IKEA: Product, Pricing, and Pass-Through

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September 2010

Abstract

The multinational retailer IKEA represents a natural laboratory for studying international pricing and product cycle behavior. With 314 stores in 38 countries, IKEA is a major international presence in retail housewares and furnishings. IKEA is unique among homegoods retailers in its publication of annual catalog of prices guaranteed to hold for 1 year. This paper examines international pricing decisions of this multi-good, vertically-integrated producer using a newly created dataset of IKEA catalog prices. We provide new evidence on (i) product creation and destruction; (ii) the distribution of price changes; (iii) deviations from the law of one price; and (iv) exchange-rate pass-through.

The multinational retailer IKEA represents a natural laboratory for studying international pricing and product cycle behavior. With 314 stores in 38 countries, IKEA is a major international presence in retail housewares and furnishings. IKEA is unique among homegoods retailers in its publication of annual catalog. IKEA promises that the prices will hold for the entire catalog year. Individual goods can appear in more than one country and for more than one year. Until very recently, sales (temporary discounts) were rare in IKEA stores. Sales are still infrequent and tend to cover a small number of items. Thus, the catalog prices are extremely good measures of transactions prices. Further, the catalog describes each good in enough detail that we can determine whether a good that appears in different years or different countries is truly identical. Thus, we can track the pattern of product creation and product destruction across countries and over time.

This paper studies a newly constructed dataset containing catalog prices for every good in six countries' catalogs from 1994-2010. This dataset was constructed via professional data entry directly from the catalogs, and the prices and catalog descriptions were carefully checked for errors.[1] The six countries are Germany, France, Sweden, UK, US, and Canada–IKEA's four largest markets, its home country, plus Canada. Overall, these countries represent about 60% of annual sales. The dataset is uniquely poised to shed light on the way in which a large multinational retailer sets prices in multiple markets. IKEA sets prices in local currencies for a year in advance. Because prices are set for all countries at once, and because IKEA has a significant market share in both the input and output markets, IKEA may not wish choose to set a single exchange-rate-adjusted price in all markets. Departures from the law of one price (pricing to market) may be deliberate, resulting from profit-maximizing behavior by the parent company. Because IKEA is a privately-held company, owned by a Swedish individual (family), decisionmaking is highly centralized. However, even if the company's intention was to adhere to the law of one price, departures from the law of one price will occur as a result of exchange rate fluctuations.

The structure of the paper is as follows. Section 1 describes the history of the company, its spectacular growth, and its still-growing presence in international markets. Section 2 looks at product creation and destruction, over time and across countries. We focus on documenting the changing product mix across catalogs and the extent

[1] The data include a description of each item, its page number, name, dimensions (height, width, depth), number of items included (e.g., 2 towels), and the category of good. The dataset presently contains about 105,000 observations (a single good in a particular country and year). The price data were checked by computing deviations from the mean price within and across years. Over 2000 observations were checked against the original catalogs; fewer than 2% of the entries contained errors. More detail on the data entry and data checking procedure will be provided in a separate data appendix.

to which product creating and destruction are sensitive to the business cycle. In Section 3, we document the behavior of price changes. Specifically, we look at the extent to which price changes are coordinated across countries, and provide evidence on the fraction of price increases/decreases as well as their average magnitude. Section 4 studies the deviations from the law of one price, within and across countries. We investigate whether these deviations are related to the newness of the good or the size of the good's price. Intuitively, pricing may be targeted more carefully to achieve the law of one price when a good is new or when a good is expensive. We explore whether these predictions are borne out in the data. Section 5 estimates exchange-rate pass-through behavior in the catalog prices. Using a specification that allows for variation in costs and markups, we document the close relationship between goods' prices across countries but the very low estimated pass-through. We also determine whether catalog prices changes react to, and/or predict, exchange rate changes. Section 6 concludes.

1 The IKEA phenomenon

Ingvar Kamprad, the founder of IKEA, was born in 1926. Forbes estimates that he is the 11th wealthiest person in the world.[2] Kamprad began retailing at about 5 years of age, according to popular accounts: [3]

> "Kamprad was born in the south of Sweden in 1926 and raised on a farm called Elmtaryd, near the small village of Agunnaryd. At an early age, he learned that he could buy matches in bulk from Stockholm and sell them at a fair price, but a good profit. He reinvested his profits and expanded to fish, seeds, Christmas tree decorations, and pens and pencils. At age 17, Kamprad's father gave him a nice reward for doing well in school. What did he spend it on? He founded IKEA.
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> "The name IKEA was formed from Kamprad's initials (I.K.) plus the first letters of Elmtaryd and Agunnaryd, the farm and village where he grew up. He continued to expand his business to a variety of goods, including wallets, watches, jewelry and stockings. When he outgrew his ability to call on his customers individually, he converted to a sort of makeshift mail order operation, hiring the local milk van to make his deliveries. In 1947, Kamprad introduced furniture into the IKEA product line. The use of local manufacturers allowed him to keep his costs down.

[2]The World's Billionaires 2009 – #5 Ingvar Kamprad". Forbes. 2010-03-11. http://www.forbes.com/lists/2010/10/billionaires-2010_The-Worlds-Billionaires_Rank.html.

[3]http://entrepreneurs.about.com/cs/famousentrepreneur/p/ingvarkamprad.htm

The furniture was a hit, and in 1951, Kamprad decided to discontinue all other product lines and focus on furniture. In 1953, the first IKEA showroom opened. It came about because of competitive pressures. IKEA was in a price war with its main competitor. The showroom allowed people to see it, touch it, feel it, and be sure of the quality before buying.

"IKEA has now become known worldwide for its innovative and stylish designs. Almost all IKEA products are designed to for flat packaging, which reduces shipping costs, minimizes transport damage, increases store inventory capacity, and makes it easier for customers to take the furniture home themselves, rather than needing delivery. But the original reason for it was competitive pressure from IKEA's competitors to their suppliers, who actually boycotted IKEA, forcing IKEA to do it themselves."

Sales growth

According to Deloitte, et al. (2010), IKEA was the 30th largest retailer in the world in 2008. IKEA is listed as the fourth-largest firm in the sector 'Hardlines & Leisure Goods' (page G26), behind Home Depot, Lowe's, and Best Buy.[4] IKEA sales have quintupled since 1995, with 2009 sales of 21.5 billion Euros.[5] The top 5 countries, in terms of total sales, are Germany (16%), US (11%), France (10%), UK (7%), and Italy (7%). More broadly, IKEA reports that 80% of 2009 sales were in Europe, followed by North America (15%) and Asia/Australia (5%). It is somewhat surprising that IKEA does not have a larger presence in Asia. IKEA opened its first store in Japan in 1974–two years before Canada, and 11 years before entry into the US. However, IKEA did not fare well in Japan. According to Business Week (November 14, 2005), "A foray into Japan 30 years ago was a disaster (the Japanese wanted high quality and great materials, not low price and particle board)." IKEA closed its Japanese stores in 1986. In 2006, IKEA returned to Japan, with five stores at last count.

Product sourcing

In 2009, IKEA purchased inputs from 1,220 suppliers in 55 countries. IKEA's main product is furniture, thus, wood products are its most important non-labor input. Currently, IKEA is the third-largest purchaser of wood products in the world, behind Home Depot and Lowe's. In 2009, the top 5 country sources of inputs were China (20%), Poland (18%), Italy (8%), Germany (6%), and Sweden (5%).

[4] According to Deloitte, et al. (2010), Home Depot had 2008 fiscal-year sales of about $71 billion, the figure for Lowe's was 48 billion. IKEA's 2008 worldwide sales total, in dollars, was about $38 billion.

[5] IKEA: Facts and Figures, various annual reports, from www.ikea.com.

Regionally, 67% of inputs are sourced in Europe, 30% in Asia, and 3% in North America. IKEA has reportedly pursued aggressive and creative sourcing strategies, showing great flexibility in changing locations of product sourcing in response to changes in the size of the product market (IKEA simply outgrew the ability of Sweden to handle its requirements for wood products) and changes in relative attractiveness and ability of alternative locations to meet IKEA's needs. A case study by Hultman, et al. (2009) illustrates this nicely through the study of how sourcing of materials for one particular product evolved over time as the size of the market grew, local business conditions changed in China, and technology was transferred from the initial production location in Sweden to other countries.

Corporate structure

In 1982, partly in response to high Swedish tax rates, Kamprad set up an intricate and unusual corporate structure.[6] The Economist (2006), published an article outlining IKEA's legal structure and critiquing its behavior as a registered charitable foundation devoted to furthering interior design. According to the article:

> "Although IKEA is one of Sweden's best-known exports, it has not in a strict legal sense been Swedish since the early 1980s. ...The parent for all IKEA companies—the operator of 207 of the 235 worldwide IKEA stores—is Ingka Holding, a private Dutch-registered company. Ingka Holding, in turn, belongs entirely to Stichting Ingka Foundation. This is a Dutch-registered, tax-exempt, non-profit-making legal entity, which was given the shares of Mr. Kamprad in 1982. Stichtingen, or foundations, are the most common form of not-for-profit organisation in the Netherlands; tens of thousands of them are registered....Although Mr. Kamprad has given up ownership of IKEA, the stichting means that his control over the group is absolutely secure. A five-person executive committee, chaired by Mr. Kamprad, runs the foundation. This committee appoints the boards of Ingka Holding, approves any changes to the company's statutes, and has preemption rights on new share issues....Yet, though control over IKEA is locked up, the money is not. Mr. Kamprad left a trapdoor for getting funds out of the business, even if its ownership and control cannot change. The IKEA trademark and concept is owned by Inter IKEA Systems, another private Dutch company, but not part of the Ingka Holding group. Its parent company is Inter IKEA Holding,

[6] In 1982, according to OECD Tax Policy Studies 16: Fundamental Reform of Corporate Income Tax, the corporate income tax rate in Sweden in 1982 was about 65%. The statutory tax rate on dividends was 50%.

registered in Luxembourg. This, in turn, belongs to an identically named company in the Netherlands Antilles, run by a trust company in Curaçao. Although the beneficial owners remain hidden from view—IKEA refuses to identify them—they are almost certain to be members of the Kamprad family."

