUP

We now turn to the portion of our sample regarding the analysis of the performance of the ten banks to answer our last concern: for a given bank group, does the central bank's management offer effective incentives to the branches and are the comparative advantages properly exploited by trade area? Here, we define the branches with effective incentives as those that benefit from their comparative advantages. For these branches, the inputs allocated by the top bank's management are properly used and optimized. In adopting the point of view of the central bank's management, it is interesting to see which output mixes provide comparative advantages, but also if the observed branches actually benefit from these advantages. Table 9 gives the number and the percentages of branches with effective incentives, by banking group.

There is a great variability between the banking groups concerning the percentage of branches with effective incentives. It is noted that less than 10% of the branches of banking groups BGa, BGg and BGj have optimal output mixes while a major part of branches of groups BGb, BGf and BGi (64%, 43% and 40%, respectively) benefit from their comparative advantages.

- INSERT TABLE 9 ABOUT HERE -

To further characterize branches with effective incentives, we report a more complete table by banking group and by trade areas in the appendix. We have also tested the possible relationship between the number of branches with effective incentives and the concentration of the branches in specific environments (measured by a Herfindhal index). This test reveals that no relationship exists between the concentration and the number of bank branches with effective incentives.

4. DISCUSSION AND CONCLUSIONS

This paper aims to improve the managerial diagnosis by proposing a new approach for identifying comparative advantages of bank branches in terms of the adequacy of output mixes to the trade environment. We use Shephard's output distance function and a linear programming approach as tools to estimate the production technologies and to identify comparative advantages by trade areas. Several conclusions emerge:

(1) The answer to our first question (Q1) reveals that there are significant differences between the production technologies of different trade areas. This result has managerial implications for the banking group if one wants to get a 'fair estimate' of the bank branches performance. Though the evaluation of bank branches operating efficiency is not the primary focus of the paper, it clearly shows that we can only compare branches working in the same trade area environment. In our context, this result shows that different incentives are required for branches in different environments.

(2) Our second concern was the identification of comparative advantages among the trade area environments. Since none of the production technologies are strictly dominated, comparative advantages always exist for branches located in each trade areas. The banking group can use our model in an alternative way. If the main objective is to achieve a particular mix of outputs, the model can predict which trade area has a comparative advantage over the others. On the other hand, if the trade area of bank branches cannot be chosen by banking groups, then the model indicates which incentives must be given to the bank branches in order to benefit from the comparative advantages. These results have straightforward implications in the choice of localization of bank branches and in decisions regarding allocation of resources among branches.

(3) Our final concern related to the performance of the observed banking groups and their ability to provide the right incentives to their bank branches. Since the central bank's management decides on the resources and localization of branches as well as outputs mixes, we consider that branches that benefit from comparative advantages are provided with effective

incentives by the central bank's management. Here, we clearly distinguish between the performance of branches resulting from the operating efficiency (the technical efficiency) and the performance of the central bank's management in its ability to provide the right incentives. Our results show that the performance of banking groups varies greatly. While some banking groups have 64% of their branches that benefit from a comparative advantage, others have only 5% or less. Since comparative advantages are not related to the concentration of branches in specific trade areas, this result can be interpreted as the performance of the central bank's management.

While the focus of this paper mainly regards optimal output mixes, it must be clear that the comparative advantages can be directly translated in terms of profitability. By our definition of a comparative advantage, a branch in a specific trade area has a comparative advantage over all other trade areas if it can produce more of each output with the same resources. Therefore, whatever the output prices, a comparative advantage always leads to greater profit. In such a way, the performance of the central bank's management in providing the right incentives to the branches can be viewed as its ability to maximize the profitability of the branches. Nevertheless, there are no barriers or antagonist interests between the branches and the central bank. Both benefit from the comparative advantages and they have to unite their efforts to reach this common objective. Although the group strategy is defined by the central bank, the branches are the points of sale of the banking group and they are directly connected to the market. Their ability to learn from customer needs, to collect and to transmit the information to the central management is crucial in the decision making process and the management strategy of the group.

