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Reallocating Profits in Restructuring Industries: Evidence from European and US Banking

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Abstract
We examine the reallocation of profits in the European and US banking sectors in the period of 1995 to 2004. Specifically, we ask whether the restructuring of both industries has contributed to an efficient reallocation of assets. Using a revised decomposition framework, we find that US banks are more flexible in the reallocation of profits than their European counterparts. In the US, efficient banks that appropriate assets decrease industry profitability, as expected in a market characterized by a sufficiently high level of competition. In addition, economies of scale are exploited more in the US than in Europe. Regulatory reforms in the EU, in particular in response to the current crisis, should therefore foster a more closely integrated European market.

Keywords: market structure, efficiency, restructuring, stochastic frontier, banking.

JEL classification: O47, O30, D24, C24.

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1. Introduction

In consolidating industries, no firm's market share is guaranteed. As market concentration rises, the market restructures and scarce assets are reallocated between survivors. This implies that some firms may come out on top, and - through mergers or organic growth - capture more market share. Other firms lose market share and may eventually leave the market altogether. Yet others may see an opportunity to enter the consolidating markets. Since the seminal work by Schumpeter (1942), these effects have been well-documented. [1] Among the key lessons taught to us by this literature, is the notion that we need to investigate firm-level dynamics, in order to understand industry dynamics (Haltiwanger, 1997; Caballero and Engel, 1993b). This view is also incorporated in the theoretical (selection) models of industry dynamics by Jovanovic (1982), Hopenhayn (1992), Ericson and Pakes (1995), Melitz and Ottaviano (2008) and Bernard et al. (2009), and, for financial intermediaries, in the work of Cooley and Quadini (2001).

A change in market structure, in particular a rapid consolidation, is often the result of a shock, possibly involving (de)regulation, technological changes, or both (Rose, 1987; Stiroh and Strahan, 2003; Walker et al., 2002). The timing and depth of the process depends on the timing and amplitude of the shock, and on the stage of the economic cycle (Caballero and Engel, 1993a; Demirgüç-Kunt and Maksimovic, 2002). [2] The reallocation itself may be smooth and rather instantaneous, but more likely it is costly and abrupt. Exactly how costly reallocation is depends on the specificity of the industry's resources. As a result, a growing literature has studied possible reasons why resources may be more specific in some industries than in other industries (Bertola and Caballero, 1994; Caballero and Hammour, 1998; Mitchell and Mulherin, 1996). In addition, there is ample evidence in institutional, legal and other differences between countries, all of which may affect the specificity of resources, and thereby may alter reallocation dynamics (La Porta et al., 1997a,b, 1998). Thus, the degree of specificity may change the reallocation dynamics (Haltiwanger, 1997; Caballero and Lyons, 1992; Caballero and Hammour, 1996).

The current financial crisis illustrates that specificity is evident in the banking sector. For instance, the fire sale spiral we have witnessed shows that assets can be worthless outside a certain bank. Furthermore, the crisis will most likely lead to more regulation, which will only increase the specificity of assets. As a result, measuring reallocation dynamics in the banking sector is important for our understanding of the competitiveness and stability of the financial system

This paper, in which we analyze the banking markets of the EU and the US, makes two contributions to the literature. First, we quantify profit reallocations in both markets. Specifically, we measure the change in profitability of banks by means of a decomposition exercise in order to find out whether profit-efficient banks gain market share at the expense of their less efficient counterparts. Second, we test whether restructuring is driven by the exploitation of scale economies, using panel VAR estimations.

We find large differences in the amount of reallocation that has taken place in both markets. In the US, much of the total change in industry profitability can be attributed to reallocation dynamics. However, there is no evidence of profit efficiency gains in the

[1] For examples applied to the banking industry, see King and Levine (1993); Stiroh and Strahan (2003); Berger et al. (1999); Baily et al. (1992); Klepper (1996); Wheelock and Wilson (2000).

[2] Of course, the cycle itself may change because of the shock and the resulting structural changes.

restructuring process. Instead, reallocation results in downward pressure on industry profitability. Apparently, attempts to reach the minimum efficient scale have put strong negative pressure on industry profitability. In the EU, hardly any reallocation has taken place and changes in industry profitability cannot be attributed to market dynamics. For the US, we find additional evidence that the restructuring process has contributed to lower profits while it has been accompanied by lower costs through the successful exploitation of cost scale economies. For Europe, this evidence is largely absent. We therefore conclude that in the US the market has been more flexible in reallocating assets than in the EU. Regulatory reforms in the EU in response to the crisis, should therefore focus on a truly integrated European market with sufficient reallocation dynamics providing welfare gains for European consumers.

The paper proceeds as follows: Section 2 describes the banking sectors in Europe and the United States. Section 3 presents the methodology and Section 4 introduces the data and reports the empirical results. Section 5 summarizes the findings and concludes.

