Online Appendix for "Are Online and Offline Prices Similar? Evidence from Multi-Channel Retailers"

Alberto Cavallo
MIT & NBER

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A Appendix

A.1 Price-level Comparison with Amazon.com

This section studies the relation between the prices for multi-channel retailers in the US and the prices that can be obtained for those same products at Amazon.com.

I constructed a dataset with three prices for each product: the offline price at the retailer, the online price at the website of that same retailer, and the price at Amazon.com. The process to collect data offline and online for the multi-channel retailers was described in the paper. In addition to the online price, I also collected the product description from the website of the multi-channel retailers. Using this text, I then searched the US Amazon.com website to find the same product and collect the "amazon price". All of these matches required a careful manual check to make sure we had exactly the same products sampled in the three locations (offline, online, and at Amazon.com). At Amazon's website, goods can be either sold by Amazon or by third party sellers. I first show results for all goods marked as "Sold by Amazon.com".

The resulting matched dataset contains 1049 observations from 342 products and 8 multi-channel retailers: BestBuy, Walmart, Target, Lowes, Macys, OfficeMax, and Staples. This dataset is significantly smaller than the one used in the paper to compare online and offline prices within multi-channel retailers, but it can still provide valuable information about the way more traditional retailers, such as Walmart, compete with online-only retailers, such as Amazon.

Table A1 provides the price-level comparison results between Amazon and the online store of the multi-channel retailers, in the same format as Tables 3 and 4 in the main paper. To be consistent with the benchmark results in the paper, these results exclude sales and allow for prices to be collected with up to a 7 day difference. Including sales does not change these results significantly, as I show in another section of this Appendix.

On average, about 38 percent of all observations have identical prices in Amazon and the online store of these multi-channel retailers. This is less than the shares between online and offline prices, but it is still high considering that we are now comparing the

Table A1: Amazon - Online Price Level Differences

Sector	(1) Ret.	(2) Days	(3) Prod.	(4) Obs	(5) Ident. (%)	(6) High Am (%)	(7) Low Am (%)	(8) On Mark. (%)	(9) Differ. (%)
ALL	8	87	342	1049	38	14	47	-9	-5
Household	1	10	66	306	35	19	47	-6	-4
Drugstore	1	3	9	32	3	25	72	-9	-8
Electronics	1	20	94	320	35	7	58	-14	-9
Office	2	21	59	73	19	22	59	-10	-8
Multiple/Mix	3	46	114	318	53	15	32	-4	-2

Note:Results updated 29 Aug 2016. {Difference} includes identical prices. {Markup} excludes identical prices.

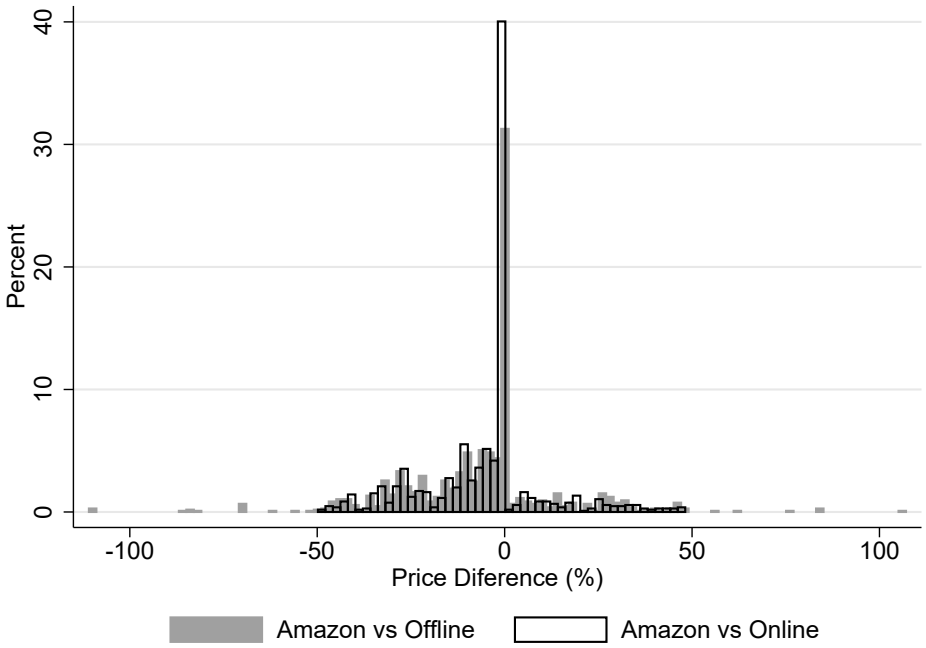
same goods across different retailers.

Overall, Amazon is slightly cheaper than the multi-channel retailers in this data. The price difference is about -5 percent when we include all prices, and -9 percent when we only consider prices that are different. The biggest price differences are in electronics.

Table A1 further shows that, as might be expected, prices tend to be more similar between Amazon and multi-channel retailers that sell a wide range of products and are likely its traditional competitors. The share of identical prices is 53 percent, and on average prices are only 2 percent cheaper in Amazon. The share of identical prices is also relatively high in retailers that specialize in goods that tend to be popular in Amazon, such as electronics and household products.

