New Low Price!
An Analysis of IKEA Pricing

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Why Study Prices?

- Some prices change continuously in response to economic news
  - Stock and bond prices
  - Commodity prices (oil; gold)
- Most prices don't change that frequently aside from temporary sales
  - Firms selling inputs on the wholesale market to other firms
  - Textbooks; college tuition
- To understand how monetary policy will affect the economy, we need to understand how prices will respond to a change in policy

Previous Literature

- Supermarket prices in the US (Nielsen scanner data): Midrigan (2011)

- Goods used to calculate price indexes for consumer goods or import/export price indexes, within one country: Nakamura and Steinsson (2008)

- Cross-country comparison of a few similar but not identical goods: Crucini et al. (2005)

- Retail price differences across Japanese cities: Crucini, Shintani and Tsuruga (2010)

- Cross-section web scraped prices across countries: Cavallo et al. (2014)

- Single-country studies of wholesale price setting by manufacturing firms: Schoenle (2017) for the US; Dedola et al. (2021) for Denmark

Problems with the Existing Studies

- Product replacement: When a good disappears, it is usually replaced with a similar but not identical good
- Comparing goods across firms with the same industry: even if they are all "chairs", they are not exactly the same
- Most contributions study a single country: the existing cross-country studies compare similar but not identical goods
- Prices may be "posted" prices but not the "transactions prices" that customers actually pay (problem with unobserved discount prices)

Why Study IKEA Prices?

- Unique opportunity to observe one company setting prices for thousands of goods sold in many countries at once, and for many years at a time

- These are posted, consumer-currency transactions prices that are set by the firm that produces and sells the good, which is often not the case for prices used in other studies

- Prices change infrequently, with only a few limited sales

- IKEA prices are free of issues associated with product substitution or missing data

IKEA catalog prices

- IKEA's iconic catalog represented 70% of IKEA advertising budget; over 200 million copies printed each year
- The catalogs are released in the summer of each year; the 2014 catalog was mailed in June 2013
- Catalog prices are listed in the purchaser's currency, including VAT in European countries
- IKEA guaranteed the catalog prices until the next year's catalog is released
- Most catalog goods are available in all catalogs, allowing cross-country price comparisons

Overview

Overview

Constructing the dataset

- Gathered physical copies of IKEA catalogs for
  - Ten years: 2005-2014
  - Seven countries: **Germany, France, US, UK** (4 largest markets) plus Italy, Sweden, UK: 2/3 of worldwide sales
- Professional double-keyed entry of all product information on every product entry in the catalogs,
  - guaranteed 99% accuracy
  - 2,000 items per catalog; over 140,000 individual items
  - Information includes item name, dimensions, numeric code, color, materials, and any other text in the catalog that describes the good

Two-seat sofa with chaise longue 6390:- with removable, washable cover in 92%cotton/8% polyester. Width 244xDepth 93/158. Height 80cm. SIVIK yellow. **[Item number] 498.483.13**.

KARLSTAD 2-sits soffa med schäslong

6390:-

92% bomull/8% polyester. L80×B64, H48cm. SIVIK

2-sits soffa med schäslong 6390:- med avtagbar, tvättbar klädsel i 92% bomull/8% polyester. B244×D93/158, H80cm. SIVIK ljusgul. 498.483.13

Ben 250:-/4st i aluminium. H15cm. 101.189.14
HEDDA RAK kuddfodral 69:-/2st Se s. 274.
KARLSTAD kudde 199:-/st i 100% bomull. B30×L67cm. DILLNE flerfärgad. 601.201.65
KARLSTAD kudde 249:-/st i 87% bomull/ 13% polyester. B48×L58cm. KORNDAL brun. 401.201.85
HEDDA BLOM kuddfodral 79:- Se s. 274.
RUBRIK lucka/skrivtavla 450:-/st B40×H70cm. 900.866.74 Visas här med **FAKTUM väggskåp 145:-/st** B40×D35, H70cm. 341.796.10 **Gångjärn INTEGRAL 40:-/2st** 042.613.00 Säljs separat.

