Merger simulation in the banking industry : the Crédit Agricole/Crédit Lyonnais case

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Résumé

Froeb & Werden (1996,1994) used a multinomial logit model to simulate mergers. Economists and antitrust authorities have applied their simulation model to many industries (long-distance carriers, cosmetics...). Given that it is speci…cally designed for horizontal Bertrand merger analysis in di¤erentiated product industries, we apply it to the banking industry. We simultaneously estimate the e¤ects of bank mergers on loan and deposit markets, and go on to assess the price and welfare e¤ects of the merger of Crédit Agricole and Crédit Lyonnais on the French banking industry. The antitrust implications of this simulation are the following : the prices of all loans in the industry increase and the prices of all deposits in the industry decrease. But these two anti competitive e¤ects are fairly weak and lead to output reallocations : reallocation from the merging banks to the non merging ones and reallocation from the merging bank with the smaller pre merger share (i.e. the Crédit Lyonnais) to the merging banks with the larger pre merger share (i.e. the Crédit Agricole). Consequently, the net decrease in total and consumer welfare is typically smaller.

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1 introduction

Antitrust authorities[1] prohibit horizontal mergers that might lessen competition. Traditionally they undertake a structural analysis with reference to the structure-conduct-performance paradigm. First the relevant product and geographic markets are delineated. Then anti competitive e¤ects are assessed. "Unilateral" e¤ects are estimated using the HHI index[2] and market shares along with "coordinated" e¤ects , potential entry, e¢ciency gains. The acceptance of a merger depends on these e¤ects.

Simulation models are an alternative to structural merger policy analysis. "Unilateral" e¤ects are assessed without de…ning the relevant market. Simulations require little information : prices, market shares and two elasticities (the aggregate elasticity of demand and the cross elasticity of demand). It is therefore relatively easy to de…ne the post merger Nash equilibrium. Froeb & Werden (1994,1996) of the US department of justice created the …rst simulation model : the Antitrust Logit Model (ALM) which is based on the multinomial logit demand model. These types of simulations need high level programming languages like Maple 8 or Mathematica. Here, the former is used. Mergers have already been simulated in various industries such as long-distance carriers in the United States (Froeb & Werden (1994)), and in Japan (Froeb, Tardi¤ & Werden (1994))...Simulation is a powerful tool for antitrust analysis. For instance, in 1996, two US o¢ce superstores, Staples and O¢ce Depot, noti…ed a merger but the Federal Trade Commission opposed it, since simulation analysis indicated substantial increases in post merger prices. In contrast, in the L'Oreal/Maybelline case, simulations predicted only minor changes in post merger prices, and the merger was accepted. Finally, the European Commission has also simulated mergers, for instance, in the Volvo/Scania case in work by M.Ivaldi and F.Verboven[3]. Nevertheless, it is worth noting that simulations are never the sole tool used to estimate the e¤ects of mergers. They are used as a complement to the traditional analyses of antitrust authorities.

The current trend of concentration in the European banking industry raises the question of the nature of the "unilateral" e¤ects of domestic mergers and what lessons can be learnt from simulation models. In fact this type of model is particularly suitable for Bertrand mergers in di¤erentiated product industries. In this paper, the ALM is used to simulate the impact of mergers on loan and credit markets. Banks are assumed to compete though loan and deposit prices. It is also assumed that

[1] The Merger Task Force of the European Commission, the Federal Trade Commission and the US department of justice in the United-states.

[2] The HHI (Her…ndahl Hirshman Index) measures the dergree of concentration in an industry. It's the squared sum of the market shares of all the …rms in an industry.

[3] European Commission [2000], Case N0 COMP/M. 1672 - Volvo/Scania, § 72 à 75.

bank products are di¤erentiated : spatial di¤erentiation, long term bank industry relationship, bank reputation, the public perception of di¤erentiation. After adapting the model proposed by Froeb & Werden to the banking industry, we estimate the impact of the merger of Crédit Agricole and Crédit Lyonnais on the French banking industry. The CECEI[4] analyzed the anti-competitive impacts of a bank merger, but the operation was not challenged on 13 March, 2003. For the CECEI, this merger will not be su¢ciently pro competitive for retail banking, and so a divestment of 85 agencies was imposed[5]. However there may be grounds for concern over the anticompetitive e¤ects of such a merger on the French retail banking market. The Crédit Agricole could bene…t from a dominant position in the relevant markets. The post-merger entity would represent 25% of the French retail banking market (a little more for the deposit market and a little less for the loan market). Consequently, we are interested in using the ALM to simulate bank mergers and more particularly to determine the "unilateral" e¤ects of the Crédit Agricole/Crédit Lyonnais merger on the French banking industry

In section 2, we present the ALM for the retail banking, i.e. for both deposit and loan markets. In section 3, we examine the e¤ects of the merger of Crédit Agricole and Crédit Lyonnais. We estimate the anticompetitive impact on the French banking industry, where the price e¤ects, changes in outputs, consumers'welfare and total welfare are given by our bank ALM.

2 The multinomial logit model applied to the banking industry

We use the simulation model of Froeb & Werden (1996,1994) based on a multinomial logit demand system in which consumers make a discrete choice among a set of n alternatives (Ben Akiva & Lerman (1985), McFadden (1974)). We apply this approach to the banking industry and incorporate both the loan market and the deposit market.

We consider an economy with n-1 banks which o¤er n-1 loans and deposits. Each customer makes a loan and a deposit but not necessarily in the same bank. The n^{th} product is the outside good.

The utility that customer i associates with the choice of bank j for deposit and bank k for the loan is given by :

$$U_{ijk} = U_{ij}^{D} + U_{ik}^{L} \quad (1)$$

[4]Comité des établissements de crédit et des entreprises d'investissement.

[5]J.O. n±72 of 26 March, 2003, Décision du 14 mars 2003 concernant la prise de contrôle du Crédit Lyonnais par le groupe Crédit Agricole.

