

Sectoral growth effects of United States mergers and acquisitions: a time series analysis

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The objective of this paper is to study the sectoral growth effects of both domestic and cross-border merger and acquisition (M&A) sales in the United States for the period 1978-2006. M&A sales are broken down by sectors and in services- into financial and non-financial services M&A. Controlling for the initial level of output and investment, we find consistent across-sector evidence that M&A sales where the acquiring firm is of foreign origin lead to a slowdown of US economy. Additionally, we find that total M&A Granger cause real GDP growth, as well as services value added growth.

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1. Introduction

Sectoral growth effects of Mergers and Acquisitions (M&A) sales have not been well studied. Theoretically M&A should have both short-run and long-run effects on both income and employment. M&A are manifestation of cost synergies and economies of scale. They lead to increased market shares and access to new technologies.

There have been two strings of theories that attempt to explain why M&A occur. The neoclassical theory views them as responses to aggregate or industry economic shocks (Gort, 1969; Mitchell and Mulherin, 1996; Andrade et al., 2001; Sudarsanam, 2003; Andrade and Stafford, 2004; Weston et al., 2004; and Harford, 2005), such as new regulations or technologies, facing liquidity constraints or new competition. M&A are also considered related to industry cycles- growth and maturity of industries (Coase 1937; Nelson 1959; and Harford 2005). At the same time behavioral theory considers M&A be the results of temporary stock market misvaluation (e.g., Shleifer and Vishny, 2003; Rhodes-Kropf and Viswanathan, 2004; Rhodes-Kropf *et al.*, 2005; and Dong *et al.*, 2006).

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The implications of M&A for growth, however, fall more into the area of the revived Schumpeterian creative destruction growth theory. Endogenous growth theory deal extensively with the issue of whether increased competition (decreased concentration) causes growth. Here, traditional Schumpeterian view has been that the possibility of future monopoly rents motivates firms to innovate and therefore induces economic growth (Aghion and Howitt, 1992; Caballero and Jaffe (1993). The classic growth text of Grossmann and Helpman (1991) also shows that competition hurts research and development and thus growth if promotes imitation instead of innovation. However, empirical work (Nickell (1996) or Blundell *et al.* (1995)) point to a positive correlation between competition (measured number of competitors or the inverse of a market share or profitability index) and productivity growth within a firm or industry. To that, Aghion et al (2005) add that the relationship between product market competition and innovation is an inverted U, i.e. “competition discourages laggard firms from innovating but encourages neck-and-neck firms to innovate” Aghion et al (2005).

Mergers and acquisitions play a role in competition, since they lead to a reduction the number of firms in the industry and an increase of the market share of the existing firms. Thus M&A activity leads to an increased level of concentration of in the affected industry. Viewed in such fashion, M&A could be regarded as an alternative to “organic” innovation driven firm growth, which poses the question: do M&A contribute to growth at the aggregate or the industry level or do they hurt growth. Most recently this question has taken an international dimension as well. The last fifth wave of M&A activity was a large extent a global one- a wave to due cross border operations. It has been described as a wave of strategic megamergers concentrated in industries undergoing deregulation, globalization and technological revolution (Weston, 2001; Ribeiro, 2010). Studies that have tested the cross-border M&A- growth relationship have found evidence that most economies benefit from financial service M&A sales and that manufacturing and the primary sector M&A sales may hurt manufacturing and services sectors (Doytch and Uctum, 2011; Doytch, 2011)².

The current study aims to test for growth effects of domestic and international sectoral M&A sales in the United States. We conduct the analysis at both aggregate and sector levels of economic activity. We disaggregate M&A sales into primary sector, manufacturing, services, as well as financial, and non-financial services M&A to account for the sectoral heterogeneity of the sales. Each of the above categories is further divided into domestic and cross-border sales, where the later present a foreign cash inflow. We find that the impact of M&A shares of the economy varies considerably by sector and by origin of the acquirer- domestic vs. foreign. We find consistent cross-sector evidence that M&A sales where the acquiring firm is of foreign origin lead to a slow down of US domestic economic activity.

The rest of the paper introduces the model, the methodology, data and empirical results, finally it concludes.