2. Consolidation in banking

The restructuring process of an industry is linked closely to what Schumpeter (1942) referred to as creative destruction. If the 'invisible hand' works properly, the firms with the lowest average costs survive, while the bad performers will ultimately cease to exist. On the industry level, this evolution should boost scale economies and foster economic growth, resulting in a consolidated industry. Although in practice we do observe consolidation, within-sector differences can be quite large and persistent over time (Baily et al., 1992). We can distinguish between two elements that drive consolidation: market-level developments and firm-level dynamics, the latter being the subject of research in this paper. For the former, we can point out four causes of consolidation (Berger et al., 1999). First, technological progress, e.g. internet banking, has increased the optimal scale of a bank. Second, improvements in financial conditions yielded higher profits, which freed resources available for takeovers. Third, excess capacity can be put into use for scale enlargement, reducing existing inefficiencies. Finally, to facilitate positive returns to scale, countries deregulate and loosen geographical and/or product restrictions.

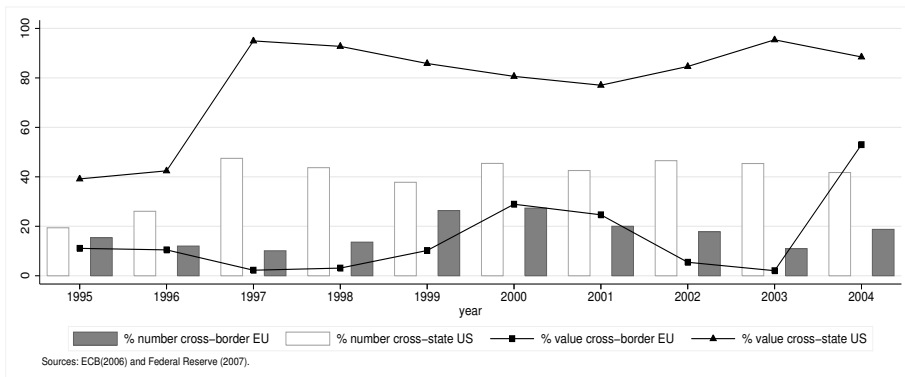
Both in the EU and in the US, banking markets have faced significant regulatory changes which were expected to lead to a restructuring of these markets. [3] For US banks, geographical restrictions have been lifted in two steps. The 1982 amendment to the Bank Holding Company (BHC) Act made it possible for out-of-state BHCs to acquire failed banks. By that time, nearly half of all 51 states allowed state-wide branching through mergers and acquisitions (cf. Stiroh and Strahan, 2003, for an overview of the years in which restrictions were lifted). The second step involved the passing of the Riegle-Neal Interstate Banking and Branching Efficiency Act of 1994, allowing nation-wide reallocation by the end of 1995 (Berger et al., 1995, 1999). Most importantly, the starting date of our sample (1995) allows us to consider the US banking market in full.

[3] Deregulation and technological changes have been well documented for the banking industry (Berger et al., 1999; Perottia and Suarez, 2002; Rose, 1987; Vennet, Vander, 1994; Wheelock and Wilson, 2000; Frame and White, 2004).

Figure 1. Consolidation and mergers

(a) Consolidation

(b) M&A activity



Similarly, the European national banking markets have been integrated in the European market for financial services as of 1993, with the enactment of the Second Banking Coordination Directive of 1988. This Directive established the single banking license, allowing all European banks to set up branches in the entire EU area. Although *de jure* a single European market exists, Bos and Schmiedel (2007) find that country-specific cost and profit frontiers are still suggested by the data.[4] Berger et al. (1999) argue that institutional and cultural differences still impede cross-border reallocation. Indeed, figure 1b indicates that cross-border mergers are rare in the European Union, compared to cross-state mergers and acquisitions in the US. Yet, with cross-border mergers exceeding 50 % towards the end of our sample period and because of the possibilities to open cross-border branches and subsidiaries, we should look at the European Union as one market. For the US, the evidence is even stronger.

Both markets have experienced a serious increase in concentration, due to increasing merger activity, entry and exit over a period of ten years (1995-2004). Figure 1a shows that the Hirschmann-Herfindahl Index (HHI) of both geographical banking sectors has increased over time, indicating larger and fewer banks (European Central Bank, 2006; Federal Reserve Bank of Chicago, 2007). At the same time, we observe a slower consol-

[4] However, they do find support in favor convergence to the single European meta-frontier.

idation pace in Europe.[5] However, if cross-border M&A activity continues in the same fashion as in 2003 - 2004 (see figure 1b), the HHI is likely to increase sharply in Europe as well. Moreover, the restructuring process is not yet finished. The financial crisis that started in 2007 is likely to lead to a new era of tighter regulation, inevitably leading to stronger restructuring incentives.

3. Methodology

To analyze the impact of the restructuring process on both absolute performance and profit efficiency of banks, we opt for a revised decomposition model of sector-level profitability. The goal of our decomposition analysis is to explain industry-wide growth by focusing on firm-specific behavior. The decomposition method explicitly accounts for heterogeneity in firm performance and may prove particularly insightful in restructuring industries (Foster et al., 2001, 2006). According to Jeon and Miller (2005), "aggregate industry data hide important firm- and plant-level dynamics that collectively determine overall industry dynamics." The advantages of decomposition methods were first acknowledged in studies on the manufacturing industries (Dunne et al., 1989, Baily et al., 1992). In these studies, productivity (total factor, multi-factor or labor productivity) is the dependent variable. Despite the advantages of the focus on heterogeneity at the micro level, the banking sector has received comparatively little attention in the decomposition literature (exceptions include Jeon and Miller, 2005, and Stiroh and Strahan, 2003).