Although IKEA was founded in Sweden by a Swedish citizen, IKEA is arguably no longer Swedish. Nevertheless, IKEA seems to encourage people to believe that it is Swedish, with its prominent blue-and-yellow stores and frequent references to Swedish values and design. The previously-quoted study by Deloitte, et al. lists IKEA as a Swedish company. One important part of the IKEA empire, Swedwood Inc, is based in Ängelholm, Sweden. Swedwood responsible for all aspects of sourcing, production, and distribution of IKEA's wood furniture. Much of the design work is still done in Sweden. Most, if not all, of the members of the board that oversee IKEA are Swedish (the board currently includes Kamprad, his wife, and 3 other members). Thus, in an important sense, IKEA is still Swedish.

2 Product creation and destruction

This dataset provides a unique window into a single firm's decisions to introduce goods and to remove them from the market. Since IKEA has stores in many countries, there is also a decision to be made regarding the pattern of good diffusion. Should a good be introduced into one or two countries, and then offered in more countries if it is successful? Or, should the good be launched in all countries at once? The data also provide insight into IKEA's perspective on the character of the global marketplace. Specifically, we investigate whether goods appear in clusters of countries. For example, there may be a large number of goods present in the North American catalogs, but not the European catalogs. In this section, we describe our findings on each of these questions. We also relate our findings to those of prior researchers who have studied the temporal pattern of product creation and destruction.

2.1 Catalog characteristics: number of goods by year and country

Figure 2-1 shows the number of distinct goods present in the catalogs of each of the countries in our sample. In the early part of the sample, the European countries (Sweden, France, Germany, and UK) showed very similar fluctuations in the number of goods present in their catalogs. In 1994, these countries had nearly 1200 goods in each of their catalogs, but this number fell below 1000 in 1996. The number of

goods in the European catalogs continued to rise and fall together, although with an upward trend. With the onset of the recent recession, the number of goods in every catalog fell dramatically. Between the 2008 catalog and the 2010 catalog, the number of goods in European catalogs fell by 21%.

The US and Canadian catalogs show a time pattern quite distinct from that of the European countries. At the beginning of our sample, the US and Canada had many fewer goods in their catalogs than did the European countries–about 600 goods in 1995 for the US and Canada, compared with about 1150 for Europe. Over time, the number of goods available in the US and Canadian catalogs grew sharply, although not always in a synchronized fashion. This contrasts with the European countries, for which the fluctuations in the number of catalog goods moved together. By 2008, the North American catalogs had about 1200 goods, compared with 1350 for the European countries. North American was definitely catching up to the Europeans in terms of the number of goods available. However, the onset of the recession affected the US and Canada in exactly the same way as it did the European countries: the number of goods available in the catalogs fell dramatically.

From looking at Figure 2-1, it would seem that the number of distinct goods available from IKEA probably did not change much over the sample period, until the onset of the recent recession. By a "distinct" good we mean single product, counted only once even though it may be offered in more than one country. In Figure 2-1, we count each good once each time it appears in a catalog. In Figure 2-2, we show the behavior of the number of distinct goods offered in all catalogs. We also show the number of goods per country for reference purposes (the same information shown in Figure 2-1). We find that the number of distinct goods displays a mild downward trend over the sample period. The number of goods offered declined by 24 percent from 1994 to 2010. The trend is not a smooth one–there are temporary increases in 1996, 1999-2003, and 2005-2008. There are two sharp declines in 2005 and 2008-2010. At the same time that the number of distinct goods was falling, however, the number of goods offered in each catalog was rising, especially in the North American catalogs. These two facts, taken together, imply that the number of goods common across countries rose during the sample period. We take a more detailed look at this in the next sub-section.

2.2 Globalization of product distribution

The findings of the prior sub-section suggested an increase in a particular type of globalization: it appears that IKEA has been introducing goods into a wider group of countries over time. In this sub-section, we directly examine the number of countries' catalogs into which a good is first launched. The top panel of Table 2-1

shows the number of individual goods that were offered in only one country's catalog. We provide figures for the first year of our sample, the middle year, and the last year. Overall, few goods are offered in just one country. In the European countries, the number of single-country goods has been falling over time, while the opposite is true for the US and Canada. The two trends offset each other: in 2010, about 11% of goods were offered in just one country, compared with 16% in 1994.

Panel B presents evidence for the main clusters of countries in which goods are offered. The US and Canada formed a separate block at the beginning of the sample, with 10% of goods offered in just these two countries. By the 2010 catalog year, only 2% of goods were in just these two catalogs. A large number of goods, 26%, were offered in the cluster of European countries at the beginning of the sample but at the end of the sample only 4% were offered just within this group. Most dramatically, the number of goods offered in all countries in our sample almost quadruple over the sample period, from 13% to 51%, although the number of available goods remained roughly constant.

2.3 Product creation and product destruction

The pattern of product placement across countries was examined in the last section. In this section, we shift our focus to the pattern of product creation and destruction. For this purpose, we define four mutually exclusive age categories to which a good might belong. The age categories are defined at the level of distinct goods, not by country. First, a good may be created, where "created" means that the good has never appeared in any previous IKEA catalog in any country. There are two possible future outcomes for a good that is created in the current year**.** The good may, or may not, appear in a future catalog. Thus there are two age categories for new goods: "created/destroyed" for goods that are both created in the current year and which exit all catalogs after this year, and "created/continue" for goods that are created in the current year and will appear in future catalog (the future does not necessarily mean in the next year). There are similarly two categories for goods that are not created in the present year's catalog. These are called 'continuing' goods. Among continuing goods, some will exit in the present year, and some will continue into some future catalogs. Thus the categories for continuing goods are: "continued/destroyed" and "continued/continued."

Figure 2-3 presents information on the number of goods in each of the four age categories. This graph shows strikingly that the largest single category consists of "created/destroyed" goods – goods introduced into one or more catalogs for one single catalog year (if present in more than one country's catalog, it is the same year for each catalog). In fact, nearly all of the year-to-year variation in the total number of

goods available is due to fluctuations in the created/destroyed goods. The number of goods in the other categories is quite stable until the recession at the end of the sample period. In 2008, and especially in 2009, we see a decline in the number of "created/continued" goods and an increase in the number of "continued/destroyed" goods. At the same time, the number of "created/destroyed" goods also drops. Clearly, in response to the recession, IKEA contracted the number of goods in its catalogs along all dimensions. The number of new goods decreased while goods already in the catalogs were withdrawn in larger numbers than in previous years.

To generate a clearer picture of the evolution of product creation and destruction, we use data from the four age categories to define two larger groups: created goods and destroyed goods. Created goods are the sum of created/destroyed goods and created/continued goods. Similarly, destroyed goods are the sum of created/destroyed goods and continued/destroyed goods. Note that both categories include created/destroyed goods, and neither includes the continued/continued goods.

Figure 2-4 shows the number of created and destroyed goods over our sample period, along with the total number of distinct goods for reference. This figure shows three distinct sub-periods for the process of product creation and destruction. From 1994-2003, product creation and product destruction fluctuated at around 1400 goods. The year 2004 marks the onset of the second period. Product destruction was much higher in this year and product creation dropped the following year. As a result the total number of distinct goods was sharply lower in 2005. From this point, product creation and destruction both began to increase again, until 2008. The effect of the world recession was first reflected in the 2009 catalog which was distributed in the summer of 2008. The most important change in the 2009 catalog was the low number of created goods–only 1019 new goods in the 2009 catalog compared with 1422 in 2008. This decline of over 400 goods was similar to the decline in 2005. Product destruction was somewhat higher in 2008 than in the prior year (50 goods higher) but by historical standards this was not unusual. Our overall finding, that net product creation is driven by product creation, echoes the finding in Broda and Weinstein (2010). Since 2010 is the last catalog available, we know the extent of product creation in this year, but we do not know anything about product destruction. We find that product creation increased by 3%, but remained among its lowest level in the sample.

We next take a look at product creation and destruction at the level of individual countries. Here, we define goods as being 'created' if they are new in the given country. All other definitions similarly pertain to creation and destruction at the country level. Figure 2-5 graphs product creation and destruction for each country. Figure 2-6 graphs net product creation (creation minus destruction). The six coun-

tries display roughly similar patterns of product creation and destruction over our sample period–with North America following a different trend. The most noticeable event shared by every country is the substantial decline in product creation (and net product creation) in 2009.

These events raise the question of whether product creation and destruction are related to the business cycle. Certainly the dramatic increase in product destruction across all countries in 2009 must be related to the world recession. But there is another recession in our dataset, namely, the recession of 2000-2001 (the European recession began before the US recession, as discussed below). The aggregate IKEA data show no effect of this recession on overall product creation and destruction during this period. The total number of goods available in the 2001 catalog dropped in the UK and the US. However, this seems unlikely to be related to the US or the European recession. For the US, it is doubtful that the US effect was due to concerns about US demand. Recall that the 2001 catalog was distributed in the summer of 2000, well before the US cyclic peak in 2001 and more than a year before the US trough in November 2001. The Euro zone, and Europe more broadly, experienced cyclic downturn earlier than in the US, beginning during the year 2000 yet net product creation were on the rise over this period. Another piece of evidence against the theory that the US experienced business-cycle effects on its catalog is the following. In the summer of 2001, halfway between the US peak and trough, IKEA released the year-2002 catalogs. The US catalog show sharply increased numbers of product creation and total available goods. The onset of the US slowdown seemed not to decrease product creation at all. Overall, we find that the 2000-2001 recession had no effect on product creation and destruction. However, the 2008 recession had very significant effects.

