

Supplemental Online Content

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This supplemental material has been provided by the authors to give readers additional information about their work.

eTable 1. Adjusted likelihood of manufacturers' coupon use, drugs in the monopolistic market vs. market with high competition

Variables	Drugs in the monopolistic market (n=342)			Drugs in the market with high competition (n=2,159)		
	Odds Ratio	p-value	95% CI	Odds Ratio	p-value	95% CI
<i>Patient-Cost Characteristics</i>						
Mean total cost per patient per drug (per 10% increase)	1.06	0.00	1.02- 1.11	1.03	0.000	1.01-1.04
Mean patient copay before offset (per 10% increase)	0.92	0.01	0.87- 0.97	0.98	0.003	0.97-0.99
<i>Drug Characteristics</i>						
Later-class-entrant single-source drugs				1.44	0.010	1.09-1.90
<i>Drug-class Characteristics</i>						
Mean prevalence of coupon use among in-class competitors (5 percent point increase)				1.18	0.000	1.10-1.26
Drug classes without generic competition				1.37	0.163	0.88-2.14
In-class mean total cost per patient per drug (per 10% increase)				1.01	0.075	0.99-1.03
In-class mean patient copay before offset (per 10% increase)				0.97	0.054	0.94-1.00

Source: Author's analysis of data for October 2017- September 2019 from IQVIA Formulary Impact Analyzer.

eTable 2. Subgroup analysis – drugs with vs. without new in-class brand-name competitor

Variables (referent)	Drugs with new brand-name competitor			Drugs without new brand-name competitor		
	Odds Ratio	p-value	95% CI	Odds Ratio	p-value	95% CI
<i>Patient-Cost Characteristics</i>						
Mean total cost per patient per drug ^a (per 100% increase)	1.46	0.002	1.16-1.84	1.24	0.003	1.08-1.43
Mean patient copay before offset ^b (per 100% increase)	0.83	0.095	0.66-1.03	0.79	0.010	0.66-0.95
<i>Drug Characteristics</i>						
Later-class-entrant single-source drugs	2.63	0.000	1.65-4.20	1.03	0.867	0.73-1.46
<i>Drug-class Characteristics</i>						
Mean prevalence of coupon use among in-class competitors (5 percent point increase)	1.13	0.011	1.03-1.23	1.19	0.000	1.10-1.29
Drug classes without generic competition	7.06	0.011	1.57-31.74	1.34	0.238	0.83-2.18
In-class mean total cost per patient per drug (per 100% increase)	1.18	0.169	0.98-1.49	1.08	0.375	0.91-1.27
In-class mean patient copay before offset (per 100% increase)	0.86	0.611	0.48-1.53	0.74	0.088	0.53-1.05
Mean percentage of claims with coupons per drug, % (SD)	10.2% (18.3%)			5.9% (13.9%)		

Among drugs with estimated net-price information, 559 drugs (or 75%) had coupon use, and drugs with coupons had a lower mean net-to-gross ratios (63.4 vs. 71.1, eTable 3).

eTable 3. Estimated net total cost per patient and net-to-gross price ratio of prescription drugs by manufacturer coupon use

Variables	All (n=749)	None (n=190)	Any (n=559)	t-test <i>p</i> -value	Group by Manufacturer Coupon Use Frequency			
					1 st quartile (n=106)	2 nd quartile (n=134)	3 rd quartile (n= 159)	4 th quartile (n=160)
Estimated mean total net-cost per patient per drug, mean \$ (SD)	16097 (43359)	16193 (43542)	16065.4 (43336)	0.9722	4570 (13253)	10177 (20839)	18181 (49799)	26509 (58444)
Estimated mean net-to-gross price ratio per drug, % (SD)	65.5 (26.2)	71.1 (27.4)	63.4 (25.5)	0.0002	63.2 (25.3)	62.3 (25.7)	65.2 (24.8)	62.6 (26.1)
Relative net price-based total cost per patient per drug to the class mean, (SD) ^a	1.00 (1.39)	0.89 (1.32)	1.04 (1.42)	0.2262	0.75 (0.77)	0.83 (0.59)	1.19 (1.65)	1.24 (1.87)

In the sensitivity analyses using net-price based cost estimates, we found a stronger association between the within-class net-price based cost variable and likelihood of coupon use but coefficients for other drug-class level variables were not statistically significant possibly due to the small number of drug classes (**eTable 4**).

eTable 4. Adjusted likelihood of coupon use among drugs with coupon use from multilevel mixed-effect logistic regression with net-price-based cost variable

