NEW PRODUCT INTRODUCTIONS AND PRICE MARKUPS

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INTRODUCTION

The present study contributes to the literature of countercyclical price markups (real price rigidities). Specifically, it discusses the relation between new product introductions and industry and aggregate demand fluctuations, as well as their impact on firms' pricing policies, and in particular on price markups.

Devinney [1990] shows that the introduction of new products happens mostly at the beginning of the business cycle, while Axarloglou [2003] explores the seasonal and non-seasonal properties of new product introductions in U.S. manufacturing. The present study extends this literature by showing that price markups decline in response to new product introductions, and since new product introductions vary in a procyclical manner, price markups can be countercyclical.

Recently, researchers have presented mostly theoretical support for the idea that price markups are countercyclical. Specifically, Rotemberg and Saloner [1986], and Rotemberg and Woodford [1991; 1992] derive countercyclical price markups as an oligopolist's optimal response to exogenous changes in aggregate demand. Bils [1989] argues in favor of countercyclical price markups in customer markets, where economic booms bring new and more price-sensitive consumers into the market, resulting in higher price elasticity of demand and lower price markups. Chevalier and Scharfstein [1996] attribute countercyclical price markups to liquidity constraints and imperfections in capital markets. Finally, Warner and Barsky [1995] show that economies of scale in shopping make consumers to concentrate their shopping activities during a few trips to the market. Because of that, they search more intensively for better prices. Price elasticity of demand becomes procyclical and price markups countercyclical.

In the present study we add to the literature by showing that countercyclical price markups might also be the outcome of new product introductions that intensify market competition and therefore depress price markups. Based on recent findings that new product introductions are strongly procyclical [Axarloglou, 2003], we em-

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Recent evidence [Axarloglou, 2003] indicates that new product introductions follow seasonal patterns, with February, June, September, October, and November being the months showing most of the activity. Also, Axarloglou [2003] decomposes the fluctuations of new product introductions into the part attributed to the seasonal demand fluctuations and the other due to the cyclical demand fluctuations. In the present paper, the mechanism for countercyclical price markups is tested in business cycle frequencies. All variables in estimations, therefore, are seasonally adjusted employing the standard X-11 methodology. Using the Dickey-Fuller test the hypothesis for unit roots is rejected for each of the variables in the regressions. Finally, since the data are in a panel form, the Fixed Effects model is used in estimations controlling for industry heterogeneity.[8]

Demand Fluctuations and New Product Introductions

Theoretically, market expansions lead to new entry and therefore to new product introductions, with researchers [Axarloglou, 2003; Droge, Jayaram and Vickery, 2000; Krider and Weinberg, 1998; Radas and Shugan, 1998] focusing primarily on the relation between new product introductions and seasonal market demand. Axarloglou [2003] and Devinney [1990] also study the links between new product introductions and business cycle fluctuations. In replicating their findings, reduced-form equation (1) is estimated using the fixed effects model controlling for heterogeneity across industries. The two sets of regressors include proxies for industry(IND_{it}) and aggregate(AGG_{it}) demand fluctuations along with some time lags. Various specifications are estimated and the results are reported in Table C4.[9]

$$PRD_{ti} = f(IND_{it}, AGG_{it}) \tag{1}$$

In business cycle frequencies, industry demand fluctuations, proxied by the growth rate of industrial production (ΔIND_{it})and also lagged by one month, have a positive and statistically significant impact on new product introductions. At the same time, aggregate demand fluctuations, proxied by the growth rate of manufacturing sales (ΔSM_{it}) and also lagged by one month, have a similar impact on new product introductions.[10]

Alternatively, the estimated coefficients indicate that new product introductions respond much more to fluctuations in industry demand than in aggregate demand. New product introductions increase by approximately 1.3 percent in response to a one percent growth in aggregate demand. Also, a one percent growth in industry demand leads to a 70 percent increase in new product introductions.

Overall, these results support the idea that market demand expansions over the business cycle lead to new product introductions, a finding that is consistent with both the theoretical discussion above and the empirical findings in Axarloglou [2003] and Devinney [1990].

Theoretically, though, new products lead to more intense market competition and therefore to lower price markups only under certain conditions. In the next section this relation is tested empirically.