U_{ij}^{D} is the utility that depositor i associates with the choice of bank j :

$$U_{ij}^{D} = \alpha_j - \beta_D r_D^j + \varepsilon_{ij} \tag{2}$$

and U_{ik}^{L} is the utility that borrower i associates with the choice of bank k :

$$U_{ik}^{L} = \gamma_k - \beta_L r_L^k + \phi_{ik} \tag{3}$$

r_D^j is the deposit interest rate offered by bank j and r_L^k is the loan interest rate offered by bank k. We assume the utility of a depositor depends positively on the deposit interest rate, so that β_D is negative, and the utility of a borrower depends negatively on the loan interest rate and β_L is positive. The price coefficients β_D et β_L are assumed to be identical for all customers and banks.

Quality differences among loans and deposits are summarized by the terms α_j and γ_k. The disturbance terms ε_{ij} and ϕ_{ik} represent individual-specific components of utilities. The ε_{ij} and ϕ_{ik} are assumed to be uncorrelated with prices r_D^j and r_L^j. The disturbance terms are independently and identically distributed.

Then the choice probabilities for each bank are :

$$\pi_D^j = \frac{\exp(\alpha_j - \beta_D r_D^j)}{\sum_{a=1}^{n} \exp(\alpha_a - \beta_D r_D^a)} \tag{4}$$

$$\pi_L^k = \frac{\exp(\gamma_k - \beta_L r_L^k)}{\sum_{a=1}^{n} \exp(\gamma_a - \beta_L r_L^a)} \tag{5}$$

To parameterize the model we must define r_L^n and r_D^n as zero. This ensures that the utility of the outside good is constant.

The share-weighted average pre-merger rates are denoted $\overline{r_D}$ and $\overline{r_L}$.

$$\overline{r_D} = \sum_{a=1}^{n} r_D^a \times s_D^a \tag{6}$$

$$\overline{r_L} = \sum_{a=1}^{n} r_L^a \times s_L^a \tag{7}$$

where s_D^a is the market share of bank a on the deposit market and s_L^a is the market share on the loan market.

We then calculate the own and cross-price elasticities for loans and deposits.

The own-price elasticity of demand for a deposit in bank j is :

$$\varepsilon_D^j = -\frac{d\theta_D^j}{dr_D^j}\frac{r_D^j}{\theta_D^j} = -\beta_D r_D^j(1-\theta_D^j) = \frac{1}{\bar{r}_D}\left[r_D^j\left[\beta_D\left[\bar{r}_D\left(1-s_D^j\right)+\varepsilon_D\right]s_D^j\right]\right] \quad (8)$$

The own-price elasticity of demand for a loan in bank k is :

$$\varepsilon_L^k = \frac{d\theta_L^k}{dr_L^k}\frac{r_L^k}{\theta_L^k} = -\beta_L r_L^k(1-\theta_L^k) = -\frac{1}{\bar{r}_L}\left[r_L^k\left[\beta_L\left[\bar{r}_L\left(1-s_L^k\right)+\varepsilon_L\right]s_L^k\right]\right] \quad (9)$$

The cross-price elasticity for a deposit in bank j is :

$$\varepsilon_D^{jz} = -\frac{d\theta_D^j}{dr_D^z}\frac{r_D^z}{\theta_D^j} = -\beta_D r_D^z\theta_D^z = -\frac{1}{\bar{r}_D}s_D^z r_D^z\left(\beta_D\bar{r}_D-\varepsilon_D\right) \quad (10)$$

The cross-price elasticity for a loan in bank k is :

$$\varepsilon_L^{kz} = \frac{d\theta_L^k}{dr_L^z}\frac{r_L^z}{\theta_L^k} = -\beta_L r_L^z\theta_L^k = \frac{1}{\bar{r}_L}s_L^z r_L^z\left(\beta_L\bar{r}_L-\varepsilon_L\right) \quad (11)$$

where ε_D is the aggregate elasticity of demand for deposits and ε_L is the aggregate elasticity of demand for loans :

$$\varepsilon_D \equiv \frac{d\theta_D}{d\bar{r}_D}\frac{\bar{r}_D}{\theta_D} = \theta_D^n\beta_D\bar{r}_D \quad (12)$$

$$\varepsilon_L \equiv -\frac{d\theta_L}{d\bar{r}_L}\frac{\bar{r}_L}{\theta_L} = -\theta_L^n\beta_L\bar{r}_L \quad (13)$$

It is straightforward to calculate the choice probabilities for loans and deposits :

$$\theta_D^n = \frac{\varepsilon_D}{\beta_D\bar{r}_D} \quad (14)$$

$$\theta_L^n = -\frac{\varepsilon_L}{\beta_L\bar{r}_L} \quad (15)$$

$$\theta_D^j = s_D^j\left(1-\theta_D^n\right); j = 1:::n-1 \quad (16)$$

$$\theta_L^k = s_L^k(1 - \theta_L^n); k = 1:::n - 1 \tag{17}$$

The bank-speci…c demand constants α_j and β_j can be calculated from the logarithm of the ratios θ_D^j/θ_D^n and θ_L^j/θ_L^n :

$$\alpha_j = \ln\left(\frac{\theta_D^j}{\theta_D^n}\right) + \alpha_n + \mu_D r_D^j \tag{18}$$

$$\beta_j = \ln\left(\frac{\theta_L^j}{\theta_L^n}\right) + \beta_n + \mu_L r_L^j \tag{19}$$

Following Froeb & Werden (1994,1996), we set the demand constants for the oustide good equal to an arbitrary constant : 10. Then if pre-merger deposit and loan interest rates and pre-merger market shares of each banks are known, and if ε_L, ε_D, μ_L, μ_D are estimated, choice probabilities and demand constants can be easily found. The marginal costs of each bank for loan and deposit markets can then be recovered from the …rst order conditions.

The pro…t function of bank j is :

$$\Pi_j = (r_L^j - Cm_L^j) \cdot \theta_L^j(r_L^j) + (r_D^j - Cm_D^j) \cdot \theta_D^j(r_D^j) \tag{20}$$

where Cm_L^j is the marginal cost of bank j for managing loans and Cm_D^j is the marginal cost of bank j for the management of deposits. The marginal costs are :

$$Cm_D^j = r_D^j + \frac{1}{\mu_D(1 - \theta_D^j)} \tag{21}$$

$$Cm_L^j = r_L^j - \frac{1}{\mu_L(1 - \theta_L^j)} \tag{22}$$

Next, we simulate the e¤ects of a merger of banks 1 and 2. We …nd the post-merger Nash equilibrium. Marginal costs are assumed to be constant. Consequently, the merger has only interest rate e¤ects. Afterwards, this assumption will be relaxed and we will calculate the e¤ects of the merger in which the merged banks produce at the minimum of the marginal costs of the merging banks.