Figure A1 adds the comparison between Amazon and the *offline* prices from multi-channel stores. Amazon's prices are closer to the online prices of multi-channel retailers than to their offline prices in physical stores. This could mean that some of the online-offline differences found in the paper are caused by the multi-channel retailers setting their online prices to match those found at Amazon.com.

Figure A1: Price Differences with Amazon.com (US only)



However, as Table A2 shows, the conditional probability of having an identical online price with Amazon is the same for goods with identical online-offline prices than for those that have some online-offline price difference. Furthermore, a probit regression with binary indicator variables of an identical online-offline price on an identical amazon-online price does not show any economically or statistically significant relation between them.

Table A2: Amazon - Online Price Level Differences

Sector	(1) Ret.	(2) Obs	(3) Ident. (%)	(4) High Am (%)	(5) Low Am (%)	(6) On Mark. (%)	(7) Differ. (%)
ALL	8	1049	38	14	47	-9	-5
Identical Online-Offline	8	801	38	11	51	-10	-6
Different Online-Offline	8	248	38	25	37	-3	-2

Note:Results updated 29 Aug 2016. Difference includes identical prices. Markup excludes identical prices.

Table A3 shows the results for 407 observations and 145 products sold by sellers participating in the "Amazon Maketplace". These are typically small companies that use the Amazon infrastructure to sell online. The prices for these sellers was only collected if Amazon did not sell the product as well. The share of identical prices with online multi-channel retailers is lower, at 19 percent. Again, there is no evidence that the multi-

channel retailers are making their online prices different from their offline prices in order to match the marketplace sellers on Amazon.com.

Table A3: Amazon - Online Price Level Differences

Sector	(1) Ret.	(2) Obs	(3) Ident. (%)	(4) High Am (%)	(5) Low Am (%)	(6) On Mark. (%)	(7) Differ. (%)
ALL	5	407	19	34	48	-2	-2
Identical Online-Offline	4	195	19	37	44	0	0
Different Online-Offline	4	212	18	31	51	-4	-3

Note:Results updated 29 Aug 2016. Difference includes identical prices. Markup excludes identical prices.

A.2 Offline Price Differences in Multiple Zip Codes

To evaluate the degree of offline price dispersion, I use a subset of the data with prices from identical products sampled in multiple offline locations on the same day. The size of this dataset is small because my efforts in this paper were geared to make the comparison between offline and online prices. Given that the crowdsourced workers were asked to to obtain prices for a random set of products in any offline location close to them, the chances that the sampled products are the same in two different zip codes is extremely low.

Still, there are 684 observations that can be used for this purpose (including some for which an online price is not available). These prices cover 275 products in 25 retailers, as shown in Table A4. In column (5), I report the percentage of times where the price for the same good is the same across two offline locations (each product was sampled at most in two zip codes on a given day).

These findings show little offline price dispersion across zipcodes within multi-channel retailers. Indeed, the share of identical prices in the US is 79 percent, and 77 percent if we include data from other countries. If we split the US retailers into sectors, the share of identical offline prices is highest in electronics and lowest in drugstores. Although there is little data to make strong conclusions, these sectoral differences are consistent with the online-offline price level differences in the paper.

To some readers, the lack of offline price dispersion may appear to be at odds with a growing literature that uses scanner data and documents a large amount of offline price dispersion across physical stores. For example, Kaplan and Menzio (2015) find that the standard deviation of standardized prices is 19 percent for a given UPC code in a quarter, and that between 50 and 70 percent of the variance in these prices can be explained by

Table A4: Offline Stores Price Level Differences

Source	(1) Obs.	(2) Products	(3) Zip Codes	(4) Retailers	(5) Identical Price (%)	(6) Different Price (%)
USA	626	247	55	10	79	21
Clothing	28	14	4	2	79	21
Drugstore	134	67	10	1	66	34
Electronics	140	48	14	1	96	4
Office	104	51	9	2	81	19
Multiple/Mix	218	66	23	3	75	25
Other Countries	58	28	30	15	59	41
All Countries	684	275	85	25	77	23
Identical On-Off	241	99	42	8	88	12
Different On-Off	180	79	34	9	67	33

Note: Results updated 29 Aug 2016. This data includes only offline prices for identical product barcodes in different zip codes. Each product was priced in two different zip codes.

the "transaction component" of the price, defined as the price of the good in a particular transaction relative to the average transaction price of that good at a particular store.

