Finance and Efficiency: Do Bank Branching Regulations Matter?* Companion Paper

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Abstract

We document that the deregulation of bank branching restrictions in the United States triggered a reallocation across sectors, with end effects on state-level volatility. The change cannot be explained simply by shifts in sector-level returns and volatility. A reallocation effect is at play, which we study in the context of mean-variance portfolio theory applied to sectoral returns. We find the reallocation is particularly strong in sectors characterized by young, small and external finance dependent firms, and for states that have a larger share of such sectors. The findings suggest that improving bank access to branching affects the sectoral specialization of output, in a manner that depends on the variance-covariance properties of sectoral returns, rather than on their average only.

Key words: Financial development, Growth, Volatility, Diversification, Deregulation, Liberalization, Mean-variance efficiency.

JEL classification: E44, F02, F36, O16, G11, G21, G28

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1. Alternative Benchmark Allocations

In order to illustrate the importance of the covariance structure of sectoral returns - rather than simply their growth rates - we estimate a benchmark frontier where all the covariance terms in the estimation are set to zero (sectoral variances are still allowed to vary across states). The first column of coefficients in Table I shows that this benchmark is simply unable to explain the convergence properties of sector weights in state-level output. Estimates for α and β are close to one and zero, respectively. Covariances between sectors matter, which is not surprising since they arise naturally in state business cycles. More importantly, this assuages the concern that high growth sectors mechanically see increasing allocations because we measure $w_{s,i,t}$ with observed output shares. We do not merely find reallocation towards high growth sectors. Convergence is significant only when the covariance of returns across sectors is appropriately accounted for in benchmark allocation.

Recent contributions in the literature on portfolio optimization suggest that simple investment criteria such as allocating $\frac{1}{N}$ of the portfolio share to each of the N assets achieves better performance than more complex schemes such as MVE weights, because of an estimation error in computing MVE weights (see DeMiguel, Garlappi and Uppal (2007)). We show this $\frac{1}{N}$ criterion also does a poor job at explaining the evolution of realized allocation across sectors. In the second column of Table I, we find that there is no convergence toward this benchmark. Estimates of α are again close to one, and the interaction effect of deregulation on convergence is insignificant. We conclude that $\frac{1}{N}$ is not a useful benchmark for the issue at hand either.

To summarize, although the intuitively simple notion of mean-variance efficiency has been argued to have limitations, it is a useful benchmark at least in a positive sense. For individual US states, the observed output shares of different sectors converge towards the state-level mean-variance efficient frontiers. Alternatively defined frontiers do not appear successful in explaining the convergence properties of sectoral output shares.

2. Excluding Stable and Regulated Sectors

Next, we check whether our conclusions are altered by the exclusion of exceptionally stable sectors that end up having large weights in the typical MVE portfolio. In particular, Government and Health and Education (GHE) consistently receive large weights, because their returns tend to be high on average but with low volatility. This may happen for reasons that are partly artificial since these sectors are heavily regulated. They should not necessarily enter the MVE portfolio optimization. We also exclude Finance, Insurance and Real Estate (FIRE) since returns there are likely to be endogenous to the specific regulation under study. The middle four columns of Table I present estimates for equation (4) evaluated over the remaining sectors when GHE and FIRE are excluded. In all cases, we re-compute the frontier as if these sectors were simply not part of the economy. The estimates reveal clearly that the interaction between convergence and branching deregulation does not depend on these specific sectors. The interaction coefficients continue to be significant in all cases where they were in Table 4 of the main paper, and indeed are of similar economic magnitude.

3. Excluding States with Out-of-State Banking Activity

It is possible that for a small number of states, and for specific banking activities, out-of-state investment by banks preceded deregulation. If so, then focusing on deregulation dates could lead to spurious results. We check whether our conclusions are robust to the exclusion of such states. We drop Delaware because in 1982 a law was passed providing a tax incentive for out-of-state credit card banks to operate there. As a result, the share of GSP in Delaware attributed to the banking system doubled. Jayaratne and Strahan (1996) describe the Delaware banking industry in more detail. Similarly we drop the District of Columbia because district boundaries may not reflect the true nature of state regulation. The rightmost two columns of Table I present estimates for equation (4) excluding Delaware and the District of Columbia. The estimates reveal that our conclusions are not dependent on the inclusion of these two states. The coefficients of the interaction between convergence and branching deregulation continue to be both statistically and economically significant.