Π_1 and Π_2 are the pro…t functions of the merging banks, and θ_D^m is the sum of θ_D^1 and θ_D^2. θ_L^m is the sum of θ_L^1 and θ_L^2.

$$\Pi_1 = (r_L^1 - Cm_L^1) \cdot \theta_L^m + (r_D^1 - Cm_D^1) \cdot \theta_D^m \tag{23}$$

$$T_2 = (r_L^2 - Cm_L^2) \times \theta_L^m + (r_D^2 - Cm_D^2) \times \theta_D^m \tag{24}$$

The first order conditions of the merging banks are :

$$\frac{dT_j}{dr_D^j} = 0 \;,\; r_D^j - Cm_D^j = \frac{1}{\alpha_D(1 - \theta_D^m)} \tag{25}$$

$$,\; r_D^j - Cm_D^j = \frac{\overline{r_D}}{\overline{r_D}\,\alpha_D(1 - s_D^m) + s_D^m \varepsilon_D} \tag{26}$$

$$\frac{dT_j}{dr_L^j} = 0 \;,\; r_L^j - Cm_L^j = \frac{1}{\alpha_L(1 - \theta_L^m)} \tag{27}$$

$$,\; r_L^j - Cm_L^j = \frac{\overline{r_L}}{\overline{r_L}\,\alpha_L(1 - s_L^m) + s_L^m \varepsilon_L} \tag{28}$$

where $j = 1;2$, $s_L^m = s_L^1 + s_L^2$ and $s_D^m = s_D^1 + s_D^2$.

It is easily seen that the first order conditions for the non-merging banks are :

$$r_D^j - Cm_D^j = \frac{1}{\alpha_D(1 - \theta_D^j)} = \frac{\overline{r_D}}{\overline{r_D}\,\alpha_D(1 - s_D^j) + s_D^j \varepsilon_D} \tag{29}$$

$$r_L^j - Cm_L^j = \frac{1}{\alpha_L(1 - \theta_L^j)} = \frac{\overline{r_L}}{\overline{r_L}\,\alpha_L(1 - s_L^j) + s_L^j \varepsilon_L} \tag{30}$$

where $j = 3::n - 1$.

As marginal costs and β_j, γ_j, ε_L, ε_D, α_L, α_D are assumed to be constant, we obtain two systems each with (n-1) equations and (n-1) unknowns. The post-merger loan interest rates of each banks can be recovered from the system of equations (25) and (27). Likewise equations (26) and (28) give us post-merger deposit interest rates.

We obtain the numerical solutions of the two systems using a Maple 8 algorithm.

For the outside good we assume that :

$$r_D^n = r_L^n = 0 \tag{31}$$

$$\Delta^{n}_{D} = 1 - \sum_{j=1}^{n-1} \Delta^{j}_{D} \tag{32}$$

$$\Delta^{n}_{L} = 1 - \sum_{j=1}^{n-1} \Delta^{j}_{L} \tag{33}$$

We then derive loan and deposit interest rate variations, choice probabilities and market shares changes for loans and deposits, the post-merger own and cross-price elasticities of demand, share-weighted average post-merger rates, new pro…ts and HHI indexes, the post-merger merging banks rates etc...Furthermore we can calculate the change in consumer welfare for loan and deposit markets (Small & Rosen (1981)) :

$$\begin{aligned} &\frac{1}{\alpha_L}\left[\ln \sum_j \exp(\beta_j - \gamma_L r_L^{j(apres\,fusion)}) - \ln \sum_j \exp(\beta_j - \gamma_L r_L^{j(avant\,fusion)})\right] * 100 + \\ &\frac{1}{\alpha_D}\left[\ln \sum_j \exp(\delta_j - \gamma_D r_D^{j(apres\,fusion)}) - \ln \sum_j \exp(\delta_j - \gamma_D r_D^{j(avant\,fusion)})\right] * 100 \end{aligned} \tag{34}$$

The change in the total welfare is the sum of the change in consumer surplus and the change in pro…ts of banking industry. Changes in surplus will be estimated as a percentage of pre-merger revenue (Froeb & Werden (1996,1994)).

3 "Unilateral" e¤ects of the Crédit Agricole/Crédit Lyonnais merger on the French banking sector

We apply our bank ALM to the Crédit Agricole/Crédit Lyonnais case. The inputs of the model are : market shares of the French banks on the loan and deposit markets, loan and deposit prices, aggregate elasticities of demand for loans and deposits (ε_D et ε_L) and the price coe¢cients ($\bar{\gamma}_D$ et $\bar{\gamma}_L$). As we do not have su¢cient data to estimate the demand parameters ε and $\bar{\gamma}$, these are chosen in an arbitrary manner, assuming that : $\varepsilon_D > 0$, $\bar{\gamma}_D < 0$, $\varepsilon_L < 0$ and $\bar{\gamma}_L > 0$.

Market shares and prices of each banks are in Table 1, and are taken from the Comptes annuels des établissements de crédit 2000 published by the Commission Bancaire. Prices are imputed from loan revenues and deposit expenses :

- the average interest rate on loans for bank i is calculated as annual loan revenues for bank i divided by total loans granted by bank i,

Banks	Deposit market		Loan market	
	Market shares	Prices of deposits	Market shares	Prices of loans
Crédit Agricole CA Indosuez	0.2285	-8.4132	0.2172	10.1281
Crédit Lyonnais	0.0619	-18.4775	0.0694	17.0715
Réseau des caisses d'épargne et de prévoyance	0.1579	-5.061	0.0712	13.9914
BNP Paribas	0.1315	-21.7199	0.1614	16.6738
Société générale	0.1176	-17.0515	0.1057	18.5361
Confédération nationale du crédit mutuel	0.0679	-6.0647	0.053	10.5097
Groupe banques populaires	0.0726	-13.5335	0.0821	13.2859
Natexis Crédit commercial de France	0.0144	-22.5676	0.0172	17.7371
Other banques	0.1477	-27.7872	0.2228	19.4984
« outside good »	0	0	0	0

Table 1: Credit and loan market shares and prices

- the average interest rate on deposits for bank i is calculated as total interest rate paid on deposits by bank i divided by total deposits received by bank i.