2. Theoretical background, methodology, and data

We model M&A growth effects following empirical growth literature based on the neoclassical Solow-Swan, Ramsey-Coopmans-Kass model:

$$\log y_t = (1 + \beta) \log(y_{t-1}) + W_{it} + \varepsilon_t \quad (1)$$

² Likewise the results of studies on employment effects of M&A sales have been very mixed (Upadhyaya and Mixon 2003; Doytch, Upadhyaya and Mixon, 2010).

where W_i is a matrix containing the log of the traditional growth model growth determinants, such as population growth rate, technological progress and depreciation rate, human and physical capital (Mankiw, Romer, and Weil 1992) and β is the coefficient on the rate of convergence.

After performing a Granger causality test, which allows us to rule out the possibility of reverse causation, we estimate the following model:

$$\log(y_t^k) = \beta_0 + \beta_1 \log(y_{t-1}^k) + \beta_2 \log(x_t) + \beta_3 \log(f_t^j) + \varepsilon_t \quad (2)$$

where $\varepsilon_t \sim \text{i.i.d.}(0, \sigma_\varepsilon)$, $\log(y_t^k)$ is log of the variable k, where k is indexed as k = real GDP per capita, primary sector real value added, manufacturing sector real value added, services sector real value added. All real numbers are in year 2000 US dollars. x_t is the gross fix capital formation in percent of GDP. f_t^j is the M&A /GDP values and the superscript j stands for a M&A index as j= total M&A /GDP, the domestic M&A /GDP, the cross-border M&A /GDP. T denotes time from 1978 to 2005 for all data set, and from 1987 to 2005 for manufacturing value added data.

Real GDP per capita, primary sector real value added per capita, manufacturing sector real value added per capita, services sector real value added per capita, as well as gross fix capital formation as a share of GDP are all from World Development Indicators (World Bank). The M&A sales, measured as values of transactions are taken from the SDC Thomson Financial data set. Their value, originally measured in millions of USD at current prices, is divided by GDP in current USD.

3. Empirical results.

3.1. ADF testing and Granger causality

Macroeconomic data tends to be non-stationary. The estimation of a model using non-stationary data can produce spurious results. To test for stationarity, we conduct Augmented Dickey-Fuller and KPSS testing. We use Campbell and Perron's (1991) (reduction method to choose the optimum lag length. We start from the maximum 10 lags and stop at the lag value where t-statistic is significant. The results are summarized in Table 1. The unit root null hypothesis is rejected in favor of the series is stationary at 1 percent significant level for the log of Real GDP with a constant and trend in ADF test. On the other hand, the null hypothesis that the considered series is stationary cannot be rejected at 1 percent for the same series. We can conclude that the log of Real GDP in US is stationary during the sample period. This contradictory stationary result about the GDP series may be due to the use of a shorter than usual data set. In addition, we find that log of agriculture value added, total M&A, M&A in agriculture, M&A in manufacturing, and M&A in services are stationary for the considered sample period.

Table 1. Unit root test results for the variables

Series	ADF _{μ} ^a	Level		
		ADF _{μ} ^b	KPSS _{μ} ^c	KPSS ^d
Real GDP/capita	0.12(6)	-4.60 ^{***} (9)	0.66 [*]	0.06 ^{***}
Primary sector val.added	-0.76(0)	-3.58 [*] (0)	0.67 [*]	0.10 ^{***}
Manufac.sector real val.added	-0.58(0)	-2.06(0)	0.54 [*]	0.54 [*]
Services real val.added	2.27(7)	-3.01(5)	0.67	0.15 ^{**}
Total M&A	-4.64 ^{***} (1)	-3.27 [*] (1)	0.50	0.12 [*]
Manufacturing M&A	-4.34 ^{***} (1)	4.13 ^{**} (1)	0.45	0.11 [*]
Primary Sector M&A	-7.66 ^{***} (0)	-7.25 [*] (0)	0.19	0.10 [*]
Financial M&A	-2.90 [*] (1)	-2.22(1)	0.49	0.15 ^{**}

Notes: *,** indicate significance at the 10, 5, and 1 percent levels, respectively. The numbers in parenthesis are the lags numbers.

^aTest allows for a constant; one-sided (lower-tail) test of the null hypothesis that the variable has a unit root; 10, 5, 1 percent significance critical value equals -2.576, -2.863, and -3.441, respectively.

^bTest allows for a constant and a linear trend; one-sided (lower-tail) test of the null hypothesis that the variable has a unit root; 10, 5, 1 percent critical values equals -3.134, -3.428, and -3.973, respectively.

^cTest allows for a constant; one-sided (lower-tail) test of the null hypothesis that the variable has not a unit root; 10, 5, 1 percent significance critical value equals 0.739, 0.463, 0.347, respectively.