We start by disaggregating industry-wide performance growth between two consecutive time periods:

$$\Delta\Pi_t = \sum_{i=1}^{M} \Pi_{i,t}\theta_{i,t} - \sum_{i=1}^{M} \Pi_{i,t-1}\theta_{i,t-1} \tag{1}$$

where Π denotes performance, $\theta_{i,t}$ is the market share of firm i in period t and M the total number of firms in a given period. We can dissect M by noting that it consists of survivors S, which are present in t and $t-1$, the entering firms N, present only in period t and the exiting firms X, present only in $t-1$. Rearranging equation 1, it can be shown that:[6]

$$\begin{aligned}\Delta\Pi_t = &\underbrace{\sum_{i\in S} (\Pi_{i,t} - \Pi_{i,t-1})\theta_{i,t-1}}_{\text{within effect}} + \underbrace{\sum_{i\in S} (\Pi_{i,t} - \Pi_{t-1})\,(\theta_{i,t} - \theta_{i,t-1})}_{\text{between effect}} \\ &+ \underbrace{\sum_{i\in N} (\Pi_{i,t} - \Pi_t)\theta_{i,t}}_{\text{entry effect}} - \underbrace{\sum_{i\in X} (\Pi_{i,t-1} - \Pi_{t-1})\theta_{i,t-1}}_{\text{exit effect}}\end{aligned} \tag{2}$$

where the within effect measures how firm-level changes in the survivor's profitability contribute to industry-wide performance growth, subject to macroeconomic conditions,

[5] Throughout this paper, we use "Europe" or "EU" to refer to the EU 15, which includes Austria, Belgium, Denmark, Finland, France, Germany, the United Kingdom, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and Sweden.

[6] The complete derivation of the model is available upon request.

technological change and regulatory structures (Stiroh and Strahan, 2003).

The remaining terms measure the dynamics between market participants. In a given period, firms can increase or decrease in size relative to other firms, changing the market share of the surviving firms. This is the so-called between effect. Furthermore, entry and exit restructure the market. These phenomena determine the size and sign of the reallocation effect, which is obtained by summing the between, entry and exit effect. This reallocation effect will be positive if above-average performing firms grow in size or enter, thereby contributing positively to industry-level performance. Alternatively, if below-average firms decrease or exit the market, industry-wide profitability will increase as well. The reallocation effect therefore quantifies the restructuring in both banking sectors. For that reason, it is this reallocation effect that we are interested in. The results for both the European countries and the United States are presented in the next section.

Knowing the size and sign of the within and reallocation effect gives insight in the performance dynamics of the market. To evaluate potential efficiency gains from the restructuring process, we need to look at efficiency at the firm level by extending the dynamic reallocation model.[7] More precisely, we measure each firm's optimal profit $\Pi^*_{i,t}$ using a stochastic frontier profit model (for details, see the Appendix, section **??**). A firm's profit efficiency, $PE_{i,t}$, is then measured as the ratio of actual profits, $\Pi_{i,t}$ and optimal profits. An inefficient firm has foregone profits (profit slack), $\Pi^F_{i,t}$. Foregone profits are equal to the difference between optimal (*i.e.* fully efficient) profits , $\Pi^*_{i,t}$ and actual profits, $\Pi_{i,t}$. For a fully efficient firm, $PE_{i,t} = 1$, and foregone profits are equal to zero. For a fully inefficient firm, $PE_{i,t} = 0$, and foregone profits are equal to optimal profits.

Since profit slack can be written a$\Pi^F_{i,t} = \frac{\Pi_{i,t}}{PE_{i,t}} - \Pi_{i,t} = \left(\frac{1-PE_{i,t}}{PE_{i,t}}\right)\Pi_{i,t}$, we can write equation (1) as:

$$\Delta\Pi_t = \sum_{i=1}^{M} (\Pi^*_{i,t} - \Pi^F_{i,t})\theta_{i,t} - \sum_{i=1}^{M} (\Pi^*_{i,t-1} - \Pi^F_{i,t-1})\theta_{i,t} \tag{3}$$