It is true that these average interest rates are poor measures of banks'prices. The numerator is an annual income or expense ‡ow, while the denominator is a balance sheet item recorded at a point in time (Gilbert (1984)). Nevertheless, because of the unavailability of the loan and deposit interest rates of each bank, this type of approximation has already been used in various papers (for instance Adams, Roller & Sickles (2002)). Thus the loan price of bank i represents the average earnings of each euro loaned by this bank, just as the deposit price of bank i represents the average amount paid per euro of deposit received by this bank.

We …x $"_L$ at one of four arbitrary values ($¡0:5; ¡1; ¡2; ¡4$), and for $¯_L$ ($2:5; 5; 7:5; 10$), $"_D$ (0.5, 1, 2, 4) and $¯_D$ (-2.5, -5, -7.5,-10). Thus we simulate the Crédit Agricole/Crédit Lyonnais merger for 16 di¤erent scenarios in the two retail banking markets. Our results are the following.

In all cases, the loan prices of the merging banks increase (Table 2[6]) and the deposit prices of the merging banks decrease (Table 3) as a result of the merger. The magnitudes of variations are more sensitive to di¤erences in " than to di¤erences in ¯. The magnitude of the loan and deposit prices variations decreases with increases in "$_L$ and "$_D$ in absolute value. The higher the absolute value of ", the more the customers tend to switch out of the banking sector when the average loan interest rate increases and/or when the average deposit interest rate decreases. Consequently, in an economy characterized by a high absolute value of ", merging banks increase less their loan price and decrease less their deposit price. The higher ¯$_L$ and ¯$_D$ in absolute value, the smaller the size of price variations. In fact, the utility of customers is more sensitive to changes in prices. Nevertheless, even when ¯$_L$ and "$_L$ are small in absolute value (¯$_L$ = 2:5, "$_L$ = ¡0:5), increases in loan prices are less than 0.65% for the Crédit Lyonnais and less than 0.31% for the Crédit Agricole. When ¯$_D$ and "$_D$ are small in absolute value (¯$_D$ = ¡2:5, "$_D$ = 0:5), decreases in deposit prices are less than 0.64% for Crédit Lyonnais and less than 0.33% for Crédit Agricole.

The merger increases the loan price of the merging bank with the smaller share by a greater absolute than it increases loan price for the merging bank with the larger share. Actually, the Crédit Lyonnais has the smaller pre merger market share (6.94% on the loan market and 6.19% on the deposit market). Its increases in loan prices and decreases in deposit prices are greater. Depending on the assumptions made about demand elasticities, the increases in loan prices vary from +0.1597% to +0.6410% for the Crédit Lyonnais and between +0.0758% to +0.3083% for the Crédit Agricole. For deposits, variations range from -0.1567% to -0.6387% for the Crédit Lyonnais and from -0.0808% to -0.3288% for the Crédit Agricole.

After the merger, each bank raises its loan price and decreases its deposit price. But, the non-merging banks vary their prices less than the merging ones (Tables 2 and 3). Depending on the assumptions made about demand elasticities, the loan price increases are all less than +0.0169% and the deposit price decreases are all less than 0.0498% in absolute value. Among the non-merging banks, the larger banks increase/decrease prices more than the smaller ones. On the loan market, BNP-Paribas is the larger competitor (market share : 16.14%). Its loan price rises by +0.0040% to +0.169% (Table 2). On the deposit market, the Caisses d'Epargne et de Prévoyance network bene…ts from the larger market share (15.79%). Its deposit price decreases vary from -0.0118% to -0.0498% (Table 3). The smaller banks increase/decrease prices less.

At the same time, these price e¤ects lead to reallocations of output in the respective markets. In the loan and deposit markets, the output of the merging bank decreases because it raises loan prices and decreases deposit prices more than the other banks in the industry (Tables 4 and 5). The

[6] Tables 2 to 7 are presented in the appendix.

decrease in output is more marked for the Crédit Lyonnais because its prices change more. Depending on the assumptions on demand elasticities, its output decreases by -21.0337% to -21.3169% on the loan market and by -22.6019% to -22.9327% on the deposit market. The variations of the Crédit Agricole output are the following : from -3.9552% to -3.9610% on the loan market and from -3.3965% to -3.3998% on the deposit market. We can conclude that price variations lead to a reallocation of output from the merging banks to the nonmerging ones. This phenomenon is all the more noticeable when $"_L$ and $"_D$ are small in absolute value and when $\bar{}_L$ and $\bar{}_D$ are high in absolute value. The smaller banks bene…t more from the reallocation because they raise loan prices less and decrease deposit price less. In our case, this type of reallocation is sizeable as the average industry loan price decreases and the average industry deposit price increases.

Moreover, it can be seen that there is another reallocation of output among the merging banks. As the magnitude of price variations of the Crédit Lyonnais is higher, there is a shift in output from the Crédit Lyonnais to the Crédit Agricole. This phenomenon is all the more relevant given that the market shares of the merging banks are unequal. Thus the average cost of the merging bank diminishes. In fact, the marginal cost of the Crédit Agricole is the lowest and there is reallocation in favour of Crédit Agricole.

More generally, the increase in loan prices and the decrease in deposit prices lead to an increase in the total pro…t of banking industry, and a decrease in consumer and total welfare (Table 6). Nevertheless, the reductions in surplus seem limited. On the loan market, the consumer surplus varies between -0.0996% and -0.0244% of premerger revenue. The total surplus varies between -0.0149% and -0.0015%. On the deposit market, the consumer surplus varies -0.0963% to -0.0236% and the total surplus from -0.0160% to -0.0018%. These limited decreases stem from signi…cant reallocations among the merging banks and from the merging banks to the nonmerging ones.

We can add that the merger creates a greater total surplus when reallocation is pronounced. This is the case when $"_L$ and $"_D$ are small in absolute value and when $\bar{}_L$ and $\bar{}_D$ are high in absolute value. Nevertheless this situation is not better for the customers. Their loss is weaker when the magitude of price variations is limited, i.e. when $"_L$, $"_D$, $\bar{}_L$ and $\bar{}_D$ are large in absolute value.