Classification of Products

Family: a product line identified by name
Example: POANG family of seating; BILLY bookcases

New Lower Price

POÄNG

Rocking chair

Previous price $339.00

$299.00

★★★★⯨ (3)

New Lower Price

POÄNG

Armchair and ottoman

Previous price $229.00

$219.00

New Lower Price

POÄNG

Armchair and ottoman

Previous price $389.00

$379.00

Good: Different products within a family

Example: Goods in the POANG family include rocking chair, armchair, ottoman, and even children's chairs

New Lower Price

POÄNG
Rocking chair

Previous price $339.00
$**299**.00
★ ★ ★ ★ ½ (3)

New Lower Price

POÄNG
Armchair and ottoman

Previous price $229.00
$**219**.00

New Lower Price

POÄNG
Armchair and ottoman

Previous price $389.00
$**379**.00

Variety: Goods within a family that differ only in fabric, color, or wood finish

Example: Varieties of the POANG armchair may have different prices because some fabrics are more expensive.

POÄNG	POÄNG	POÄNG
Armchair	Armchair	Armchair
$149.00	$249.00	$249.00

Linking IKEA Products

- Beginning in 2005 IKEA catalogs became much more standardized across countries, with a much higher fraction of common goods than previously.

- Also beginning in 2005, IKEA assigned a unique key to some items; by 2007, nearly all items contained a key for at least one country.

- The information in the dataset was used to join together goods across countries and years to produce a new panel dataset containing prices for each individual IKEA catalog good.

Could The Data Have Been Scraped from the Web?

- Cavallo et al. (2014) has extensive research on web-scraped prices, including IKEA prices
- Each item identified by its item number
- But the item number is
  - Different for the same item in different countries and different years
  - Different for the same item but with a different color or fabric
- There is no way to join together the same item across countries, years, and varieties without using the other information like name, dimensions, etc.

Gaps in the Price Line

- Price-lines for individual products in a given country are sometimes interrupted

- When a product is missing in one country it is usually missing in all countries for that year: similarity of catalogs across countries is probably the reason

- Fill the missing price with the last observed price (standard approach; see Klenow and Willis (2007); Nakamura and Steinsson (2008)) so the price does not change until it is observed in a catalog

A Price Line
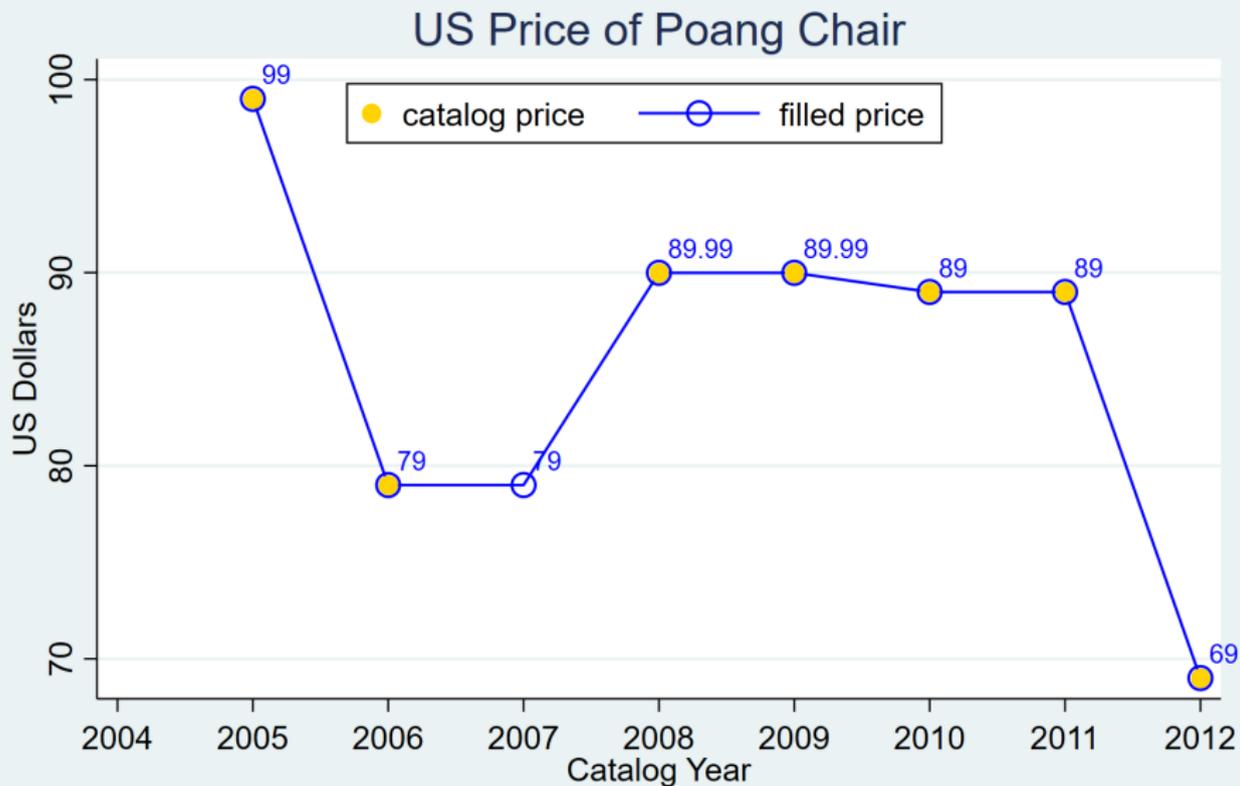
"Charm Pricing"