Decomposing in a way similar to equation (2) produces:

$$\begin{aligned}
\Delta\Pi_t = &\underbrace{\sum_{i\in S} \left(\Pi^*_{i,t} - \Pi^*_{i,t-1}\right)\theta_{i,t-1}}_{\text{pure between (I)}} + \underbrace{\sum_{i\in S} \left(\Pi^F_{i,t} - \Pi^F_{i,t-1}\right)\theta_{i,t-1}}_{\text{slack-reducing between (II)}} + \\
&\underbrace{\sum_{i\in S} \left(\Pi^*_{i,t} - \Pi^*_{t-1}\right)\left(\theta_{i,t} - \theta_{i,t-1}\right)}_{\text{pure within (III)}} + \underbrace{\sum_{i\in S} \left(\Pi^F_{i,t} - \Pi^F_{t-1}\right)\left(\theta_{i,t} - \theta_{i,t-1}\right)}_{\text{slack-reducing within (IV)}} + \underbrace{\sum_{i\in N} \left(\Pi^*_{i,t} - \Pi^*_{t}\right)\theta_{i,t}}_{\text{pure entry (V)}} \\
&+ \underbrace{\sum_{i\in N} \left(\Pi^F_{i,t} - \Pi^F_{t}\right)\theta_{i,t}}_{\text{slack-reducing entry (VI)}} - \underbrace{\sum_{i\in X} \left(\Pi^*_{i,t-1} - \Pi^*_{t-1}\right)\theta_{i,t-1}}_{\text{pure exit (VII)}} - \underbrace{\sum_{i\in X} \left(\Pi^F_{i,t-1} - \Pi^F_{t-1}\right)\theta_{i,t-1}}_{\text{slack-reducing exit (VIII)}}
\end{aligned} \tag{4}$$

[7] Essay 3 of Färe and Grosskopf (2003) contains a much more elaborate discussion of the relationship between firm-level efficiency and industry efficiency.

Hence, we have obtained two components for every term in equation (2). To simplify the discussion, we will again sum over the between, entry and exit effect to obtain an optimal and a slack-reducing reallocation effect. Slack-reducing reallocation occurs when firms increase their market share and at the same time reduce their profit slack, moving closer to the common profit frontier. A positive (negative) slack-reducing reallocation effect means higher (lower) foregone profits, thus contributing negatively (positively) to total industry profits. If there is positive optimal reallocation, this is reflected in an outward shift of the common profit frontier. One particularly interesting example of such a shift is the widespread adoption of Internet banking during the time period of this study. [8]

So far, we have argued that reallocation can contribute to industry profitability. What happens to profit efficiency, as measured by the slack-reducing reallocation effect, is less clear cut. On the one hand, we expect the more profit-efficient banks to survive in a restructuring environment, in other words a negative slack-reducing reallocation effect (foregone profits diminish over time). On the other hand, in order for banks to gain market share, they may have to incur costs, thereby giving up profits and stimulating restructuring at the same time. Here one can think of costs for attracting new physical or financial capital to serve other geographical or product markets. These costs are likely to be made before the returns are reaped, lowering current profits. From components (IV), (VI) and (VIII) in equation (4), this would imply a positive slack-reducing reallocation effect. We want to investigate which effect dominates. Our first hypothesis can be formulated as follows: [9]

Hypothesis 1
H_0^1 *(Expansion costs): The slack-reducing reallocation effect is positive.*
H_a^1 *(Selection): The slack-reducing reallocation effect is negative.*

Furthermore, we expect more reallocation in the market that is most flexible in reallocating assets, i.e., with the lowest barriers for reallocation. This brings us to our second hypothesis:

Hypothesis 2
H_0^2 *(US>Europe): Long-run slack-reducing reallocation is stronger in the United States.*
H_a^2 *(Europe>US): Long-run slack-reducing reallocation is stronger in Europe.*

If it is costly to reallocate, in which case hypothesis H_0^1 would be favored, it is not profitable for banks to do so. Whether banks do reallocate depends on the competitive conditions in the market. We can mimic this situation with the help of impulse response functions, where we give an upward shock to cost scale economies, resulting in a downward shift in the minimum efficient scale. This could be some exogenous shock to the sector, for example a new regulatory framework, leading to a larger minimum efficient scale. The response in the slack-reducing reallocation effect then determines the compet-

[8] See DeYoung et al. (2007) for the effect of internet banking on the performance of US banks.
[9] Please note that we do not test H_0 against H_a, but instead use two one-sided tests on both hypotheses separately.

itive conditions in the industry. If banks do not react to this shock in scale economies, there is likely to be a lack of competition in the market. However, if the market does respond, by eliminating inefficient firms, the market is competitive, possibly beyond some appropriability barrier. Our third and final hypothesis is stated as follows:

Hypothesis 3
H_0^3 *(Competition): A downward shift in the minimum efficient scale stimulates reallocation.*
H_a^3 *(Lack of competition): There is no reallocation after a change in scale economies.*

Summing up, we have hypothesized the direction, magnitude and effect of reallocation in these restructuring markets by means of three hypotheses. In the next section, we introduce our data and describe our results

4. Data and results

We use data on independent European and US banks over the period 1995-2004. European data are taken from Bureau van Dijk's BankScope database. US data are taken from the Federal Reserve Call Reports. We only include independent banks, in order to properly measure reallocation between banks (rather than within banks). [10] The resulting data set is unbalanced as, for various reasons, not all banks are covered in the entire period. Only commercial, cooperative and savings banks are included, as these banks are more or less homogeneous in terms of financing structure.