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FIGURES

Figure 1. Dominance relationships between two production technologies

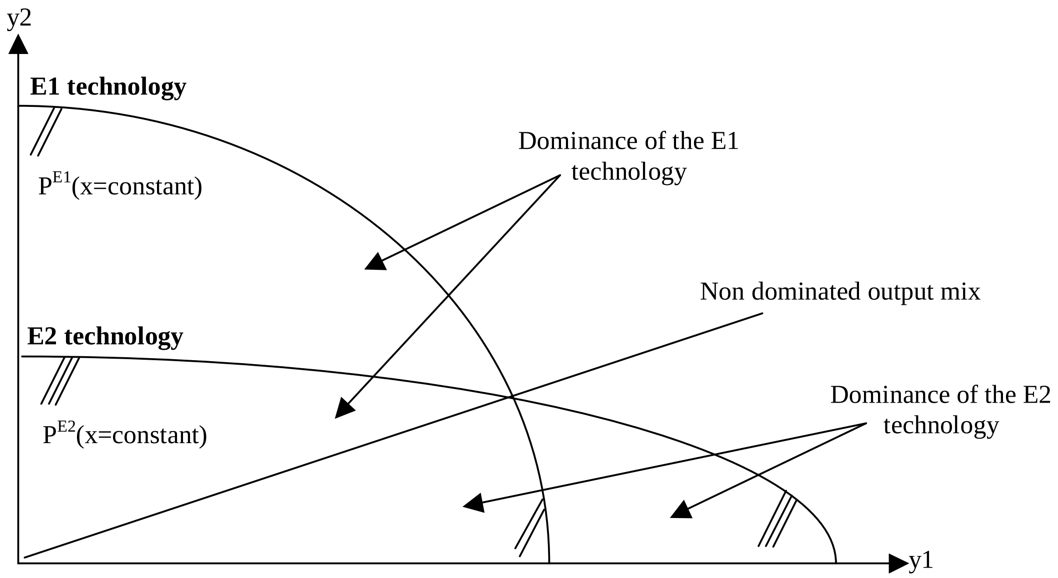
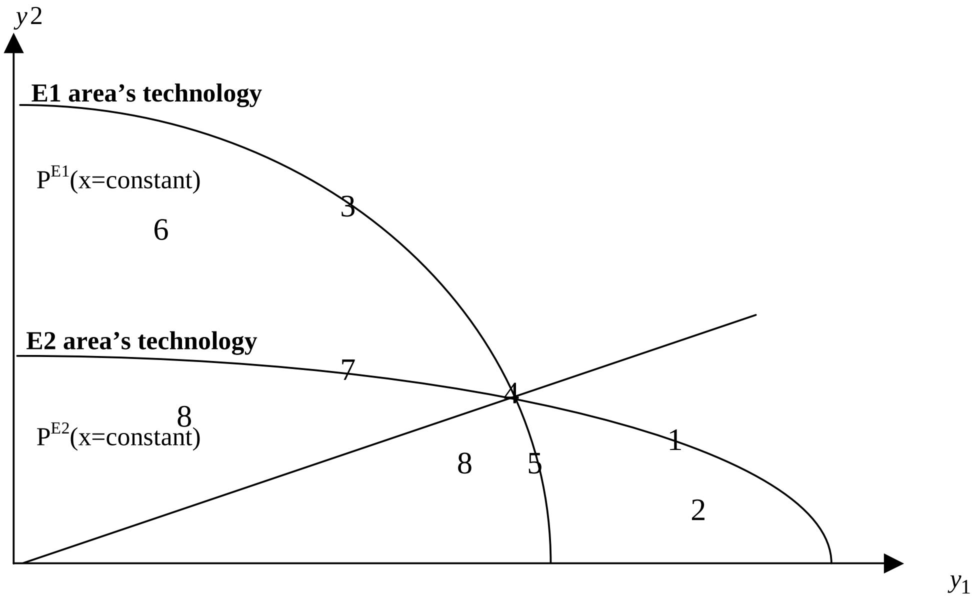


Figure 2. Dominance of production technologies and values of the distance function[(a)]



(a) Numbers refer to the different cases depicted in Table 1.

