The Impact of a Demand Shock on the Employment of Temporary Agency Workers: Evidence from Japan during the global financial crisis

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Abstract

This study investigates the effect of a negative demand shock on the composition of the type of workers at firms, focusing on the change in the share of temporary agency in all workers. To clearly identify the causal link between the demand a firm faces and the composition of its workforce in terms of the type of workers and rule out any reverse causation, we use the 2007–2009 global financial crisis as a natural experiment, with the drop in demand experienced by exporting firms in Japan serving as an exogenous demand shock. We find that firms with a higher export ratio, a higher share of temporary agency workers, and a larger increase in the share of temporary agency worker ratio prior to the crisis decreased the share of temporary agency workers more than other firms in response to the demand shock. We also find that firms with a higher liquid asset ratio and higher volatility in their sales decreased the share of temporary agency workers less than other firms during the crisis. These results suggest that temporary agency workers serve as a buffer against demand shocks.

1. Introduction

Labor market reforms such as lowering dismissal costs, promoting part-time contracts, and loosening regulations on temporary agency workers have led to the prevalence of flexible labor contracts in most developed economies, especially in Europe and Japan. Against the background of this widespread use of flexible labor contracts, a large body of literature has emerged to examine the effects of the different dismissal costs between permanent (or primary) and temporary (or secondary) workers on labor demand. A number of theoretical and empirical studies suggest that lowering dismissal costs for temporary workers results in more volatile labor demand, although it also temporarily increases total labor demand (Saint-Paul, 1991; Bentolila and Saint-Paul, 1995; Boeri and Garibaldi, 2007; Boeri, 2011; Sala, Silva and Toledo, 2012; Costain, Jimeno and Thomas, 2010). From a theoretical perspective, the reason that labor demand becomes more volatile is that temporary workers are used at the margin to adjust to fluctuations in demand. Surprisingly, however, there is little empirical evidence that firms actually use temporary workers to adjust employment levels in response to demand fluctuations. The aim of the present study is to fill this gap in the empirical literature and examine how demand shocks affect the demand for temporary workers.

To answer this question, empirical researchers need to clearly identify demand shocks, which is generally not as easy as it may seem. The reason is that while demand shocks may affect the share of temporary workers at a firm, the share of temporary workers is also likely to affect the firm's productivity and hence its output. We overcome this identification problem using the global financial crisis of 2007–2009 as a natural experiment, with the precipitous drop in global demand representing an exogenous demand shock to Japanese exporters. The global financial crisis led to a severe global recession as well as a rapid appreciation of the Japanese yen, both of which substantially decreased demand for Japanese exports (Harada et al., 2011; Hosono, Takizawa, Tsuru, 2013). Total real exports fell by 14.0% in the fourth quarter of 2008 from the previous quarter, and 25.3% in the first quarter of 2009. These falls were much larger than

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the decline in total exports of OECD countries (6.7% and 8.2% respectively in the two quarters). Using this decline in exports as a demand shock for Japanese exporters, we examine subsequent changes in the share of temporary agency workers at these exporters.

The reason for focusing on temporary agency workers among the various types of non-regular workers found in Japan is that dismissing temporary agency workers is considerably easier than dismissing other types of non-regular workers and far easier then dismissing permanent (or regular) workers.[2] Figure 1 shows that, as one would expect, the number of temporary agency workers in Japan has been much more volatile than that of other types of workers. Specifically, the number of temporary agency workers increased substantially and relatively steadily in the early 2000s, but then suddenly decreased from late 2008 in the wake of the global financial crisis.

Using a firm-level dataset of Japanese exporters, we examine whether firms that were more exposed to the demand shock in the wake of the global financial crisis decreased the share of temporary agency workers more than other exporters. We also examine how other pre-crisis firm characteristics affected changes in the share of temporary agency workers during the global financial crisis. Our results can be summarized as follows. First, the more firms exported before the crisis, the more they tended to decrease the share of temporary agency workers. Second, the higher firms' liquid asset ratio or volatility of sales growth, the less they tended to decrease the share of temporary agency workers. These results suggest that firms use temporary agency workers at the margin to adjust to fluctuations in demand.