- Marketing research has shown that customers are influenced by prices that end in the digit "9", believing that these prices are especially low or attractive

- IKEA used this form of "charm pricing" extensively in some countries

- The use of "9" as the last digit is most common in the US (75%) and Canada (69%), and least common in the UK, Sweden and France (about 48% in each of these countries).

- It is also common in Japan

限定コレクション

UPPFYLLD ウップフィルド
果物ナイフ3本セット

¥**799**

New

TABBERAS タッベラス
ナイフ＆ピーラー

¥**799**

Types of Price Changes

- Previous work distinguishes between "small" price changes, usually because of a temporary sale, and "regular" price changes that are not meant to be temporary.

- IKEA did not have "sales", but IKEA did experiment extensively with "charm pricing", where prices ending in the digit "9" were used to entice buyers

- **Penny price change:** A price change less than 1 currency unit, mainly because of experiments with "charm pricing"

- **Regular price change:** All other price changes

Type of Price Changes

Country	Regular	Penny	Total
Canada	83%	17%	100%
Germany	72%	28%	100%
France	75%	25%	100%
Italy	64%	36%	100%
Sweden	100%	0%	100%
UK	71%	29%	100%
US	88%	12%	100%
Average	**78%**	**22%**	**100%**

Overview

Price Setting Behavior

- IKEA did not change prices every year, even though they print a new catalog every year

- **About 70% of possible price changes (the good is in the catalog two years in a row) are equal to zero**

- Firms don't always change prices when they have the opportunity to do so because of a "menu cost" or some other force that makes changing prices costly to the firm

- By observing how often prices change, under what circumstances they change, and the size of the change, we can learn about the size of these costs