TABLES

Table 1. Dominance of production technologies and values of the distance function

		$D_o^{E1}(x, y)$		
		>1	= 1	<1
$D_o^{E2}(x, y)$	>1	Impossible	3	6
	= 1	1	4	7
	< 1	2	5	8

Table 2. Inputs and outputs used in the specification of the production technology

Inputs

- Number of personnel
- Amount of operating expenses
- Number of current accounts

→

Outputs

- Interest-bearing deposits
- Personal loans (personal loans and mortgages)
- Commercial loans
- Services relating to demand accounts
- Damage insurance
- Financial savings (Mutual funds and life insurance)

Table 3. Sample of descriptive statistics

	Mean	**Q25%**	**Median**	**Q75%**
Number of personnel	10	6	9	13
Amount of operating expenses	771	454	645	947
Number of current accounts	3 551	1 985	2 939	4 286
Interest-bearing deposits	33 176	16 851	26 480	41 943
Personal loans (personal loans and mortgages)	20 649	11 297	17 186	25 230
Commercial loans	7 398	2 499	4 958	9 717
Services relating to demand accounts	309	175	263	392
Damage insurance	513	220	388	624
Financial savings	19 096	9 048	14 346	24 114

Table 4. Classification of the 728 bank branches among the six types of trade area environments

	CATEGORIZATION	Number of branches	Percentage of branches
E1	**Rural Area** (active/farming population and retired persons)	211	29%
E2	**Residential area** (trades people, retired persons, second home and tourist areas)	45	6%
E3	**Mid-Area**	207	28%
E4	**Urban Area (a)** (high unemployment rate)	63	9%
E5	**Peripheral Area** (high population growth rate, high shares of large housing buildings and householders)	109	15%
E6	**Urban Area (b)** (high executive employment rate)	93	13%

Table 5. Similarity test results: Friedman and Wilcoxon signed ranks tests(a)

	Friedman test	**Wilcoxon signed ranks test**					
		E1	**E2**	**E3**	**E4**	**E5**	**E6**
E1	**	/	**	*	**	**	**
E2	**	*.085*	/	*.986*	**	**	**
E3	**	**	**	/	**	**	**
E4	**	**	*	**	/	*	*.132*
E5	**	**	**	*.057*	**	/	**
E6	**	*.424*	**	**	**	*	/

(a) ** means rejection of H_0 at 1% level. * at 5% level.

Table 6. Dominance results by trade area environment

	E1	**E2**	**E3**	**E4**	**E5**	**E6**
E1	/	38%	29%	22%	30%	35%
E2	42%	/	40%	27%	45%	49%
E3	22%	40%	/	10%	27%	28%
E4	73%	78%	64%	/	74%	67%
E5	55%	67%	41%	25%	/	43%
E6	47%	60%	40%	27%	54%	/
GLOBAL	**21%**	**33%**	**21%**	**10%**	**20%**	**24%**

Table 7. Median outputs mix by trade area environment

	Area E1	Area E2	Area E3	Area E4	Area E5	Area E6	Total sample 728 branches
R1	**0.531** [0.438-0.703]	0.596 [0.454-0.746]	0.623 [0.515-0.817]	0.593 [0.491-0.723]	**0.746** [0.556-1.014]	**0.684** [0.565-0.913]	**0.623 [0.480-0.798]**
R2	**0.258** [0.189-0.361]	**0.249** [0.112-0.338]	0.182 [0.102-0.286]	**0.111** [0.070-0.180]	0.161 [0.104-0.260]	0.162 [0.087-0.283]	**0.200 [0.112-0.300]**
R3	**0.008** [0.007-0.011]	0.010 [0.008-0.011]	0.010 [0.008-0.012]	**0.012** [0.010-0.014]	0.010 [0.008-0.014]	0.010 [0.008-0.013]	**0.010 [0.008-0.012**
R4	0.016 [0.012-0.020]	0.017 [0.015-0.025]	0.014 [0.009-0.021]	**0.011** [0.008-0.015]	0.018 [0.012-0.026]	0.013 [0.008-0.017]	**0.015 [0.010-0.020]**
R5	0.558 [0.483-0.650]	0.569 [0.478-0.667]	0.541 [0.450-0.625]	**0.514** [0.444-0.580]	0.553 [0.447-0.650]	**0.594** [0.486-0.704]	**0.554 [0.466-0.643]**

Table 8. Identification of the comparative advantages by trade area environment:

a Mann-Whitney test(a)

	R1	R2	R3	R4	R5
E1	-**	+**	-**	-	-
E2	+	+	+	+*	-
E3	+**	+	+	+	+*
E4	-	-*	-	-	+
E5	+	+	+	+	-
E6	+	+	-	-	+

(a) ** means rejection of H_0 at 1% level. * at 5% level.

