A Note on Cross-Border Mergers and Investment

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The theoretical literature suggests that there should be a bi-directional relationship between investment and mergers. This essay uses homogenous and heterogeneous panel Granger causality tests to examine this hypothesis. The paper finds that in high-income countries, cross-border mergers tend to Granger cause investment, while in low- to middle-income countries, investment Granger causes mergers.

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I. INTRODUCTION

Since the early-1990s, there has been a significant expansion in number of cross-border mergers and acquisitions across the globe. Statistics on corporate consolidations collected by the United Nations' Conference on Trade and Development (UNCTAD) suggests that, on average, over five thousand deals were done per year across the world between 1994 and 2004 (a cumulative 58,000 deals during the period).

The theoretical literature on investment suggests that there should be a bi-directional relationship between mergers and investment. Based on the Q-theory of investment, a firm's investment rate should rise with its Q – the ratio of the market value of a firm to the net replacement cost of the firm's assets (Tobin, 1969 and 1982). Therefore if a merger results in a rise in market expectations about the future value of the firm, reflected by a rise in its market value, the Q-theory suggest that the firm should continue to invest as the return the firm should expect to make from its assets (reflected by its share price) exceeds the cost of the assets. More recently, Jovanovic and Rousseau (2002) use the Q-theory of investment to explain why some firms buy other firms.

The empirical relationship between mergers and investment, however, has not received a lot of empirical investigation. One of the few studies in the area is presented by Bittlingmayer (1996) who finds that merger-intensive industries are also more investment-intensive, and they have higher value-added per employee. This study uses data on 38 developing and developed countries to examine the

relationship between mergers and investment between 1987 and 2001. The econometric model accounts for the possible endogenous relationship between investment and mergers as well as heterogeneity in the causal relationship.

II. METHODOLOGY AND DATA

Traditional panel data causality analysis is conducted using the approach put forward by Holt-Eakin, Newey and Rosen (1988):

$$y_{it} = \alpha_i + \sum_{k=1}^{p} \gamma_k y_{it-k} + \sum_{k=0}^{p} \beta_{ik} x_{it-k} + \varepsilon_{it} \quad (1)$$

where each individual is denoted by $i = 1, 2, \ldots, N$, time period $t = 1, 2, \ldots, T$, α are the country-specific slope coefficients, γ and β are the regression coefficients on lagged values of y and contemporaneous as well as lagged values of x and ε is an error term assumed to be independently and identically distributed with a zero mean and variance σ_ε^2.

To eliminate the individual country-effects, one can difference the data, and test the hypothesis that x Granger causes y with an F-test of the joint hypothesis:

$$\beta_1 = \beta_2 = \ldots = \beta_k = 0$$

This specification suffers from the problem of simultaneity as the error term is correlated with the regressor. As a result, the authors employ the Generalised Method of Moments (GMM) estimation procedures suggested by Arellano and Bond (1991), first differences of the variables are employed as instruments, and the

Arellano and Bover (1995) and Blundell and Bond (1998), first difference terms as well levels of the variables are used as instruments, to deal with the correlation. Time dummies are also included in all regressions.

To check for the robustness of results to model misspecification, the Granger causality test equations are also augmented with other macroeconomic variables that could influence the evolution of investment. These are the real interest rate, inflation, (as a measure of uncertainty) and the availability of finance (proxied by domestic credit provided by the banking sector as a percentage of GDP).

In addition to the homogenous Granger causality tests, the authors also employ the Hurlin and Venet (2001) procedure that permits the use of both cross-sectional and time series information to test the causal relationship between two variables. The first step in the process consists of testing for homogenous non-causality (HNC). If the null hypothesis is rejected, then there is evidence of Granger causality.

If the null hypothesis of homogeneous non-causality is rejected, Hurlin and Venet (2001) note that two configurations could appear: homogenous causality (HC), where all of the β_{ik} coefficients are identical for all lag k and are non-null, or heterogeneous non-causality ($HENC$), where some of the β_{ik} coefficients are different for each individual. To empirically test the HC one can imposes the homogeneity assumption for each lag k of the coefficients on x_{it-k}. The $HENC$ test, on the other hand, looks at whether the null hypothesis for each individual $i = 1,2 \ldots N$ can be rejected. This test allows one to identify the individual for which there is no causal relationship.