Price Changes Happen Infrequently

Distribution of Age of Prices by Product Lifetime
X-axis: Number of Years the Product Existed
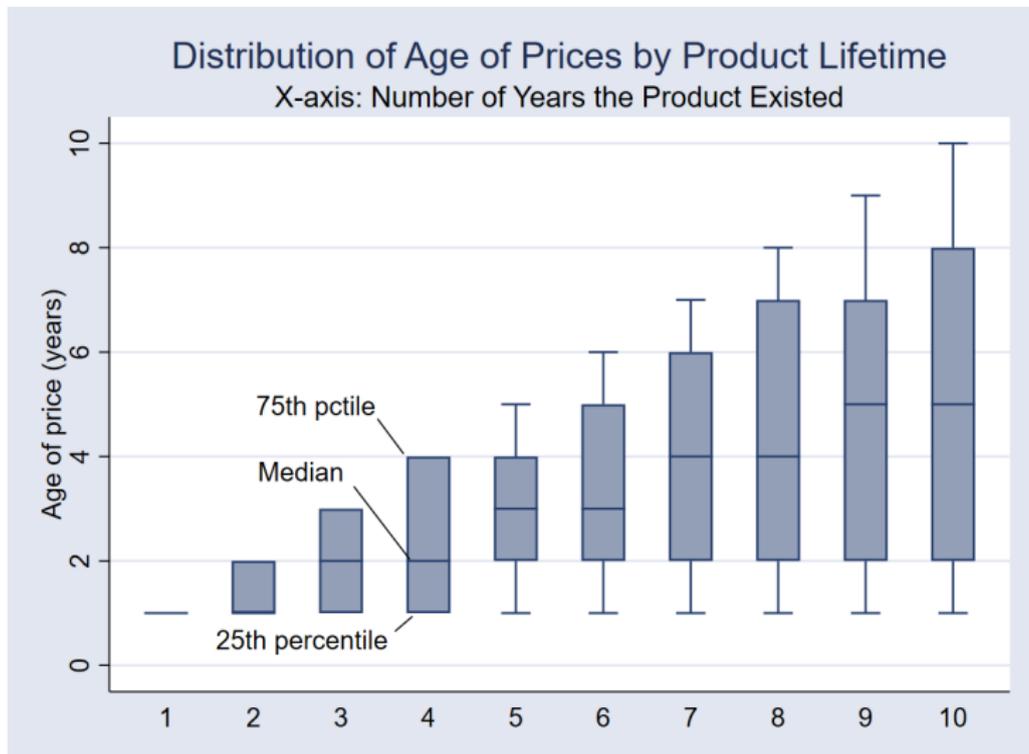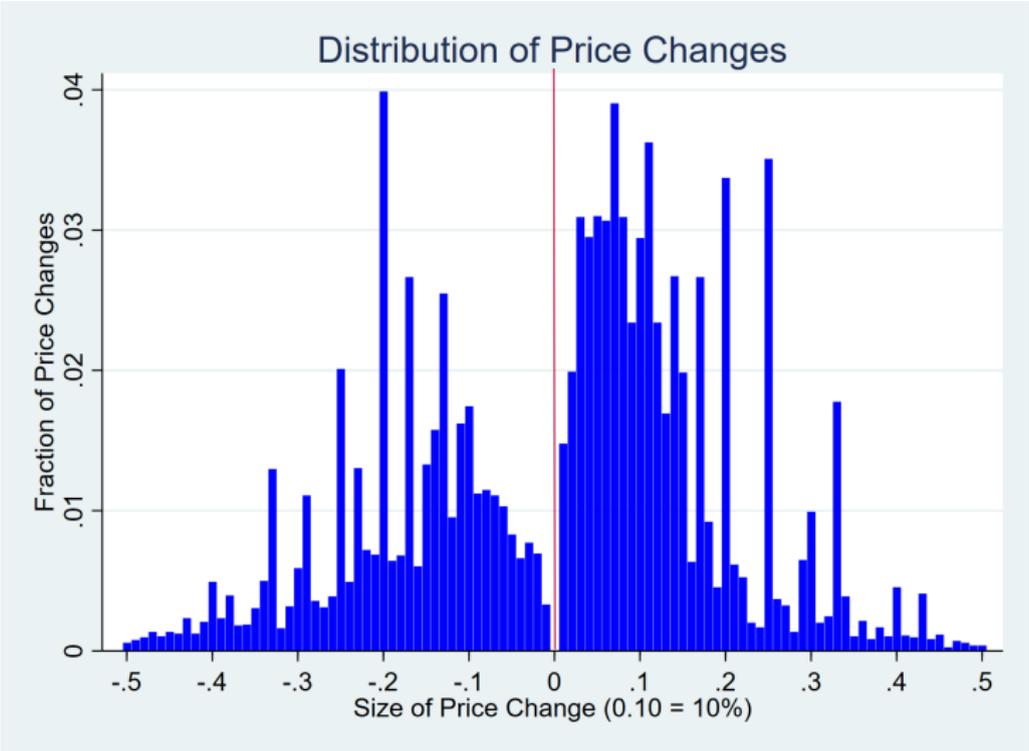
Distribution of Price Changes

	Fraction	Size: Mean	Size: Median
Zero price change	70%	0%	0%
Positive price change	19%	17%	11%
Negative price change	12%	-19%	-17%

- Price increases are more frequent and larger in absolute value than price decreases
- But IKEA's advertising draws attention to
  - Goods that have the same price as last year
  - Goods with lower prices than last year: "New Low Price!"