As a performance indicator, we use banks' return on assets (ROA). The market shares are calculated based on total assets. The European banks are pooled together, so that the market share of each firm measures its size in the total European banking sector. We consider this to be the `fair' comparison of European and US banks, as both - in principal - are supposed to operate on markets that are internally open. [11] Outputs, input prices and the equity ratio are the basis for our estimation of profit efficiency, as explained in the Appendix.

We present our results by first discussing the reallocation dynamics and subsequently analyzing the extent to which these are efficiency-driven. To test our hypotheses, we examine the development of these dynamics in the long run by showing cumulative effects.

Table 1 contains our decomposition results, based on equation **??**. We focus on the decomposition of changes in industry return on assets into a within and reallocation effect. The total within effect for the EU is the sum of (I) and (II) in Table 1. The total reallocation effect is the sum of (III) till (VIII).

In Figure 2a, we plot the cumulative total, within and reallocation effects. From this figure we observe that industry ROA (which equals the total effect) develops differently

[10] For EU banks, the BankScope independence indicator is used (with a cut-off at independence rating B), and for US banks an independence variable has been constructed using items RSSD9397, RSSD9001 and RSSD9365.

[11] All analyses in this paper have also been conducted for Germany, France, Italy and the United Kingdom separately. Findings as presented here are robust, and these additional results are available upon request.

Table 1
Decomposition results (based on equation (4))

year	region	$\Delta\Pi_t$	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
1996	EU	0.012	0.044	0.034	0.003	0.001	-0.006	-0.005	0.001	0.002
1997	EU	0.034	0.137	0.139	0.040	0.022	0.001	0.003	-0.023	-0.005
1998	EU	0.088	0.264	0.203	0.012	0.002	0.126	0.129	-0.085	-0.065
1999	EU	0.160	0.426	0.314	0.054	0.034	0.125	0.113	-0.148	-0.133
2000	EU	0.218	0.711	0.543	0.063	0.040	0.073	0.068	-0.183	-0.160
2001	EU	0.068	0.200	0.143	0.070	0.041	-0.153	-0.110	-0.221	-0.195
2002	EU	-0.023	-0.209	-0.155	0.176	0.116	-0.231	-0.174	-0.215	-0.188
2003	EU	0.026	0.003	0.021	0.175	0.114	-0.211	-0.162	-0.244	-0.213
2004	EU	0.118	0.198	0.152	0.256	0.172	-0.210	-0.162	-0.296	-0.261
1996	US	0.041	0.231	0.171	0.064	0.065	-0.032	-0.013	-0.357	-0.357
1997	US	0.018	0.317	0.238	0.069	0.077	-0.093	-0.037	-0.673	-0.670
1998	US	0.013	0.185	0.101	0.050	0.060	-0.111	-0.028	-0.964	-0.942
1999	US	-0.087	0.009	-0.059	0.038	0.053	-0.343	-0.187	-1.281	-1.263
2000	US	-0.184	0.284	0.122	-0.680	-0.517	-0.428	-0.230	-1.488	-1.472
2001	US	-0.168	0.428	0.246	-0.810	-0.613	-0.575	-0.421	-1.543	-1.543
2002	US	0.028	1.723	1.299	-0.722	-0.537	-0.654	-0.467	-1.526	-1.550
2003	US	0.141	2.251	1.719	-0.696	-0.509	-0.689	-0.490	-1.646	-1.651
2004	US	0.211	2.557	1.948	-0.793	-0.592	-0.842	-0.601	-1.896	-1.852

Cumulative results. Columns refer to equation (4).

in Europe and the US. After the process of deregulation, the US banking industry experiences a drop in ROA, followed by a gradual increase. At the end of our sample period, the US banking industry is shown to have experienced (cumulatively) a small increase in ROA. European banks on the other hand, experience an increase in ROA, followed by a slight drop.

The most interesting aspect, however, from Figure 2a is the importance of reallocation. In Europe, the within effect dominates throughout. Put differently, the increase in ROA is shared by almost all banks in the banking system, and there is hardly any reallocation. In the US, on the other hand, the within effect is strongly positive, but counterbalanced by a sharply negative reallocation effect. Put differently, US banks as such became more profitable over our sample period, but highly profitable banks lost market share to other banks that undercut them and thereby grew at their expense.

To indicate the economic significance of these results, we note that, for the period as a whole, ROA has increased by 11.8 percentage points in Europe, and by 21.1 percentage points in the US. In the EU, 7.2 percentage points of this increase result from reallocation of assets, while the restructuring process alone has decreased ROA in the US by almost 40 percentage points. This amounts to a cumulative gain in the level of profits (on the market level) of approximately $49 billion in Europe, and a loss of roughly $145 billion in profits in the US, due just to the restructuring of the industry.

Hypothesis 1: the slack-reducing reallocation effect is positive

In order to test our first hypothesis, we start by graphically examining the trends in reallocation in both markets. From figure 2b, we see that efficiency-driven (slack-reducing) reallocation is positive in both the EU and the US. Furthermore, from section 3, we know that this positive effect implies a negative impact on profitability. Recall that these are cumulative, or long-run, effects. Apparently, profit-efficient banks are losing market share to relatively inefficient competitors.

