Aggregate and Firm level volatility: A Chimera?

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Abstract

The purpose of this paper is to revisit an intriguing finding. Although over the last few decades - up to the great recession - there has been a marked reduction in the volatility of aggregate output and inflation, there appears to have been a corresponding increase in the volatility of individual firms. Here we argue that this is directly due to an increase in churning of firm activity in the form of acquisition and disposal of real assets. This creates an increase in negative covariances between firms, so while the volatility of underlying organic growth has also fallen, observed volatility has risen.

JEL: D12, E52, E43.
Key-Words: Volatility, firm level growth.

1 Introduction

A puzzle of the years before the financial crisis of 2008-9 was that, while aggregate volatility in both output and inflation had fallen to historic lows, there had been an apparent rise in the volatility of quoted firms. Campbell, Lettau, Malkiel, and Xu (2001), amongst others, document increasing stock price volatility, while a series of papers using the Compustat dataset report growing sales growth volatility for public listed firms (Comin and Philippon (2005), Comin and Mulani (2006), Chaney, Gabaix, and Philippon (2002)). On the other hand, using the LBD database that contains data on all US firms, Davis et al (2006) find that, overall, firm volatility has declined and conclude that the increased volatility among public firms was overwhelmed by a fall in the volatility of private firms.

Comin and Philippon (2005) developed a sophisticated explanation for the volatility puzzle, in which the growing importance of proprietary assets such as R&D leads to increasing idiosyncratic volatility at the firm level but falling covariance between firms. In this paper we argue that there is a more simple data-consistency explanation why the observed volatility in sales growth in the Compustat population is a misleading correlate for US macroeconomic volatility. In particular, we argue that there is a more straight

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forward explanation for the increased volatility of individual firms. An increase in the churning of firm activity in the form of acquisition and disposal of assets raises sales when firms acquire other firms and reduces sales when firms dispose of assets by selling them to other firms. This market for corporate assets created an increase in negative covariances between firms, so while the volatility of underlying organic growth had fallen during the great moderation, observed volatility in the population of quoted companies had risen.
Though in terms of GDP, the merger or acquisition or divestiture of firms in the economy is a neutral event (at least in the short run), it has a significant effect on the reported sales volatility of individual companies. Comin and Mulani (2006) recognize this but imply that the problem is with large takeovers and can be addressed by winsorizing at, say, sales growth rates above 50%. In fact, some firms exhibit organic growth rates of this level. But particularly when the acquired asset is a division disposed of by another firm in the population, quite small transactions generate significant churning in terms of observed sales growth. As we show, there are many such transactions.
In a later paper Comin et al claim to adjust for the effect of takeovers, but do not explain how they do it. It seems likely that they used Compustat variable 249, 'the effect of acquisitions on sales'. Unfortunately, although this field is available in Compustat, it is rarely used and is non zero in only a small fraction of cases where a firm was known to have acquired or disposed of assets in the year.

In section 2 we first reconsider the volatility result and update the numbers to 2015. In section 3 we turn to a simple model of acquisitions and divestitures/disposals and show that an increase in the market for corporate assets raises the volatility of firms but leaves aggregate volatility unchanged. In section 4 we turn to the data and combine the quoted company dataset of Compustat with the SDC database of acquisitions and divestitures. We show that the information we have on acquisitions and disposals in Compustat is seriously incomplete and locate a very large number of transactions from SDC. Although SDC provides valuable information on the occurrence of an acquisition and a divestiture it does not always give any information about the value of the transaction nor a direct estimate of the effect of this activity on sales of the acquiring or divesting firm. Nevertheless, our panel estimation results suggest that when an individual firm acquires assets its sales are higher, while if it divests its sales are lower. In section 5 we conclude and suggest that many studies that use the Compustat dataset for empirical research need to be aware of the need to control for the market for corporate assets.

2 Firm and Aggregate Volatility

In this section we reprise the work of Comin and Mulani (2006) and Comin and Philippon (2007) and update using Compustat as the source of company accounts data on individual firms to 2015. We compute a measure of volatility of the *ith* firm as the moving average of the standard deviation of the growth of real sales:

$$\sigma_{i,t} = \sqrt{[\frac{1}{10}\sum_{k=-4}^{+5}(g_{t+k,i} - \tilde{g}_{t,i})^2]} \tag{1}$$

and a weighted growth of the standard deviation of real sales

$$\sigma_{i,t}^{w} = \sqrt{[\frac{1}{10}\sum_{k=-4}^{+5} \omega_{it}(g_{t+k,i} - \tilde{g}_{t,i})^2]} \tag{2}$$

where $\tilde{g}_{t,i}$is the average rate of growth of real sales for the ith firm between periods $t-4$ and $t+5$. The weight $\omega_{it} = S_{it}/\sum_{j=1}^{N} S_{jt}$, where N is the number of firms in any given year. The results are shown in Figure 1 below. The estimates are computed using data from 1950 up to 2015. Because of the forward looking terms the last point is 2011.