There are many reasons that can explain this apparent difference in findings. First, many papers in this literature compare data from different retailers, so that *within* retailer price dispersion is mixed with *between* retailer price dispersion. My results focus exclusively on price differences *within* retailers. The distinction is key to understand retail price dispersion, as also documented with CPI data by Nakamura et al. (2011). Second, the price in scanner datasets is a weekly average. As I discuss in Cavallo (2016), this can cause significant measurement error in some applications. For measuring price dispersion, consider a good with identical prices in two stores, a price change on a Wednesday, and a single transaction in each store. If one store sold the good on a Monday, and the other on Friday, the "weekly" price will appear to be different when in fact prices were identical on a daily basis. Similarly, some scanner datasets tend to have unit values instead of prices. These are calculated as the ratio of sales to quantities sold, and can therefore be affected by the number of coupons used or the share of transactions that take place at different prices. Of course, for some purposes it makes sense to include coupons or transaction weights that affect the price actually payed by the consumer, but the fact that there is price dispersion caused by coupons should not lead us to believe that prices for the same goods are shown with different prices across stores of the same retailer. Third, price dispersion is often measured within a month or a quarter, so much of difference in observed prices is caused by the same good being bought at different times. That is why Kaplan and Menzio (2015) note a major potential theoretical explanation for their findings is intertemporal substitution. Finally, scanner datasets mostly contain prices for groceries

and related goods. These are also the sectors for which I find more online-offline price dispersion, as well as offline price differences across physical stores.

A more important question for my main results is whether the offline price dispersion, however small, can help explain some of the online-offline price differences in the paper. The reason is that scraped online prices are not "matched" to the zip code where the offline data was collected. For most retailers, this is not even possible because they have a single online price, regardless of the location. There is nothing wrong with the online-offline differences generated in this way. For example, imagine a retailer with half of the zip codes with one price different to the online price and the other half with another price equal to the online price. Those buyers in the first group of zip codes could get the same products at a different price (excluding shipping). If so, my estimates of online-offline dispersion would correctly capture the difference. There are, however, a few supermarkets that ask the customer to enter the location before showing prices. In those cases, the scraping robot was not customized to match the zip code for each offline observation. Therefore, some of these online - offline price differences may be "spurious" and simply caused by the fact that the offline and online zipcodes do not match.

Table A5 shows the results for the online - offline comparison, as in the main paper, but this time restricted to those products where I have prices for multiple zipcodes collected on the same day.

Table A5: Online - Offline Price Level Differences for Multiple Zipcodes

Country	(1) Ret.	(2) Obs	(3) Identical (%)	(4) High On (%)	(5) Low On (%)	(6) Markup (%)	(7) Difference (%)
USA	9	406	60	11	29	-4	-2
Different Offline	7	85	35	16	48	-5	-3
Identical Offline	8	316	67	9	24	-3	-1

Note: Results updated 29 Aug 2016. Column 3 shows the percentage of observations that have identical online and offline prices. Column 4 has the percent of observation where prices are higher online and column 5 the percentage of price that are lower online. Column 6, is the online markup, defined as the average price difference excluding cases that are identical. Column 7 is the average price difference including identical prices.

There are three things to note in this Table. First, even though the sample is very small, we get roughly the same share of identical online-offline prices that in Table 3 of the paper, with 60 percent of the prices being identical online and offline. Second, as expected, goods that have different offline prices (across zipcodes) tend to have much lower probability of identical online - offline prices (only 35 percent of the time). Third, if we focus exclusively on products with the same offline price everywhere, labeled "Identical Offline" in the Table, the percentage of identical online - offline prices rises from 60 percent

to 67 percent. Note that the impact is limited by the fact that there are actually few products for which the offline prices are different across zipcodes. This is similar to what I found with sale prices. Although sale prices cause many online-offline differences, the number of sales is relatively small, so it does not have much impact on the aggregate results.

The extent of online-offline differences caused by spatial differences also depends on whether supermarkets have different *online* prices across zip codes. The next section explores this topic in detail and finds little evidence of online price discrimination across locations by a large supermarket in the US.

A.3 Online Supermarket Prices in 45 Zip Codes

As mentioned before, the vast majority of large retailers that sell online show prices without requiring users to register or enter zip codes or other location information. The only exceptions tend to be supermarkets selling groceries, which sometimes request a zip code before displaying prices. This could mean that the online prices are different across zip codes, and cause "spurious" online-offline price differences.

In this section, I show results from a scraping exercise aimed to simultaneously collect prices for the same goods in a large number of zip codes. I programmed a scraping software to visit the website of one of the largest multi-channel supermarkets in the US. The software first entered a zip code, then collected the prices for 1328 goods. This was repeated for 45 different zip codes in 13 mayor cities in 8 states. The browser's cache and "cookie" files were deleted after collecting data for each zip code to ensure that the website would see each round as a different browsing session. The zip codes within cities were chosen to represent areas with different median incomes according to the last US Census data. All prices used here were collected on the exact same day (though I repeated the exercise on alternative dates and found that these results are robust over time.)

Table A6 show the summary statistics for the prices in this database, with an average of $6.76 and a range from $0.25 to $35.19. All the products sold by this retailer are food and groceries.