4. Alternative Values for the Risk-Free Rate

In the tests reported in Sections 4 and 5 of the main paper, we set the risk-free rate to zero when identifying tangency portfolio on the MVE frontier. Our results are not particularly sensitive to the choice of a risk-free rate. In Table II, we estimate equation (4) with alternative values. In particular, we present evidence based on values for the risk-free rate of 2% and 4%. There is no substantial difference between Table 4 of the main paper and Table II.[1] Our interpretation is the following. Convergence appears to have operated primarily through volatility changes, or through a leftward movement towards the MVE frontier. Therefore,

[1]We also experimented with 7%, with no differences in results.

a specific choice of the risk-free rate, which implies a tangency portfolio, is not the critical driver of convergence. Realized output weights on sectors would converge towards that of a candidate tangency portfolio as long as that tangency portfolio is reached through a leftward move towards the frontier. This does not depend crucially on the level of the risk free rate.[2]

5. GMM Estimation

The last column in Table II reports estimates corresponding to the GMM estimator introduced by Blundell and Bond (1998). The approach corrects for the bias arising in fixed effect estimations of dynamic models. The correction has proved to be especially relevant for coefficient estimates on the lagged dependent variable. Table II confirms our results continue to obtain with GMM.

6. The Endogeneity of Deregulation Dates

We consider the possibility that the reform of branching in the US was endogenous to growth prospects in various states. We have already shown that deregulations have heterogeneous effects across sectors, depending on exogenous characteristics, which assuages some endogeneity concerns. In addition, Kroszner and Strahan (1999) and Kroszner (2001) provide support that widespread banking failures in the 1980s and technological advance were the two main, exogenous events that triggered deregulation. In related work, Jayaratne and Strahan (1996) show that the magnitude of bank lending and investment remained broadly unchanged around deregulation dates. If deregulation had been warranted by high growth prospects, it is likely that bank lending would have accelerated as a whole. Jayaratne and Strahan conclude that it is the efficiency of lending that improved, a result that is entirely consistent with this paper's results.

We verify that deregulation is indeed not endogenous to the nature of reallocation, which we measure using our frontier metric. Figure 1 plots for different states the number of years since intrastate deregulations, against the initial distance to the MVE frontier. If deregulation responded to prospective reallocation, the correlation should be positive. Such

[2]In fact, MVE weights as implied by different values of the risk free rate are highly correlated. For instance, the correlation between weights as implied by a 2% (4%) risk free rate and those implied by a zero risk free rate equals 0.91 (0.77).

is not the case. Linear fits to the data in the figure reveal essentially zero slope coefficient.[3] Hence, our results are unlikely to be an artefact of the endogeneity of branching deregulation to states' reallocation of output shares across sectors.

7. Interstate Banking Flows

Our measure of financial deregulation is a binary variable, by definition unable to capture *how much* the lifting of branching restrictions favored reallocation. An attractive alternative is introduced in Morgan, Rime and Strahan (2004), who compute the total out-of-state assets held by holding companies operating in state s in year t, divided by total assets in state s. This provides a continuous variable, capturing the magnitude of the flows in banking capital across states. Of course, the variable is more relevant to interstate branching deregulation. In the data however, the dates for interstate and intrastate deregulations are highly correlated, and their effects can not be identified separately.

We replace $DEREG_{s,t}$ in the estimation of equations (1) and (4) by $Flow_{s,t}$, the Other State Asset Ratio measure introduced by Morgan, Rime and Strahan (2004). The variable captures the share of total out-of-state assets held by holding companies also operating out of the state, and thus approximates the intensity of out-of-state capital inflows. Table III presents the results for equations (1) and (4) replacing $DEREG_{s,t}$ with $Flow_{s,t}$ and restricting data to the post interstate deregulation periods. The restriction is natural since $Flow_{s,t}$ is by definition zero prior to interstate branching deregulation. The continuity of $Flow_{s,t}$ as a variable also helps assess whether convergence responds to the strength of interstate bank linkages, rather than solely to a binary variable capturing deregulation. The results are overall similar to those obtained in Tables 3 and 4 of the main paper. Specifically, even during the post interstate deregulation period, convergence is faster in those years when out-of-state banks have a large participation in local banks' capital.

8. Changes in Banks' Characteristics

Finally, we illustrate that it is the emergence of larger, better-diversified and healthier banks following branching deregulation that leads to reallocation, rather than a simple, mechanical

[3] The slope is weakly negative. This is not surprising. Kroszner and Strahan (1999) document that the primary rationale for states introducing branching restrictions was to increase state revenues from local banks, to restrict competition, create local monopolies, grant more charters and simply extract greater rents. The delay in deregulation and the resulting reallocation may thus both be linked to the underlying political economy of the state government, an endogeneity that in fact may bias us against the effects we find.

change in the market structure of the banking sector. In the second column of coefficients in Table III, we run a horse-race between $Flow_{s,t}$ and the Herfindahl-Hirschman index of bank concentration in the state, with weights in the index implied by the deposit base of each bank. We find that the effect of interstate banking flows on convergence is robust to controlling for bank concentration in the state. In fact bank concentration by itself (after controlling for flows) impedes convergence. In unreported results, we find that replacing the Herfindahl index by the number of banks or branches in the state produces similar results.