New Products and the Cyclicality of Price Markups

The dynamic behavior of price markups traditionally has drawn significant interest among researchers. Most try to associate price markups with industry concentration, the stage of the business cycle, or the level of import competition in a given industry. In the present paper a different angle is presented—that of the impact of new products on price markups. Theoretically, it is expected, at least in the context of location models, that new products will squeeze price markups by intensifying market competition. In testing this notion, we estimate various specifications of the reduced-form equation (2) using the fixed effects model. Table C5 reports the results.

$$\mu_{ti} = f(IND_{it}, AGG_{it}, PRD_{it}) \tag{2}$$

Again, we use various proxies for industry and aggregate demand fluctuations as independent variables along with the level of new product introductions. In estimations new products have a negative and statistically significant impact on price markups and this result is robust across various specifications.[11] Alternatively, price markups appear to be procyclical with respect to industry demand fluctuations as proxied by the growth of industry sales (ΔSM_{it}), a finding that is consistent with Domowitz et al. [1986]. Finally, a 10 percent increase in the level of new products in the market causes an approximately 0.5 percent drop in price markups.

However, the above results might be suffering from an endogeneity bias since new products might also be causing an expansion in industry and aggregate demand. Equation 2, therefore, is estimated again using instead instrumental variables (IV). Specifically, we include a few lagged values of each independent variable in the regressions as instruments. Table C6 reports the results from the IV estimations.

New products again have a depressing and statistically significant impact on price markups, and these effects are robust across various specifications. Also, the estimated coefficients are double in magnitude indicating that a 10 percent increase in new product introductions causes an approximate one percent drop in price markups. At the same time, price markups appear procyclical, but these results are not robust across various specifications.

Finally, we explore the impact of new products on the procyclicality of price markups. Specifically, we include interaction variables between proxies for demand fluctuations and new products in estimating reduced-form equation (2). The estimated coefficients of these interaction variables show the impact of new products on the cyclicality of price markups. In estimations, these coefficients are negative and statistically significant, supporting the idea that new products make price markups less procyclical.[12]

Industry Effects

The compiled data on new products allows us also to study the tested relations between market demand fluctuations, new product introductions, and price markups on an industry level. For that, two sets of interaction variables are included in esti-

mating various specifications of equation (2). The first set, which captures the industry-specific cyclicality of price markups, includes interaction variables between industry dummies and proxies for industry demand (for example, $IND_{20,t}$ is the growth of industrial production in Food (SIC 20)). The second set, which captures the industry-specific effects of new product introductions on price markups, includes interaction variables between industry dummies and new product introductions (for example $PRD_{20,t}$ for the food industry). Table C6 reports the results.[13]

At least in some specifications, price markups appear to be procyclical primarily in Instruments (SIC 38), but countercyclical in Food (SIC 20) and Transportation Equipment (SIC 37). This finding is also consistent with Domowitz et al. [1986], who find that price markups are more procyclical in concentrated industries such as Instruments.

New products, alternatively, appear to depress price markups in Food (SIC 20), Electronic Equipment (SIC 36) and Transportation Equipment (SIC 37) while they increase price markups in Instruments (SIC 38), results that are robust across various specifications. This is a quite interesting outcome showing significant across-industry heterogeneity of the relation between new product introductions and price markups.

While studying this outcome is beyond the scope of the present study, it appears that new products depress price markups in industries with overall low price markups (such as Electronics and Transportation Equipment) while increasing price markups in industries with overall high price markups (Instruments).[14] Obviously, low price markups reflect quite competitive market conditions, at least at the product level and despite the fact that some segments of these industries are very much concentrated (such as Household Appliances (SIC 363), Motor Vehicles and Car Bodies (SIC 3711) or Aircraft and Parts (SIC 372)). Also, and especially in electronics and automobiles, new products are important driving forces bringing along new product attributes and capabilities. In these industries, therefore, new products are expected to exercise a depressing effect on price markups of existing products that quickly become obsolete in the presence of new products.

Instruments, alternatively, is a quite concentrated industry (especially some sections of it such as Measuring and Controlling Devices (SIC 382) or Medical Instruments and Supplies (SIC 384)). New products are not used to necessarily attract customers, as in electronics and automobiles, and competition does not happen through new products and pricing. Instead, technological leadership raises barriers to entry and therefore preserves high price markups for the incumbents. Consequently, new products, at least from new entrants, are not expected to depress price markups in this industry. A more thorough analysis is required to shed light on the apparent heterogeneous impact of new product introductions on price markups across various manufacturing industries.