2.4 Catalog pricing

We have seen that IKEA's policy is to turn over a large fraction of its goods every year. Given the high average turnover rate, we explore whether there has been a notable change over time in the price distribution of goods in the catalog. We begin by looking at the local-currency prices for each country. Figure 2-7 shows that there was a downward trend in the mean catalog price in every country until about 2005 or 2006, when this trend began to reverse itself. We have seen that the number of goods in the catalogs decreased sharply in 2009 and 2010. However, the mean price remained roughly constant in every country between 2009 and 2010. Of course, IKEA's focus would be on receipts in Swedish kronor, not the local currency unit. Figure 2-8 shows the mean price measured in kronor. This figure shows even more clearly the decline in the mean catalog price between 1994 and 2005, with subsequent

increases. This figure also shows wide dispersion in the mean kronor price across countries in the early part of the sample period. However, by 2005 the kronor prices had nearly converged. Subsequently, there has been much less dispersion in mean prices. Between 2009 and 2010, IKEA receipt (in kronor) rose from every country.

3 The frequency and timing of price changes

There is much current interest in learning about the frequency and size distribution of price changes for narrowly-defined goods. This information is useful in guiding the construction of aggregative models since it can provide indirect evidence on menu costs and other frictions in the price-setting process. Recent research has provided insight and structure that helps us understand the firm's pricing problem when adjustment is costly.[7]

Our dataset is different in many ways from those used in prior studies.[8] There is a single economic agent setting prices for all goods, and the prices are set in multiple countries at the same time. We are able to match specific, unique goods being sold in different countries as in Burstein and Jaimovich (2009) and Boivin, Clark, and Vincent (2010). The use of catalog prices was earlier implemented by Kashyap (1996) and Haskel and Wolf (2001). Related work using the posted prices of *The Economist* magazine was undertaken by Ghosh and Wolf (1004) and Knetter (1997).[9]

3.1 Fractions of goods with price changes

Computation of price changes is complicated by the fact that prices in the French and German catalogs were quoted in French francs and Deutsche marks, respectively, until 2002. In the 2002 French and German catalogs, prices were presented in both Euros and the local currency units. The Euro price was more prominently featured, appearing in large type with the photo of the good. In the text describing the good, the Euro price was listed in boldface type, while the previous local currency price was listed last in parentheses and not boldfaced. Interestingly, the French franc price

[7] This growing literature includes contributions by Bils and Klenow (2004), Eichenbaum, Rebelo and Jaimovich (2010), Midrigan (2007), Nakamura and Steinsson (2008, 2009), and many others.

[8] Contributions to the study of exchange rates and prices using micro data include contributions by Bhattarai and Schoenle (2009), Broda and Weinstein (2008), Burstein and Jaimovich (2009), Crucini, Telmer, and Zachariades (2005), Crucini and Shintani (2008), Crucini and Telmer (2009), Fitzgerald and Heller (2008), Gopinath and Itskhoki (2008), Gopinath and Rigobon (2008), Gopinath et al. (2010), Imbs, et al. (2005, 2009), Nakamura (2008), Nakamura and Steinsson (2008, 2009) and Schoenle (2009).

[9] There is one price for every store in a given country, so all price variations are due to the "border effect." We thus cannot address questions of within country vs. cross-country price variation.

was in integers, as is typical for prices in IKEA catalogs. The associated Euro price thus was not in integers, but typically was listed with two digits after the decimal. For example, the Granas table base was listed with a Euro price of 90,71€. The associated French franc price was listed as 595F. Apparently, IKEA took pains to keep the French franc prices in the year-2000 catalog in units that would look familiar to French consumers. The reverse decision was made in the case of Germany. In the year-2000 German catalog, the Euro prices are in integers, e.g. €120 (or with a typical form for lower priced goods, e.g., €2.99), while the local currency prices are shown with two digits. From the 2003 catalog onward, both the French and German catalogs present prices in Euros in integers.[10] The adoption of the Euro thus necessarily introduced small price changes in to common-currency prices (e.g., all German prices expressed in Euros throughout the sample) even if IKEA's intention was to keep the price of the good the same through the conversion year. Thus we count a price as unchanged if, in France or Germany over the period 2001-2002, the new price is different from the prior price by more than one Euro. In addition, we do not consider price changes smaller than 0.10 in local currency units. These small changes arise when a price changes from, e.g., $4.99 to $4.95. With this adjustment, we then compute an indicator variable that takes on three values, depending on whether a particular good's price increases, stays the same, or decreases between period t and period $t+1$. This indicator is computed at the level of the individual country. Using the notation presented earlier, where p_{ijt} measures the net-of-vat price of good i in country j in period t, we compute:

$$\begin{aligned}
\Delta_{ijt} &= 1 \text{ if } \frac{P_{ij,t+1}}{P_{ijt}} > 1 \text{ (price increase)} \\
&= 0 \text{ if } \frac{P_{ij,t+1}}{P_{ijt}} = 1 \text{ (no change in price)} \\
&= -1 \text{ if } \frac{P_{ij,t+1}}{P_{ijt}} < 1 \text{ (price decrease)} .
\end{aligned}$$

Table 3-1 presents information on the direction of price changes, by year and by country. Aggregating over all years and countries, we find that 56% of all potential price changes are equal to zero. A potential price change means that a particular good exists in two catalogs in a given country, and that the price does not change between the value in the catalog of year t and the value in the catalog in the next year that the good appears. Thus, in 44% of potential cases, the price does change. Prices decrease in 21% of these cases, and prices increase in 23% of cases. The

[10] The prices of low-price goods are frequently not in integers. As is common in retailing, a good may have trailing digits of .95 or .99, e.g., $4.95 instead of $5.00. Most goods in the catalog, and nearly all higher-price goods, have prices in integers.

top panel of Table 3-1 shows the pattern of price changes over time. This table shows that there were a few unusual years for price changes. In 1995 (i.e., between 1995 and 1996), the number of goods with no price change was only 30%–by far the lowest percentage in our entire sample (over the rest of the sample, 39%-65% of goods had no price change). The year 1995 also had a remarkably large fraction of price increases, 47%. In fact, the fraction of goods with price decreases in 1995 actually fell slightly, meaning that all of the adjustment from the "no change" group occurs in the "increase" group. The fraction of goods with price increases was high in the beginning of the sample period (1994-1996) and again at the end of the sample period (2007-2009). The fraction of goods with price decreases is very low in the last three years of our sample.

Table 3-1, Panel B summarizes the direction of price changes by country, averaging across all years in the sample. We do not see a substantial difference across countries in the mean fractions of goods in each price change category. France has the highest fraction of goods with price decreases (27%), while the US has the lowest percentage (16%). France has the smallest percentage of price increases, (18%), while the UK has the largest (28%).

Table 3-1, Panel C, shows percentages of goods with each direction of price changes, sorted by the number of years that a good remains in a country's catalog.[11] We find that the percentage of goods with price decreases is lower as the good remains in the catalogs for many years. By contrast, there is no clear trend in the percentage of price increases or the percentage of "no change" over the lifetime of goods in the catalog.

3.2 The size of price changes

A key focus of the recent literature on micro-pricing, both at the closed-and open-economy levels, has been on the size of price adjustments. This information is useful in evaluating alternative models of firm pricing behavior. This sub-section reports our findings on the size of catalog price changes in the IKEA catalogs. In the prior sub-section, we learned that 56% of all potential price changes are equal to zero.

To learn about the size of the non-zero price changes, we provide the histograms in Figure 3-1. Panel A uses bin sizes of 5%, while Panel B uses 10%. From Panel A, we see that 14% of all non-zero price changes lie between 0% and 5%, while about 6% of non-zero price changes lie between 0% and -5%. The data shows a similar pattern in Panel B, in which small price increases happen far more frequently than

[11] There are goods that have more than 8 appearances in a country's catalog, but the number of such goods is quite small.

small price decreases. Specifically, 26% of all non-zero price changes are increases of less than 10%, while 13% are decreases of less than 10%. From the shape of the histograms, it is clear that there are many more small price increases than there are small price decreases. The overall fraction of price increases was 23% of the full sample, while price decreases make up 21%.

Figure 3-2 graphs positive price changes overlaid with the absolute value of negative price changes. That is: negative price changes in the interval [-0.05,0) are graphed next to positive price changes in the interval (0,0.05]. In this way, we can more easily compare the relative importance of large vs. small price changes. Here we can see clearly that there are more than twice as many positive price changes less than 5% than there are small negative prices less than 5% in absolute value. In the 5%-10% bin for price changes, there are still many more positive price changes (23% of all non-zero price changes) than negative price changes (15% of all non-zero price changes). When we look at price changes greater than 10% in absolute value, however, the situation reverses. There are 19 percent of negative price changes and 17 percent of positive price changes in the 10%-15% range. For price changes larger than this (in absolute value), the negative price changes outweigh the positive price changes by more than two-to-one in some bins.

Table 3-2 presents detailed information on price changes by country and by year. The table shows mean and median increases and decreases. We find that the mean increase is 17% while the mean decrease is -18%. The median increase (among all price increases) is uniformly smaller than the mean–much smaller for some years and some countries. The median increase is 10% and the median decrease is -16%. This clearly shows the impact of small, positive price changes as shown in the preceding graphs. There is no striking difference across countries or across years in the price change statistics. This suggests that there is not a simple country effect or a year effect explaining the distribution of price changes.

Data on median absolute price changes are shown in Table 3-3. These data are presented for comparison with prior studies of absolute price changes. Klenow and Kryvtsov (2008) report a 13.3% monthly average absolute price change for goods in the CPI. Broda and Weinstein (2010) report a mean quarterly change of 8.8%. In our data, the mean absolute price deviation is stable at around 8 percent across countries and across years–with the exception of the years 1994-1996 where the absolute mean deviation is around 10-12%. The median absolute price change is close to zero for all countries and years. The exceptions are the year 1994-1996. The standard deviations vary across countries. The standard deviation in Germany (computed across goods in all German catalogs) is 39% while the standard deviation in Sweden and in the US is 19 percent. The standard deviations also vary across years. The standard

deviations are relatively high at the beginning (33% in 1994 and 41% in 1995) and at the end (64% in 2009) of the sample period, and lower in the middle–oscillating around 20% between 1996 and 2008.[12] In 2009, IKEA dramatically changed the number of goods in the catalogs. Apparently, this restructuring also increased the dispersion of year-over-year changes in prices of retained goods.