Table A6: Summary Statistics

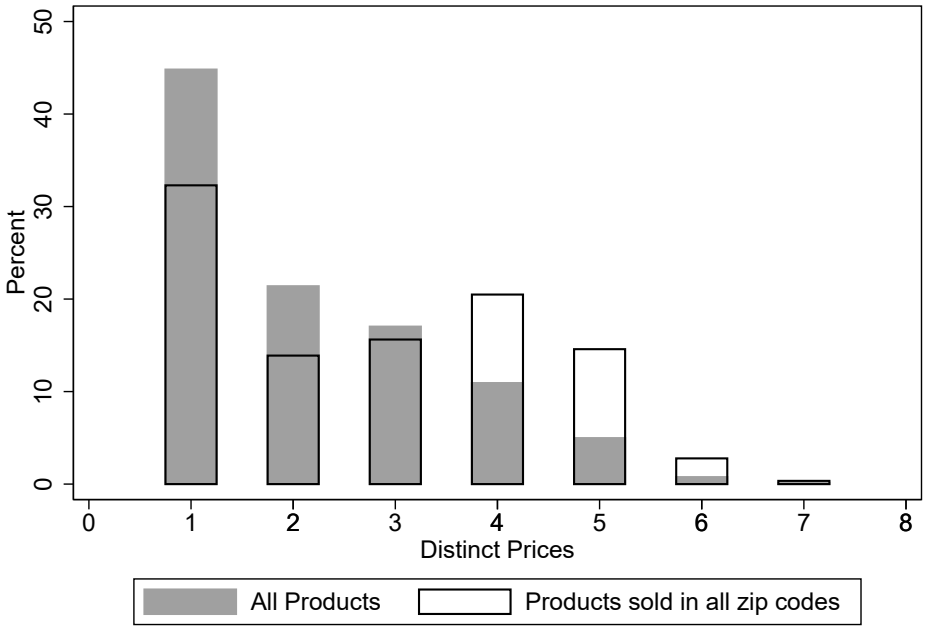
					Quantiles				
Variable	Products	Obs.	Mean	S.D.	Min	0.25	Median	0.75	Max
Price	1328	35132	$6.76	$5.13	$0.25	$3.33	$5.29	$7.99	$35.19

One of the simplest ways to measure the dispersion of prices across multiple zip codes is to count the number of distinct prices found for the same good across locations. For

example, if the same good is sold for $1.99 in 10 zip codes and $1.49 in 35 other zip codes, the number of distinct prices for that good is two. On one extreme, we could have all goods with only one distinct price. On the other, we could have 45 distinct prices, one for each zip code.

Figure A2 below shows a histogram with the percentage of goods with different distinct prices.

Figure A2: Supermarket Products with Distinct Prices



Prices from a large supermarket collected for 1300 products in 45 zip codes in a single day.

If we include all products (1328), more than 44 percent of them have a single price in all locations where they are sold. More than 80 percent of goods have at most 3 distinct prices in 45 locations. If we focus exclusively on the goods that are available in all locations at the same time (288), these numbers fall slightly, to 32 percent and 61 percent respectively. There is no good in this whole sample with more than 7 distinct prices across locations.

These results suggest that even in supermarkets that are explicitly asking for zip code information, there is a limited amount of online price discrimination between customers in different locations. Combined with the fact that most online retailers do not even ask for zip codes (and that there is no evidence of ip-address pricing as discussed in the paper), this implies that online prices are the same everywhere (excluding shipping costs) for a given good and retailer. Furthermore, given that most online and offline prices tend to be the same for multi-channel retailers, as shown in the paper, we can expect the mayority of offline prices to be the same as well across locations.

A.4 Retailer Heterogeneity

Table A7 shows price level and changes comparisons for individual retailers with more than 100 observations. The columns are the same as those in Tables 3 and 6 in the main sections of the paper.

Retailers' names have been encoded to ensure their confidentiality, as the goal is to provide evidence of heterogeneous pricing behaviors, not to identify the pricing strategies of individual companies.