^dTest allows for a constant and a linear trend; one-sided (lower-tail) test of the null hypothesis that the variable has not a unit root; 10, 5, 1 percent critical values equals -0.216, 0.146, and 0.119, respectively.

In Table 2, we describe the Granger causality results, whose implication is ruling out reverse causality. Using F test, within the framework of a vector autoregression (VAR) model, we employ Granger causality test. We choose VAR lags based on AIC. We find 4 lag is appropriate for the tests. Table 2 presents that there is no bidirectional Granger causality between the interested variables. The empirical results show that the hypothesis of total M&A sales not Granger causing real GDP is rejected at 5 percent significance level. The hypothesis that total M&A do not Granger cause services growth is also rejected at 5 percent significance level.

Table 2. Pairwise Granger causality tests between the M&A and RGDP

Null Hypothesis	Test Values	
	F-value	P-value
RGDP \neq (Total M&A)	4.515 ^{**} (4)	0.02
RGDP \neq (Total M&A)	2.44 (4)	0.11
(Total M&A) \neq (Manuf. Val)	0.88 (4)	0.54
(Manuf. Val) \neq (Total M&A)	2.32 (4)	0.12
(Total M&A) \neq (Services Val.)	3.1 ^{**} (4)	0.04
(Services Val.) \neq (Total M&A)	1.8 (4)	0.17
(Total M&A) \neq (Agricul. Val.)	2.56 (4)	0.09
(Agricul. Val.) \neq (Total M&A)	2.0 (4)	0.16

Notes: ** denote rejections of the null hypothesis at 1% significance levels, respectively; and the symbol " \neq " implies does not Granger-cause. The numbers in parenthesis represents the lag length in VAR model.

3.2. Time Series Regression Estimation Results

The growth effects of the M&A coefficients are presented in Table 3. The table is designed as an "impact table", summarizing only the estimates of the variable of interest- M&A by sectors. We estimate 4 dependent variables, namely shown in columns 1, 2, 3 and 4, by different explanatory variables, given in panels. The aggregate economy and the different sectors are denoted in columns 1, 2, 3, and 4; various M&A classifications are denoted in rows and panels (1, 2, 3, 4, 5, 6), starting with total aggregate M&A sales, and disaggregating them into a domestic and cross-

border components. The column variables are estimated by the first row of each panel, then estimated one more time by the second and third rows of each panel to determine the disaggregated effect of the M&A. The cross-border M&A sales represent assets bought by foreigners. The last two panels of M&A (5 and 6) represent M&A in the financial and non-financial services industries, respectively and together constitute the tertiary sector. This additional breakdown of services M&A allows us to control for the significance of the financial industry in the sector of services, as well as to differentiate between two groups services industries, which are very heterogeneous.

The rich data classification we are using allows us not only to look at the growth effects at a sectoral level, but also to distinguish between the effects of domestic and international M&A sales. As Table 3 shows, there is no unified result for all sectors; to the contrary, the impact by M&A tends to vary with the sector and with the origin of the buyers- domestic vs. international.

When we explore M&A growth effects at the aggregate economic level, we do not find a significant result for the total or for the domestic M&A sales. However, we do see an indication even at the aggregate level that cross-border M&A, i.e. the sales done with foreigners hurt aggregate growth (panel 1, column 1). Disaggregating M&A further into a primary sector, manufacturing and services components reveals that the sales that significantly contribute to this negative effect are in the services sector. Disaggregating further M&A into a financial services and a non-financial services component shows that both of these contribute to the negative impact (panels 5 and 6, column 1). At the level of the aggregate economy no significant results are found by either total or domestic sectoral M&A. There are no significant results for effects on primary sector growth (column 2).

The effects of total M&A within the sector of manufacturing (panel 1, column 3) provide some explanation of the negative impact of cross-border M&A we saw at the aggregate level (panel 1, column 1). There are no significant effects by either total or domestic manufacturing M&A, but the cross-border ones produce negative significant effects. When we try to link to negative results to a specific M&A sectoral sales, we uncover that the effect is due to primary sector M&A, manufacturing M&A and only one part of services cross-border M&A- the financial industry sales (all along column 3). Altogether at the aggregate level of the economy, as well as within the primary and secondary sectors, the theme of growth-hurting effects kept repeating. Within the services sector we are about to see some mixed results.