To sum up, we see that price deviations are volatile across countries and years. In the next section, we explore the importance of exchange rates for explaining IKEA's price-setting across countries.

4 The Law of One Price

In this section, we explore whether IKEA pricing adheres to the predictions of the law of one price. As one of the basic international 'parity conditions,' this prediction of the effects of spatial arbitrage has engendered a long and rich literature. IKEA products are typically produced in a single location, e.g., the "LACK" coffee tables would all be produced in and shipped from one country. If transportation costs from this location were identical across countries, if nontraded goods costs (local costs) were also identical, and if pricing were competitive, then the implications of spatial arbitrage would imply that IKEA would endeavor to set identical prices across countries. This section begins with an empirical exploration of this simple version of the law of one price. Later, we relax the assumptions of competitive pricing and no transportation costs.

4.1 Deviations from the law of one price

IKEA publishes prices in local currency units, inclusive of value-added-tax (VAT) in countries that impose this tax. Let $\widetilde{P}_{ijt}$ denote the local currency, inclusive-of-VAT catalog price of good i in country j at date t. The VAT is denoted by τ_{jt}. The VAT varies across countries but not across the catalog goods. We focus on the amount received by IKEA from the sale of product i, i.e., the net-of-VAT price P_{ijt}:

$$P_{ijt} \equiv \widetilde{P}_{ijt}/(1+\tau_{jt})$$

Let E_{jt} denote the exchange rate between country j and Sweden at date t, measured in local currency units per Swedish krona. The simplest form of the law of one price (LOP) states that the exchange-rate adjusted net-of-VAT price is equalized across all

[12] Remember that these are standard deviations of local currency price changes. The exchange rate affects these price changes only indirectly via IKEA's price-setting mechanism.

countries:

$$\frac{P_{ijt}}{E_{jt}} = \frac{P_{ikt}}{E_{kt}} \tag{1}$$

for all countries (j, k) for every good i and date t.

We define the deviation from the law of one price as the log deviation in the given year of each country's exchange-rate-adjusted price from the cross-country mean price. Letting lowercase letters denote natural logarithms, we define $\overline{p}_{it}$ to be the log of the period-t geometric mean price for good i, where N_{it} is the number of catalogs in which good i appears in year t:

$$\overline{p}_{it} = N_{it}^{-1} \sum\nolimits_{j=1}^{N_{it}} \left(p_{ijt} - e_{jt}\right). \tag{2}$$

For good i in country j in period t, the deviation from the law of one price is:

$$d_{ijt} = \left(p_{ijt} - e_{ijt}\right) - \overline{p}_{it}. \tag{3}$$

where e_{jt} is the exchange rate at the time that the catalog prices are determined.[13]

Note that the deviation from the law of one price has mean zero when averaged across all countries for a given good i at time t. However, the mean deviation from the law of one price is not necessarily zero when averaged across all goods in a particular country's catalog. In prior research into the law of one price, researchers have found that some countries tend to be high-price countries and some tend to be low-price countries. This is believed to be related to the prices of nontraded goods (or, equivalently, the level of income) in the particular country.

At date t, there are M_{jt} goods in country j's catalog. The mean law of one price deviation for country j at time t is defined as follows, where all goods in the catalog are weighted equally:

$$\overline{d}_{jt} = M_{jt}^{-1} \sum\nolimits_{j=1}^{M_{jt}} d_{ijt}.$$

Figure 4-1 plots the country-level deviations from the law of one price for each country in the sample over the entire time period. If IKEA strove to adhere to the law of one price, we would expect that the country-level deviations would be uncorrelated over time and would have mean equal to zero. Clearly, this is not what we find. The deviations across countries show wide dispersion and no detectable pattern overall. If we set Canada aside, there is evidence that the deviations are smaller in absolute value from about 2004 onward. The deviations for Canada actually rise over this

[13] We could, alternatively, compute the deviation based on the actual exchange rate in place during the catalog year. It turns out that this makes no important difference. In the last part of section 4, we illustrate this claim by showing that catalog price deviations do not predict exchange rate changes.

period to levels unprecedented in the earlier data. It is natural to wonder if the lack of relationship between these deviations reflects the fact that the overlap in goods across catalogs is not 100%. That is: there are many goods that are not represented in all six catalogs. Figure 4-2 plots the country-level law of one price deviations using only goods that are available in all six catalogs. Strikingly, the pattern of deviations looks nearly exactly the same as in Figure 4-1 which uses all goods.

In both Figures 4-1 and 4-2, Sweden is the low-price country throughout the sample period. That is: Sweden's mean deviation from the law of one price is negative throughout, implying that Sweden's prices are lower than those of other countries. The Swedish deviations from the law of one price were much larger in the earlier part of the sample, averaging about -20% from 1994 to about 2002, but subsequently were in the neighborhood of about -5%. This is unexpected in light of prior research, e.g., the research on Big Mac prices in which Sweden was typically found to be a high price country. Wages and the price of nontraded goods are high in Sweden, and this is thought to explain why Sweden is usually one of the higher-price countries. Here, however, it is the lowest-price country. A first explanation that springs to mind is that transportation costs are lower to Sweden, since IKEA is a Swedish country. For some goods, this is true, but IKEA sources the bulk of its goods in Eastern Europe and in Asia, especially China. The transportation costs from these production locations to Sweden must be at least as high as the transportation costs from these locations to France or Germany. However, we find that the French and German deviations from the law of one price are substantially smaller than Sweden's in nearly every year. The French and German cases are particularly interesting, as the law of one price deviations for these two countries track each other quite closely. The US is the high-price country in the early part of the sample, an honor taken over by Canada toward the end of the sample. If transportation costs were important determinants of deviations from the law of one price, we would expect that these two North American destinations would have similar deviations from the law of one price. However, we do not find any evidence to support this prediction.

4.2 New vs. continuing goods

When a new good is introduced into an IKEA catalog, a price must be assigned to that good. A good that has been present in previous years already has a price, and IKEA must decide whether to change the price. There is thus a basic asymmetry between new and continuing goods. If there is a menu cost of changing prices, the menu cost must be paid for new goods but there is the option of foregoing the menu cost in the case of a continuing good and keeping the good's price unchanged at its previous level. The category "new" contrasts with the category "create" defined in

section 2: A "new" good is a good's first appearance in a country, while a "created" goods is a good's first appearance in the dataset. This sub-section examines the behavior of law of one price deviations for new goods and continuing goods. We are interested in determining whether law of one price deviations are smaller for new goods, as they would be if IKEA were attempting to achieve a single worldwide price when setting prices for new goods.

Figure 4-3 graphs the law of one price deviations for new goods vs. continuing goods for each country. If IKEA is attempting to adhere to the law of one price for new goods, the deviations for new goods will be closer to zero than the deviations for continuing goods. However, there is no clear indication that law of one price deviations tend to be smaller for new goods. For some countries such as Sweden and the UK, the deviations for new goods are smaller (in absolute value) than for continuing goods. Overall, however, the prediction that IKEA attempts to achieve the law of one price for new goods is not well-supported by the data.[14]

Table 4-1 presents summary statistics for the mean and standard deviation of the law of one price deviations for new and continuing goods. This table shows the mean and standard deviations of law of one price deviations over the entire sample period. Here, once we average out year-to-year variation, we do find support for the prediction that deviations are smaller for new goods. In every country, the mean law of one price deviation is smaller for new goods than for continuing goods (in absolute value). Canada, Sweden and the US are high-average-deviation countries (in absolute value), while Germany, France and the UK are low-average-deviation countries. The US is an unusual case, because the mean deviation for new goods is very close to the mean deviation for continuing goods. The standard deviation is also uniformly smaller for new goods than for continuing goods. Surprisingly, however, the standard deviations are quite similar across the high-average-deviation countries and low-average-deviation countries.

4.3 High vs. low-price goods

We know from Section 2 that IKEA changed its mix of products over our sample period, introducing many more low and medium-low priced products in the later period. We therefore break our sample into four price categories, where goods are assigned to price categories based on their real value (net of VAT, deflated using the CPI) in Swedish krona. The price ranges for the categories were chosen so that each category contains roughly 20%-25% of all the goods in a typical catalog. The cutoff values, in year-2000 krona, are as follows: (1) low-price goods, price less than 70 krona

[14] Similar results are obtained if we look at newly created goods only.

(about $10) ; (ii) medium-low price goods, price between 70 and 250 krona ($10-$40) ; (iii) medium-high price goods, price between 250 and 1000 krona ($40-$150); and (iv), high-price goods, price higher than 1000 krona ($150). The reason for studying separate price categories is that a given percentage mis-pricing of high-value goods will have a greater impact on IKEA profits than will the same percentage mis-pricing of low-price goods. On the other hand, if monopolistic pricing concerns are important for setting of IKEA prices, then we could see greater deviations from the law of one price for high-value goods.

Figure 4-4 plots the deviations from the law of one price separately for each price group in each country. This figure shows no evidence that IKEA adheres more closely to the law of one price when pricing high-value goods compared with low-value goods. Overall, there is no evidence of greater adherence to the law of one price for any of the groups. The main finding from this figure, however, is that deviations in all price groups move together within each country.

4.4 Persistence of deviations from the law of one price

A major focus of past research is persistence in the deviations from the law of one price. We therefore investigated the extent to which IKEA price deviations are persistent. Specifically, we estimated univariate autoregressions of price changes in each country. An observation is a price change for a particular product in a particular country's catalog. Thus, this product enters the autoregression only if it is present in the catalog for a sufficient number of years. For example, if we wish to estimate a first-order autoregression in the price changes, the good must be in the catalog for three years. The number of observations available will drop sharply as we increase the order of the autoregression, so we have restricted ourselves to first- and second-order autoregressions.[15] These are estimated for the sample as a whole, and also for each country separately. The results are presented in Table 4-2. The AR(1) coefficients range from 0.62-0.74, while the sum of coefficients in the AR(2) ranges from 0.68 to 0.80. With annual data, this implies a half-life of deviations from the law of one price of about three to four years. The attractive feature of our data is that we do not have product substitution or missing data on prices. We know exactly when a good enters the catalogs and when it leaves. Thus the half-life of deviations from the law of one price is unaffected by bias stemming from either of these considerations. Prior work by Nakamura (2008) and Nakamura and Steinsson (2009) have shown that these considerations can be quite important.