Consequently, the Crédit Agricole/Crédit Lyonnais case may only lead to a limited e¤ect on surplus because of reallocations of outputs. This result comes from simulations with the assumption of constant marginal costs. The e¤ects of merger e¢ciencies in the form of cost reductions can be easily incorporated in our simulation model. E¢ciency gains from merger should limit decreases in welfare (Froeb & Werden (1996,1994)). So, we simulate the CA/CL merger again to calculate the

minimum required marginal cost decreases for a zero variation in consumer surplus (table 7). We also estimate the variation of merging banks'marginal cost if the merged bank's marginal cost is set equal to the lower of the marginal costs of the two merging banks. In all cases, the latter is always higher than the change of marginal cost required for a zero variation in consumer surplus. Consequently, if the merging bank aligns its marginal cost to the lower of the two merging banks, consumer surplus must rise and a fortiori so will the total surplus.

It is important to put our results into context. Firstly, the ALM only takes "unilateral" e¤ects into account. Before and after the merger, the equilibrium is assumed to be non-cooperative, i.e. there is no collusion. Nevertheless, when concentration increases, the risk of collusion increases too. Thus if there were collusion after the merger, the magnitude of price changes and surplus decreases would be under-estimated.

Secondly, even if there is no problem of market de…nition in our ALM, the question of which products to include in the simultaion raises similar problems. If a competitor is omitted from the simulation, there will be an under-estimation of post-merger price variations. In fact, price variations of the merging banks will be greater as will the variations of competitors'prices etc...If the market shares of the omitted competitor are small, then the bias will be limited. In our context, the Post O¢ce (La Poste) could be included as a competitor. Its role is relatively important as a deposit collector in the French banking sector. Besides the CECEI included it in its study of the Crédit Agricole/Crédit Lyonnais case. However, it is di¢cult to include La Poste in our simulation because the data needed to calculate the price of deposits are not available. We can only conclude that the anti competitive impact will be slightly under-estimated on the deposit market.

Finally, the ALM is based on the restrictive assumption known as Independance of Irrelevant Alternatves (IIA). This assumption implies that all products all equally close to each other. When a consumer substitutes away from a product , he purchases the other products in proportions equal to their market shares. We could introduce product di¤erences using a Nested Logit Model but it contains many more parameters.

4 Conclusion

In this paper we apply the Antitrust Logit Model to the banking industry, and more particularly to retail banking (loan and deposit markets). This simulation model represents an alternative to structural merger policy analysis and it is increasingly used by antitrust authorities. The model enables us to estimate the "unilateral" e¤ects of the Crédit Agricole/Crédit Lyonnais merger on the

French banking sector. The loan prices of all banks increase and the deposit prices of all banks decrease as a result of the merger. The magnitude of price variations of the merging banks is relatively larger.

Nevertheless, these anticompetitive impacts lead to reallocations of outputs in favour of the non-merging banks, in the two relevant markets. The smaller banks change their prices less but bene…t more from the reallocation of output from the merging bank. Among the merging banks, the opposite occurs. The smaller bank (Crédit Lyonnais) raises its loan prices more and decreases its deposit prices more too. Consequently, there is a shift in output from the Crédit Lyonnais to the Crédit Agricole. This latter phenomenon is all the more pronounced since the market shares of the two merging banks are unequal. Reallocations of outputs o¤set anticompetitive price variations. Thus, even if the market shares of the merging bank are high in the loan and deposit markets, reductions in welfare are limited. Moreover, if the merger implies e¢ciency gains the impact on welfare will be positive.

The Antitrust Logit Model is a useful tool to measure the impact of bank mergers. Only a limited amount of information is needed : prices and market shares. The two demand parameters can be estimated or …xed arbitrary. This model provides a simple way to estimate the impact of Bertrand-type mergers in di¤erentiated product industries. In subsequent work we will use this model to simulate various hypothetical bank mergers in the French banking industry. We will try to identify those characteristics of mergers which are more e¢cient for consumers or for the economy. We will estimate the minimum required e¢ciencies for a positive externality.