Variables (referent)	Main model			Net price			Net-to-WAC ratio		
	Odds Ratio	p-value	95% CI	Odds Ratio	p-value	95% CI	Odds Ratio	p-value	95% CI
<i>Patient-Cost Characteristics</i>									
Mean total cost per patient per drug ^a (per 10% increase)	1.03	0.00	1.01-1.04	1.05	0.00	1.02-1.09			
Mean patient copay before offset ^b (per 10% increase)	0.98	0.00	0.97-0.99	0.94	0.00	0.91-0.98	0.96	0.005	0.93-0.99
Mean net-price based total cost per patient per drug (per 100% increase)									
Net-to-WAC ratio per drug (per 1% increase)							0.80	0.769	0.17-3.66
<i>Drug Characteristics</i>									
Single-source later-class-entrant	1.44	0.01	1.09-1.89	1.45	0.17	0.85-2.48	1.78	0.03	1.07-2.99
<i>Drug-class Characteristics</i>									
Mean prevalence of coupon use among in-class competitors (5 percent point increase)	1.18	0.00	1.10-1.26	1.12	0.05	1.00-1.25	1.13	0.031	1.01-1.26
Drug classes without generic competition	1.35	0.18	0.87-2.09	1.64	0.20	0.77-3.47	1.41	0.31	0.73-2.74
In-class mean total cost per patient per drug (per 10% increase)	1.01	0.07	1.00-1.02						
In-class mean patient copay before offset (per 10% increase)	0.97	0.06	0.94-1.00	0.98	0.23	0.94-1.02	0.97	0.050	0.94-1.00
In-class mean net-price-based total cost per patient per drug (per 1% increase)				0.99	0.95	0.98-1.02			
In-class mean net-to-WAC ratio (per 1% increase)							0.74	0.67	0.19-2.92

Source: Author's analysis of data for October 2017- September 2019 from IQVIA Formulary Impact Analyzer and SSR Health Net Pricing Data

Using different combinations of cost copay-related variables and specifications, we found that our estimates for explanatory variables were consistent across models (**eTable 5**). For example, the odds ratio for later-class-entrant drugs was 1.42 ($p=0.003$) in the model without cost variables and 1.44 ($p=0.01$) in the main model.

eTable 5. Adjusted likelihood of manufacturers' coupon use for models with different specification of cost-related variables (n=2501)

Variables	Model 1	Model 2	Model 3	Main model
<i>Patient-Cost Characteristics</i>				
Mean total cost per patient per drug (per 10% increase)	-	1.03***	-	1.03***
Mean patient copay before offset (per 10% increase)			0.99	0.98**
<i>Drug Characteristics</i>				
Single-source later-class-entrant	1.42**	1.43**	1.56**	1.44**
<i>Drug-class Characteristics</i>				
Mean prevalence of coupon use among in-class competitors (5 percent point increase)	1.15***	1.17***	1.20***	1.18**
Drug classes without generic competition	1.40	1.43	1.43	1.35
In-class mean total cost per patient per drug (per 10% increase)		1.01		1.01
In-class mean patient copay before offset (per 10% increase)			0.98*	0.97

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes Model 1: Model without cost variables; Model 2: Model 1 with total cost variable; Model 3: Model 1 with copay variable; Model 4: full model with cost and copay variables

In quantile median regressions to assess whether the outliers drove the estimated association of coupon use explanatory variables, the association was similar across the distribution of coupon use frequency, but there was a greater magnitude of association among drugs with high coupon use frequencies (e.g., change in percentage point of claims with a coupon: 0.37, 2.33, 4.04 in 50th, 75th, 90th percentile) (**eTable 6**).

eTable 6. Mean percentage point changes in the median of the proportion of transactions with coupons, quantile regression (n=2501)

Variables	50th percentile			75th percentile			90th percentile		
	Change in Percent of Transactions with a Coupon (percentage point)	Standard Error	p-value	Change in Percent of Transactions with a Coupon (percentage point)	Standard Error	p-value	Change in Percent of Transactions with a Coupon (percentage point)	Standard Error	p-value
<i>Patient-Cost Characteristics</i>									
Mean total cost per patient per drug (per 1% increase)	0.37	0.13	0.005	2.33	0.68	0.001	4.04	0.96	0.000
Mean patient copay before offset (per 1% increase)	-0.04	0.13	0.768	-1.04	0.84	0.214	-2.51	1.79	0.162
<i>Drug Characteristics</i>									
Me-too single-source drugs	0.93	0.36	0.009	3.85	1.49	0.010	4.78	2.08	0.021
<i>Drug-class Characteristics</i>									
5 percent point increase in mean prevalence of coupons among in-class competitors	0.17	0.08	0.037	1.55	0.50	0.002	3.30	0.58	0.000
Drugs that were more expensive relative to the in-class mean	1.35	0.55	0.014	3.33	1.98	0.093	4.23	2.33	0.070
Drugs that had higher mean patient copay relative to the in-class mean	0.79	0.32	0.014	3.31	1.59	0.037	7.09	2.71	0.009
Drugs that were more expensive relative to the in-class mean	-0.62	0.30	0.038	-1.23	1.42	0.385	-1.99	2.85	0.487

Source: Author's analysis of data for October 2017- September 2019 from IQVIA Formulary Impact Analyzer.

NOTES: Quantile regression results using median, 75th percentile, and 90th percentile of the coupon use frequency as dependent variable. Coefficients represent changes in percentage point.

eTable7. Drug classes with high frequency of coupon use

Therapeutic area	Drug Class	Number of products with high coupon use	Number of manufacturers	Mean proportion of transactions with offsets per drug	Mean years on the market
Anti-infectives	Tetracyclines	5	4	61.9	11.3
Non-HIV Antivirals	Viral hepatitis products	9	4	53.6	6.5
Vascular agents	Angiotensin II antagonists	5	4	51.3	11.9
Diabetes, non-insulin	SGLT-2 Inhibitors	9	3	47.3	5.4
HIV antivirals	HIV- reverse transcriptase inhibitor	5	3	44.4	15.8
HIV antivirals	HIV antiviral combinations	12	6	43.7	6.6
Diabetes, non-insulin	DPP-4 inhibitors	7	3	42.1	7.7

*Drug class with more than 5 products with high frequency of coupon use