The rest of the paper proceeds as follows. Section 2 briefly describes the Japanese labor market to provide some background to the following analysis. Next, Section 3 describes the dataset and the empirical methodology, while Section 4 then presents and discusses the results.   Section 5 concludes.

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[2] Firms can hire workers based on a temporary contract without depending on an agency. According to legal precedent, however, if firms renew the contract repeatedly, it becomes more and more difficult for them to dismiss workers, since such contract renewals create the expectation among workers that contracts will be renewed again when they expire.

2. Background Information on the Japanese Labor Market

When Japanese firms were forced to adjust employment levels in the wake of the global financial crisis, this adjustment concentrated on non-regular workers, especially temporary agency workers. To help understand the reasons for this, the present section provides some background information on labor market developments in Japan before the crisis.

Demand for non-regular workers continued to increase for almost two decades from the 1990s to the global financial crisis. With the exception of 1993–1994, even during recessions no decrease in the number of non-regular workers was observed. In the recessions of 1997–1999 and 2000–2002, the number of non-regular workers continued to increase, while that of regular workers decreased. Among the various types of non-regular workers, the number of temporary agency workers increased at a much higher pace than that of regular workers, although the share of temporary agency workers is still relatively low at about 2%. One of the reasons for the increase in temporary agency workers is the low dismissal costs. The lift of the ban on the use of temporary agency workers for manufacturing operations in 2004 also contributed to the increase in the share of temporary agency workers.

3. Data and Methodology

3.1 Construction of the Dataset

For our empirical analysis, we rely primarily on two firm-level data sources. First, information on firms' exports is obtained from the *Basic Survey of Business Structure and Activities* (BSBSA; *Kigyo Katsudo Kihon Chosa* in Japanese) compiled by the Ministry of Economy, Trade and Industry. The main purpose of this survey is to gauge quantitatively the activities of Japanese enterprises. The survey covers all enterprises in Japan with more than 50 employees and with paid-up capital of over 30 million yen. From this data source, we obtain the firm-level data on the number of temporary agency and other types of workers, as well

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as exports, sales, and equity capital.

Second, we rely on a firm-level database for listed firms, the NEEDS-Corporate Governance and Evaluation System (NEEDS-CGES) database provided by Nikkei Digital Media Inc. The aim of this database is to provide information making it possible to qualitatively assess the corporate governance of listed firms. The database covers all firms listed on a stock exchange in Japan. From this data source, we obtain data on the ownership share of foreign shareholders.

In addition to these two data sources, we use the Corporate Finance Databank provided by the Japan Economic Research Institute. This database contains financial statements information for all firms listed on a stock exchange in Japan. From this data source, we obtain data on liquid assets.

Specifically, we construct our dataset using the following four steps. First, we match firms in the NEEDS-CGES and BSBSA datasets. This leaves us with 1,962 firms. Second, we select firms which reported non-zero exports in 2006. Of the 1,962 firms obtained in the previous step, 1,863 firms provided information on exports for 2006, with 962 reporting non-zero exports. Third, we select firms for which all the other information required for the analysis below is available. Because information on the number of temporary agency workers is available only for a relatively small number of firms, we are left with 360 firms at this stage. Finally, to exclude outliers, we drop firms for which the change in the share of temporary agency workers (which is the dependent variable in the regression analysis below) falls into either of the 1% tails of its distribution. We end up with 353 firms to use for the analysis.

To examine whether our dataset suffers from sample selection bias, we compare the industry composition of the 353 firms that we use for our analysis with that of the 962 firms that we are left with after matching firms in the BSBSA and NEEDS-CGES databases and that reported non-zero exports in 2006. These are shown in Tables 1(a) and (b) and we find no substantial difference between the two.