Convergence due to out-of-state flows may be faster simply because in-state banks were inefficient prior to deregulation.[4] Hence, in the third column of Table III, we control for the effect of the health of banks operating in a state. We approximate this with the average state capital to assets ratio, i.e., the total capital of banks operating in the state divided by their total assets. Again, we find that the acceleration of convergence to efficiency in response to interstate banking flows is robust to this control. In this case however, the health of the banking sector also contributes to the acceleration.

[4] At the bank level, deregulation should also offer the best performers more scope for growth and introduce discipline through a higher likelihood of being taken over. Both of these should result in larger, better banks and increased efficiency. Indeed, Strahan (2003) shows that deregulation led to larger banks operating across a wider geographical area and Jayaratne and Strahan (1998) report that non-interest costs, wages and loan losses all fell after states deregulated branching.

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Table I. Robustness Tests: Alternative Allocations

The table investigates alternative benchmarks. No Covariance (Equal Weights) investigate the convergence properties towards frontiers where covariance terms are all set to zero (weights are all equal). GHE omits Government, Health and Education. FIRE omits Finance, Insurance and Real Estate. "Excl. DC and Del." excludes the District of Columbia and Delaware. All results pertain to a sample of 18 sectors, omitting Agricultural Services since they sum to unity. Estimations include a state-industry specific intercept and year effects. Standard errors are clustered by state, and are reported between parentheses. *** (**, *) denote significance at the 1% (5%, 10%) confidence level.

$$w_{s,i,t+1} - w^*_{s,i} = \delta_{s,i} + \theta_t + (\alpha + \beta DEREG_{s,t})\,[w_{s,i,t} - w^*_{s,i}] + \gamma DEREG_{s,t} + \epsilon_{s,i,t}$$

	Zero	Equal	GHE		FIRE		Excl. DC and Del.	
	Covariance	Weights	All	Non-Zero	All	Non-Zero	All	Non-Zero
Interaction	3.68×10^{-04}	0.0016	-0.0095**	-0.0109*	-0.0099***	-0.0040	-0.0084***	-0.0030
	(0.0077)	(0.0037)	(0.0038)	(0.0062)	(0.0035)	(0.0025)	(0.0029)	(0.0024)
$[w_{s,i,t} - w^*_{s,i}]$	0.9757***	0.9750***	0.8751***	0.9234***	0.8895***	0.9290***	0.8713***	0.9257***
	(0.0039)	(0.0031)	(0.0359)	(0.0213)	(0.0310)	(0.0088)	(0.0317)	(0.0103)
Deregulation	9.30×10^{-06}	6.96×10^{-06}	-1.03×10^{-04}	1.17×10^{-04}	6.23×10^{-08}	5.85×10^{-08}	3.55×10^{-06}	-4.24×10^{-09}
	(1.35×10^{-05})	(1.50×10^{-05})	(1.08×10^{-04})	(0.98×10^{-04})	(6.65×10^{-08})	(7.12×10^{-08})	(7.02×10^{-06})	$(5.95 \times 10^{-09}$
Observations	20,631	20,631	17,135	7,452	19,458	8,207	19,941	7,912

Table II. Robustness Tests: Alternative Risk Free Rate & GMM Estimation

Notes: Table II investigates alternative values for the risk free rate. 2% (4%) use these values for the risk free rate. GMM implements the two-step Arellano-Bond estimator to account for the presence of a lagged dependent variable in a fixed effect estimation. All results pertain to a sample of 18 sectors, omitting Agricultural Services since they sum to unity. Estimations include a state-industry specific intercept and year effects. Standard errors are clustered by state, and are reported between parentheses. *** (**, *) denote significance at the 1% (5%, 10%) confidence level.