The total M&A sales produce both kinds of significant effect on growth of services- positive and negative (column 4). The fact that the total number of sales is growth enhancing indicated that the positive effect of domestic M&A dominates over the negative effect of international M&A sales. In short, even with aggregate sales, it is evident that the domestic M&A sales are growth-contributing, whereas the foreign ones are growth-harming. Further down the right column we uncover which sub-set of sales these impacts are due to. Most M&A classifications- manufacturing, services, financial and non-financial services M&A produce positive effects at the total M&A deal level. All of the services sales, including financial and non-financial also produce an effect the domestic level as well. Although, the international sectoral sales do not display significant effects, the negative sign in front of the combined services cross-border sales suggests about a negative impact due to sales within the tertiary sector.

Table 3. Summary of regression models' coefficients of M&A sales

	Col 1 Aggregate growth	Col 2 Primary sector growth	Col 3 Manufact.growth	Col 4 Services growth
1 Total M&A sales	-0.010** (-0.959)	0.022 (1.041)	-0.083 (-1.155)	0.005*** (-2.214)
Total Domestic M&A sales	-0.0046 (-0.408)	0.0488 (1.040)	0.0216 (0.322)	0.012** (2.667)
Total Cross-border M&A sales	-0.016*** (-3.279)	-0.020 (-0.612)	-0.091*** (-2.712)	-0.006* (-1.727)
2 Total Primary sector M&A sales	-0.006 (-0.924)	0.006 (0.528)	-0.088*** (-2.845)	0.001 (0.628)
Primary sector domestic M&A sales	-0.002 (-0.369)	-0.009 (-0.268)	-0.040 (-1.641)	0.004 (1.107)
Primary sector cross-border M&A sales	-0.003 (-1.117)	-0.0018 (-0.102)	-0.036*** (-2.736)	0.001 (0.768)
3 Total Manufacturing M&A sales	0.005 (0.393)	0.018 (0.903)	-0.0277 (-0.299)	0.004*** (2.210)
Manufacturing domestic M&A sales	0.0089 (0.775)	0.048 (1.042)	0.024 (0.378)	0.006 (1.355)
Manufacturing cross-border M&A sales	-0.013 (-1.683)	-0.033 (-0.845)	-0.129*** (-2.971)	0.005 (1.244)
4 Total Services M&A sales	-0.006 (-0.813)	0.0215 (0.990)	-0.037 (-0.769)	0.007*** (3.029)
Services domestic M&A sales	-0.003 (-0.338)	0.047 (1.275)	-0.005 (-0.113)	0.010*** (3.134)
Services cross-border M&A sales	-0.012*** (-3.935)	-0.0235 (-0.810)	-0.042 (-1.483)	-0.004 (-1.486)
5 Total Financial Services M&A sales	-0.003 (-0.552)	0.019 (0.472)	-0.033 (-0.822)	0.005*** (2.459)
Financial Services domestic M&A sales	-0.0002 (-0.050)	0.018 (0.473)	-0.028 (-0.816)	0.005*** (2.280)
Financial Services cross-border M&A sales	-0.013*** (-5.443)	0.0005 (0.02)	-0.044* (-1.893)	0.0003 (0.172)
6 Total Non-Financial Services M&A sales	-0.005 (-0.791)	-0.02 (-0.539)	-0.021 (-0.497)	0.006*** (3.324)
Non-Financial Services domestic M&A sales	-0.003 (-0.487)	-0.03 (-0.574)	0.012 (0.280)	0.010*** (2.898)
Non-Financial Services cross-border M&A sales	-0.009*** (-2.359)	0.005 (0.146)	-0.0389 (-1.319)	-0.002 (-0.690)

Notes: *,** denote rejections of the null hypothesis at 10%, 5%, and 1% significance levels, respectively. The numbers in parentheses are the t-statistics.

4. Conclusion

In this paper, we estimate a simple Solow growth model by sectors, including the change of the share of M&A sales of aggregate GDP as an explanatory variable for growth. We find that the impact of M&A shares of the economy varies considerably by sector and by origin of the acquirer- domestic vs. foreign. We find consistent cross-sector evidence that M&A deals where the acquiring firm is of foreign origin lead to a slow down of the domestic economy. In the case of cross-border M&A deals synergies and economies of scale are created at the level of the foreign firm, which does not necessarily boost up US economic activity. Our results suggest that access to new markets and technologies for foreign firms generally does not contribute to economic growth in the domestic US economy, to the contrary- it can be growth hurting. At the level of the aggregate economy this negative effect is best explained by services cross-border M&A sales, in manufacturing it is explained by primary sector, manufacturing and financial services M&A sales.

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