3.2 Methodology

To examine the determinants of temporary agency employment at firms, we estimate the following

equation using ordinary least squares (OLS) with standard errors clustered by industry:

$$\Delta Temp_{i2009} = \beta_1 Exports_{i2006} + \beta_2 Liquidity_{i2006} + \beta_3 Temp_{i2006}$$
$$\text{(1)} \qquad\qquad + \beta_4 \Delta Temp_{i2006} + \beta_5 Volatility_{i2006} + \beta_6 ForeignOwn_{i2006}$$
$$+ \beta_7 ROA_{i2006} + \beta_8 Size_{i2006} + \beta_9 Equity_{i2006} + Industry_s + \varepsilon_i.$$

The dependent variable ($\Delta Temp_{i2009}$) is the change in the share of temporary agency workers from fiscal

2007 to fiscal 2009 at firm i. The share of temporary agency workers is measured as the ratio of the number

of temporary agency workers to the number of regular workers.[3]

As for the explanatory variables, we use their values for fiscal 2006 (except for the industry dummies).

They are defined as follows. $Exports_{i2006}$ is the share of exports to total sales, which aims to capture the size

of the demand shock during the crisis and hence is expected to take a negative coefficient. Next, $Liquidity_{i2006}$ is the ratio of cash and deposits to total assets. When a firm is hit by a negative demand shock, it can

survive by selling liquid assets. Firms can also save cash by dismissing temporary agency workers. Thus, it

could be said that liquid assets and temporary agency workers act as substitutes for each other in the sense

that both act as a buffer to a negative demand shock.[4] We therefore hypothesize that $Liquidity_{i2006}$ takes a

positive coefficient.

Further, we include $Temp_{i2006}$, the ratio of temporary agency workers to full-time workers in fiscal 2006,

and $\Delta Temp_{i2006}$, the change in the shares of temporary agency workers from fiscal 2004 to fiscal 2006, at

firm i in the estimation. The reason for including these variables is that firms that had a higher share of

temporary agency workers and/or that had increased the share of temporary agency workers more than other

firms prior to the global financial crisis are likely to have decreased the share by more in response to the

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[3] According to the classification of workers in the BSBSA, full-time workers and part-time workers constitute regular workers, while temporary agency workers do not.
[4] A number of studies show that liquidity shortages had a negative impact on employment at European firms during the global financial crisis, although they do not focus on temporary workers. See, e.g., Boeri, Garibaldi and Moen (2012, 2013), Chodorow-Reich (2014), and Carneiro, Portugal and Varejao (2013).

negative demand shock.[5] We therefore expect both $Temp_{i2006}$ and $\Delta Temp_{i2006}$ to take negative coefficients.

$Volatility_{i2006}$ is the standard deviation of firm i's sales growth from fiscal 2002 to fiscal 2006, which captures the degree of uncertainty that the firm faces. Firms that face greater uncertainty with regard to future demand are more likely to rely on temporary agency workers as a buffer to future demand shocks.[6] We therefore hypothesize that $Volatility_{i2006}$ takes a positive coefficient.

$ForeignOwn_{i2006}$ is the ownership share of foreign shareholders in firm i. If foreign shareholders are more short-term profit-oriented than domestic shareholders, as is often assumed, we expect $ForeignOwn_{i2006}$ to take a negative coefficient.

ROA_{i2006} is the ratio of current income to total assets, which captures the firm's profitability. Just like liquid assets, profits may serve as a buffer for a demand shock. We therefore hypothesize that ROA_{i2006} takes a positive coefficient.

$Size_{i2006}$ is the logarithm of total assets, which captures firm size. Larger firms are likely to produce a greater variety of products and/or serve a larger number of countries, meaning that it is easier for such firms to diversify away from products or countries affected by the demand shock. We therefore expect that such firms need a smaller number of temporary agency workers as a buffer for demand shocks and hence that $Size_{i2006}$ takes a negative coefficient.

Next, $Equity_{i2006}$ represents the ratio of capital to total assets. On the one hand, like liquid assets, equity may serve as a buffer to demand shocks, so that firms with greater equity capital are less likely to reduce the number of temporary workers in response to a negative demand shock. On the other hand, firms with less equity capital are more likely to fail and hence may try to avoid failure by decreasing the number of permanent workers rather than that of temporary agency workers to achieve greater savings on labor costs.