Price Changes: Intensive and Extensive Margins

- The literature on price stickiness and inflation has emphasized the distinction between the extensive margin and intensive margin for price changes.

- Extensive margin: change in the fraction of goods having price changes

- Intensive margin: the same fraction of goods experienced price changes, but the average size of the price change changes

- Different models of price-setting have different implications for the predicted importance of intensive vs. extensive margins

- Klenow and Kryvtsov (2008) find that the variance of US CPI inflation is due mainly to variation along the intensive margin

- IKEA 'country level inflation' is also mostly due to changes on the intensive margin but with a more significant covariance term

Price change decomposition

- Let π_{ct} denote the annual inflation rate of an IKEA price in country c in year t (suppressing the subscript for the particular good).

- Write π_{ct} as the product of the average size of the price change, sz_{ct} and the fraction of goods changing price, fr_{ct}:

$$\pi_{ct} = sz_{ct} \cdot fr_{ct}.$$

- A second-order approximation yields

$$var(\pi_{ct}) = var(sz_{ct})\overline{fr_c}^2 + var(fr_{ct})\overline{sz_c}^2 + 2\overline{fr_c}\,\overline{sz_c}\,cov(fr_{ct}, sz_{ct}) + O_{ct}$$

where $\overline{fr_c}$ denotes the sample mean of fr_{ct}, $\overline{sz_c}$ denotes the sample mean of sz_{ct} and O_{ct} denotes higher-order terms.

Price change decomposition, continued

Klenow and Kryvtsov (2008) define intensive margin (IM) and extensive margin (EM) components as follows:

$$IM = var(sz_{ct})\overline{\overline{fr_c}}^2$$
$$EM = var(fr_{ct})\overline{\overline{sz_c}}^2 + 2\overline{\overline{fr_c}}\,\overline{sz_c}\,cov(fr_{ct}, sz_{ct}) + O_{ct}.$$

This decomposition allocates the covariance term to the extensive margin component, which is unimportant in the Klenow and Kryvstov (2008) data where the covariance term is very small and the intensive margin component accounts for over 90% of the variance of inflation.

Intensive and Extensive Margins

	Corr. w/IKEA inflation		
	Intensive	Extensive	Corr(IM,EM)
Canada	0.94	0.80	0.67
France	0.96	0.85	0.73
Germany	0.94	0.78	0.61
Italy	0.95	-0.20	-0.02
Sweden	0.96	0.75	0.58
UK	0.96	0.71	0.61
US	0.98	0.83	0.80

Variance Decomposition of IKEA Inflation

	Share of inflation variance explained by			
	IM	EM	Corr(IM,EM)	O
Canada	0.74	0.01	0.14	0.11
France	0.78	0.02	0.16	0.04
Germany	1.02	0.04	0.24	-0.30
Italy	0.74	0.03	0.01	0.23
Sweden	0.74	0.00	0.04	0.22
UK	0.62	0.05	0.23	0.10
US	0.74	0.04	0.28	-0.06

Intensive Margin: Non-Zero Regular Price Changes

Age of Price (years)	Price Change mean	s.d.	N
2	0.29%	11.39%	25,162
3	1.02%	12.42%	13,066
4	1.47%	12.80%	7,867
5	1.22%	12.40%	4,417
6	1.27%	15.41%	2,798
7	0.24%	14.67%	1,528
8	3.36%	24.35%	658
9	3.09%	22.49%	347
10	2.15%	20.90%	197

The Hazard Rate

The hazard rate—the probability of a price change conditional on the price being unchanged for N years – appears to be independent of N. Estimation results below show that the age of the price has a small but significant effect on the probability of a price change.