[15] We did estimate an AR(3) for those goods with enough price quotes. The AR(3) coefficient was uniformly insignificant.

5 Exchange-rate pass-through

The simple version of the law of one price described above ignores cross-country differences in transportation costs and local distribution costs. In reality, these factors are likely to be extremely important. An important literature on exchange-rate pass-through has sought to isolate the important determinants of the extent of pass-through. For example, it may be affected by the currency in which the good is invoiced (Goldberg and Hellerstein (2008, 2009), or the type of good being traded (Goldberg and Knetter (1994), Goldberg and Verboven (2001), Kasa (1992), Knetter (1989, 1993, 1995), and Marston (1990)). Exchange-rate pass-through can vary due to deliberate corporate decisions to vary the good's markup, or it can vary due to unexpected movements in the exchange rate in situations in which the good is priced in the consumer's currency as is the case with IKEA's products.

To incorporate these effects, we develop some additional notation. Let C_{it} denote the cost in Swedish kronor of good i in period t.[16] The sum of country-specific transportation costs and local distribution costs is denoted by κ_{ijt}, assumed proportional to price. The country- and good-specific markup is denoted by μ_{ijt}. Thus the net-of-VAT price, expressed in Swedish kronor, is given by:

$$P_{ijt} = C_{it} * (1 + \mu_{ijt}) * (1 + \kappa_{ijt}) * (E_{jt})$$

or, in logs, where $c_{it} = \ln(C_{it})$:

$$p_{ijt} = c_{it} + (\mu_{ijt} + \kappa_{ijt}) + (e_{jt}) \tag{4}$$

The price thus depends on a good-specific component, c_{it}, a component that varies with the good and the country, $(\mu_{ijt} + \kappa_{ijt})$, and a country-specific component,e_{jt}.[17] Since the cost of the good is not directly observable, we can use the price of good i at time t in another location to develop an equation that does not contain the cost term. For this section, we will consider Sweden to be the baseline country against which

[16]Most IKEA goods are produced outside of Sweden, so c_{it} implicitly adjusts for the exchange rate between Sweden (the home country) and the production location.

[17]In principle, variation in p_{ijt} could be decomposed into a country-specific component, a good-specific component, and a component that reflects both country and good-specific influences. This is an idea pursued in prior literature (Marston, Knetter). For example, we could assume that the markup is country- and good-specific but not time-varying (this corresponds to constant demand elasticities, an assumption made by Knetter in his work). The barrier to our implementation of their methodology is is that we have a lot of goods but very few goods that are distributed in many countries even for a small number of periods. Thus the Knetter approach of identifying time and country effects, separately for each good, is not possible. We could estimate time and country effects for all goods as a group, but this seems less interesting than the approach implemented here.

other countries' prices are measured. Since Sweden has the lowest average prices, it must also have the lowest average markup since avereage transportation costs are probably not substantially lower for Sweden. Subtracting the Swedish version of equation (4) from the country-j version, we have

$$p_{ijt} = p_{i,SE,t} + (\mu'_{ijt} + \kappa'_{ijt}) + e_{jt} \tag{5}$$

where $\mu'_{ijt} = \mu_{ijt} - \mu_{i,SE,t}$ and $\kappa'_{ijt} = \kappa_{ijt} - \kappa_{i,SE,t}$.

5.1 Estimating pass-through

We base our estimation of the extent of exchange-rate pass-through on the following version of equation (5), with a separate equation estimated for each country, j:

$$p_{ijt} = \alpha_j + \beta_j p_{i,SE,t} + \gamma_j e_{jt} + \zeta_{ijt} \ . \tag{6}$$

The parameter α_j measures the mean of $(\mu'_{ijt} + \kappa'_{ijt})$. The parameter β_j measures the extent to which goods prices in country j move in concert with prices in Sweden. The parameter γ_j measures pass-through from movements in the exchange rate between country j and Sweden to the prices of goods in country j's catalog. As explained by Knetter (1989, 1993, 1995) and Marston (1990), theory only predicts 100% markup, $\gamma_j = 1$, if marginal cost is constant.[18] Estimates of equation (6) are shown in Table 5-1. In the top panel of the table, the equation is estimated as shown above. For every country, we estimate $\widehat{\beta}_j = 0.99$. One interpretation of this finding is that prices are set initially for Swedish catalog goods and then are adjusted proportionally for the other markets.

Our estimates for the exchange rate coefficient vary from a low of 0.10 for the US to 1.16 for France. Thus we find very low pass-through to the US, middling levels in Canada, the UK, and Germany (0.34, 0.62, and 0.80 respectively), and a high level, even somewhat higher than full pass-through, for France. The R-2 in each equation exceeds 0.97. Since the coefficient on the Swedish price term is nearly 1.0, we run another group of regressions in which the dependent variable is the difference between the country-j price and the Swedish price:

[18] We could use other countries on the right-hand-side of this equation. We restrict ourselves to Sweden as the reference country for the time being because (i) most goods are in Sweden if they are in multiple countries, and (ii) Sweden is the low-cost country. Since IKEA is a Swedish company, this estimation strategy gives us a clear estimate of the pass-through for Swedish exchange rates. Using a different country as the partner to country j would lead to differences of pass-through coefficients appearing on the right-hand side of this equation. This can be managed empirically, but in this first draft we focus on Sweden as the partner country.

$$p_{ijt} - p_{i,SE,t} = \alpha_j + \gamma_j e_{jt} + \zeta_{ijt} \ . \tag{7}$$

The results are shown in Panel B of Table 5-2. Rewriting the estimating equation in this way had virtually no effect on the estimated pass-through coefficients. The notable effect was on the R-2 of the equations, which now ranges from 0%-9%.

To the extent that there may be spurious trends reflected in prices and exchange rates, it may be useful to look at estimates based on first-differenced data. Thus we estimate the following:

$$\Delta p_{ijt} = \beta_j \Delta p_{i,SE,t} + \gamma_j \Delta e_{jt} + \Delta \zeta_{ijt}. \tag{8}$$

The estimates are presented in Table 5-3. The estimated coefficients on the Swedish price terms, $\widehat{\beta}_j$, are smaller than in the levels regressions. They now range in value from 0.25-0.41. The exchange-rate coefficient is also smaller in the first-differenced version of the equation. The new coefficients γ_j now range from -0.01 for Canada to 0.13 for France. Clearly, the extent of exchange rate pass-through varies substantially across countries.

5.2 Do prices forecast exchange rates?

In early work using micro price data, Cumby (1997) found that prices of Big Macs forecast future exchange rate movements. Specifically, countries in which the exchange-rate-adjusted price of the Big Mac was high relative to a partner country in year t tended, on average, to experience a depreciation of its currency against that of the partner country in the subsequent time period. Similarly, IKEA has incentive to set its prices to account for expected exchange rate movements during the catalog year. If IKEA expects the U.S. dollar to depreciate against the Swedish krona over the catalog year, then IKEA will set the US local currency catalog price high enough to offset the expected devaluation. In this section, we explore whether prices set at the beginning of the catalog year forecast exchange rates over the year the catalog is in force. We use prices and exchange rates at the beginning of the year to construct the expected devaluation of country j's currency vis-a-vis the Swedish krona, as follows:[19]

$$\text{expected devaluation} = E_t \Delta e_{jt} = E_t(e_{j,t+1} - e_{jt}) = \ (p_{ijt} - e_{jt} - p_{i,SE,t})$$

[19] To keep the notation in line with the work above, we express these equations in natural logs. However, in the empirical implementation we work with these variables in exact form, not in logs, since the approximation $\ln(1+x) = x$ is not a good one for values as large as the expected devaluations. For example, the expected devaluation is computed as $\ln(P_{ijt}/E_{jt}P_{i,SE,t})$.

The actual devaluation is:

$$\text{actual devaluation} = \Delta e_{jt} = (e_{j,t+1} - e_{jt})$$

If IKEA is setting prices to achieve the law of one price in expected value, then the actual devaluation will equal the expected devaluation plus an i.i.d. expectation error. Denote the expectation error for the country-j exchange rate for the devaluation between t and $t+1$ as $u_{jt,t+1}$. To test the theory that ex ante price differentials should predict price changes, we estimate the following regression:

$$\Delta e_{jt} = \alpha_j + \beta_j E_t \Delta e_{jt} + u_{t,t+1}.$$

Table 5-4 contains the results. We find that there is virtually no predictive value for future exchange rate changes in the expected devaluation measure implied by ex-ante prices and exchange rates. The coefficient estimates on the expected exchange rate range from 0.01 for the UK to 0.04 for Canada and the US. The R^2 measures range from 0.00 to 0.01.

6 Summary and Conclusion

This paper examines international pricing behavior using a newly-created dataset consisting of prices of every item in the IKEA catalogs of six countries across 16 years. Within the context of these data, we provide evidence on (i) product creation and destruction; (ii) the distribution of price changes; (iii) deviations from the law of one price; and (iv) exchange-rate pass-through. Our key results in each of these areas are as follows.

Product creation and destruction in the IKEA catalogs is dominated by a large group of goods that are created and destroyed in the same year. The creation and destruction pattern of the longer-lived goods shows no response to the 2001 recession. However, due mainly to a dramatic drop in product creation, the total number of goods in catalogs drops sharply in response to the current recession.

Our results on the distribution of price changes contribute to the growing literature in this area. We find zero price changes in 56% of all potential price changes, increases in 23% of all potential changes and decreases in the remaining 21%. The data show a very large fraction of small price changes. Generally, the distribution of price increases has more mass at lower price increases but the distribution of price decreases has more mass at larger changes.