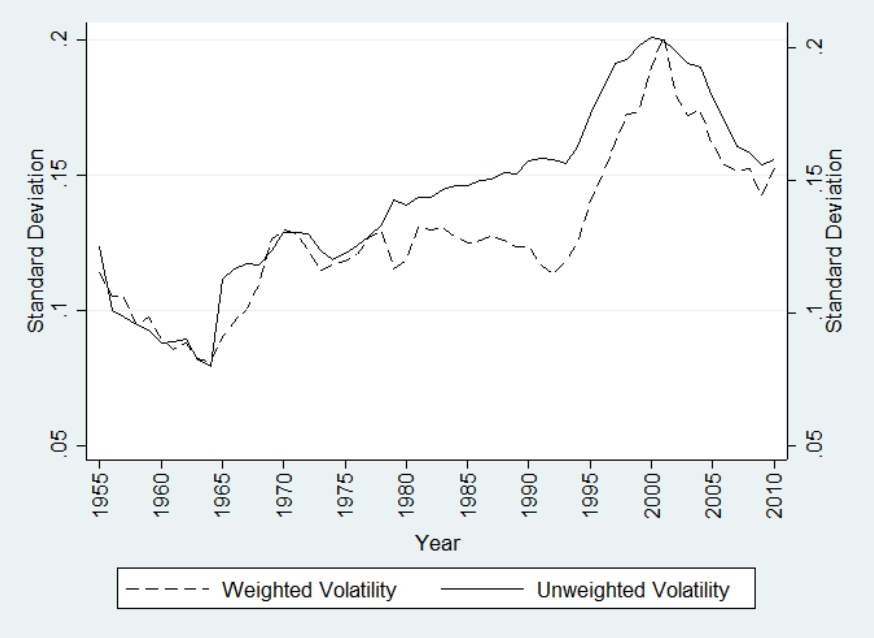

Figure 1. Firm Level Volatility.

Comin and Mulani (2006) use volatility data up to 1997. We observe that volatility peeked at about 2000 and declined thereafter, but by 2011 it was still at levels higher than in the first half of the 1990s. In Figure 2 below we first aggregate the data on firms and then calculate the moving average of the standard deviation of the total. The results are shown below. A period of lower volatility is associated with the 'great moderation'. From 2003 the forward-looking element kicks in with the 'great recession' of 2008-9. [DO

WE NEED SOMETHING BASED ON GDP ALSO?]

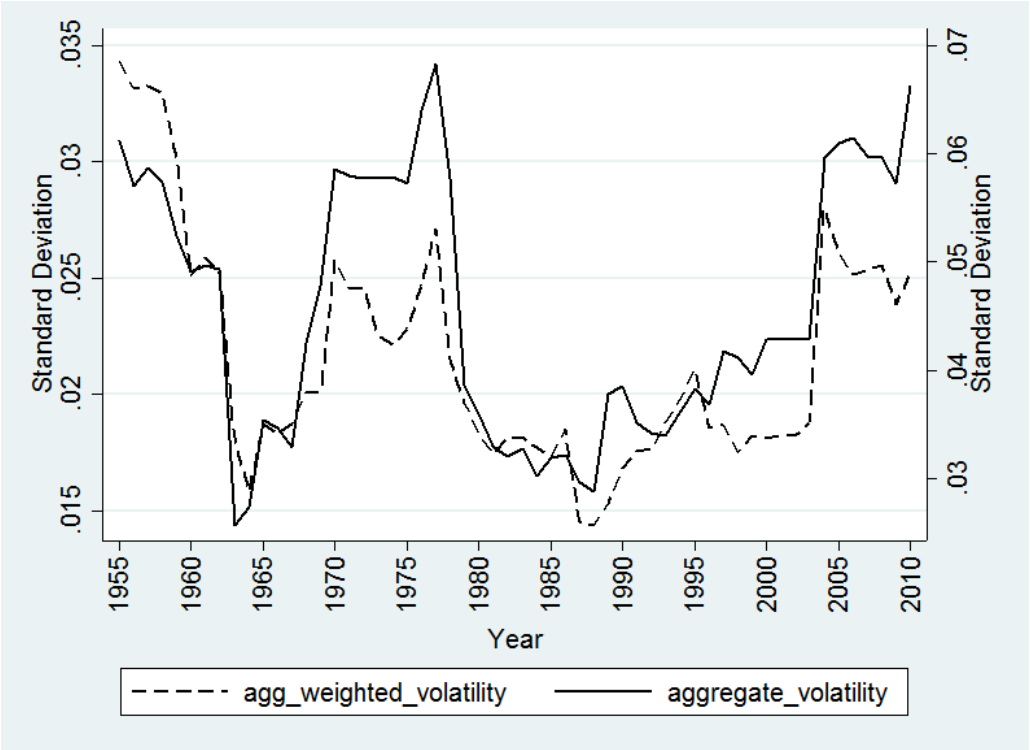

Figure 2: Volatility of aggregated quoted Firms

If we use real GDP for the US we get a similar picture with much lower volatility during the period of the great moderation.