Hazard Rate
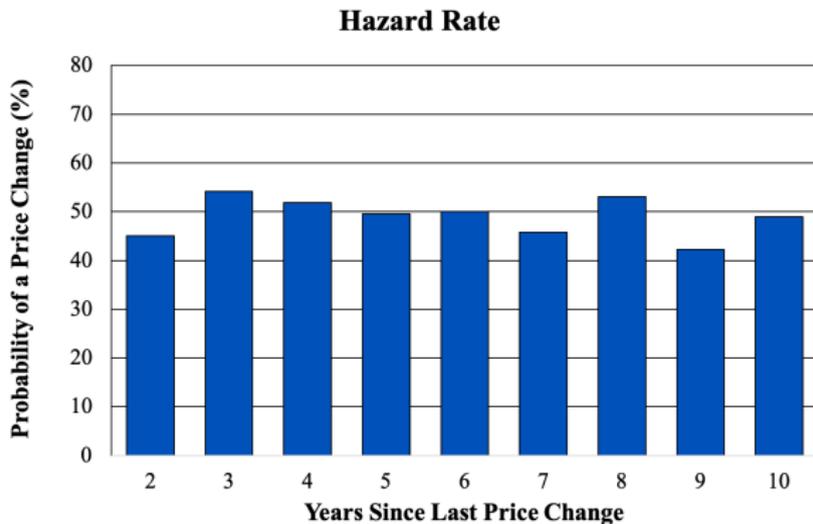
Facts about Prices	IKEA	Prior Literature
Frequent price changes (every 7 months)	**NO**	Yes
Large average absolute price changes (10%+)	Yes	Yes
Many small price changes	Yes	Yes
Price incr. smaller & more frequent than decr.	Yes	Yes
Variable price durations	Yes	Yes
Flat hazard rates	Yes	Yes
Size of price changes does not increase with duration	Yes	Yes
Intensive margin dominates the variance of inflation	Yes	Yes

Overview

Coordination of Price Changes

- We can learn about the costs of changing prices by observing whether firms selling many products choose to change the prices of many goods at the same time. That is: are price changes *coordinated*?

- If price changes are coordinated, and especially if there are many small price changes, this suggests the presence of **economies of scope** in price setting: changing one price makes it less costly to change other prices

- Why would this be true? Information costs; attention costs; time and effort to calculate the optimal level of a new price

Evidence on Economies of Scope

Several papers find evidence on economies of scope operating at the level of the firm: coordinated price changes within firms is much higher than coordination across firms. Two examples are:

- Midrigan (2011) suggests that economies of scope can explain the presence of many small price changes in a US supermarket chain
- Dedola et al. (2021) study individual product prices for multi-product Danish firms. They find evidence of coordination of price changes within firms, but not across firms in the same industry.

Price Coordination for IKEA

- Following Dedola et al. (2021), estimate a probit with dependent variable = 1 if the good's price increased (decreased) in a given country, year, and family

- Significant within-year coordination of price changes in a country

- When adding family-level variables, within-country coordination is significant at the family level, but the overall country variable becomes insignificant

- Rest-of-the-world (ROW) price changes at the country or family level are not significant

- Results are consistent with the spirit of Dedola et al. (2021) who found coordination of price changes within a firm but not across firms in the same industry

Probit: Coordination of Price Increases

	(1)	(2)	(3)
Inflation (lagged)	−0.39	−0.35	−0.68
	(0.32)	(0.25)	(0.53)
Age of price (years)	0.04***	0.04***	0.04***
	(0.00)	(0.00)	(0.00)
Fraction incr. in c, y	0.39***	0.06*	0.05*
	(0.04)	(0.03)	(0.02)
Fraction incr. in family, c, y		0.36***	0.36***
		(0.01)	(0.00)
Price increases in ROW, y			0.09
			(0.06)
Fraction incr. in family, ROW, y			−0.01
			(0.01)
Observations	74113	63370	63178

Marginal effects evaluated at variables' means.
Includes country dummies. SE's in parentheses, clustered at country level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Probit: Coordination of Price Decreases