Table A7: All Retailers and Statistics

Retailer	(1) Days	(2) Workers	(3) Prod.	(4) Obs	(5) Ident. (%)	(6) High On (%)	(7) Low On (%)	(8) Differ. (%)	(9) On Mark. (%)	(10) Price Changes	(11) Mean Freq. Online	(12) Mean Freq. Offline	(13) t-test p-val	(14) Mean Abs Size Online	(15) Mean Abs Size Offline	(16) t-test p-val
ARGENTINA_1	19	8	342	665	88	9	3	1	7	36	.097	.144	.192	11.11	10.46	.693
ARGENTINA_2	22	5	554	952	16	79	6	5	6	106	.288	.184	.002	7.53	7.31	.889
ARGENTINA_3	19	6	310	513	56	14	30	0	-1	37	.096	.103	.844	8.91	13.73	.242
ARGENTINA_4	17	6	643	906	85	5	10	-1	-6	28	.071	.077	.833	65.18	15.8	0
ARGENTINA_5	21	8	475	663	62	13	24	0	1	40	.069	.225	0	7.85	20.94	.023
AUSTRALIA_6	20	5	655	864	16	77	7	7	8	58	.12	.201	.068	52.57	47.27	.509
AUSTRALIA_7	24	6	987	1050	98	2	0	0	11	1	.167	.167	1	8.07	8.07	
AUSTRALIA_8	23	6	849	1020	95	1	5	-1	-28	3	0	.018	.179		15.35	
AUSTRALIA_9	20	7	582	863	81	9	10	0	2	10	.021	.023	.904	16.48	23.11	.598
BRAZIL_10	3	1	51	118	92	3	6	0	1	7	.103	.103	1	5.65	5.68	.995
BRAZIL_13	23	8	504	765	5	10	85	-13	-14	59	.209	.141	.142	11.85	10.22	.518
BRAZIL_14	10	4	275	348	10	71	20	7	8	18	.25	.269	.861	8.75	8.29	.9
BRAZIL_15	21	9	603	680	90	3	7	-1	-9	1	0	.033	.326		20.04	
CANADA_16	29	7	1060	1237	94	4	1	1	13	10	.029	.076	.127	9.86	23.92	.155
CANADA_17	21	7	741	1022	90	3	7	0	-4	31	.093	.129	.204	4.12	9.43	.096
CANADA_18	25	5	174	575	89	2	9	-2	-18	37	.086	.02	.005	50.43	76.76	.185
CANADA_19	31	6	518	811	88	4	8	-1	-12	31	.107	.038	.012	31.66	15.87	.001
CANADA_20	29	5	165	386	96	3	2	0	10	11	.065	.069	.916	32.27	32.87	.953
CHINA_22	14	4	393	495	88	7	4	1	5	2	.014	.022	.783	13.42	7.3	
GERMANY_23	18	5	249	373	92	2	6	-1	-10	5	.03	.023	.698	18.93	13.18	.195
GERMANY_24	11	3	288	358	53	3	44	-3	-6	4	0	.167	.09		4.9	
GERMANY_25	22	3	340	511	93	3	5	-1	-7	7	.045	.028	.458	32.51	28.83	.858
GERMANY_26	6	3	246	269	54	2	44	-5	-10							
JAPAN_28	13	2	376	427	21	16	63	-10	-13	12	.225	.029	.02	35.61	7.41	.379
JAPAN_30	12	2	271	571	74	1	26	-2	-8	0	0	0				
JAPAN_31	39	5	230	644	64	12	25	-2	-4	20	.007	.035	.077	8.31	8.33	.994
JAPAN_32	23	5	251	544	22	3	75	-16	-21	64	.191	0	0	8.55		
SOUTHAFRICA_33	13	5	199	222	85	8	7	0	-1	3	0	.222	.207		29.05	
SOUTHAFRICA_34	12	4	221	288	96	1	2	0	-6	4	.022	.072	.274	8.34	34.53	
SOUTHAFRICA_35	18	7	454	691	92	2	6	-1	-15	15	.044	.028	.394	26.53	34.27	.565
SOUTHAFRICA_36	38	12	1146	1496	80	9	11	0	-1	62	.164	.114	.133	15.72	13.61	.445
SOUTHAFRICA_37	17	7	324	515	87	4	9	-1	-5	25	.087	.053	.267	41.59	6.46	.007
UK_40	17	7	566	663	92	3	5	-1	-9	4	.115	.154	.721	32.23	20.6	.565
UK_41	16	5	394	483	98	1	0	0	9	1	0	.011	.321		2.63	
UK_42	12	3	260	391	74	1	25	-2	-7	3	0	.025	.093		25.7	
UK_43	16	6	455	557	96	2	3	0	-11	17	.152	.181	.677	51.9	54.07	.905
USA_44	16	8	96	124	92	8	0	1	16	0	0	0				
USA_45	75	51	1027	1662	85	4	11	-1	-6	51	.063	.074	.617	10.88	20.42	.007
USA_46	91	28	1334	2425	24	12	64	-4	-5	34	.002	.048	0	7.19	14.11	.621
USA_47	32	11	555	655	100	0	0	0	15	0	0	0				
USA_48	28	7	253	551	85	13	2	2	12	29	.026	.077	.06	73.05	42.86	.071
USA_49	87	44	695	1476	90	5	5	0	-3	34	.017	.04	.103	16.64	19.79	.473
USA_50	29	3	381	1094	95	2	3	0	0	15	.023	.012	.392	12.8	49.52	.029
USA_51	66	52	487	807	91	5	4	1	6	3	0	.01	.102		4.88	
USA_53	4	2	44	113	35	19	46	-3	-4	2	.03	0	.164	10.73		
USA_54	24	13	143	232	85	10	5	1	4	1	0	.012	.323		50	
USA_57	36	11	448	976	24	39	37	1	1	30	.02	.051	.087	14.34	22.16	.432
USA_58	61	14	261	1009	72	5	23	-4	-13	188	.243	.037	0	33.2	15.13	.001
USA_59	119	106	1408	2428	70	5	25	-3	-11	136	.08	.084	.859	11.73	17.73	.038
USA_60	19	8	109	222	98	0	1	0	-9	2	0	.025	.324		33.11	
USA_62	60	65	586	1432	80	5	16	-2	-10	36	.051	.018	.035	18.47	15.23	.646

Note: Results updated 29 Aug 2016. "Difference" includes identical prices. "Online Markup" excludes identical prices.

A.5 Price Differences for Manually-Matched goods

Section 3 of the paper shows that about 76 percent of the goods sampled offline where also found online. This estimate includes goods that were matched automatically using product id numbers (as in the sample used for the main results in the paper) and also goods that were matched by manually searching for product descriptions in the website of the store.

Table A8 shows the share of identical online and offline prices for both types of matched goods. Column 4 provides the percentage of identical prices when both automatic and manually-matched goods are included (equal to a weighted mean of columns 2 and 3).