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6 Appendix

	Banks	$e_L = -0.5$	$e_L = -1$	$e_L = -2$	$e_L = -4$
$b_L = 2.5$	*Crédit Lyonnais*	+0.6410%	+0.6386%	+0.6163%	+0.5729%
	Crédit Agricole	+0.3083%	+0.3032%	+0.2932%	+0.2737%
	Caisses d'Epargne	+0.0082%	+0.0078%	+0.0071%	+0.0058%
	BNP Paribas	+0.0169%	+0.0161%	+0.0146%	+0.0119%
	Société Générale	+0.0095%	+0.0091%	+0.0082%	+0.0067%
	Crédit Mutuel	+0.0080%	+0.0077%	+0.0069%	+0.0057%
	Groupe Banques populaires	+0.0066%	+0.0063%	+0.0057%	+0.0047%
	Natexis banques populaires	+0.0032%	+0.0031%	+0.0028%	+0.0023%
	Crédit commercial de France	0.0014%	+0.0014%	+0.0013%	+0.0011%
	Other banks	+0.0208%	+0.0198%	+0.0180%	+0.0146%
$b_L = 5$	*Crédit Lyonnais*	+0.3278%	+0.3250%	+0.3193%	+0.3082%
	Crédit Agricole	+0.1554%	+0.1542%	+0.1516%	+0.1466%
	Caisses d'Epargne	+0.0042%	+0.0041%	+0.0040%	+0.0036%
	BNP Paribas	+0.0087%	+0.0085%	+0.0080%	+0.0073%
	Société Générale	+0.0049%	+0.0048%	+0.0045%	+0.0041%
	Crédit Mutuel	+0.0041%	+0.0040%	+0.0038%	+0.0035%
	Groupe Banques populaires	+0.0034%	+0.0033%	+0.0031%	+0.0029%
	Natexis banques populaires	+0.0016%	+0.0016%	+0.0015%	+0.0014%
	Crédit commercial de France	+0.0008%	+0.0007%	+0.0007%	+0.0006%
	Other banks	+0.0107%	+0.0104%	+0.0099%	+0.0090%
$b_L = 7.5$	*Crédit Lyonnais*	+0.2192%	+0.2179%	+0.2154%	+0.2104%
	Crédit Agricole	+0.1039%	+0.1033%	+0.1022%	+0.0999%
	Caisses d'Epargne	+0.0028%	+0.0028%	+0.0027%	+0.0025%
	BNP Paribas	+0.0058%	+0.0057%	+0.0055%	+0.0052%
	Société Générale	+0.0033%	+0.0032%	+0.0031%	+0.0029%
	Crédit Mutuel	+0.0028%	+0.0027%	+0.0026%	+0.0025%
	Groupe Banques populaires	+0.0023%	+0.0022%	+0.0022%	+0.0020%
	Natexis banques populaires	+0.0011%	+0.0011%	+0.0010%	+0.0010%
	Crédit commercial de France	+0.0005%	+0.0005%	+0.0005%	+0.0004%
	Other banks	+0.0072%	+0.0070%	+0.0068%	+0.0064%
$b_L = 10$	*Crédit Lyonnais*	+0.1646%	+0.1639%	+0.1625%	+0.1597%
	Crédit Agricole	+0.0780%	+0.0777%	+0.0770%	+0.0758%
	Caisses d'Epargne	+0.0021%	+0.0021%	+0.0020%	+0.0020%
	BNP Paribas	+0.0044%	+0.0043%	+0.0042%	+0.0040%
	Société Générale	+0.0025%	+0.0024%	+0.0024%	+0.0023%
	Crédit Mutuel	+0.0020%	+0.0020%	+0.0020%	+0.0019%
	Groupe Banques populaires	+0.0017%	+0.0017%	+0.0016%	+0.0016%
	Natexis banques populaires	+0.0008%	+0.0008%	+0.0008%	+0.0008%
	Crédit commercial de France	+0.0004%	+0.0004%	+0.0004%	+0.0003%
	Other banks	+0.0054%	+0.0053%	+0.0052%	+0.0049%

Table 2: Variations of loan prices

	Banks	$e_D = 0.5$	$e_D = 1$	$e_D = 2$	$e_D = 4$
$b_D = -2.5$	*Crédit Lyonnais*	-0.6387%	-0.6269%	-0.6037%	-0.5585%
	Crédit Agricole	-0.3288%	-0.3231%	-0.3119%	-0.2901%
	Caisses d'Epargne	-0.0498%	-0.0473%	-0.0427%	-0.0346%
	BNP Paribas	-0.0094%	-0.0090%	-0.0081%	-0.0066%
	Société Générale	-0.0106%	-0.0101%	-0.0091%	-0.0074%
	Crédit Mutuel	-0.0166%	-0.0158%	-0.0142%	-0.0157%
	Groupe Banques populaires	-0.0091%	-0.0086%	-0.0078%	-0.0063%
	Natexis banques populaires	-0.0007%	-0.0007%	-0.0006%	-0.0005%
	Crédit commercial de France	-0.0009%	-0.0008%	-0.0008%	-0.0006%
	Other banks	-0.0084%	-0.0008%	-0.007%	-0.0058%
$b_D = -5$	*Crédit Lyonnais*	-0.3223%	-0.3194%	-0.3135%	-0.3018%
	Crédit Agricole	-0.1658%	-0.1644%	-0.1615%	-0.1559%
	Caisses d'Epargne	-0.0255%	-0.0249%	-0.0236%	-0.0213%
	BNP Paribas	-0.0048%	-0.0047%	-0.0045%	-0.0041%
	Société Générale	-0.0055%	-0.0053%	-0.0051%	-0.0046%
	Crédit Mutuel	-0.0085%	-0.0083%	-0.0079%	-0.0071%
	Groupe Banques populaires	-0.0046%	-0.0045%	-0.0043%	-0.0039%
	Natexis banques populaires	-0.0004%	-0.0004%	-0.0003%	-0.0003%
	Crédit commercial de France	-0.0005%	-0.0004%	-0.0004%	-0.0004%
	Other banks	-0.0043%	-0.0042%	-0.0040%	-0.0036%
$b_D = -7.5$	*Crédit Lyonnais*	-0.2155%	-0.2142%	-0.2116%	-0.2064%
	Crédit Agricole	-0.1109%	-0.1102%	-0.1089%	-0.1064%
	Caisses d'Epargne	-0.0171%	-0.0169%	-0.0163%	-0.0152%
	BNP Paribas	-0.0033%	-0.0032%	-0.0031%	-0.0029%
	Société Générale	-0.0037%	-0.0036%	-0.0035%	-0.0033%
	Crédit Mutuel	-0.0057%	-0.0056%	-0.0054%	-0.0051%
	Groupe Banques populaires	-0.0031%	-0.0031%	-0.0030%	-0.0028%
	Natexis banques populaires	-0.0002%	-0.0002%	-0.0002%	-0.0002%
	Crédit commercial de France	-0.0003%	-0.0003%	-0.0003%	-0.0003%
	Other banks	-0.0029%	-0.0028%	-0.0027%	-0.0026%
$b_D = -10$	*Crédit Lyonnais*	-0.1619%	-0.1612%	-0.1597%	-0.1567%
	Crédit Agricole	-0.0833%	-0.0829%	-0.0822%	-0.0808%
	Caisses d'Epargne	-0.0129%	-0.0127%	-0.0124%	-0.0118%
	BNP Paribas	-0.0024%	-0.0024%	-0.0024%	-0.0022%
	Société Générale	-0.0028%	-0.0027%	-0.0027%	-0.0025%
	Crédit Mutuel	-0.0043%	-0.0042%	-0.0041%	-0.0039%
	Groupe Banques populaires	-0.0023%	-0.0023%	-0.0023%	-0.0022%
	Natexis banques populaires	-0.0002%	-0.0002%	-0.0002%	-0.0002%
	Crédit commercial de France	-0.0002%	-0.0002%	-0.0002%	-0.0002%
	Other banks	-0.0022%	-0.0021%	-0.0021%	-0.0020%