	(1)	(2)	(3)
Inflation (lagged)	0.17	−0.06	−0.05
	(0.11)	(0.16)	(0.16)
Age of price (years)	0.03***	0.03***	0.03***
	(0.00)	(0.00)	(0.00)
Fraction decr. in c, y	0.48***	0.10***	0.08*
	(0.03)	(0.02)	(0.04)
Fraction decr. in family, c, y		0.26***	0.26***
		(0.00)	(0.00)
Fraction decr. in ROW, y			0.04
			(0.08)
Fraction decr. in family, ROW, y			−0.03**
			(0.01)
Observations	74113	63370	63178

Marginal effects evaluated at variables' means.
Includes country dummies. SE's in parentheses, clustered at country level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Overview

Do Exchange Rates Affect IKEA Prices?

- IKEA goods are produced in several steps that can take place in several different countries
- Workers at each stage of production must be paid in their home country currency
- The cost of material inputs that cross borders can be affected by changes in the exchange rate
- The finished goods are shipped from the final production location to stores around the world, where local "distribution services" are incurred in the local currency, and goods prices are set in the home currency of the customer
- The exchange rate should affect the local currency price in the store because the cost of the physical good was paid in in the currency of the production location

Estimating Exchange-Rate Pass-Through

- The IKEA store combines the goods with retail services and sells the goods to the consumer
- The cost of good i at the border (the price to the local IKEA store of the good when it arrives in the country, but before being put into the store) at date t is denoted P_{ict}^{border} and is measured in Euros
- The country-c local currency price of this good at the border is then $E_{ct}P_{ict}^{border}$ where E_{ct} is the exchange rate expressed as local currency units per Euro.
- The share of retail services in the overall cost of delivering the good is given by ρ
- The local currency price of distribution services is D_{ct}

The Pricing Equation

The cost to IKEA of selling good i in country c at time t is

$$COST_{ict} = \left(E_{ct} P_{ict}^{border}\right)^{(1-\rho)} \left(D_{ct}\right)^{\rho}$$

IKEA may add a markup over cost equal to Γ_{ict}, in order to earn some profit from selling the good.

The in-store price of the good is:

$$P_{ict} = \left(E_{ct} P_{ict}^{border}\right)^{(1-\rho)} \left(D_{ct}\right)^{\rho} \Gamma_{ict}$$

Notice that this becomes the Law of One Price if there are no distribution services: $\rho = 0$, and if there is no markup.

To turn the price equation into a linear form that we can estimate using regression methods, take the log difference of both sides:

$$\Delta p_{ict}^{retail} \equiv ln(P_{ict}^{retail}) - ln(P_{ic,(t-1)}^{retail})$$

Then we have:

$$\Delta p_{ict}^{retail} = (1 - \rho) \left(\Delta e_{ct} + \Delta p_{ict}^{border} \right) + \rho \Delta d_{ict} + \Delta \gamma_{ict}.$$

Estimating Exchange-Rate Pass-Through

We have data on the retail price and the exchange rate, and the local price level will be used as our measure of local distribution costs. We do not observe the border price or the markup. Rearrange the passthrough equation as follows:

$$\Delta p_{ict}^{retail} = (1-\rho)\Delta e_{ct} + \rho \Delta d_{ict} + \left[(1-\rho)\Delta p_{ict}^{border} + \Delta \gamma_{ict}\right].$$

The change in the border price would be the same for all countries except for the different costs of shipping to different countries, since each good, with few exceptions, is made in the same location in the world. So the change in the border price would be approximately the same for all countries, except for changes in relative shipping costs. Most of the variation in the last term will be coming from changes in the markup.

Estimating Exchange-Rate Pass-Through

The ERPT estimating equation includes country fixed effects, Ψ_i, that capture each country's average change in markup and shipping costs.

$$\Delta p_{ict}^{retail} = \Psi_i + (1 - \rho)\Delta e_{ct} + \rho \Delta d_{ict} + u_{ict}$$

The error term u_{ict} captures good-level changes in factory prices and deviations from country-level average markups.