Table A8: Automatic and Manual Price Level Comparison

Country	(1) Sample	(2) Automatic Identical Price (%)	(3) Manual Identical Price (%)	(4) Total Identical Price (%)
ARGENTINA	500	73	45	69
AUSTRALIA	500	73	50	71
BRAZIL	400	49	50	49
CANADA	500	92	87	90
CHINA	100	88	67	87
GERMANY	400	79	87	80
JAPAN	500	45	47	46
SOUTHAFRICA	500	89	84	88
UK	500	90	67	87
USA	1600	75	60	71
ALL (mean)	5500	75	64	74

Note: Results updated 23 Mar 2016. Manual check with 200 products per retailer. Only a subset of retailers in each country are included.

The price-level comparison for manually-matched goods produces very similar shares of identical prices as those reported in Section 3 of the paper. In some countries, such as Argentina, the share of identical prices is lower for manually-matched goods, which might be evidence for obfuscation. But the number of manually-matched goods is small compared to the total, so the impact on the aggregate results in Column (4) is small.

A.6 Product Selection By Retailer

Table A9 provides the table discussed in Section 3 and 4 at the retailer level. The first four columns are equivalent to those in Table 7 of the paper, while columns (5) and (6) show the share of identical online and offline prices for both types of matched goods.

Table A9: Retailer - Product Selection Overlap

Retailer	(1) Sample	(2) Found Auto-matically	(3) Found Manually	(4) Total Overlap (%)	(5) Automatic Identical P (%)	(6) Manual Identical P (%)
ARGENTINA_1	100	43	16	59	88	88
ARGENTINA_3	200	95	18	57	56	22
ARGENTINA_4	100	93	4	97	85	50
ARGENTINA_5	100	63	14	77	62	21
AUSTRALIA_6	100	94	5	99	16	20
AUSTRALIA_7	100	87	6	93	98	100
AUSTRALIA_8	100	89	9	98	95	0
AUSTRALIA_9	200	165	16	91	81	81
BRAZIL_10	100	100	0	100	92	
BRAZIL_13	100	85	7	92	5	0
BRAZIL_14	100	75	0	75	10	
BRAZIL_15	100	71	5	76	90	100
CANADA_16	100	99	1	100	94	100
CANADA_17	100	76	5	81	90	80
CANADA_19	100	61	22	83	88	82
CANADA_20	200	43	104	74	96	85
CHINA_23	100	50	3	53	88	67
GERMANY_24	100	30	6	36	92	100
GERMANY_25	100	68	4	72	53	75
GERMANY_26	200	80	13	47	93	85
JAPAN_29	100	59	26	85	21	42
JAPAN_31	100	90	1	91	74	100
JAPAN_32	100	26	2	28	64	0
JAPAN_33	200	154	32	93	22	47
SOUTHAFRICA_35	100	43	10	53	96	100
SOUTHAFRICA_36	100	65	9	74	92	100
SOUTHAFRICA_37	200	146	31	89	80	77
SOUTHAFRICA_38	100	78	10	88	87	60
UK_41	100	82	13	95	92	23
UK_42	100	68	11	79	98	82
UK_43	100	76	6	82	74	83
UK_44	200	147	29	88	96	79
USA_45	100	85	7	92	92	57
USA_46	200	177	16	97	85	81
USA_47	200	60	90	75	24	32
USA_48	100	56	14	70	100	100
USA_49	100	82	3	85	85	0
USA_50	200	138	46	92	90	78
USA_52	100	64	8	72	91	63
USA_55	100	83	1	84	85	100
USA_58	100	43	18	61	24	28
USA_60	200	113	57	85	70	70
USA_62	200	102	56	79	80	48

Note: Results updated 23 Mar 2016. Manual check with 200 products per retailer.

A.7 Results with Sales

This section replicates the tables included in the paper for a sample that includes all observations that can be classified as "sale prices".

Table A10: Country - Level Differences

Country	(1) Ret.	(2) Obs	(3) Identical (%)	(4) High On (%)	(5) Low On (%)	(6) Markup (%)	(7) Difference (%)
Argentina	5	4015	58	26	16	3	1
Australia	4	4076	72	20	7	4	1
Brazil	5	2036	40	19	41	-7	-4
Canada	5	4261	90	5	5	-1	0
China	2	518	87	7	6	3	0
Germany	5	1661	74	4	22	-7	-2
Japan	4	2232	47	7	46	-13	-7
South Africa	5	3272	85	6	9	-2	0
UK	4	2368	88	3	9	-6	-1
USA	17	19149	61	10	28	-7	-3
ALL	56	43588	67	11	21	-5	-2

Note: Results updated 29 Aug 2016. Column 3 shows the percentage of observations that have identical online and offline prices. Column 4 has the percent of observation where prices are higher online and column 5 the percentage of price that are lower online. Column 6, is the online markup, defined as the average price difference excluding cases that are identical. Column 7 is the average price difference including identical prices.