IfReal

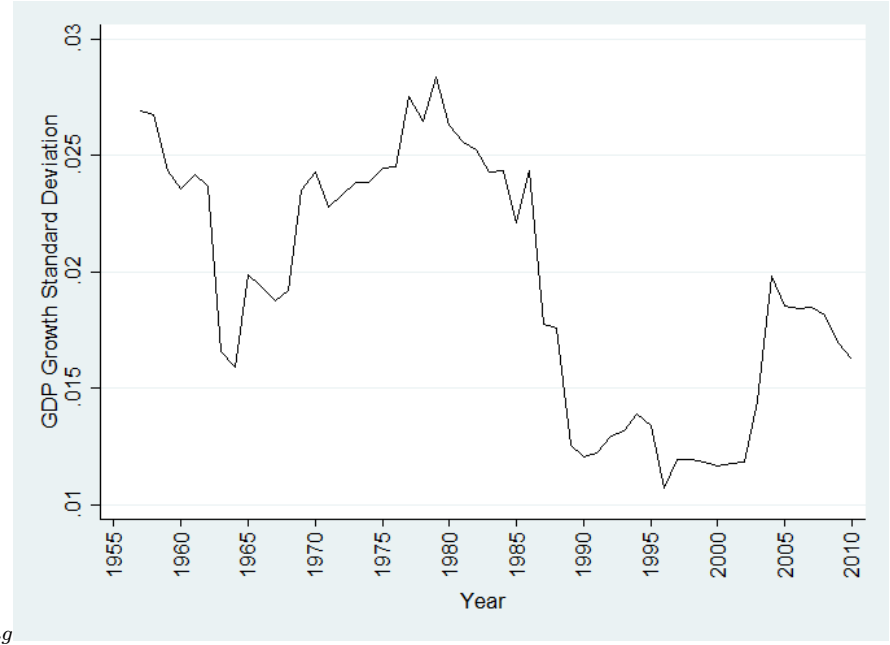

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Figure 3: Volatility of real US GDP

3 Model

In this section we turn to a model in which there is a market for corporate assets. Rather than investing in fixed assets a firm can purchase another firm or parts of it. If the firm wants to contract it can do so by selling off parts of its operations. If a firm acquires more assets usually its sales will rise, while if it disposes of assets sales will fall.

3.1 No Acquisitions or disposals

Consider a population of N firms. For simplicity the number of firms is constant, they are publicly quoted and there are no exits or entry. Firms do not buy and sell assets with non-quoted companies so this is a closed population of firms. At any given time, $t \in \mathbb{R}_{++}$, each firm, $i \in \{1...N\}$, produces an output $Y_{i,t}$. We assume that this production follows a stationary AR(1) process;

$$Y_{i,t} = y_i + \phi_i Y_{i,t-1} + \zeta_{i,t} + \varepsilon_t$$

where $\zeta_{i,t} \sim iid\left(0, \sigma_i^2\right)$ represents a firm specific shock to output and $\varepsilon_t \sim iid\left(0, \sigma_t^2\right)$ represents an economy wide shock to output. The parameters $y_i \in \mathbb{R}_{++}$, $Y_{i,0} \in \mathbb{R}_{++}$ and $\phi_i \in (0,1)$ are all assumed to be given exogenously.

Subtracting $Y_{i,t-1}$, we can write each firm's *individual organic growth* (i.e., firms' growth without any acquisitions) as;

$$g_{i,t}^o = \Delta Y_{i,t} = y_i + \left(\phi_i - 1\right) Y_{i,t-1} + \zeta_{i,t} + \varepsilon_t$$

The variance associated with this individual growth is then given by;

$$\sigma_{g_{i,t}^o}^2 = V_t\left[g_{i,t}^o\right] = \sigma_i^2 + \sigma_t^2 + 2Cov\left(\zeta_{i,t}, \varepsilon_t\right)$$

We can also consider the *aggregate organic growth* of firms, $g_t^o = \sum_{i=1}^N g_{i,t}^o$. The variance of this aggregate growth is given by;

$$\sigma_{g_t^o}^2 = V_t\left[g_t^o\right] = \sum_{i=1}^N \sigma_{g_{i,t}^o}^2 + 2\sum_{i=1}^N \sum_{j=1}^i Cov\left(g_{i,t}^o, g_{j,t}^o\right)$$

where $Cov\left(g_{i,t}^o, g_{j,t}^o\right) = Cov\left(\zeta_{i,t}, \zeta_{j,t}\right) + Cov\left(\zeta_{i,t}, \varepsilon_t\right) + Cov\left(\zeta_{j,t}, \varepsilon_t\right) + \sigma_t^2$. [IF FIRM SPECIFIC SHOCKS ARE UNCORRELATED WITH AGGREGATE SHOCKS THEN COVARIANCES ARE ZERO]

3.2 With Acquisitions and disposals

Now let us suppose that firms can offset shocks by acquiring/disposing of output producing assets from/to rival firms. Let a_{ijt} denote the net acquisitions of firm i from firm j at time t, and $a_{it} = \sum_{j=1}^n a_{ijt}$ denote firm i's total net acquisitions. Because the number of firms does not change a firm only acquires some part of another firm[1]. Note that $a_{ijt} = -a_{jit}$, since a positive net acquisition by i from j must be associated with an

[1] When we turn to actual data there is a very large number of exits from the population of quoted companies. Firms are acquired completely, or firms become private. Equally there is a large number of entries with IPOs,

identical net disposal by j to i. It follows that the sum of all total net acquisitions must equal zero, $A_t = \sum_{i=1}^{n} a_{it} = 0$.