Results from Pass-Through Regressions

	Dependent variable: price change (t)
Inflation (t-1)	1.025***	0.990***	0.951***	0.955***	0.954***
(Std. Error)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Depreciation (t-1)	0.078***	0.071***	0.076***	0.077***	0.077***
(Std. Error)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Fixed Effects					
Country		Y	Y	Y	Y
Age			Y	Y	Y
Price decile				Y	Y
Variety					Y
Adjusted R^2 (%)	0.9	1.2	1.5	1.7	1.7
Observations	56,067	56,067	56,067	56,067	56,067

Approximately Zero Exchange-Rate Pass-Through

- The coefficient on the change in the exchange rate –the amount of exchange-rate pass-through –was expected to be equal to $\rho \approx 0.33$, the share of the physical good in the total cost of providing the good to the consumer. But the estimate is only about $0.07 - 0.08$.
- This result is consistent with many previous studies on exchange-rate pass-through
- Firms choose not to pass on changes in costs coming from the exchange rate to customers
- Firms may be worried about keeping their prices in line with competitors, or may be worried about upsetting their customers

Almost 100% Pass-Through of Local Inflation

- The expected coefficient was $\rho \approx 0.67$, but the estimates are all close to 1.00, meaning that 100% of local inflation is passed through into IKEA prices in that country

- This is also consistent with many previous studies that find high pass-through of local inflation to prices, especially when local costs are a substantial fraction of the overall cost of delivering the good

- It can also reflect the firm's focus on the costs of local competitors, whose prices will probably change with the level of local inflation

Anticipating VAT Changes

IKEA looks ahead two years and raises prices before the VAT change so it can lower them later!

- Three countries increased their Value-Added-Tax rates during the sample period

- In each case, it was known at least two years in advance that the VAT increase was coming.

- IKEA raised prices in the two years ahead of the VAT increase, but decreased prices in the year the VAT increase took place

- This allowed IKEA to advertise lower VAT-inclusive prices when the VAT rose!

Value-Added Tax Rates

	France	Germany	Italy	US	Canada	UK	Sweden
			Country specific VAT across years				
2005	.196	.16	.20	0	0	.175	.25
2006	.196	.16	.20	0	0	.175	.25
2007	.196	.16	.20	0	0	.175	.25
2008	.196	.19	.20	0	0	.175	.25
2009	.196	.19	.20	0	0	.175	.25
2010	.196	.19	.20	0	0	.175	.25
2011	.196	.19	.20	0	0	.175	.25
2012	.196	.19	.21	0	0	.200	.25
2013	.196	.19	.21	0	0	.200	.25
2014	.196	.19	.22	0	0	.200	.25

Pass-through with VAT Changes

	(1)	(2)	(3)	(4)
	Dependent Variable: Price Change (t)			
Inflation (t-1)	1.025	1.028	0.992	1.144
	(0.06)	(0.06)	(0.06)	(0.08)
Depreciation (t-1)	0.078	0.076	0.075	0.099
	(0.01)	-0.01	(0.01)	(0.01)
VAT Change (t)		-0.515	-0.496	-0.572
		(0.14)	(0.14)	(0.20)
VAT Change (t-1)			1.145	0.708
			(0.14)	(0.20)
VAT Change (t-2)				1.340
				(0.19)
Observations	56,067	56,067	56,067	30,903
Adjusted R-squared	0.009	0.009	0.011	0.014

Overview

Summary and Conclusion

- The IKEA catalogs formed the foundation for a new data set allowing the analysis of transactions prices for precisely defined goods across countries and over time

- The analysis shows that IKEA is truthful in advertising its extraordinary commitment to unchanging prices

- Prices last an average of half the lifetime of the product, compared with just a few months for prices analyzed in previous studies

- IKEA advertises reductions in price but actually increases more prices than it decreases, just by a smaller average amount

Summary and Conclusion

- Overall, the "price facts" for IKEA are similar to the facts for other studies of prices, except for the extremely long time that IKEA prices remained unchanged

- IKEA focuses its focus pricing strategy at the country level: there is little cross-country coordination in price changes despite the fact that most IKEA goods are produced in a single location and shipped worldwide

- Exchange-rate pass-through is approximately zero – much lower than predicted, even with an important role for distribution services.

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