Table A11: Sector - Price Level Differences

Sector	(1) Ret.	(2) Obs	(3) Identical (%)	(4) High On (%)	(5) Low On (%)	(6) Markup (%)	(7) Difference (%)
Food	10	6328	52	32	16	2	1
Clothing	7	3766	65	11	24	-10	-4
Household	9	8079	78	5	17	-8	-2
Drugstore	4	3613	36	10	53	-6	-4
Electronics	5	4344	79	5	16	-8	-2
Office	2	1203	27	36	37	0	0
Multiple/Mix	18	16232	75	7	18	-9	-2

Note: Results updated 29 Aug 2016. Markup excludes identical prices. Difference includes identical prices.

Table A12: Country - Price Change Frequency and Size

	(1) Obs.	(2) Price Changes	(3) Mean Freq. Online	(4) Mean Freq. Offline	(5) Equality t-test p-val	(6) Mean Abs Size Online	(7) Mean Abs Size Offline	(8) Equality t-test p-val
Argentina	1558	289	.13	.167	.02	13.6	12.99	.74
Australia	829	108	.102	.122	.37	36.74	38.52	.73
Brazil	545	116	.223	.142	.01	11.27	10.71	.72
Canada	1622	214	.089	.128	.01	33.26	31.49	.65
Germany	442	19	.042	.042	1	24.63	16.34	.32
Japan	1083	101	.078	.013	0	12.3	8.24	.33
South Africa	926	134	.103	.096	.71	23.51	19.74	.25
UK	531	47	.086	.107	.35	49.2	45.56	.65
USA	9731	1746	.165	.13	0	27.89	30.4	.02
ALL	17267	2779	.131	.117	.01	26.03	27.4	.12

Note: Results updated 29 Aug 2016.

Table A13: Country - Price Changes

	(1) Obs.	(2) Price Changes	(3) Synchronized Price Changes (%)
Argentina	1558	289	33
Australia	829	108	31
Brazil	545	116	19
Canada	1622	214	37
Germany	442	19	32
Japan	1083	101	1
South Africa	926	134	14
UK	531	47	49
USA	9731	1746	24
ALL	17267	2779	25

Note: Results updated 29 Aug 2016.

Table A14: Amazon - Online Price Level Differences

Sector	(1) Ret.	(2) Obs	(3) Ident. (%)	(4) High Am (%)	(5) Low Am (%)	(6) On Mark. (%)	(7) Differ. (%)
ALL	8	1476	38	15	47	-7	-5
Identical Online-Offline	8	997	39	11	50	-9	-6
Different Online-Offline	8	479	36	22	42	-4	-3

Note:Results updated 29 Aug 2016. Difference includes identical prices. Markup excludes identical prices.

A.8 Results Collected on the Same Day, without Sales

This section replicates the tables included in the paper for a sample that includes only prices that were collected on the same day online and offline. Observations classified as being a sale price are also excluded.

Table A15: Country - Level Differences

Country	(1) Ret.	(2) Obs	(3) Identical (%)	(4) High On (%)	(5) Low On (%)	(6) Markup (%)	(7) Difference (%)
Argentina	5	2060	51	40	9	5	2
Australia	4	2533	73	21	6	5	1
Brazil	4	771	24	36	40	-2	-2
Canada	5	2608	91	3	5	-5	0
China	1	121	91	5	4	0	0
Germany	4	723	84	2	14	-8	-1
Japan	4	1428	52	4	43	-14	-7
South Africa	5	1761	86	5	9	-4	-1
UK	4	864	87	2	11	-7	-1
USA	15	7335	70	8	22	-6	-2
ALL	51	20204	71	12	17	-3	-1

Note: Results updated 29 Aug 2016. Column 3 shows the percentage of observations that have identical online and offline prices. Column 4 has the percent of observation where prices are higher online and column 5 the percentage of price that are lower online. Column 6, is the online markup, defined as the average price difference excluding cases that are identical. Column 7 is the average price difference including identical prices.

Table A16: Sector - Price Level Differences

Sector	(1) Ret.	(2) Obs	(3) Identical (%)	(4) High On (%)	(5) Low On (%)	(6) Markup (%)	(7) Difference (%)
Food	10	3873	44	42	14	4	2
Clothing	5	287	95	4	0	14	1
Household	9	4292	83	4	13	-8	-1
Drugstore	4	1333	37	12	51	-4	-3
Electronics	4	2524	84	3	14	-10	-2
Office	2	355	28	35	37	1	0
Multiple/Mix	17	7540	81	5	15	-10	-2

Note: Results updated 29 Aug 2016. Markup excludes identical prices. Difference includes identical prices.

Table A17: Country - Price Change Frequency and Size

	(1) Obs.	(2) Price Changes	(3) Mean Freq. Online	(4) Mean Freq. Offline	(5) Equality t-test p-val	(6) Mean Abs Size Online	(7) Mean Abs Size Offline	(8) Equality t-test p-val
Argentina	695	147	.21	.182	.3	15.37	10.33	.1
Australia	460	11	.019	.017	.88	16.48	24.8	.66
Brazil	152	37	.233	.198	.58	10.68	7.52	.19
Canada	778	60	.087	.033	0	41.65	30.74	.22
Germany	198	7	.032	.038	.78	28.9	23.3	.75
Japan	651	22	.037	.006	.01	29.05	11.83	.26
South Africa	296	20	.092	.072	.63	33.96	13.79	.04
UK	229	10	.03	.044	.49	47.04	26.9	.09
USA	3992	279	.053	.044	.25	17.33	19.19	.41
ALL	7451	596	.071	.056	.01	21	16.78	.02

Note: Results updated 29 Aug 2016.