CONCLUSIONS

This paper introduces a mechanism that results in procyclical new product introductions and countercyclical price markups. The collected data from U.S. manufacturing industries seem to support the proposed theoretical mechanism. New products are procyclical and depress price markups, with results that are robust across different specifications and estimation procedures. The discussed mechanism introduces a source for countercyclical price markups or at least for price markups that are less procyclical than some have found.

The relation between new products and price markups, however, is quite heterogeneous across industries, perhaps the outcome of the specific characteristics of the competitive environment in these industries. A more thorough study should be appropriate in addressing this issue.

Finally, the negative relation between new product introductions and price markups we find in the present study is attributed, at least theoretically, to new entry of firms. New products that have been introduced by incumbent firms, however, can also exercise similar pressure on price markups. Although a quite important topic, our empirical results do not distinguish between the two effects and such an analysis is beyond the scope of our study. Since we have the name of the individual firm that introduced each one of the new products in our data set, however, a suitable reorganization of our data should allow us to study this quite interesting issue, and is left for now for future research.

APPENDIX A
Data Sources

New Product Introductions: The number of new products introduced in all 2-digit SIC U.S. manufacturing industries as recorded through the articles of the *Wall Street Journal*. Source: *Wall Street Journal*.

Inventories: The real value of inventories for the industries in the sample (in millions of dollars, seasonally adjusted). Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

Sales: The real value of sales for the industries in the sample (in millions of dollars, seasonally adjusted). For Instruments and Related Products (SIC 38), since there was no data on sales in Citibase, the value of shipments is used as a proxy for sales (in millions dollars, seasonally adjusted). Source: U.S. Dept. of Commerce, Bureau of Economic Analysis.

Employment: Employment of production workers as the number of workers on non-agricultural payrolls by industry (thousands, seasonally adjusted). Source: U.S. Dept. of Labor, Bureau of Labor Statistics.

Earnings: Gross average hourly earnings of production or non-supervisory workers on private non-agricultural payrolls (thousands, non-seasonally adjusted, nominal figures). Source: U.S. Dept. of Labor, Bureau of Labor Statistics.

Materials: The cost of materials across industries (in millions of current dollars). The data come yearly, so every figure was divided by 12 and the outcome was used for

every month of the year in calculating price markups. Source: The Annual Survey of Manufactures, the U.S. Bureau of the Census.

Industrial Production: The index of real industrial production for each of the five industries and for total manufacturing. Source: U.S. Federal Reserve Bank.

Patents and Trademarks: The number of new patents issued and the number of trademarks registered annually in the U.S. Source: "Commissioner of Patents and Trademarks," U.S. Dept. of Commerce, Patent and Trademark Office, Annual Report, Fiscal Year 1992.

APPENDIX B
New Product Introductions

Using the Dow Jones Retrieval Service, and following a Content Analysis, 8,324 Wall Street Journal abstracts (and if necessary the corresponding articles) were reviewed for information on new product introductions. The search finally resulted in recording a total of 3,669 new product introductions classified per industry (according to 2-digit SIC) and on a monthly basis. For the search, the following key words were used: "announce, launch, release, introduce, unveil, update, facelift, improve" along with "new product(s), existing product(s), new line(s), and new model(s)". Some examples from the search are following:

Example 1: *"Today Eastman Kodak Co. plans to introduce a consumer film and five cameras: a single-use camera for taking portraits, two compact 35mm models and two models of Star cameras...,"* from: Eastman Kodak Co. New Film and Five Cameras Set for Introduction, *The Wall Street Journal*, 2 October 1993.

In our data set, we included six (6) new products in the Electrical Machinery industry (36) on February of 1993.

Example 2: *"During the Oscars tonight, GM will launch the latest version of the Camaro with a teaser..."* from "Autos: New Camaro Steers Tricky Route to Win Import Buyers but Keep Muscle-Car Fans, *The Wall Street Journal*, 29 March 1993.

This product was classified in the Transportation Equipment industry (37) on March of 1993.

Example 3: *"Ford Motor Co. said a restyled version of its Mustang sports car will appear in dealer showrooms Dec. 27"* from "Business Brief – Ford Motor Co.: Redesigned Mustang for '94 Goes to Dealers in December," *The Wall Street Journal*, 4 August 1993.