Assuming that acquisitions translate directly to output, we can now rewrite firms' production process;

$$Y_{i,t} = y_i + \phi_i Y_{i,t-1} + a_{it} + \zeta_{i,t} + \varepsilon_t$$

Once again subtracting $Y_{i,t-1}$, firms now have *individual total growth* $g_{i,t} = \Delta Y_{i,t} = g^o_{i,t} + g^a_{i,t}$, which is composed of their organic growth, $g^o_{i,t}$, and their acquisition growth, $g^a_{i,t} = a_{it}$. Thus, introducing the possibility of acquisitions allows firms to grow more or less than they organically would. The variance associated with firms' total growth is given by;

$$\sigma^2_{g_{i,t}} = V_t\left[g^o_{i,t} + g^a_{i,t}\right] = \sigma^2_{g^o_{i,t}} + \sigma^2_{g^a_{i,t}} + 2Cov\left(g^o_{i,t}, g^a_{i,t}\right)$$

where $Cov\left(g^o_{i,t}, g^a_{i,t}\right) = Cov\left(a_{it}, \zeta_{i,t} + \varepsilon_t\right)$. This gives us our first finding;

Result 1: Acquisitions increase (decrease) the volatility of a firm's growth if and only if $\sigma^2_{g^a_{i,t}} > (<) - 2Cov\left(g^o_{i,t}, g^a_{i,t}\right)$.

From here, we now consider *aggregate total growth*, $g_t = \sum_{i=1}^{N} g_{i,t} = \sum_{i=1}^{N} g^o_{i,t} + \sum_{i=1}^{N} g^a_{i,t}$. Crucially, noting that $\sum_{i=1}^{N} g^a_{i,t} = A_t = 0$, we have $g_t = g^o_t$. It follows that the variance of aggregate total growth is exactly the variance of aggregate organic growth (i.e., $\sigma^2_{g_t} = \sigma^2_{g^o_t}$). This gives us our second finding;

Result 2: Acquisitions have no effect on the volatility of aggregate growth.

4 Acquisition and Disposal in Compustat and SDC

For many empirical purposes in economics and finance it would be invaluable to see the components of total sales growth, excluding acquisition and currency effects to reveal organic growth. This disclosure is not required by GAAP. Some, usually larger, firms have started to voluntarily disclose this data in recent years, but even this is not available electronically.

density

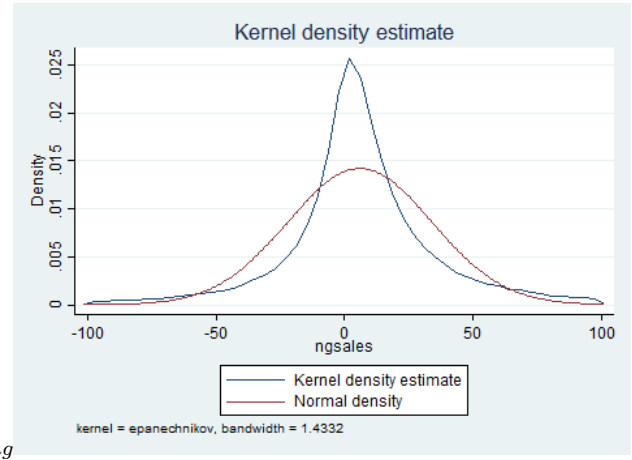

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Figure 4: Kernal Density of All Firm's real sales growth. 1950-2015. Winsorized at ±100.

If we use all of our observations for 1950 to 2015 from Compustat we have 204,975 firm/year sales. In Figure 3 we plot this as a kernal density, winsorized at ±100%.Although the distribution is leptokurtic, with fat tails, it is symmetric with skewness of .0046, and standard deviation of 28.085. The mean is 5.99. So we are as likely to see a decline in sales as an increase.

4.0.1 Case of Procter & Gamble

As an illustration of the amount of information that we have using both Compustat and SDC we show what is available for the very large corporation Procter & Gamble for 2003 to 2015. In Compustat all that we have for these years is the item goodwill. This is the increase or reduction in intangible assets such as brands. The change in total assets (WE NEED CHRIS WORDS ON THIS - what precisely are assets?).

Table 1: Procter & Gamble

	Compustat		SDC	
	Δ goodwill	ΔSales	Disposals	Acquisitions
2003	166	3204	&	4530
2004	8478	8034	&	223
2005	206	5334	210	54907
2006	35490	11481	840	&
2007	1246	8254	1343	&
2008	3215	7027	6600	&
2009	-3255	-4474	6200	&
2010	-2500	-91	8.6	468
2011	3550	3621	0	0
2012	-3789	1121	0	973
2013	1415	487	0	0
2014	-1484	-1105	0	0
2015	-6388	-6783	0	0

Note: % indicates we do not know the value.

The SDC Platinum database from Thomson Financial provides a record of M&A deals which appears to be reasonably comprehensive after 1981. SDC data is now widely used as the source for economic research into takeovers[2]. We use SDC data to identify whether each Compustat firm had either acquired, or disposed, of subsidiaries in each financial year. The accounting impact of an acquisition or disposal is recorded by the ultimate holding company. By matching the cusip codes of SDC deal participants to the Compustat population we draw two, overlapping, sets of acquisitions and disposals: the population of acquisitions where the ultimate parent of the acquirer was a Compustat constituent, and the population of disposals where the ultimate parent of the target was a Compustat constituent. Disposals of divisions, as distinct from acquisitions, were identified as deals where the target and its ultimate parent possessed different cusips and, moreover, the ultimate parent was a continuing entity within Compustat.
The SDC 'effective date' was used to associate, possible multiple, acquisitions and disposals to Compustat financial years. Both acquisitions and disposals were excluded if

[2]See, for example, Harford (2005), Colak and Whited (2007), Dong et al (2006), Rhodes-Kropf et al (2005), and Warusawitharana (2007).