Table A18: Country - Price Changes

	(1) Obs.	(2) Price Changes	(3) Synchronized Price Changes (%)
Argentina	695	147	37
Australia	460	11	0
Brazil	152	37	14
Canada	778	60	18
Germany	198	7	57
Japan	651	22	5
South Africa	296	20	20
UK	229	10	30
USA	3992	279	16
ALL	7451	596	21

Note: Results updated 29 Aug 2016.

Table A19: Amazon - Online Price Level Differences

Sector	(1) Ret.	(2) Obs	(3) Ident. (%)	(4) High Am (%)	(5) Low Am (%)	(6) On Mark. (%)	(7) Differ. (%)
ALL	7	529	49	10	42	-8	-4
Identical Online-Offline	7	409	46	8	45	-10	-5
Different Online-Offline	6	120	57	15	28	-2	-1

Note:Results updated 29 Aug 2016. Difference includes identical prices. Markup excludes identical prices.

A.9 Results Collected on the Same Day, with Sales

This section replicates the tables included in the paper for a sample that includes only prices that were collected on the same day online and offline. Observations classified as being a sale price are included.

Table A20: Country - Level Differences

Country	(1) Ret.	(2) Obs	(3) Identical (%)	(4) High On (%)	(5) Low On (%)	(6) Markup (%)	(7) Difference (%)
Argentina	5	2280	50	37	13	4	2
Australia	4	2736	72	21	7	4	1
Brazil	4	804	24	36	40	-2	-2
Canada	5	2773	91	4	5	-3	0
China	1	121	91	5	4	0	0
Germany	4	758	85	2	13	-8	-1
Japan	4	1439	52	4	44	-14	-7
South Africa	5	1778	86	5	9	-3	0
UK	4	988	83	3	14	-7	-1
USA	16	8533	66	9	25	-7	-2
ALL	52	22210	69	13	18	-4	-1

Note: Results updated 29 Aug 2016. Column 3 shows the percentage of observations that have identical online and offline prices. Column 4 has the percent of observation where prices are higher online and column 5 the percentage of price that are lower online. Column 6, is the online markup, defined as the average price difference excluding cases that are identical. Column 7 is the average price difference including identical prices.

Table A21: Sector - Price Level Differences

Sector	(1) Ret.	(2) Obs	(3) Identical (%)	(4) High On (%)	(5) Low On (%)	(6) Markup (%)	(7) Difference (%)
Food	10	4101	44	41	15	4	2
Clothing	6	376	76	9	15	-12	-3
Household	9	4412	82	4	14	-7	-1
Drugstore	4	1479	37	11	52	-5	-3
Electronics	4	2836	82	3	15	-9	-2
Office	2	382	29	32	39	-1	-1
Multiple/Mix	17	8624	77	6	17	-10	-2

Note: Results updated 29 Aug 2016. Markup excludes identical prices. Difference includes identical prices.

Table A22: Country - Price Change Frequency and Size

	(1) Obs.	(2) Price Changes	(3) Mean Freq. Online	(4) Mean Freq. Offline	(5) Equality t-test p-val	(6) Mean Abs Size Online	(7) Mean Abs Size Offline	(8) Equality t-test p-val
Argentina	774	152	.204	.183	.42	15.31	10.3	.09
Australia	504	41	.095	.075	.48	24.5	26.6	.74
Brazil	164	45	.246	.236	.87	10.76	9.47	.55
Canada	892	110	.117	.101	.4	39.54	36.76	.64
Germany	214	9	.041	.041	1	24.98	20.97	.78
Japan	659	26	.045	.006	0	26.57	11.83	.29
South Africa	300	20	.092	.072	.63	33.96	13.79	.04
UK	274	24	.082	.086	.89	50.65	45.96	.57
USA	4740	667	.126	.098	.01	25.84	26.16	.85
ALL	8521	1094	.116	.093	0	25.82	24.66	.4

Note: Results updated 29 Aug 2016.

Table A23: Country - Price Changes

	(1) Obs.	(2) Price Changes	(3) Synchronized Price Changes (%)
Argentina	774	152	38
Australia	504	41	39
Brazil	164	45	18
Canada	892	110	39
Germany	214	9	56
Japan	659	26	4
South Africa	300	20	20
UK	274	24	50
USA	4740	667	31
ALL	8521	1094	32

Note: Results updated 29 Aug 2016.

Table A24: Amazon - Online Price Level Differences

Sector	(1) Ret.	(2) Obs	(3) Ident. (%)	(4) High Am (%)	(5) Low Am (%)	(6) On Mark. (%)	(7) Differ. (%)
ALL	7	746	47	12	42	-6	-3
Identical Online-Offline	7	514	46	9	45	-8	-4
Different Online-Offline	7	232	49	17	34	-1	0

Note:Results updated 29 Aug 2016. Difference includes identical prices. Markup excludes identical prices.

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