Deviations from the law of one price are large, as is typically found in both aggregate and micro data. The deviations are not highly correlated across countries

except for a close relationship between the deviations for France and Germany. We asked whether deviations were smaller for newer goods, where there is no possibility of ignoring the price-setting decision (i.e., no chance to avoid the menu cost of price setting), so that prices should adhere more closely to this parity condition. Our results show some support for this theory when we average across all years, although this relationship does not hold on a year-by-year basis. We also investigated whether the percentage deviations were smaller for more expensive goods, studying goods divided into four price groups. Again, the finding was negative. Very low price goods do have larger deviations in some countries, but the deviations for the highest-price group of goods are no smaller than for the other three price groups.

Exchange-rate pass-through is experiencing a renewal of interest in the literature using micro-data. Our findings are broadly consistent with those being generated by other researchers. We find that exchange-rate pass-through is quite low in our data. However, this part of our investigation also turned up another surprising fact. The prices of goods that are in the Swedish catalog as well as the given country catalog move approximately proportionately with the Swedish price. Whether we view the Swedish price as a measure of cost (Sweden is the lowest-price country in all years), or whether we view the Swedish price as measuring cost plus the lowest of the country markups, these results imply that the cost (or cost+Swedish markup) component is the primary determinant of the price of the good in other countries, even though these goods are priced in local currencies. The exchange rate does not seem to be important for the local currency pricing decision. We also investigate whether beginning-of-the-year price differentials predict exchange rate changes, as theory suggests they should. We found no evidence that prices predict future exchange rate changes.

There is much research that remains to be done. At present, additional catalogs are in the data-entry process. We plan to extend the dataset in the time dimension, and also increase the geographic coverage of the dataset. With a larger dataset, we can refine and extend the tests used in this paper. On the theoretical side, the stylized facts developed in this paper will serve to guide and restrict the development of future models of international pricing.

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Table 2-1: Diffusion of IKEA products

A. Goods available in a single country

percent of all goods available in given year

Country	**1994**	**2002**	**2010**
Canada	1.6%	1.7%	1.7%
Germany	4.0%	1.9%	2.8%
France	2.9%	2.3%	1.4%
Sweden	3.4%	3.3%	1.8%
UK	2.5%	1.9%	1.6%
US	1.8%	4.3%	2.1%
All single-country goods	16.2%	15.4%	11.4%

B. Country clusters: Number of goods available in a given group

percent of all goods available in given year

Cluster	**1994**	**2002**	**2010**
North America: US, Canada	9.6%	7.3%	2.3%
Europe: UK, Sweden, France, Germany	25.5%	20.3%	4.1%
Euro Zone: France, Germany	3.0%	1.4%	0.6%
Continental Europe: Sweden, France, Germany	5.3%	2.7%	0.8%
UK, Sweden, France	4.3%	2.1%	1.1%
All countries	13.4%	27.9%	50.5%
Total: all available goods	**5,973**	**6,587**	**6,104**

Table 3-1: Direction of price changes

A. By year

Year	% decrease	% no change	% increase	observations
1994	25%	39%	36%	2,540
1995	23%	30%	47%	2,293
1996	24%	40%	36%	2,047
1997	33%	50%	17%	2,116
1998	32%	51%	17%	2,129
1999	30%	57%	13%	2,223
2000	31%	57%	12%	2,350
2001	23%	63%	14%	2,733
2002	19%	60%	21%	3,099
2003	20%	65%	15%	3,140
2004	20%	62%	18%	3,069
2005	19%	64%	17%	3,283
2006	19%	65%	16%	3,059
2007	11%	59%	30%	3,197
2008	10%	56%	34%	3,540
2009	9%	55%	36%	2,228
all years	21%	56%	23%	43,046

B. By country

Country	% decrease	% no change	% increase	observations
Canada	19%	59%	22%	5,614
Germany	22%	54%	24%	8,160
France	27%	55%	18%	7,853
Sweden	19%	54%	27%	8,536
UK	21%	51%	28%	7,613
US	16%	63%	21%	5,270
Total	21%	56%	23%	43,046

Table 3-1: Direction of price changes
C. By number of year in catalog

Years in catalog	% decrease	% no change	% increase	observations
2	22%	53%	25%	21,352
3	19%	56%	25%	8,087
4	21%	58%	21%	4,693
5	22%	59%	19%	3,064
6	21%	59%	20%	2,009
7	22%	58%	20%	1,287
8	24%	57%	19%	766
9	17%	61%	22%	531
10	17%	60%	23%	354
11	20%	65%	15%	256
12	9%	69%	22%	186
13	15%	66%	19%	154
14	19%	69%	12%	122
15	8%	61%	31%	72
16	7%	48%	45%	89
17	17%	58%	25%	24
Total	21%	56%	23%	43,046

Table 3-2: Size of price changes

A. By country

Country	mean decrease	mean increase	median decrease	median increase
Canada	-20%	21%	-17%	13%
Germany	-18%	17%	-15%	8%
France	-17%	15%	-14%	8%
Sweden	-17%	16%	-14%	9%
UK	-18%	17%	-16%	10%
US	-22%	21%	-20%	15%
Total	-18%	17%	-16%	10%

B. By year

Year	mean decrease	mean increase	median decrease	median increase
1994	-17%	17%	-14%	8%
1995	-16%	17%	-14%	9%
1996	-17%	16%	-14%	8%
1997	-17%	16%	-14%	9%
1998	-18%	12%	-15%	7%
1999	-19%	22%	-17%	10%
2000	-18%	18%	-17%	11%
2001	-20%	17%	-18%	9%
2002	-17%	17%	-15%	9%
2003	-20%	21%	-17%	13%
2004	-19%	18%	-17%	11%
2005	-19%	14%	-17%	9%
2006	-18%	19%	-16%	13%
2007	-17%	17%	-14%	11%
2008	-19%	18%	-15%	11%
2009	-17%	20%	-15%	13%
Total	-18%	17%	-16%	10%

Table 3-3: Absolute price changes

A. By country

Country	mean	median	std. dev.
Canada	8.4%	0.0%	24.7%
Germany	8.0%	0.3%	38.9%
France	7.3%	0.0%	21.2%
Sweden	7.5%	0.0%	18.8%
UK	8.6%	0.5%	24.2%
US	7.9%	0.0%	18.9%
Total	7.9%	0.0%	25.8%

B. By year

Year	mean	median	std. dev.
1994	10.6%	4.2%	33.3%
1995	11.8%	6.3%	40.7%
1996	9.9%	3.7%	21.5%
1997	8.4%	0.5%	16.4%
1998	7.8%	0.0%	22.9%
1999	8.6%	0.0%	24.6%
2000	7.9%	0.0%	15.6%
2001	7.2%	0.2%	17.4%
2002	6.8%	0.0%	20.3%
2003	7.1%	0.0%	17.2%
2004	7.0%	0.0%	15.5%
2005	6.0%	0.0%	11.9%
2006	6.4%	0.0%	13.0%
2007	7.2%	0.0%	27.1%
2008	8.0%	0.0%	18.2%
2009	8.8%	0.0%	64.0%
Total	7.9%	0.0%	25.8%

Table 4-1: Percent deviations from law of one price

Country		New goods	Continuing goods
Canada	**mean**	7.4%	9.7%
	std. dev.	16.3%	16.8%
Germany	**mean**	-2.9%	-4.0%
	std. dev.	13.8%	15.3%
France	**mean**	-2.2%	-2.8%
	std. dev.	13.0%	13.5%
Sweden	**mean**	-6.7%	-8.5%
	std. dev.	12.5%	13.9%
UK	**mean**	2.8%	3.4%
	std. dev.	14.2%	15.1%
US	**mean**	5.0%	5.0%
	std. dev.	15.4%	16.1%

Table 4-2: Autoregressions for deviations from the law of one price

	AR(1): lopdev(t) = a + B(L) lopdev(t-1) + u(t)						AR(2): lopdev(t) = a + B(L) lopdev(t-1) + C(L) lopdev(t-2)+ u(t)					
	Canada	**Germany**	**France**	**Sweden**	**UK**	**US**	**Canada**	**Germany**	**France**	**Sweden**	**UK**	**US**
lopdev(t-1)	0.67	0.67	0.66	0.62	0.72	0.74	0.64	0.50	0.59	0.47	0.73	0.70
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
lopdev(t-2)							0.12	0.18	0.09	0.22	0.03	0.10
							(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
sum							0.77	0.68	0.68	0.70	0.76	0.80
Constant	0.03	-0.01	-0.01	-0.03	0.01	0.00	0.03	-0.02	-0.01	-0.03	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	4240	5817	5691	5807	5490	3850	1824	2638	2495	2622	2449	1564
R-squared	0.46	0.43	0.46	0.39	0.49	0.55	0.51	0.45	0.44	0.43	0.52	0.57

Standard errors in parentheses

Table 5-1: Passthrough regression
Regression of p(j) on p(se) and exchange rate

Independent variables	Canada	Germany	France	UK	US
Swedish price	0.99	0.99	0.99	0.99	0.99
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Exchange rate	0.34	0.80	1.16	0.62	0.10
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)
constant	-0.91	-0.31	0.46	-0.83	-1.64
	(0.06)	(0.08)	(0.07)	(0.05)	(0.04)
Observations	8007	12660	12761	12765	7504
R-squared	0.97	0.98	0.98	0.98	0.97

Standard errors in parentheses

Table 5-2: Restricted passthrough regression
Regression of p(j)-p(se) and exchange rate

Independent variable	Canada	Germany	France	UK	US
Exchange rate	0.34	0.81	1.16	0.61	0.11
	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)
constant	-0.97	-0.37	0.42	-0.88	-1.67
	(0.06)	(0.08)	(0.07)	(0.05)	(0.04)
Observations	8007	12660	12761	12765	7504
R-squared	0.01	0.04	0.09	0.06	0.00

Standard errors in parentheses

Table 5-3: Estimating price equations in first-differences

Independent variables	Canada	Germany	France	UK	US
Swedish price	0.25	0.34	0.31	0.41	0.27
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Exchange rate	-0.01	0.05	0.13	0.07	0.13
	(0.03)	(0.04)	(0.03)	(0.02)	(0.02)
constant	0.00	-0.01	-0.02	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	2759	4438	4295	4410	2466
R-squared	0.05	0.08	0.08	0.14	0.08