Subsequently, we test the first hypothesis, by performing one-sided t-tests whether the firm-specific cumulative slack-reducing reallocation is larger than zero. Table 2 reports the p-values from these tests on (H_0^1) and as well as on the alternative hypothesis (H_a^1). We find that H_0^1 is always (except the final year) rejected for the US. In the EU, H_a^1 can never be rejected, but a positive reallocation effect can only be concluded for five years, at the 10% level. For both area's, especially in the US, this is evidence in favor of the expansion costs explanation: banks have to incur costs in order to expand, while the benefits are collected later; the restructuring process destroys banks' profits. A selection effect, in the sense that the best-performing banks survive and the worst performers are driven out of the market, is not supported.

Table 2
Tests of hypotheses 1 and 2

	Hypothesis 1						*Hypothesis 2*		
	EU			**US**					
year	H_0^1	H_a^1	N	H_0^1	H_a^1	N	H_0^2	H_a^2	KW
1996	0.625	0.375	2604	0.000	1.000	2422	0.000	1.000	0.000
1997	0.142	0.858	2597	0.000	1.000	2145	0.000	1.000	0.000
1998	0.035	0.965	2488	0.000	1.000	1857	0.000	1.000	0.000
1999	0.004	0.996	2321	0.000	1.000	1605	0.000	1.000	0.000
2000	0.012	0.988	2152	0.000	1.000	1423	0.000	1.000	0.000
2001	0.065	0.935	1986	0.000	1.000	1277	0.001	0.999	0.000
2002	0.285	0.715	1836	0.003	0.997	1142	0.001	0.999	0.000
2003	0.152	0.848	1694	0.010	0.990	1045	0.003	0.997	0.000
2004	0.028	0.972	1580	0.011	0.989	950	0.005	0.995	0.000

Reported are p-values from t-tests, based on firm-specific observations; H_0^1 (H_a^1) are p-values for a test whether the cumulative slack-reducing reallocation is >0 (<0). H_0^2 (H_a^2) are p-values for a test whether the cumulative slack-reducing reallocation is larger in the United States (Europe). For Hypothesis 2, we also report the p-value from a non-parametric Kruskal-Wallis (KW) equality-of-populations rank test.

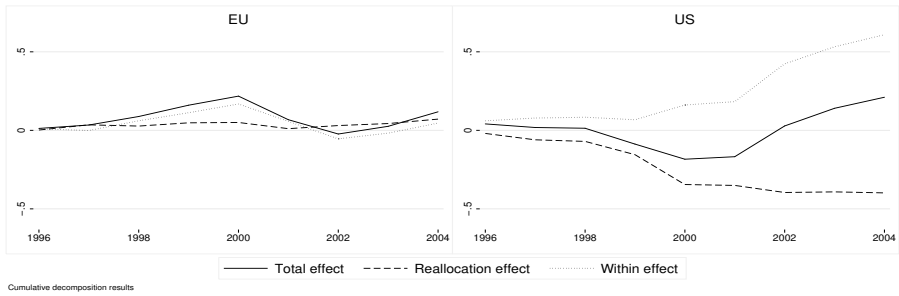
Hypothesis 2: The long-run slack-reducing reallocation effect is stronger in the United States

From figure 2b, we find that efficient reallocation has a stronger downward pressing effect on profits in the US than in the EU. For the full sample period, we find a slack-reducing reallocation effect of 0.271 in the EU, and 0.659 in the US, obtained by summing columns (IV), (VI) and (VIII) for the year 2004. In words, industry ROA went down by 27.1% (65.9%) in the EU (US) due to efficiency losses from restructuring. This difference is not surprising given the near absence of reallocation in Europe. In the US, relatively profit-efficient banks have thus lost more market share to profit-inefficient banks. This suggests that the costs of gaining market share are lower for US banks than for European banks, and that US banks are driven by more competitive forces than their EU counterparts, confirming hypothesis 2.

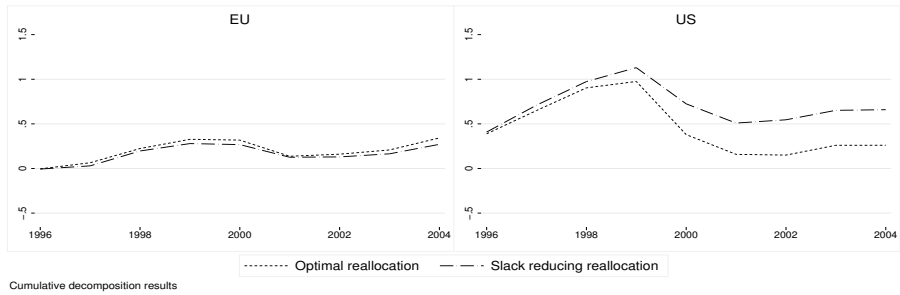
Formal tests of the second hypothesis are reported in the last three columns of Table 2. We test our null hypothesis that there is more reallocation in the US than in Europe using both a independent sample t-test (H_0^2) and a Kruskal-Wallis rank tests. A negative difference (US-EU, column H_0^2) is always rejected, hence a positive difference (H_a^2) never is, which is evidence that there are fewer incentives for reallocation in the EU than in the US; European banks are subject to less competitive forces.