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[5] For evidence on this hypothesis, see Boeri and Garibaldi (2007), Boeri (2011), Bentolila and Saint-Paul (1992), Sala, Silva and Toledo (2012), and Costain, Jimeno and Thomas (2010).
[6] For evidence on this hypothesis, see Cappelli and Neumark (2004), Houseman (2001), Ono and Sullivan (2006), Morikawa (2010), Asano, Ito and Kawaguchi (2011), and Dräger and Marx (2012).

Thus the expected sign of the coefficient on $Equity_{i2006}$ is ambiguous.

$Industry_s$ represents the industry to which firm i belongs. Following the System of National Accounts, we use 22 industries for the classification. Dropping six industries that no firm in our dataset falls into, we are left with 16 industries. We therefore use 15 industry dummies to capture industry-specific effects that may arise from technological or regulatory differences across industries. However, since at least part of the industry effects may be captured by the variables for firm characteristics described above, we conduct regressions both with and without the industry effects. Finally, ε_i is the disturbance term.

4. Results

The estimation results are shown in Table 3. The sets of columns labeled (1) and (2) respectively show the results for the specification with and without the industry dummies. The two specifications yield virtually the same results, which can be summarized as follows.

First, $Exports_{i2006}$ takes a negative and significant coefficient, consistent with the hypothesis that the more firms depended on exports and hence the larger the demand shock they experienced as a result of the global financial crisis, the more they tended to decrease the share of temporary agency workers.

Second, $Liquidity_{i2006}$ takes a positive and significant coefficient, supporting the hypothesis that liquid assets   serve as a substitute for temporary agency workers as a buffer to negative demand shocks.

Third, $Temp_{i2006}$ and $\Delta Temp_{i2006}$ take negative and significant coefficients, suggesting that firms that had more temporary agency workers, and/or that had increased their reliance on temporary agency workers more prior to the crisis decreased them more in the wake of the crisis.

Fourth, $Volatility_{i2006}$ takes a positive and marginally significant (at the 10% level) coefficient, consistent with the hypothesis that firms that face a higher degree of uncertainty about future demand rely more on temporary agency workers as a buffer to future demand shocks.

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Fifth, *ForeignOwn*$_{2006}$ is not significant, meaning that the hypothesis that firms with a higher foreign ownership stake are more short-term profit-oriented is not supported.