they involved a purchase or sale of a stake but no change of control, since control is the criterion for the target firm's sales to be recognized or derecognized in the accounts of the ultimate parent company. The effective date can be in any month of the year. The financial year also varies between firms[3]. So when matching dates to the calendar year we have to bear in mind that there can be an element of ambiguity about in which calendar year the sales took place. Moreover, since the effective date of acquisition or divestiture varies from month to month some part of the consequences for sales could be in part this year, last year or the next year.
SDC contains two promising fields, for the target's most recent sales, and for the transaction value. However the 'sales' field is only sparsely populated and, as other researchers have noted, the 'value' field is quite incomplete. Deal value is only available for slightly under half of transactions.
Hence we generated two dummy variables, a 0/1 indicator of acquisition/disposal activity in each company year; a partial value series, using SDC's reported values where available.

5 Acquisitions and Disposals: The Market for Corporate Assets.

In this section we use the SDC Platinum database to tabulate the extent of acquisition and divestiture of corporate assets between 1982 and 2015.. Maksimovic and Phillips (2001) report evidence for an earlier and overlapping period. They find that between 1974 and 1992 an average of almost 4 percent of large manufacturing plants changed ownership. There is a large literature on merger and acquisitions involving the sale of entire organisations. But there is also a large and growing market for the partial disposal and acquisition of corporate assets. Figure 4 plots the total number of firms that acquired assets among the quoted population (excluding financial firms) or divested themselves of assets. Note that in any year a firm may repeatedly acquire firms or dispose of assets.

[3]Though increasingly over time many of US firms are switching in December.

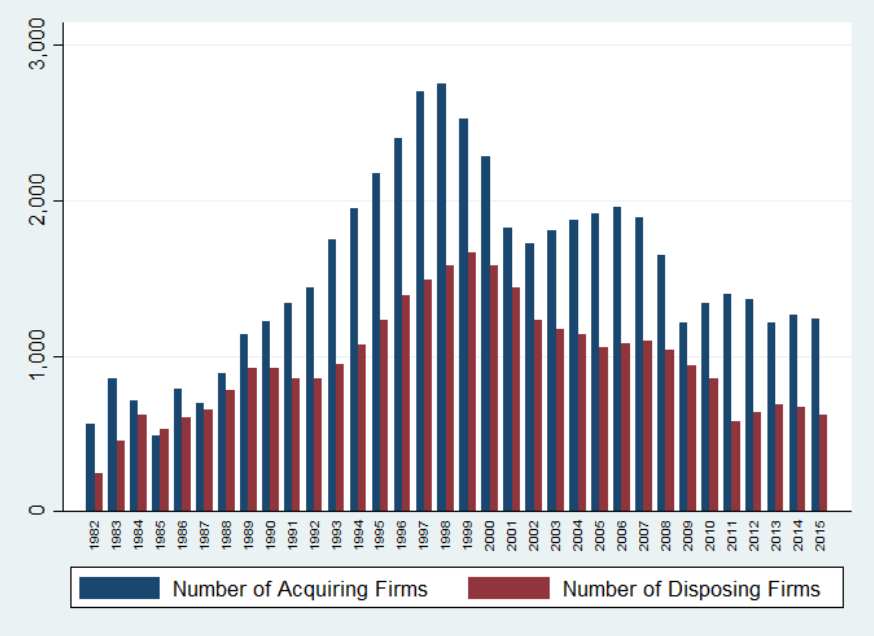

Figure 5: Number of firms that acquire and divest.

The actual numbers in each year are shown in Tables 2 and 3[4]. The second column reports the total value at current prices (when we actually know the value). This peaks in 2000 at the hight of the IT stock market boom and a merger and acquisitions upswing. The third column gives the total number of transactions and column 4 the number of firms involved in each year. Around the IT peak of 2000 about 20% of quoted firms were involved. In Table 3 we report divestitures. As with acquisitions divestitures peaked in 2000 with about 13% of firms involved. These tables draw attention to the enormous amount of churning in the corporate asset market as firms (often simultaneously) both acquire and divest assets.

6 Growth in Sales

In this section we turn to an analysis of the rate of growth of real sales by those firms who acquired or disposed of corporate assets in any given year compared to those firms that did not. The results for acquisitions and disposals are shown in Tables 4 to 6. In Table 4 we show the median of real sales growth for acquiring and non-acquiring firms, depending upon whether the acquisition took place in the current year. Column 2 shows average (nominal) sales in each year for all firms. Columns 3 shows average growth rates of sales when the acquisition is in the current year. Columns 4 shows the average growth of firms that did not make an acquisition in the current year. The differences in rates of sales growth between acquirers and the firm average are shown in columns 5 and 6. There is a clear tendency for those firms that have made an acquisition in the current year to grow significantly faster than those firms that have not made an acquisition in

[4]These are after we have combined Compustat and SDC. There are firms in SDS that are not quoted (or are financial) that are not included.

Table 2: Observed Acquisitions in conbined datasets. 1982 - 2015.