Table 3: Variations of deposit prices

	Banks	$e_L = -0.5$	$e_L = -1$	$e_L = -2$	$e_L = -4$
$b_L = 2.5$	*Crédit Lyonnais*	-21.3169%	-21.0337%	-20.4672%	-19.3344%
	Crédit Agricole	-3.9610%	-3.9552%	-3.9384%	-3.8850%
	Caisses d'Epargne	+3.5383%	+3.4246%	+3.2059%	+2.8014%
	BNP Paribas	+3.1082%	+3.0156%	+2.8365%	+2.5016%
	Société Générale	+3.3801%	+3.2742%	+3.0700%	+2.6909%
	Crédit Mutuel	+3.6183%	+3.5007%	+3.2748%	+2.8574%
	Groupe Banques populaires	+3.6244%	+3.5065%	+3.2710%	+2.8616%
	Natexis banques populaires	+3.7139%	+3.5917%	+3.3571%	+2.9245%
	Crédit commercial de France	+3.7686%	+3.6438%	+3.4043%	+2.9630%
	Other banks	+2.7883%	+2.7114%	+2.5618%	+2.2789%
$b_L = 5$	*Crédit Lyonnais*	-21.4585%	-21.3169%	-21.0337%	-20.4672%
	Crédit Agricole	-3.9632%	-3.9610%	-3.9552%	-3.9384%
	Caisses d'Epargne	+3.5963%	+3.5383%	+3.4246%	+3.2059%
	BNP Paribas	+3.1553%	+3.1082%	+3.0156%	+2.8365%
	Société Générale	+3.4342%	+3.3802%	+3.2742%	+3.0700%
	Crédit Mutuel	+3.6784%	+3.6183%	+3.5007%	+3.2748%
	Groupe Banques populaires	+3.6846%	+3.6244%	+3.5065%	+3.2710%
	Natexis banques populaires	+3.7763%	+3.7139%	+3.5917%	+3.3571%
	Crédit commercial de France	+3.8323%	+3.7686%	+3.6438%	+3.4043%
	Other banks	+2.8273%	+2.7883%	+2.7114%	+2.5618%
$b_L = 7.5$	*Crédit Lyonnais*	-21.5057%	-21.4113%	-21.2225%	-20.8449%
	Crédit Agricole	-3.9639%	-3.9625%	-3.9592%	-3.9503%
	Caisses d'Epargne	+3.6158%	+3.5769%	+3.5001%	+3.3504%
	BNP Paribas	+3.1711%	+3.1396%	+3.0771%	+2.9550%
	Société Générale	+3.4523%	+3.4161%	+3.3445%	+3.2050%
	Crédit Mutuel	+3.6985%	+3.6583%	+3.5788%	+3.4240%
	Groupe Banques populaires	+3.7048%	+3.6644%	+3.5847%	+3.4296%
	Natexis banques populaires	+3.7973%	+3.7554%	+3.6728%	+3.5120%
	Crédit commercial de France	+3.8538%	+3.8110%	+3.7266%	+3.5624%
	Other banks	+2.8403%	+2.8142%	+2.7625%	+2.6609%
$b_L = 10$	*Crédit Lyonnais*	-21.5293%	-21.4585%	-21.3169%	-21.0337%
	Crédit Agricole	-3.9642%	-3.9632%	-3.9609%	-3.9552%
	Caisses d'Epargne	+3.6256%	+3.5963%	+3.5383%	+3.4246%
	BNP Paribas	+3.1790%	+3.1553%	+3.1082%	+3.0156%
	Société Générale	+3.4614%	+3.4342%	+3.3801%	+3.2742%
	Crédit Mutuel	+3.7087%	+3.6784%	+3.6183%	+3.5007%
	Groupe Banques populaires	+3.7149%	+3.6846%	+3.6244%	+3.5065%
	Natexis banques populaires	+3.8078%	+3.7763%	+3.7139%	+3.5917%
	Crédit commercial de France	+3.8645%	+3.8323%	+3.7686%	+3.6437%
	Other banks	+2.8469%	+2.8273%	+2.7883%	+2.7114%

Table 4: Variations of outputs in the loan market

	Banks	$e_D = 0.5$	$e_D = 1$	$e_D = 2$	$e_D = 4$
$b_D = -2.5$	*Crédit Lyonnais*	-22.9327%	-22.6020%	-21.9416%	-20.6257%
	Crédit Agricole	-3.3998%	-3.3965%	-3.3851%	-3.3436%
	Caisses d'Epargne	+2.8672%	+2.7791%	+2.6088%	+2.2899%
	BNP Paribas	+2.9866%	+2.8925%	+2.7108%	+2.3718%
	Société Générale	+3.0479%	+2.9507%	+2.7631%	+2.4139%
	Crédit Mutuel	+3.2573%	+3.1495%	+2.9421%	+2.5581%
	Groupe Banques populaires	+3.2995%	+3.1896%	+2.9782%	+2.5873%
	Natexis banques populaires	+3.4616%	+3.3436%	+3.1171%	+2.6996%
	Crédit commercial de France	+3.4646%	+3.3464%	+3.1197%	+2.7017%
	Other banks	+2.9138%	+2.8234%	+2.6486%	+2.3219%
$b_D = -5$	*Crédit Lyonnais*	-23.0982%	-22.9327%	-22.6019%	-21.9416%
	Crédit Agricole	-3.4007%	-3.3997%	-3.3965%	-3.3851%
	Caisses d'Epargne	+2.9119%	+2.8672%	+2.7791%	+2.6088%
	BNP Paribas	+3.0345%	+2.9866%	+2.8925%	+2.7108%
	Société Générale	+3.0975%	+3.0479%	+2.9507%	+2.7631%
	Crédit Mutuel	+3.3123%	+3.2573%	+3.1495%	+2.9421%
	Groupe Banques populaires	+3.3556%	+3.2995%	+3.1896%	+2.9782%
	Natexis banques populaires	+3.5219%	+3.4616%	+3.3436%	+3.1171%
	Crédit commercial de France	+3.5249%	+3.4646%	+3.3464%	+3.1197%
	Other banks	+2.9598%	+2.9138%	+2.8234%	+2.6486%
$b_D = -7.5$	*Crédit Lyonnais*	-23.1534%	-23.0430%	-22.8224%	-22.3817%
	Crédit Agricole	-3.4010%	-3.4004%	-3.3988%	-3.3934%
	Caisses d'Epargne	+2.9270%	+2.8970%	+2.8376%	+2.7215%
	BNP Paribas	+3.0506%	+3.0185%	+2.9550%	+2.8310%
	Société Générale	+3.1141%	+3.0809%	+3.0153%	+2.8871%
	Crédit Mutuel	+3.3308%	+3.2939%	+3.2211%	+3.0792%
	Groupe Banques populaires	+3.3745%	+3.3369%	+3.2626%	+3.1179%
	Natexis banques populaires	+3.5421%	+3.5017%	+3.4219%	+3.2667%
	Crédit commercial de France	+3.5452%	+3.5047%	+3.4248%	+3.2694%
	Other banks	+2.9752%	+2.9444%	+2.8834%	+2.7642%
$b_D = -10$	*Crédit Lyonnais*	-23.1810%	-23.0982%	-22.9327%	-22.6019%
	Crédit Agricole	-3.4010%	-3.4007%	-3.3997%	-3.3965%
	Caisses d'Epargne	+2.9345%	+2.9119%	+2.8672%	+2.7791%
	BNP Paribas	+3.0587%	+3.0345%	+2.9866%	+2.8925%
	Société Générale	+3.1224%	+3.0974%	+3.0479%	+2.9507%
	Crédit Mutuel	+3.3401%	+3.3123%	+3.2573%	+3.1495%
	Groupe Banques populaires	+3.3840%	+3.3556%	+3.2995%	+3.1896%
	Natexis banques populaires	+3.5523%	+3.5219%	+3.4616%	+3.3436%
	Crédit commercial de France	+3.5554%	+3.5249%	+3.4646%	+3.3464%
	Other banks	+2.9830%	+2.9598%	+2.9138%	+2.8234%