The data on the number of mergers and acquisitions (*LNMA*) is taken from the UNCTAD's database available at (http://stats.unctad.org/fdi). This database provides information for each of the 38 countries (see Appendix) studied for the period 1987 to 2001. To proxy real investment (*LRI*) the authors deflate nominal gross capital formation by the GDP deflator, both were taken from the World Bank's World Development Indicators CD-Rom (2005). All variables are expressed in natural logarithms.

III. EMPIRICAL EVIDENCE

Table 1 presents the initial homogenous Granger causality tests using OLS (levels), the fixed effects model, OLS (differences) and the two system GMM methods and up to three lags. Both hypotheses are examined: that mergers do not Granger cause investment and that investment does not Granger cause mergers. In all cases, the null hypothesis is rejected, which therefore suggests that there is a bi-directional relationship between mergers and investment.

Table 1 about here

It is possible that other factors, not included in the model may influence the causal relationship between the variables. Accordingly, the authors add interest

rates, inflation and the availability of finance to the model. The results are presented in Table 2. Again, the null hypothesis of no causal relationship is rejected.

Table 2 about here

The models presented in Tables 1 and 2 assume that there exists a common Granger causal relationship in each country included in the sample. However, this may not necessarily be the case. As a result, Hurlin and Venet (2001) propose a procedural approach for testing Granger causality, which firsts looks for homogenous causality and then for heterogeneous causality. Table 3 presents the tests for homogenous non-causality (HNC) and homogenous causality (HC). HNC tests (column 3), examines whether there is an overall causal relationship between the two variables. The results given in the table indicate, in line with Tables 1 and 2, that there is a bi-directional causal relationship between the two variables. HC hypothesis tests the null of homogenous causality against the alternative of heterogeneous causality. The results suggest the existence of a heterogeneous causal relationship, even when control variables are included in the Granger causality tests.

Tables 3 and 4 about here

Tables 5 and 6 present the heterogeneous Granger causality tests for the countries included in sample. The countries are divided into low, middle and high-income countries using the World Bank's classification. Table 5 present the tests of

whether or not mergers Granger cause investment. It shows that in many high-income countries, this is the case. However, only in two low- to middle-income countries, had a significant relationship between mergers and investment. Table 6, seems to suggest the causal relationship in low- to middle-income countries is more likely to flow from investment to mergers, i.e. investment Granger causes mergers. This result could occur due to stock market inefficiencies in low- to middle-income countries: if the stock market does not accurate reflect the future value of the company then there might not be a strong incentive to invest.

Tables 5 and 6 about here

IV. CONCLUSIONS

This paper examines the empirical link between mergers and investment using a panel of 38 developed and developing countries between 1987 and 2001. Homogenous panel Granger causality tests suggest that there exists a bi-directional causal relationship between mergers and investment. However, once cross-country heterogeneity is taken into account, the results suggest that mergers tend to Granger cause investment in high-income countries, while investment Granger causes mergers in low- to middle-income states. The authors attribute this finding to stock market inefficiencies in these low- to middle-income countries, which does not provide enough incentives for firms to invest after mergers.

REFERENCES

Arellano, M. and O. Bover (1995) Another look at the instrumental variables estimation of error-component models, *Journal of Econometrics*, **68**, 29-51.

Bittlingmayer, G. (1996) Merger and the returns to labour and investment, *Applied Economics Letters*, **3**, 145-148.

Blundell, R. and S. Bond (1998) Initial conditions and moment restrictions in dynamic panel data models, *Journal of Econometrics*, **87**, 115-143.

Granger, C.W. (1969) Investigating causal relations by economic models and cross-spectral methods, *Econometrica*, **37**, 24-36.

Holtz-Eakin, D., W. Newey and H.S. Rosen (1988) Estimating vector autoregressions with panel data, *Econometrica*, **56**, 1371-1395.

Hurlin, C. and B. Venet (2001) Granger causality tests in panel data models with fixed coefficients, mimeo, University Paris IX.

Jovanovic, B. and P.L. Rousseau (2002) The Q-theory of mergers, *American Economic Review*, **92**, 198-204.

Tobin, J. (1969) A general equilibrium approach to monetary theory, *Journal of Money, Credit, and Banking*, **1**, 15-29.

Tobin, J. (1982) Money and finance in the macroeconomic process, *Journal of Money, Credit, and Banking*, **14**, 171-204.