Year	Total Value (£Mil)	Transactions	Number of Firms	% of Firms
1982	24397.02	796	559	7.35
1983	39773.06	1208	852	10.72
1984	53796.97	1009	710	8.68
1985	73845.87	664	489	5.80
1986	95481.14	1218	785	8.93
1987	79233.27	1041	695	7.81
1988	133440.4	1405	888	9.81
1989	142644.7	1881	1138	12.53
1990	77278.81	2036	1221	13.14
1991	72323.33	2208	1341	13.89
1992	66840.64	2412	1436	13.95
1993	107521.7	3154	1753	16.01
1994	178705.5	3767	1952	16.85
1995	293645.1	4178	2174	17.72
1996	317162.1	5115	2403	19.21
1997	564571.3	6579	2702	21.71
1998	892973.8	6773	2756	21.92
1999	971370.9	5665	2530	20.50
2000	1182243	4650	2287	19.26
2001	589560.1	3314	1821	16.23
2002	362108.7	3019	1728	16.11
2003	297232.4	3398	1808	17.28
2004	452812.4	3568	1874	18.13
2005	667705.2	4038	1919	18.72
2006	888904.8	4201	1959	18.65
2007	878743.5	4184	1887	17.83
2008	616574.3	3522	1652	16.00
2009	409811.3	2186	1215	11.88
2010	532224.6	2746	1340	12.85
2011	642470.9	3104	1400	12.74
2012	651370.1	2945	1366	12.31
2013	565934.9	2445	1212	11.01
2014	680298.6	2694	1264	11.83
2015	954938.1	2584	1243	12.18

Table 3: Observed Divestitures in conbined datasets. 1982 - 2015.

Year	Total Value (£Mil)	Transactions	Number of Firms	% of Firms
1982	28598.64	240	240	3.16
1983	19805.15	452	452	5.69
1984	53396.29	619	619	7.57
1985	62217.52	531	531	6.30
1986	75120.41	603	603	6.86
1987	71531.29	655	655	7.36
1988	99389.76	782	782	8.64
1989	89590.68	918	918	10.11
1990	91037.89	918	918	9.88
1991	38968.57	852	852	8.82
1992	38858.23	857	857	8.33
1993	49583.25	943	943	8.61
1994	98366.38	1073	1073	9.26
1995	132996.7	1227	1227	10.00
1996	227043.8	1392	1392	11.13
1997	319510.7	1491	1491	11.98
1998	574480.1	1580	1580	12.57
1999	647861.6	1669	1669	13.52
2000	759025	1582	1582	13.32
2001	705797.8	1437	1437	12.81
2002	247267.7	1234	1234	11.51
2003	224488.9	1174	1174	11.22
2004	276094.3	1140	1140	11.03
2005	564740.9	3641	1056	10.30
2006	825383.6	3748	1082	10.30
2007	993851.8	3708	1099	10.38
2008	734776.4	3317	1040	10.07
2009	652001.6	3021	938	9.17
2010	504353.8	2763	857	8.22
2011	199861.8	963	576	5.24
2012	224535	1084	639	5.76
2013	284210.1	1115	684	6.22
2014	304278.4	1170	670	6.27
2015	402129.8	1104	623	6.10

the current year. A similar exercise for Disposals is shown in Table 5. Here sales growth rates for firms disposing of assets is significantly less than the firm average. However, in itself this is not necessarily evidence against the Comin/Phillipon model. It may be that firms who are growing rapidly for other reasons are in a better position to make acquisitions, or firms that are in trouble may wish to divest themselves of assets[5]. We did the same exercise for the relationship between acquisitions and divestitures in the previous year in Tables 4 and 6. Again the same pattern emerges. The are a number of firms that simultaneously acquire firms and divest in the same year as they rationalised their businesses. Acquisition or divestiments may be unrelated to the underlying organic growth.

7 Estimation Results

In this section we regress in a panel with fixed effects the rate of growth of real sales against various measures of corporate asset market operations. In Table 8 two dummy variables are used. dv_t^{acq} takes a value of 1 if the firm acquired another firm in that year - whatever the actual value of the transaction - and zero otherwise. Likewise, dv_t^{dis} takes a value of 1 if a firm divests - whatever the value of the transaction - and zero otherwise. Although there is a large amount of noise with a very low R^2 acquisitions are correlated with larger growth with real sales and divestitures are correlated with lower growth. Because of the ambiguity created by the financial year and the effective month of an acquisition or divestiture on sales column 3 in Table 8 includes the lagged dummy variables and column 4 the lead dummy variables as well. In all cases they are significant and of the right sign.

In columns 4 and 5 we include also something identified by the analysis of Procter and Gamble. We include the change in total assets with both lags and leads. These terms prove to be very significant, with a considerable increase in the R^2. However, the current year acquisitions dummy variable in no longer significant.

8 Conclusions

We provide evidence to suggest that the increase in the volatility of individual firms is directly related to the market for corporate assets with many firms acquring assets or divesting assets sometimes at the same time. For example in our sample for 1982 to 2015 with a totall number of firm/years of 49,870 when acquisitions took place, and 31,435 firm/years when firms divested, there were 9950 firm/years when firms both acquired and divested in the same year. The total number of firm/years in our sample was 295,622.

[5]Denis, D.K. and Shome, D.K. (2005) find that asset disposals are negatively related to operating performance at the firm and industry levels and positively related to the firm's debt ratio and its level of diversification. Empirically they study 130 publicly traded firms that each reduce their book value of assets by at least 25% in one fiscal year between 1985 and 1994.

It is easy to separate out firm that have increased/decreased the book value of total assets by more than some cutoff of 25%. For each year calculate percentiles for % change in the book value of total assets.