Figure 2. Efficiency and reallocation

(a) Total, within and reallocation effect



(b) Slack-reducing versus optimal reallocation



Some further evidence can be found in the last four columns of Table 1. Here, we specifically focus on the extent to which entry and exit reduce profit slack. If entry barriers are low enough, a profitable market may attract additional rent-seekers. And with an enduring lack of competitive forces, entry may contribute positively to the profit-efficiency-driven reallocation. Indeed this is what the results for (VI) (entry) and (VIII) (exit) demonstrate.

Hypothesis 3: An upward shift in the minimum efficient scale stimulates restructuring

We test hypothesis 3 using a panel-data vector autoregression (VAR) methodology, following Love and Zicchino (2006). The panel VAR model allows for unobserved individual heterogeneity. Country-specific fixed effects are not included, see p. 195, (Love and Zicchino, 2006). We estimate

$$z_{i,t} = \Gamma_0 + \Gamma_1 z_{i,t-q} + f_i + e_t \tag{5}$$

where z_t is a three-variable vector that consists of scale economies, the Lerner index (as a measure of competition) and *either* optimal reallocation, *or* slack-reducing reallocation. We set the number of lags included, q, at 3. [12] As normal fixed effects are correlated with the regressors due to the lag structure of the VAR model, we use the Helmert procedure

[12] Our results are robust to changing the lag length to 2 or 4.

(Love and Zicchino, 2006) to apply forward mean-differencing and control for firm-specific fixed effects f_i. Equation (5) is estimated by GMM, and Monte Carlo simulations are used to obtain bootstrapped confidence intervals for the impulse response functions. Testing hypotheses H_0^3 and H_a^3 involves plotting the impulse response of reallocation to a shock in scale economies.

Table 3
Performance, market power, scale economies

	EU				US			
year	ROA	Lerner	scale	*PE*	ROA	Lerner	scale	*PE*
1995	0.47	0.47	1.08	0.57	0.96	0.18	1.05	0.64
1996	0.47	0.49	1.08	0.60	0.96	0.17	1.04	0.63
1997	0.44	0.51	1.08	0.60	0.86	0.16	1.03	0.64
1998	0.52	0.53	1.08	0.60	0.73	0.15	1.03	0.62
1999	0.47	0.57	1.08	0.59	0.61	0.14	1.02	0.61
2000	0.51	0.56	1.08	0.58	0.66	0.14	1.01	0.60
2001	0.49	0.54	1.08	0.56	0.59	0.14	1.00	0.58
2002	0.46	0.58	1.09	0.54	0.63	0.18	0.99	0.59
2003	0.51	0.62	1.08	0.59	0.65	0.20	0.98	0.61
2004	0.55	0.64	1.09	0.60	0.61	0.21	0.97	0.60

Lerner index is markup, scale economies measured with stochastic cost frontier, *PE* is profit efficiency.

Table 3 above shows the return on assets (ROA), the Lerner index, cost scale economies and profit efficiency (*PE*) in the EU and the US. Cost scale economies increase when the measure reported here (the elasticity of costs to output) decreases. From the table, we observe that the average Lerner index was higher and increasing in the EU. Scale economies, however, increased in the US, and stayed constant in the EU. Profit-efficiency scores do not differ across the EU and the US.

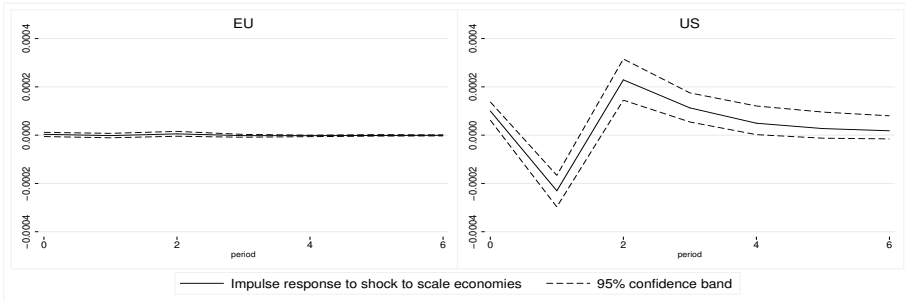
In Figure 3a, we report the impulse response of optimal reallocation to a one standard deviation increase in scale economies (i.e. a drop in "scale" as it is reported in Table 3) in both the EU and the US. Clearly, we observe that a change in scale economies has no effect on optimal reallocation in the EU. In the US, however, the initial reaction to a change in scale economies is a drop in optimal reallocation until reallocation increases and eventually resettles. This is the typical reaction in a market where an upward shift in the minimum efficient scale stimulates restructuring, as firms first restructure internally, before market shares are reallocated.