Table 1. *Homogenous Granger Causality Tests (No Controls)*

	Lags	OLS – Levels	LSDV – Levels	OLS – Differences	GMM Differences – Difference Instruments	GMM Levels – Levels and Difference Instruments
LNMA $\rightarrow$ *LRINV*	1	22.931**	31.937**	22.781**	12.781**	18.180**
	2	18.111**	30.982**	24.721**	20.041**	23.091**
	3	29.043**	24.535**	20.827**	25.384**	24.166**
LRINV $\rightarrow$ *LNMA*	1	20.185**	19.082**	17.162**	14.248**	30.434**
	2	18.374**	22.806**	22.924**	14.089**	32.961**
	3	25.444**	18.882**	17.864**	14.246**	27.825**

Note: ** and * indicates significance at the 5 and 10 percent level of testing, respectively.

Table 2. *Homogenous Granger Causality Tests (With Controls for the Effects of Interest Rates, Inflation and the Availability of Finance)*

	Lags	OLS – Levels	LSDV – Levels	OLS – Differences	GMM Differences – Difference Instruments	GMM Levels – Levels and Difference Instruments
LNMA → *LRINV*	1	15.133**	28.608**	25.988**	27.433**	10.485**
	2	36.107**	42.871**	25.506**	35.325**	20.899**
	3	21.357**	37.948**	29.771**	36.111**	17.820**
LRINV → *LNMA*	1	29.916**	19.781**	12.267**	21.151**	19.959**
	2	26.546**	23.055**	16.266**	21.951**	21.288**
	3	26.010**	22.387**	15.095**	21.777**	21.873**

Note: ** and * indicates significance at the 5 and 10 percent level of testing, respectively.

Table 3. *Hurlin and Venet Granger Causality Tests*

	Lags	F_{hnc}: HNC Hypothesis	F_{hc}: HC Hypothesis
$LNMA \rightarrow LRINV$	1	6.621**	3.154**
	2	3.424**	4.317**
	3	2.130**	-
$LRINV \rightarrow LNMA$	1	5.950**	2.877**
	2	6.260**	2.963**
	3	6.428**	-

Note: ** and * indicates significance at the 5 and 10 percent level of testing, respectively.

Table 4. *Heterogeneous Granger Causality Tests: From LNMA to LRINV*

Low Income Countries		Middle Income Countries		High Income Countries	
Country	*Chi-square*	*Country*	*Chi-square*	*Country*	*Chi-square*
Nicaragua	0.750	India	0.086	Italy	0.132
Zimbabwe	4.873**	Lebanon	0.021	Japan	6.523**
		Malaysia	0.470	Korea, RB	0.524
		Mauritius	0.275	Luxemburg	0.023
		Mexico	1.054	Netherlands	2.534
		Morocco	0.378	New Zealand	0.153
		Namibia	1.382	Norway	6.576**
		Peru	4.419	Portugal	14.393**
		Philippines	0.000	Saudi Arabia	0.950
		Poland	4.427**	Singapore	8.750**
		Romania	0.152	Slovenia	4.322**
		Russian Federation	0.060	Spain	0.487
		Slovak Republic	1.909	Sweden	0.829
		South Africa	0.192	Switzerland	7.207**
		Sri Lanka	6.083	United Kingdom	2.531
		Thailand	3.577	United States	4.676*
		Tunisia	0.571		
		Ukraine	2.727		
		Venezuela, RB	0.051		

Note: ** and * indicates significance at the 5 and 10 percent level of testing, respectively.

Table 5. *Heterogeneous Granger Causality Tests: From LRINV to LNMA*

Low Income Countries		Middle Income Countries		High Income Countries	
Country	*Chi-square*	*Country*	*Chi-square*	*Country*	*Chi-square*
Nicaragua	9.352*	India	8.217**	Italy	0.294
Zimbabwe	0.007	Lebanon	0.055	Japan	0.001
		Malaysia	0.327	Korea, RB	0.910
		Mauritius	1.353	Luxemburg	0.030
		Mexico	0.001	Netherlands	12.769**
		Morocco	0.065	New Zealand	0.335
		Namibia	0.269	Norway	3.455*
		Peru	3.566	Portugal	12.838**
		Philippines	13.415**	Saudi Arabia	0.036
		Poland	0.153	Singapore	0.929
		Romania	0.053	Slovenia	2.010
		Russian Federation	0.095	Spain	2.084
		Slovak Republic	3.724	Sweden	0.380
		South Africa	5.269*	Switzerland	0.828
		Sri Lanka	16.444**	United Kingdom	2.209
		Thailand	7.305*	United States	4.565
		Tunisia	0.493		
		Ukraine	4.805*		
		Venezuela, RB	0.094		

Note: ** and * indicates significance at the 5 and 10 percent level of testing, respectively.