Table 4: The effect of acquitition on Sales Growth in current time period.

	Median Sales Growth (%)			Deviation	
Year	All Firms	Acquirers	Non-Acquirers	Acquirers	Non-Acquirers
1982	-2.93	0.11	-3.21	3.04	-0.29
1983	4.41	8.44	3.86	4.03	-0.54
1984	7.83	12.40	7.45	4.57	-0.38
1985	2.52	7.47	2.24	4.95	-0.28
1986	4.42	9.27	3.93	4.85	-0.49
1987	6.58	12.41	6.08	5.83	-0.50
1988	6.53	11.71	5.81	5.18	-0.72
1989	2.77	7.82	1.99	5.05	-0.78
1990	0.49	6.59	-0.59	6.09	-1.09
1991	-1.38	3.09	-2.15	4.47	-0.77
1992	2.86	7.73	2.05	4.87	-0.82
1993	5.23	9.64	4.35	4.41	-0.87
1994	9.11	15.48	7.50	6.37	-1.61
1995	9.18	14.67	7.62	5.48	-1.57
1996	9.16	17.19	7.32	8.03	-1.84
1997	9.30	18.91	6.83	9.61	-2.47
1998	7.85	17.15	5.36	9.29	-2.50
1999	8.57	17.56	6.64	9.00	-1.92
2000	8.95	17.49	7.03	8.54	-1.92
2001	-0.83	4.28	-1.90	5.10	-1.07
2002	-0.69	3.30	-1.49	3.99	-0.80
2003	5.12	9.09	3.77	3.97	-1.35
2004	9.22	12.60	8.00	3.38	-1.22
2005	7.42	11.54	6.13	4.12	-1.29
2006	7.86	9.92	7.12	2.06	-0.74
2007	6.38	9.45	5.37	3.07	-1.01
2008	3.31	5.85	2.41	2.54	-0.90
2009	-6.46	-3.87	-7.09	2.58	-0.63
2010	7.52	9.49	7.01	1.98	-0.51
2011	6.11	9.56	5.05	3.45	-1.06
2012	2.14	4.74	1.52	2.60	-0.63
2013	3.30	5.32	2.81	2.03	-0.49
2014	4.59	6.46	4.02	1.87	-0.57
2015	1.31	3.68	0.75	2.37	-0.56

Table 5: The effect of acquitition on Sales Growth in the previous time period.

	Median Sales Growth (%)			Deviation	
Year	All Firms	Acquirers	Non-Acquirers	Acquirers	Non-Acquirers
1982	-2.93	0.41	-3.02	3.34	-0.10
1983	4.41	8.22	4.11	3.81	-0.30
1984	7.83	13.78	7.32	5.95	-0.51
1985	2.52	6.66	2.19	4.14	-0.32
1986	4.42	10.91	3.97	6.50	-0.45
1987	6.58	14.14	5.72	7.57	-0.85
1988	6.53	12.70	5.88	6.18	-0.65
1989	2.77	8.92	2.12	6.16	-0.64
1990	0.49	6.59	-0.46	6.09	-0.96
1991	-1.38	3.80	-2.07	5.18	-0.70
1992	2.86	8.86	1.92	6.00	-0.94
1993	5.23	10.47	4.42	5.25	-0.81
1994	9.11	16.31	7.83	7.20	-1.29
1995	9.18	16.59	7.44	7.41	-1.74
1996	9.16	16.44	7.64	7.28	-1.52
1997	9.30	18.80	7.31	9.50	-1.99
1998	7.85	18.39	5.32	10.53	-2.53
1999	8.57	14.62	6.72	6.06	-1.84
2000	8.95	15.08	7.23	6.13	-1.72
2001	-0.83	3.92	-1.98	4.75	-1.15
2002	-0.69	4.01	-1.61	4.71	-0.92
2003	5.12	10.19	3.70	5.06	-1.43
2004	9.22	14.56	7.77	5.34	-1.44
2005	7.42	12.11	6.10	4.69	-1.31
2006	7.86	9.70	7.32	1.84	-0.54
2007	6.38	8.29	5.75	1.91	-0.64
2008	3.31	5.90	2.35	2.59	-0.96
2009	-6.46	-5.09	-6.88	1.37	-0.42
2010	7.52	9.95	7.06	2.43	-0.46
2011	6.11	9.48	5.11	3.37	-1.00
2012	2.14	4.31	1.62	2.17	-0.52
2013	3.30	5.38	2.81	2.08	-0.48
2014	4.59	6.22	4.07	1.63	-0.52
2015	1.31	2.81	0.92	1.50	-0.40

Table 6: The effect of divestiments on sales growth in current year.