This product introduction was not recorded in our data set since there was a long time between the date of the article and the date the article was mentioning on the market availability of the product.

Example 4: *"Scheduled for market introduction early next year is Kodak's automated PCD Imaging Workstation 6600, which can scan film onto Photo disks almost three times faster than before and requires less manpower for operation."* From *The Wall Street Journal*, 11 December 1993.

This product was not recorded in our data set since it was not clear when the product would be available in the market.

APPENDIX C

TABLE C1
New Products, Patents, and Trademarks

Year	New Products	Patents Issued	Trademarks Registered
1984	214	72,149	45,475
1985	464	75,302	63,122
1986	348	76,993	48,971
1987	145	88,793	47,522
1988	217	83,584	46,704
1989	239	102,712	51,802
1990	434	96,727	56,515
1991	309	101,860	43,152
1992	700	109,728	62,067
1993	599	107,332	74,349

TABLE C2
Summary Statistics

Variable	Mean	Std. Deviation	Maximum	Minimum
PRD_{it}	5.10	16.078	294	0.00
IND_{it}	92.344	9.678	116.838	62.694
$INMD_{it}$	95.207	5.512	105.411	84.968
S_{it}	22,851.5	8919.16	36,404	6960
μ_{it}	0.265	294.93	0.753	−0.117

TABLE C3
Correlations

	PRD_{it}	ΔIND_{it}	$\Delta INDM_{it}$	ΔS_{it}	ΔSM_{it}	μ_{it}
PRD_{it}	1					
ΔIND_{it}	0.0626	1				
$\Delta INDM_{it}$	0.0111	0.377	1			
ΔS_{it}	0.0278	0.423	0.269	1		
ΔSM_{it}	0.0374	0.0535	0.277	0.0649	1	
μ_{it}	−0.267	-0.0103	0.0171	0.0688	0.0093	1

TABLE C4
The Cyclicality of New Products; Dependent Variable: New Products

Ind. Variables	Fixed Effects	Fixed Effects
ΔIND_{it}	70.511[a]	
	(2.252)	
$\Delta IND_{i,t-1}$	91.134[a]	
	(2.939)	
ΔS_{it}		2.011
		(0.069)
$\Delta S_{i,t-1}$		4.626
		(0.1590)
$\Delta INDM_{it}$	−63.942	
	(−0.769)	
$\Delta INDM_{i,t-1}$	−119.974	
	(−1.475)	
ΔSM_{it}		1.322[b]
		(1.715)
$\Delta SM_{i,t-1}$		1.364[b]
		(1.714)
$\bar{R}^2$	0.197	0.181
SAMPLE	509	509

T-statistics are reported in parenthesis. a. Significance at the 1 percent level. b. Significance at the 5 percent level

TABLE C5
New Products and Price Markups; Dependent Variable: Price Markups

Ind. Variables	Fixed Effects	Fixed Effects
PRD_{it}	−0.0492[a]	−0.0531[a]
	(−5.001)	(−5.489)
ΔIND_{it}	−2.463	
	(−0.454)	
$\Delta IND_{i,t-1}$	−5.422	
	(−1.001)	
ΔS_{it}		9.109[b]
		(1.892)
$\Delta S_{i,t-1}$		7.864
		(1.602)
$\Delta INDM_{it}$	7.955	
	(0.548)	
$\Delta INDM_{i,t-1}$	20.986	
	(1.457)	
ΔSM_{it}		0.143
		(0.997)
$\Delta SM_{i,t-1}$		0.175
		(1.180)
$\bar{R}^2$	0.111	0.121
SAMPLE	467	467

See Table C4.

TABLE C6
New Products and Price Markups; Dependent Variable: Price Markups

Ind. Variables	IV Model	IV Model
PRD_{it}	−0.0996[a]	−0.115[a]
	(−2.647)	(−3.085)
ΔIND_{it}	68.610	
	(1.533)	
$\Delta IND_{i,t-1}$	41.872	
	(0.972)	
ΔS_{it}		−19.116
		(−1.425)
$\Delta S_{i,t-1}$		−20.325
		(−1.495)
$\Delta INDM_{it}$	779.193[b]	
	(1.792)	
$\Delta INDM_{i,t-1}$	1263.431	
	(0.806)	
ΔSM_{it}		−0.291
		(−0.818)
$\Delta SM_{i,t-1}$		−0.314
		(−0.766)
$\bar{R}^2$	0.074	0.073
SAMPLE	465	465

See Table C4.