Standard errors in parentheses

Table 5-4: Do prices predict exchange-rates?
$\Delta e(t+1) = \alpha + \beta E\Delta e(t+1) + u(t+1)$

Independent variable	Canada	Germany	France	UK	US
Expected Δ in exchange rate	0.04	0.03	0.02	0.01	0.04
	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
constant	-0.03	-0.01	-0.01	0.01	0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	3955	5921	5761	5710	3577
R-squared	0.01	0.01	0.00	0.00	0.01

Standard errors in parentheses

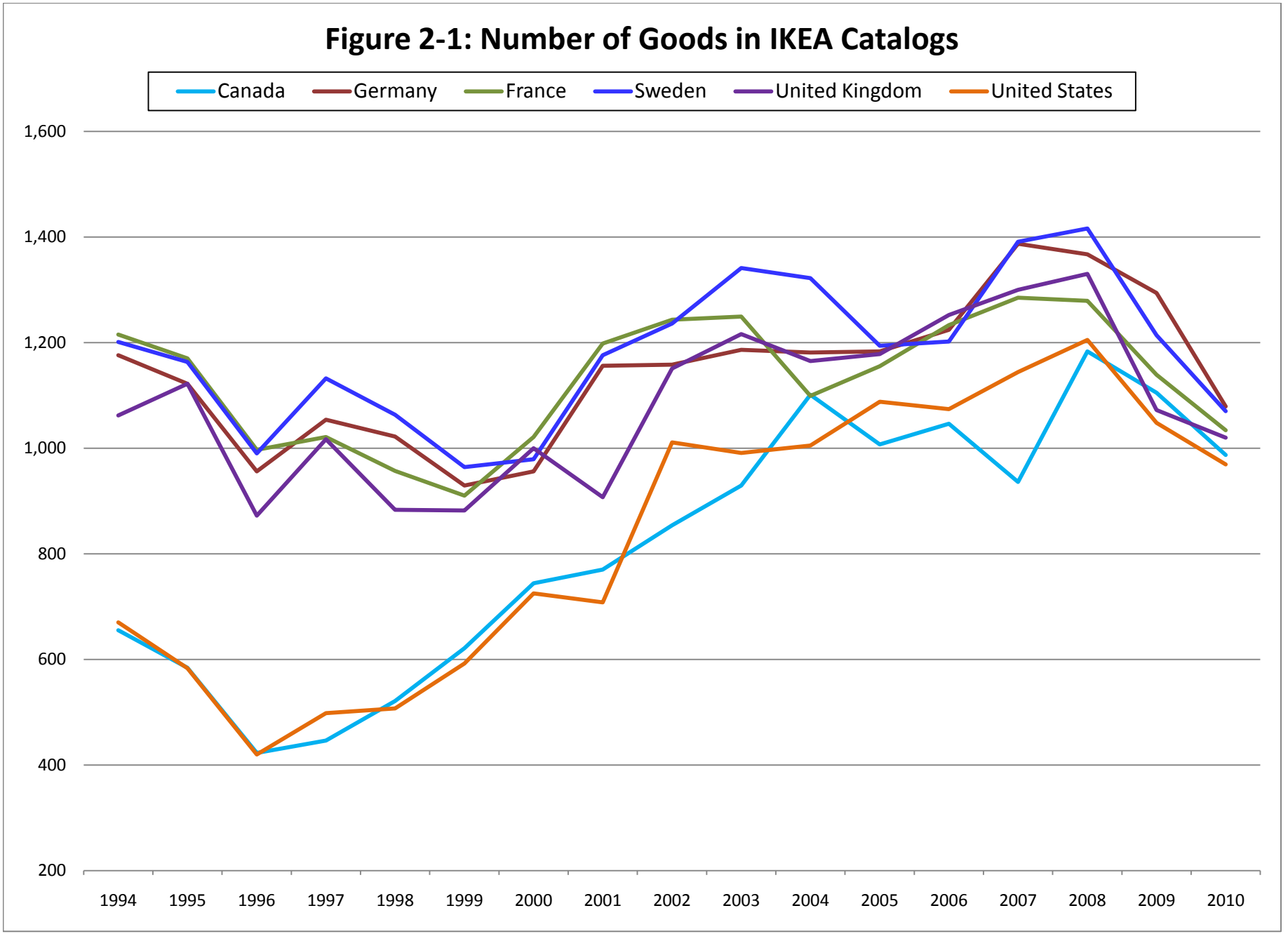


Figure 2-1: Number of Goods in IKEA Catalogs
Canada
Germany
France
Sweden
United Kingdom
United States
1,600
1,400
1,200
1,000
800
600
400
200
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

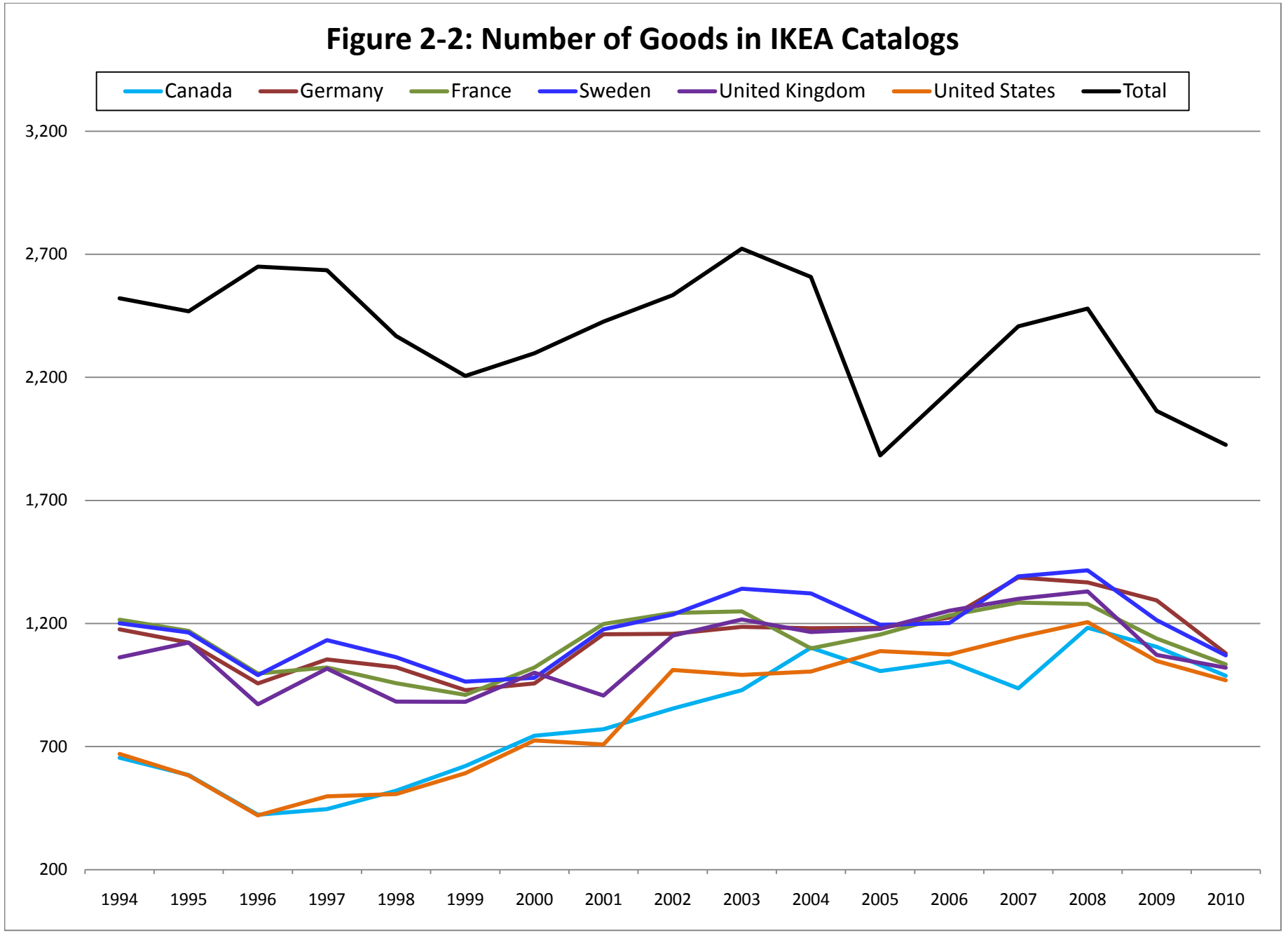


Figure 2-2: Number of Goods in IKEA Catalogs
Canada
Germany
France
Sweden
United Kingdom
United States
Total
3,200
2,700
2,200
1,700
1,200
700
200
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