Finally, we find that none of the control variables, i.e., *ROA*$_{2006}$, *Size*$_{2006}$, and *Equity*$_{2006}$, are significant.
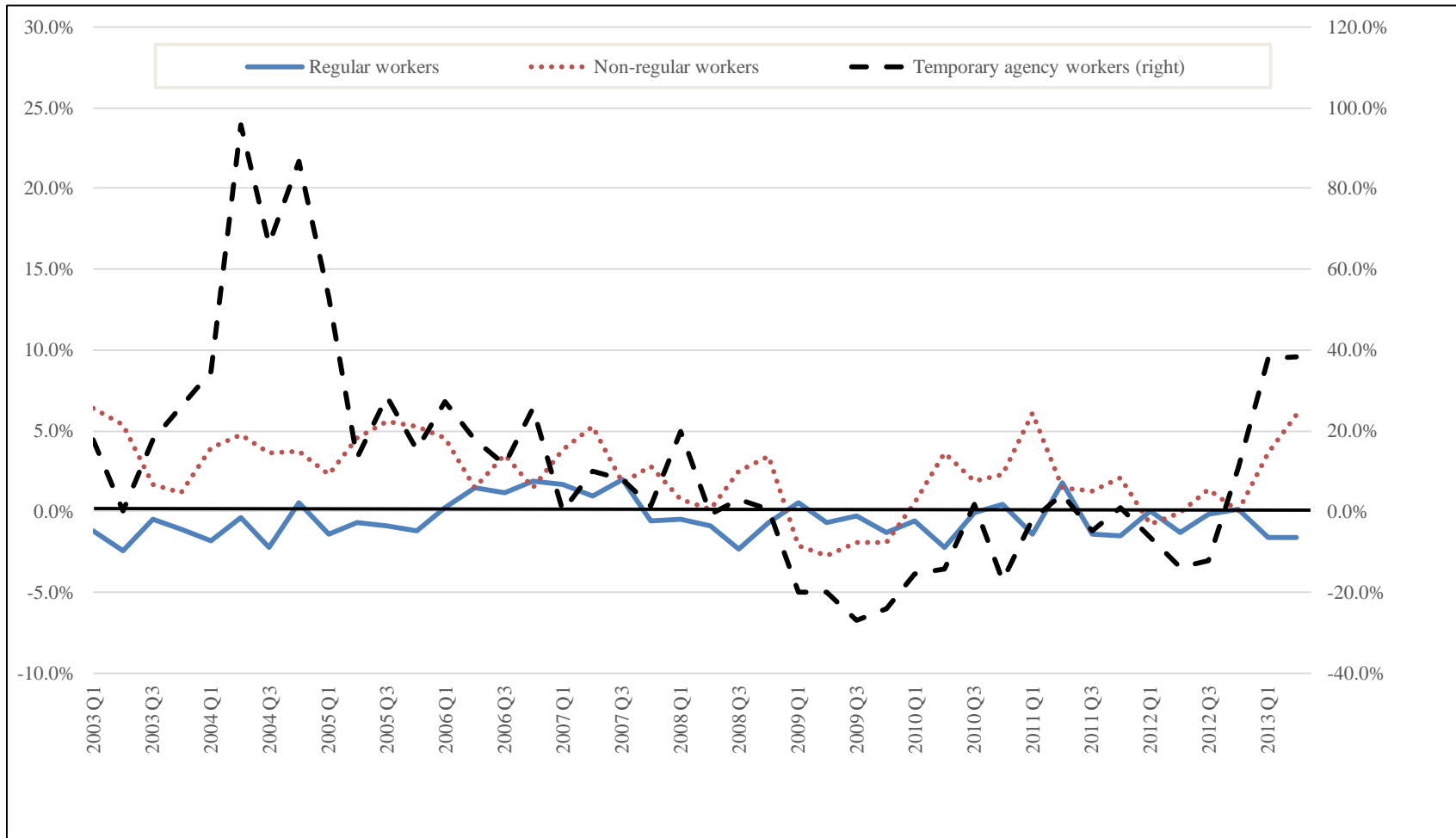

5. Conclusion

This study investigated the effect of a negative demand shock on the composition of the type of workers at firms, focusing on the change in the share of temporary agency in all workers. To clearly identify the causal link between the demand a firm faces and the composition of its workforce in terms of the type of workers and rule out any reverse causation, we used the 2007–2009 global financial crisis as a natural experiment, with the drop in demand experienced by exporting firms in Japan serving as an exogenous demand shock. We found that firms with a higher export ratio, a higher share of temporary agency workers, and a larger increase in the share of temporary agency workers ratio prior to the crisis decreased the share of temporary agency workers more than other firms in response to the demand shock. We also found that firms with a higher liquid asset ratio and a higher volatility in their sales decreased the share of temporary agency workers less than other firms during the crisis. These results suggest that temporary agency workers serve as a buffer to demand shocks.

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Figure 1. Annual rate of change in the number of regular workers, non-regular workers, and temporary agency workers in Japan

Source: *Labour Force Survey.*

Table 1. Industry composition

(a) Industry composition of the 962 firms

SNA Industry Classification	Number of firms	Share (%)	Cumulative share (%)
Food products and beverages	25	2.60	2.60
Textiles	16	1.66	4.26
Pulp, paper and paper products	10	1.04	5.30
Chemicals	109	11.33	16.63
Petroleum and coal products	4	0.42	17.05
Non-metallic mineral products	29	3.01	20.06
Basic metal	43	4.47	24.53
Fabricated metal products	30	3.12	27.65
Machinery	119	12.37	40.02
Electrical machinery	169	17.57	57.59
Transport equipment	83	8.63	66.22
Precision instruments	69	7.17	73.39
Other manufacturing	41	4.26	77.65
Construction	8	0.83	78.48
Wholesale and retail trade	189	19.65	98.13
Service activities	18	1.87	100.00
Total	962	100	

Note: The table is based on the 962 firms that could be matched in the BSBSA and NEEDS-CGES databases and that reported non-zero exports in 2006.