Table 5: Variations of outputs in the deposit market

Loan market		$e_L = -0.5$	$e_L = -1$	$e_L = -2$	$e_L = -4$
$b_L = 2.5$	Consumer surplus variation	-0.0996	-0.0976	-0.0937	-0.0864
	Total surplus variation	-0.0069	-0.00821	-0.0107	-0.0149
$b_L = 5$	Consumer surplus variation	-0.0503	-0.0498	-0.0488	-0.0469
	Total surplus variation	-0.0031	-0.0034	-0.0041	-0.0053
$b_L = 7.5$	Consumer surplus variation	-0.0336	-0.0334	-0.0330	-0.0321
	Total surplus variation	-0.0030	-0.0021	-0.0024	-0.0030
$b_L = 10$	Consumer surplus variation	-0.0253	-0.0251	-0.0249	-0.0244
	Total surplus variation	-0.0015	-0.0015	-0.0017	-0.0020
Deposit market		$e_D = 0.5$	$e_D = 1$	$e_D = 2$	$e_D = 4$
$b_D = -2.5$	Consumer surplus variation	-0.0963	-0.0944	-0.0906	-0.0834
	Total surplus variation	-0.0082	-0.0095	-0.0120	-0.0160
$b_D = -5$	Consumer surplus variation	-0.0487	-0.0482	-0.0472	-0.0453
	Total surplus variation	-0.0038	-0.0041	-0.0048	-0.0060
$b_D = -7.5$	Consumer surplus variation	-0.0325	-0.0323	-0.0320	-0.0310
	Total surplus variation	-0.0024	-0.0026	-0.0029	-0.0034
$b_D = -10$	Consumer surplus variation	-0.0244	-0.0243	-0.0241	-0.0236
	Total surplus variation	-0.0018	-0.0019	-0.0020	-0.0024

Table 6: Variations of surplus in loan and deposit markets

Loan market Variations of the Crédit Lyonnais marginal cost		$e_L = -0.5$	$e_L = -1$	$e_L = -2$	$e_L = -4$
$b_L = 2.5$	Marginal cost of the merging bank = marginal cost of Crédit Agricole	-0,4220	-0,4219	-0,4217	-0,4213
	Marginal cost required for a nul variation of consumer surplus	-0,0088	-0,0086	-0,0082	-0,0074
$b_L = 5$	Marginal cost of the merging bank = marginal cost of Crédit Agricole	-0,4143	-0,4142	-0,4142	-0,4141
	Marginal cost required for a nul variation of consumer surplus	-0,0044	-0,0043	-0,0042	-0,0040
$b_L = 7.5$	Marginal cost of the merging bank = marginal cost of Crédit Agricole	-0,4117	-0,4117	-0,4117	-0,4117
	Marginal cost required for a nul variation of consumer surplus	-0,0029	-0,0029	-0,0029	-0,0028
$b_L = 10$	Marginal cost of the merging bank = marginal cost of Crédit Agricole	-0,4105	-0,4105	-0,4105	-0,4104
	Marginal cost required for a nul variation of consumer surplus	-0,0022	-0,0022	-0,0022	-0,0021
Deposit market Variations of the Crédit Lyonnais marginal cost		$e_D = 0.5$	$e_D = 1$	$e_D = 2$	$e_D = 4$
$b_D = -2.5$	Marginal cost of the merging bank = marginal cost of Crédit Agricole	-0,5625	-0,5624	-0.5622	-0.5618
	Marginal cost required for a nul variation of consumer surplus	-0,0083	-0,0081	-0,0077	-0,0070
$b_D = -5$	Marginal cost of the merging bank = marginal cost of Crédit Agricole	-0,5535	-0 ,5535	-0,5534	-0,5533
	Marginal cost required for a nul variation of consumer surplus	-0,0041	-0,0041	-0,0040	-0 ,0038
$b_D = -7.5$	Marginal cost of the merging bank = marginal cost of Crédit Agricole	-0,5506	-0,5505	-0,5505	-0,5505
	Marginal cost required for a nul variation of consumer surplus	-0,0028	-0,0027	-0,0027	-0 ,0026
$b_D = -10$	Marginal cost of the merging bank = marginal cost of Crédit Agricole	-0,5491	-0,5491	-0,5491	-0,5490
	Marginal cost required for a nul variation of consumer surplus	-0,0021	-0,0021	-0,0020	-0,0020

Table 7: Variations of surplus in the loan and deposit markets