$w_{s,i,t+1} - w^*_{s,i} = \delta_{s,i} + \theta_t + (\alpha + \beta DEREG_{s,t})\,[w_{s,i,t} - w^*_{s,i}] + \gamma DEREG_{s,t} + \epsilon_{s,i,t}$

	RFR: 2%		RFR: 4%		GMM	
	All	Non-Zero	All	Non-Zero	All	Non-Zero
Interaction	-0.0082***	-0.0030	-0.0085***	-0.0028	-0.0163***	-0.0080***
	(0.0029)	(0.0024)	(0.0027)	(0.0033)	(0.0006)	(0.0003)
$[w_{s,i,t} - w^*_{s,i}]$	0.8826***	0.9296***	0.8792***	0.9184***	0.8037***	0.9274***
	(0.0312)	(0.0099)	(0.0317)	(0.0118)	(0.0014)	(0.0012)
Deregulation	2.39x10^{-06}	4.35x10^{-08}	2.24x10^{-06}	-8.10x10^{-09}	1.37x10^{-06}	-5.32x10^{-09}
	(7.00x10^{-06})	(5.15x10^{-08})	(7.00x10^{-06})	(1.29x10^{-08})	(9.12x10^{-06})	(2.89x10^{-08})
Observations	20,631	7,774	20,631	6,555	18,634	7,282

Table III. Banks

Notes: The sample is reduced to fully deregulated state years. In panel A, all estimations include a state-specific intercept and year effects. In panel B, all estimations include a state-industry specific intercept and year effects. Standard errors are clustered by state, and reported between parentheses. Concentration denotes the Herfindahl-Hirschman index computed on the basis of deposit bases. Capital/Assets denotes the ratio of total capital of banks operating in the state, divided by their total assets. *** (**, *) denote significance at the 1% (5%, 10%) confidence level.

Panel A: $D_{s,t+1} = \delta_s + \theta_t + (\alpha + \beta_1 Flow_{s,t})\, D_{s,t} + \beta_2 Z_{s,t} D_{s,t} + \gamma_1 Flow_{s,t} + \gamma_2 Z_{s,t} + \epsilon_{s,t}$

	Out of State Capital	$Z_{s,t}$ = Concentration	$Z_{s,t}$ = Capital/Assets
$Flow_{s,t} D_{s,t}$	-0.0101***	-0.0156***	-0.0840***
	(0.0013)	(0.0018)	(0.0013)
Lagged $D_{s,t}$	0.3052***	0.0850	0.9051***
	(0.0406)	(0.0586)	(0.0839)
$Flow_{s,t}$	$3.18\text{x}10^{-04***}$	$5.26\text{x}10^{-04***}$	$3.25\text{x}10^{-04***}$
	$(9.68\text{x}10^{-05})$	$(1.03\text{x}10^{-04})$	$(8.92\text{x}10^{-05})$
$Z_{s,t} D_{s,t}$		$1.28\text{x}10^{-04***}$	-7.5740***
		$(2.52\text{x}10^{-05})$	(0.9335)
$Z_{s,t}$		$-5.41\text{x}10^{-06***}$	0.1250***
		$(1.43\text{x}10^{-06})$	(0.0430)
Observations	470	470	470

Panel B: $w_{s,i,t+1} - w^*_{s,i} = \delta_{s,i} + \theta_t + (\alpha + \beta_1 Flow_{s,t})\,[w_{s,i,t} - w^*_{s,i}] + \beta_2 Z_{s,t}[w_{s,i,t} - w^*_{s,i}] + \gamma_1 Flow_{s,t} + \gamma_2 Z_{s,t} + \epsilon_{s,i,t}$

	Out of State Capital	$Z_{s,t}$ = Concentration	$Z_{s,t}$ = Capital/Assets
$Flow_{s,t}[w_{s,i,t} - w^*_{s,i}]$	$-4.00\text{x}10^{-04***}$	$-3.71\text{x}10^{-04***}$	$-2.37\text{x}10^{-04***}$
	$(7.22\text{x}10^{-05})$	$(9.06\text{x}10^{-05})$	$(8.02\text{x}10^{-05})$
$[w_{s,i,t} - w^*_{s,i}]$	0.7497***	0.7510***	0.7657***
	(0.0066)	(0.0071)	(0.0075)
$Flow_{s,t}$	$1.47\text{x}10^{-06}$	$1.37\text{x}10^{-06}$	$1.71\text{x}10^{-06}$
	$(1.33\text{x}10^{-05})$	$(1.43\text{x}10^{-05})$	$(1.35\text{x}10^{-05})$
$Z_{s,t}[w_{s,i,t} - w^*_{s,i}]$		$-1.02\text{x}10^{-06}$	-0.2577***
		$(1.94\text{x}10^{-06})$	(0.0577)
$Z_{s,t}$		$4.68\text{x}10^{-09}$	$-6.76\text{x}10^{-04}$
		$(2.55\text{x}10^{-07})$	(0.0930)
Observations	8,261	8,261	8,261