(b) Industry composition of the 353 firms

SNA Industry Classification	Number of firms	Share (%)	Cumulative share (%)
Food products and beverages	9	2.50	2.50
Textiles	3	0.83	3.33
Pulp, paper and paper products	5	1.39	4.72
Chemicals	46	12.78	17.50
Petroleum and coal products	1	0.28	17.78
Non-metallic mineral products	12	3.33	21.11
Basic metal	22	6.11	27.22
Fabricated metal products	9	2.50	29.72
Machinery	40	11.11	40.83
Electrical machinery	59	16.39	57.22
Transport equipment	38	10.56	67.78
Precision instruments	15	4.17	71.94
Other manufacturing	29	8.06	80.00
Construction	2	0.56	80.56
Wholesale and retail trade	68	18.89	99.44
Service activities	2	0.56	100.00
Total	360	100	

Note: The table is for the 353 firms that make up the dataset for our analysis.

Table 2. Descriptive statistics

	Mean	Median	Maximum	Minimum	Standard deviation	Number of observations
$\Delta Temp_{2009}$	-0.066	-0.042	0.098	-0.488	0.089	353
$Exports_{2006}$	0.168	0.105	0.924	0.000	0.184	353
$Liquidity_{2006}$	0.102	0.080	0.541	0.001	0.090	353
$Temp_{2006}$	0.117	0.080	0.598	0.000	0.112	353
$\Delta Temp_{2006}$	0.013	0.009	0.191	-0.212	0.030	353
$Volatility_{2006}$	31907	4009	1165742	151	110503	353
$ForeignOwn_{2006}$	12.851	9.840	52.820	0.000	11.229	353
ROA_{2006}	0.067	0.058	0.324	-0.084	0.053	353
$Size_{2006}$	11.290	11.008	17.296	8.056	1.549	353
$Equity_{2006}$	0.521	0.516	0.903	0.077	0.184	353

Note: Volatility is the standard deviation in sales growth from fiscal 2002 to fiscal 2006.

Table 3. Estimation results

Dependent variable: $\Delta Temp_{2009}$

	(1)			(2)		
	Coefficient	Standard Error		Coefficient	Standard Error	
Exports $_{2006}$	-0.054	0.018	***	-0.076	0.020	***
Liquidity $_{2006}$	0.094	0.043	**	0.098	0.044	**
Temp $_{2006}$	-0.353	0.102	***	-0.421	0.064	***
ΔTemp $_{2006}$	-0.409	0.169	**	-0.352	0.155	**
Volatility $_{2006}$	9.E-08	5.E-08	*	7.E-08	3.E-08	*
ForeignOwn $_{2006}$	0.001	0.001		0.001	0.001	*
ROA $_{2006}$	0.013	0.092		-0.028	0.104	
Size $_{2006}$	-0.004	0.005		-0.004	0.006	
Equity $_{2006}$	-0.020	0.027		0.003	0.038	
Constant	0.056	0.053		0.022	0.058	
Industry dummies	Yes			No		
Number of obs.	353			353		
F	.			154.97		
Prob > F	.			0		
R-squared	0.522			0.438		
Root MSE	0.063			0.067		

Notes: Volatility is the standard deviation in sales growth from fiscal 2002 to fiscal 2006.
     Robust standard errors are shown.
     The F-test cannot be conducted in column (1) because the variance-covariance matrix is not of full rank.
     * p<0.10, ** p<0.05, *** p<0.01.