TABLE C7
New Products and Price Markups; Industry Effects Dependent Variable: Price Markups

Ind. Variables	IV Model	IV Model
$\Delta IND_{i,t-1}$	4.530	
	(0.630)	
$\Delta S_{i,t-1}$		−3.135
		(−0.504)
$\Delta INDM_{it}$	0.995	
	(0.058)	
$\Delta INDM_{i,t-1}$	−5.829	
	(−0.355)	
ΔSM_{it}		−0.0621
		(−0.375)
$\Delta SM_{i,t-1}$		−0.0644
		(−0.336)
$\Delta IND_{20,t}$	−30.734[a]	
	(−1.984)	
$\Delta IND_{28,t}$	14.146	
	(0.895)	
$\Delta IND_{36,t}$	6.861	
	(0.433)	

TABLE C7 (cont.)
New Products and Price Markups; Industry Effects
Dependent Variable: Price Markups

Ind. Variables	IV Model	IV Model
$\Delta IND_{36,t}$	−41.599[a]	
	(−3.152)	
$\Delta INDM_{38,t}$	103.885[a]	
	(6.460)	
$\Delta S_{20,t}$		−7.529
		(−0.450)
$\Delta S_{28,t}$		3.793
		(0.239)
$\Delta S_{36,t}$		4.0815
		(0.259)
$\Delta S_{37,t}$		−5.967
		(-0.663)
$\Delta S_{38,t}$		−19.815
		(−1.289)
$\Delta PRD_{20,t}$	−0.0564[b]	−0.0598[b]
	(−1.916)	(−1.865)
$\Delta PRD_{28,t}$	0.0368	0.0356
	(1.265)	(1.135)
$\Delta PRD_{36,t}$	−0.0841[a]	−0.0828[a]
	(−5.277)	(−5.249)
$\Delta PRD_{37,t}$	−0.137[a]	−0.146*
	(−4.886)	(−4.931)
$\Delta PRD_{38,t}$	0.238[a]	0.281[a]
	(7.876)	(8.505)
$\bar{R}^2$	0.309	0.219
SAMPLE	465	465

See Table C4.

NOTES

1. In light of empirical evidence that price markups are overall procyclical [Domovitz, Hubbard, and Petersen, 1986; 1988], our findings demonstrate that new product introductions can at least make price markups less procyclical.
2. Notice that the Chamberlinian models of monopolistic competition also predict procyclical introduction of new product varieties.However, in these models the degree of substitutability among different varieties stays the same since the dimension of the product-characteristic space adjusts with new entry [Koenker and Perry, 1981]. Consequently, in these models market demand fluctuations and new entry do not affect price markups and thus price markups are acyclical.
3. In total, 8,324 abstracts and articles from the Wall Street Journal were reviewed in compiling the data set on new product introductions.
4. Using in addition the data on new products collected by Devinney (which cover the period between 1975 and 1984), the corresponding correlations are 0.742 and 0.835 respectively.These correlations are similar even when the appropriate series are detrended.
5. They are Food and Kindred Products (20), Chemicals and Allied Products (28), Electronic and Other Electric Equipment (36), Transportation Equipment (37) and Instruments and Related Products (38).
6. Notice that in notation i = an industry index and t = a time index.
7. In regressions, not reported in the paper, a few more lags of the demand proxies were included but the results were similar to the ones reported in the paper.

8. Also, the Random Effects model was used in estimations but was rejected in favor of the Fixed Effects model.
9. Notice that all the regressors in logs.
10. In estimating equation (1) alternative proxies for industry and aggregate demand fluctuations have been used with quite similar result that are not reported in table C4.
11. The results from alternative estimated specifications are similar and thus not reported in the paper.
12. Due to space limitations these results are not reported in the paper but are available upon request.
13. Various specifications have been estimated with results similar to the ones reported in the paper.
14. In our data, Electronic Equipment and Transportation Equipment are the industries with the lowest price markups while Instruments shows the highest price markups among the five industries in our sample.

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