Table 9. Branches with effective incentives, by banking group

Banking Group	Number of branches	Number of branches with effective incentives	Percentage of branches with effective incentives
BGa	39	0	**0%**
BGb	28	18	**64%**
BGc	54	8	15%
BGd	57	14	25%
BGe	167	24	14%
BGf	60	26	43%
BGg	146	10	7%
BGh	81	29	36%
BGi	58	23	40%
BGj	38	2	**5%**

APPENDIX A. Branches with effective incentives, by banking group and by area

Banking Group	Area	Number of branches	*Percentage of branches*	Number of branches with effective incentives	*Percentage of branches with effective incentives*
BGa	**E1**	**25**	***64%***	**0**	***0%***
	E5	6	*15%*	0	*0%*
	E6	8	*21%*	0	*0%*
Total BGa		39		0	*0%*
BGb	**E2**	**11**	***39%***	**9**	***82%***
	E3	6	*21%*	4	*67%*
	E4	1	*4%*	1	*100%*
	E5	**9**	***32%***	**4**	***44%***
	E6	1	*4%*	0	*0%*
Total BGb		28		18	*64%*
BGc	**E1**	**29**	***54%***	**3**	***10%***
	E2	11	*20%*	1	*9%*
	E3	11	*20%*	3	*27%*
	E6	3	*6%*	1	*33%*
Total BGc		54		8	*15%*
BGd	**E1**	**34**	***60%***	**11**	***32%***
	E2	1	*2%*	0	*0%*
	E3	13	*23%*	1	*8%*
	E5	3	*5%*	0	*0%*
	E6	6	*11%*	2	*33%*
Total BGd		57		14	*25%*
BGe	**E1**	**40**	***24%***	**8**	***20%***
	E3	**45**	***27%***	**5**	***11%***
	E4	**40**	***24%***	**4**	***10%***
	E5	22	*13%*	4	*18%*
	E6	20	*12%*	3	*15%*
Total BGe		167		24	*14%*
BGf	E1	1	*2%*	1	*100%*
	E2	4	*7%*	4	*100%*
	E3	**31**	***52%***	**14**	***45%***
	E4	10	*17%*	1	*10%*
	E5	3	*5%*	1	*33%*
	E6	11	*18%*	5	*45%*
Total BGf		60		26	*43%*

APPENDIX A. Branches with effective incentives, by banking group and by area (cont'd)

Banking Group	Area	Number of branches	*Percentage of branches*	Number of branches with effective incentives	*Percentage of branches with effective incentives*
BGg	**E1**	**47**	***32%***	**2**	***4%***
	E2	11	*8%*	0	*0%*
	E3	**40**	***27%***	**4**	***10%***
	E4	4	*3%*	0	*0%*
	E5	**30**	***21%***	**0**	***0%***
	E6	14	*10%*	4	*29%*
Total BGg		146		10	*7%*
BGh	**E1**	**32**	***40%***	**20**	***63%***
	E3	**20**	***25%***	**5**	***25%***
	E5	**20**	***25%***	**3**	***15%***
	E6	9	*11%*	1	*11%*
Total BGh		81		29	*36%*
BGi	E1	1	*2%*	0	*0%*
	E2	7	*12%*	1	*14%*
	E3	**23**	***40%***	**7**	***30%***
	E4	1	*2%*	0	*0%*
	E5	14	***24%***	9	*64%*
	E6	12	***21%***	6	*50%*
Total BGi		58		23	*40%*
BGj	E1	2	*5%*	0	*0%*
	E3	**18**	***47%***	**1**	***6%***
	E4	7	*18%*	0	*0%*
	E5	2	*5%*	1	*50%*
	E6	9	*24%*	0	*0%*
Total BGj		38		2	*5%*