	Median Sales Growth (%)			Deviation	
Year	All Firms	Disposers	Non-Disposers	Disposers	Non-Disposers
1982	-2.93	-6.63	-2.84	-3.70	0.09
1983	4.41	-0.14	4.60	-4.54	0.20
1984	7.83	2.65	8.14	-5.18	0.31
1985	2.52	-4.24	2.74	-6.76	0.23
1986	4.42	-1.59	4.74	-6.00	0.32
1987	6.58	2.90	6.80	-3.68	0.23
1988	6.53	3.88	6.82	-2.64	0.29
1989	2.77	0.77	3.10	-2.00	0.34
1990	0.49	-1.20	0.78	-1.70	0.28
1991	-1.38	-4.57	-1.00	-3.20	0.38
1992	2.86	-0.96	3.44	-3.82	0.58
1993	5.23	-0.30	5.98	-5.52	0.75
1994	9.11	3.61	9.79	-5.51	0.67
1995	9.18	4.40	9.86	-4.79	0.68
1996	9.16	2.97	9.85	-6.19	0.69
1997	9.30	4.44	9.94	-4.85	0.64
1998	7.85	3.37	8.49	-4.48	0.63
1999	8.57	3.42	9.28	-5.15	0.71
2000	8.95	3.75	9.58	-5.20	0.64
2001	-0.83	-4.82	-0.15	-3.99	0.68
2002	-0.69	-6.11	-0.15	-5.42	0.55
2003	5.12	1.41	5.51	-3.71	0.39
2004	9.22	4.78	9.81	-4.44	0.59
2005	7.42	2.17	8.14	-5.25	0.72
2006	7.86	3.77	8.52	-4.09	0.66
2007	6.38	3.15	7.12	-3.23	0.74
2008	3.31	-0.03	3.76	-3.34	0.45
2009	-6.46	-11.29	-5.91	-4.83	0.55
2010	7.52	3.87	8.00	-3.65	0.48
2011	6.11	3.53	6.40	-2.59	0.29
2012	2.14	-0.64	2.31	-2.78	0.17
2013	3.30	1.00	3.44	-2.30	0.14
2014	4.59	2.00	4.86	-2.59	0.27
2015	1.31	-4.96	1.84	-6.27	0.52

Table 7: The effect of divestiments on sales growth in previous year.

	Median Sales Growth (%)			Deviation	
Year	All Firms	Disposers	Non-Disposers	Disposers	Non-Disposers
1982	-2.93	-5.85	-2.91	-2.92	0.02
1983	4.41	2.01	4.42	-2.39	0.02
1984	7.83	4.97	7.89	-2.86	0.06
1985	2.52	-1.92	2.72	-4.44	0.21
1986	4.42	-0.10	4.61	-4.51	0.19
1987	6.58	4.45	6.68	-2.13	0.10
1988	6.53	4.58	6.68	-1.94	0.16
1989	2.77	1.29	2.90	-1.47	0.13
1990	0.49	0.20	0.59	-0.29	0.09
1991	-1.38	-4.45	-1.03	-3.07	0.35
1992	2.86	0.61	3.22	-2.25	0.36
1993	5.23	0.66	5.68	-4.57	0.46
1994	9.11	4.72	9.67	-4.40	0.55
1995	9.18	6.10	9.60	-3.08	0.42
1996	9.16	4.82	9.73	-4.34	0.58
1997	9.30	3.85	9.98	-5.45	0.68
1998	7.85	4.80	8.28	-3.06	0.43
1999	8.57	4.33	9.14	-4.24	0.57
2000	8.95	4.00	9.55	-4.95	0.60
2001	-0.83	-4.37	-0.36	-3.54	0.47
2002	-0.69	-3.70	-0.26	-3.01	0.44
2003	5.12	2.70	5.34	-2.43	0.21
2004	9.22	6.99	9.61	-2.23	0.39
2005	7.42	4.08	7.81	-3.34	0.39
2006	7.86	4.35	8.34	-3.51	0.48
2007	6.38	4.15	6.83	-2.24	0.45
2008	3.31	1.27	3.64	-2.04	0.33
2009	-6.46	-9.45	-6.09	-2.99	0.37
2010	7.52	5.02	7.85	-2.50	0.33
2011	6.11	4.55	6.41	-1.57	0.29
2012	2.14	0.51	2.28	-1.63	0.14
2013	3.30	1.66	3.41	-1.63	0.11
2014	4.59	1.53	4.92	-3.06	0.33
2015	1.31	-5.41	1.90	-6.73	0.59

Table 8: Panel Results

	Panel Estimates: Fixed Effects Log Growth of Sales				
	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5
dv_t^{acq}	9.154***	8.448***	7.853***	0.645	-0.37
	(-22.52)	(-20.64)	(-19.05)	(-1.66)	(-0.95)
dv_t^{dis}	-12.312***	-12.239***	-11.084***	-6.799***	-4.883***
	(-23.42)	(-23.17)	(-20.87)	(-13.68)	(-9.98)
dv_{t-1}^{acq}		6.759***	6.975***	7.512***	4.701***
		(-16.37)	(-16.8)	(-19.37)	(-12.18)
dv_{t-1}^{dis}		-6.510***	-5.956***	-2.907***	-0.695
		(-11.96)	(-10.89)	(-5.69)	(-1.39)
dv_{t+1}^{acq}			2.775***	0.438	-0.934*
			-6.79	-1.14	(-2.42)
dv_{t+1}^{dis}			-8.236***	-3.979***	-1.906***
			(-17.21)	(-8.84)	(-4.00)
Δlat_t				47.047***	48.733***
				(-172.24)	(-158.45)
Δlat_{t-1}					19.730***
					(-75.03)
Δlat_{t+1}					5.542***
					(-17.93)
constant	8.314***	7.825***	8.634***	3.965***	0.376*
	-56.82	(-49.02)	(-48.46)	(-23.12)	(-2.14)
overall R^2	0.0079	0.0105	0.0115	0.1865	0.2112
N	217955	217955	200967	195786	172244

*** 0.01%, 88 0.05%, * 0.10%

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