For the EU, the situation is similar when we consider the impulse response of slack-reducing reallocation to the same increase in scale economies in Figure 3b. In the US, slack reducing reallocation initially increases, indicating that firms are unable to adjust and increase efficiency in the short run. Over time, however, the most profit-efficient firms are the first to benefit from the increase in optimum size, causing slack-reducing reallocation to be negative, which implies a positive profit growth in the market.

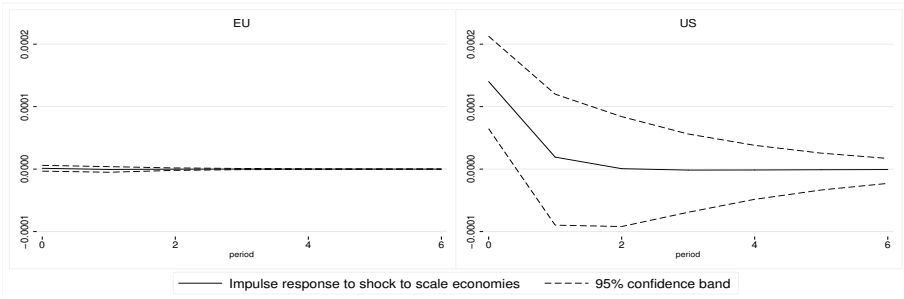
Summing up, we find that the US banking market is competitive beyond some appropriability barrier. For the EU, we find no evidence of any reallocation as a result of changes in scale economies. Note that this result should not be interpreted as evidence of real competition in the US market. Yet, it is clearly in favor of the result found in the literature that he US banking market is more competitive than its European counterpart.

Figure 3. Response of reallocation to a change in productivity and market power

(a) Impulse response of optimal reallocation to a change in scale economies



(b) Impulse response of slack reducing reallocation to a change in scale economies



5. Conclusion

We contribute to the growing literature on the restructuring of firm assets by studying the efficiency of the reallocation process that has taken place as banking markets in the EU and the US went through a significant consolidation over the last decade.

We find that efficient restructuring occurs in both markets. In the US, restructuring banks decrease industry profitability, as highly profitable banks lose market share to other banks that undercut them and grow at their expense. On the other hand, in the EU reallocation of assets between banks has little effect on industry profitability.

Moreover, whereas we find strong evidence that US banks react to a positive shock to cost scale economies by appropriating the assets of less successful competitors, the same shock has no effect in the EU.

We therefore conclude that in the US, the banking market has been more flexible in reallocating assets than in the EU. Additional regulatory reforms in the EU, for example in response to the current crisis, should therefore foster a truly integrated European market in which banks compete for market share and excessive rents are dissipated through reallocation.

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Appendix: Efficiency estimation

We employ stochastic frontier analysis (SFA) to measure X-efficiency relative to cost and profit frontiers. [13] We follow the alternative profit approach (Humphrey and Pulley, 1997). In brief, banks face perfect input markets, but on the output side they are allowed limited price discretion as reflected by an additional pricing opportunity constraint in the maximization problem. We include firms with negative profit, following Bos and Koetter (forthcoming). We use a translog functional form including a time trend variables and write the profit frontier as: [14]

$$\ln PBT_k = a_0 + \sum_{i=1}^{I} a_i \ln x_{ikt} + \tfrac{1}{2} \sum_{i=1}^{I} \sum_{j=1}^{J} a_{ij} \ln x_{ikt} \ln x_{jkt} + \varepsilon_k \tag{A.1}$$

Here x consists of outputs y, input prices w, control variables z and a time trend t. The composed error ε_k consists of random noise component, v, and a systematic inefficiency component labeled u. We assume that the random component v is i.i.d. $N(0, \sigma_v)$. For the inefficiency part we assume that u is i.i.d. $N|(\mu, \sigma_u)|$. As profit inefficient banks operate below the efficient frontier the latter term is added to random deviations, resulting in a composed error of the form $\varepsilon_k = v_k - u_k$. Firm-specific efficiency estimates are derived as the expected value of inefficiency conditional on total error and we can calculate efficiency scores:

$$PE_k = [\exp(-\hat{u}_k)] \tag{A.2}$$

In estimating equation (A.1), we use European data from BankScope, US data from the Federal Reserve Call Reports. Profit and outputs are in millions of (PPP) US dollars, the equity ratio is between 0 and 100%. The total number of observations (banks) is 27456 (4079) for the EU, 17249 (3157) for the US Total number of observations in frontier estimations or decomposition may very slightly due to some missing observations. All banks are independent, using Bureau van Dijk independence indicator B and higher for EU, and the Federal Reserve independence indicator for the US. Detailed estimation results are available on request. Table 3 in the paper shows the development of the average PE score over time.

[13] We refer to Kumbhakar and Lovell (2000) for an excellent discussion of the development and application of SFA to efficiency measurement.
[14] We use maximum likelihood estimation to obtain both parameter estimates for equation (A.1) and the error components. We impose homogeneity of degree one in input prices and symmetry.