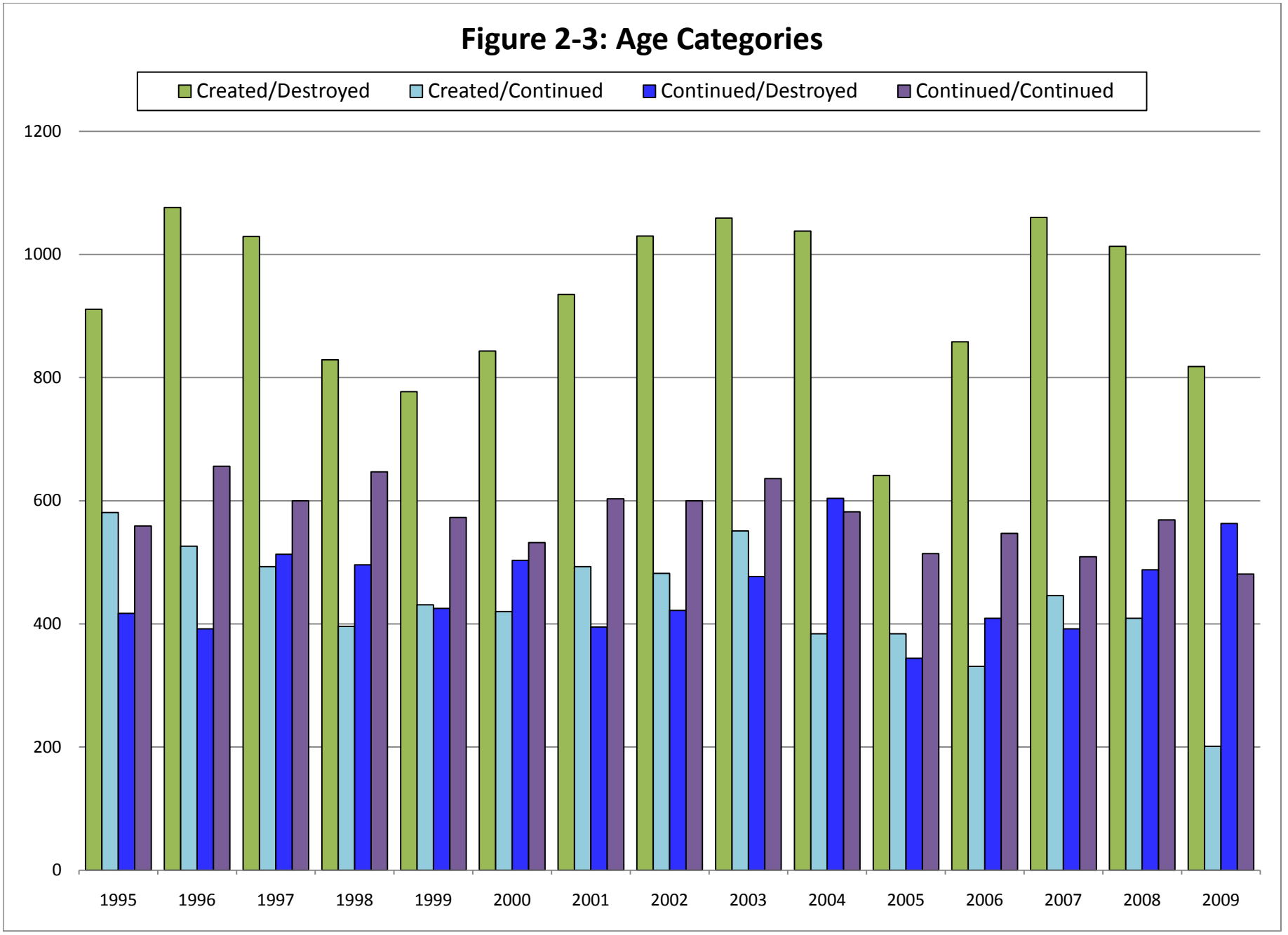


Figure 2-3: Age Categories
Created/Destroyed
Created/Continued
Continued/Destroyed
Continued/Continued
1200
1000
800
600
400
200
0
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009

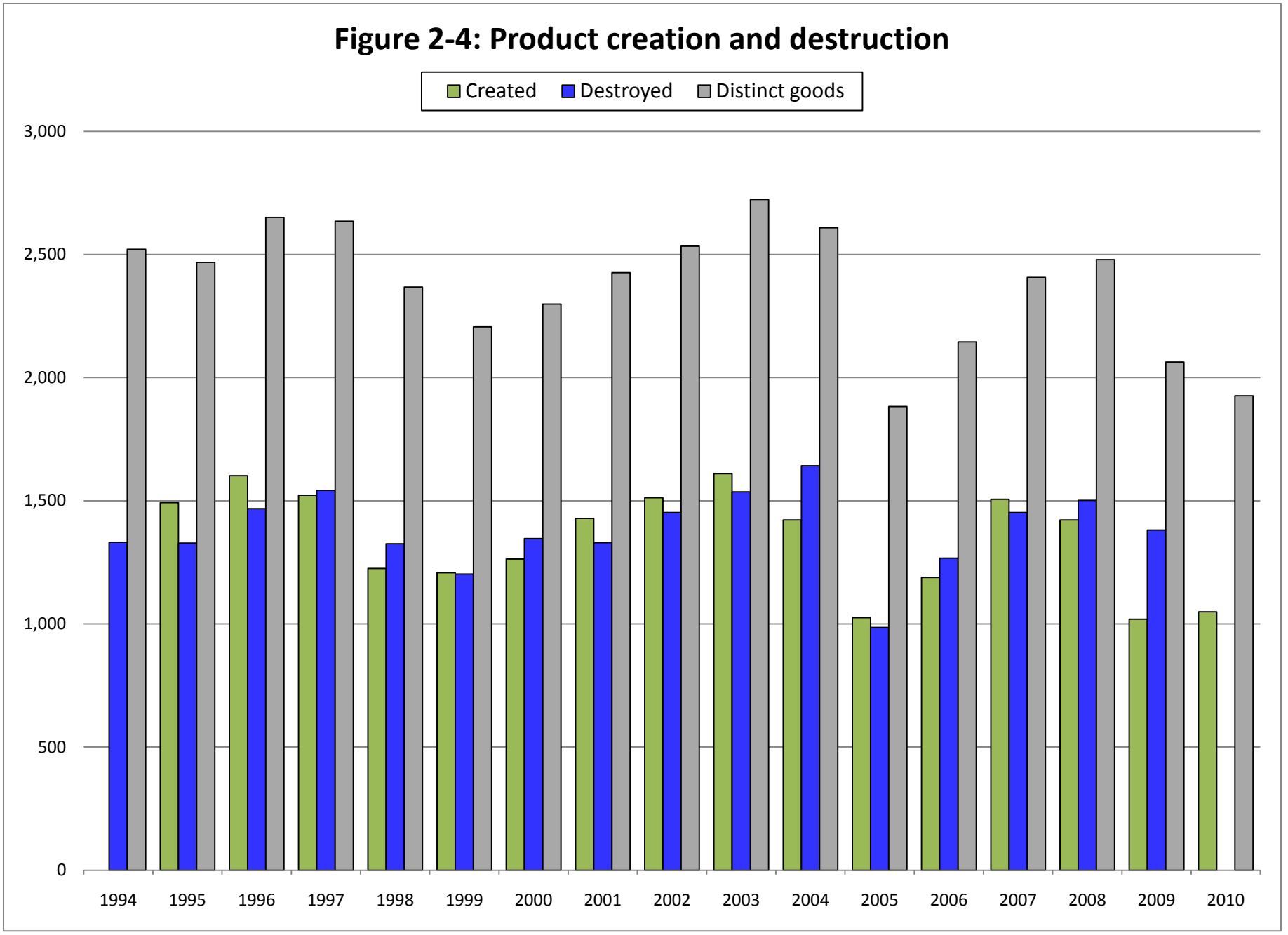
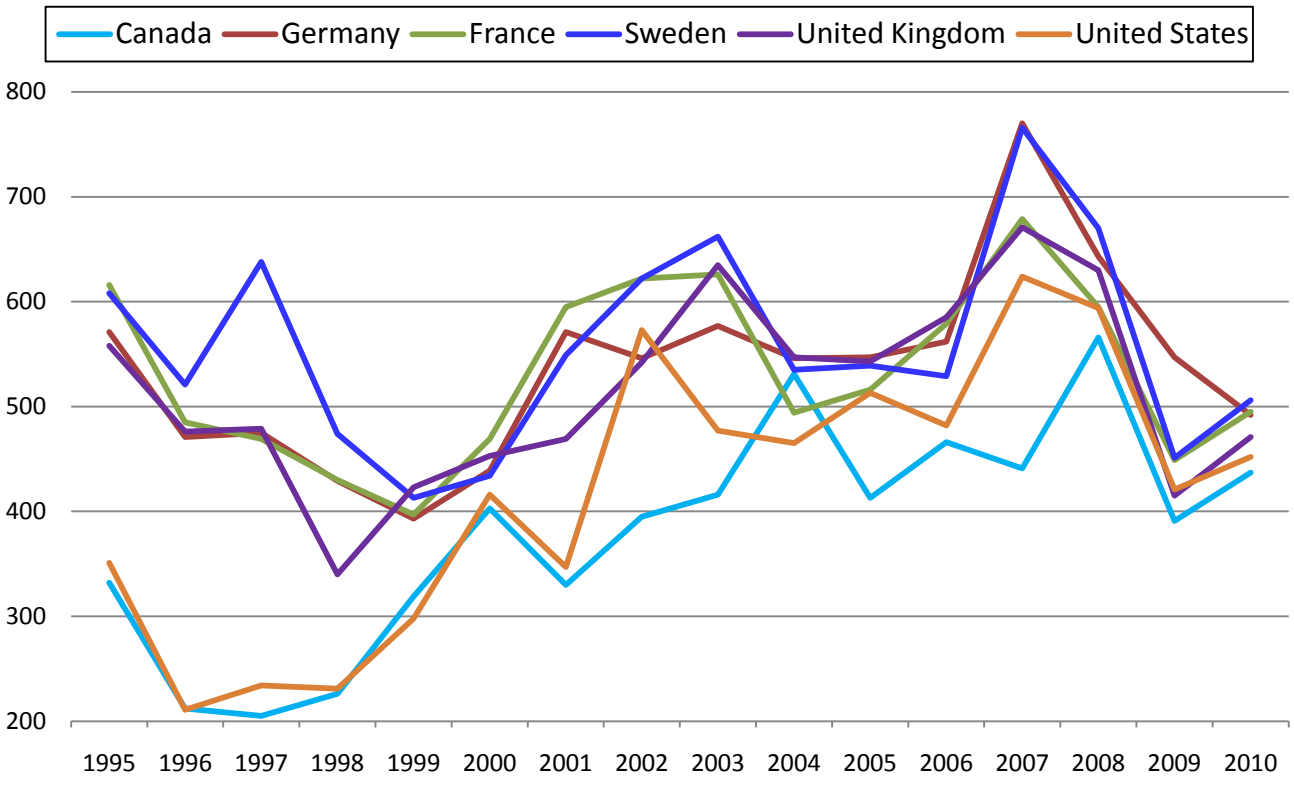


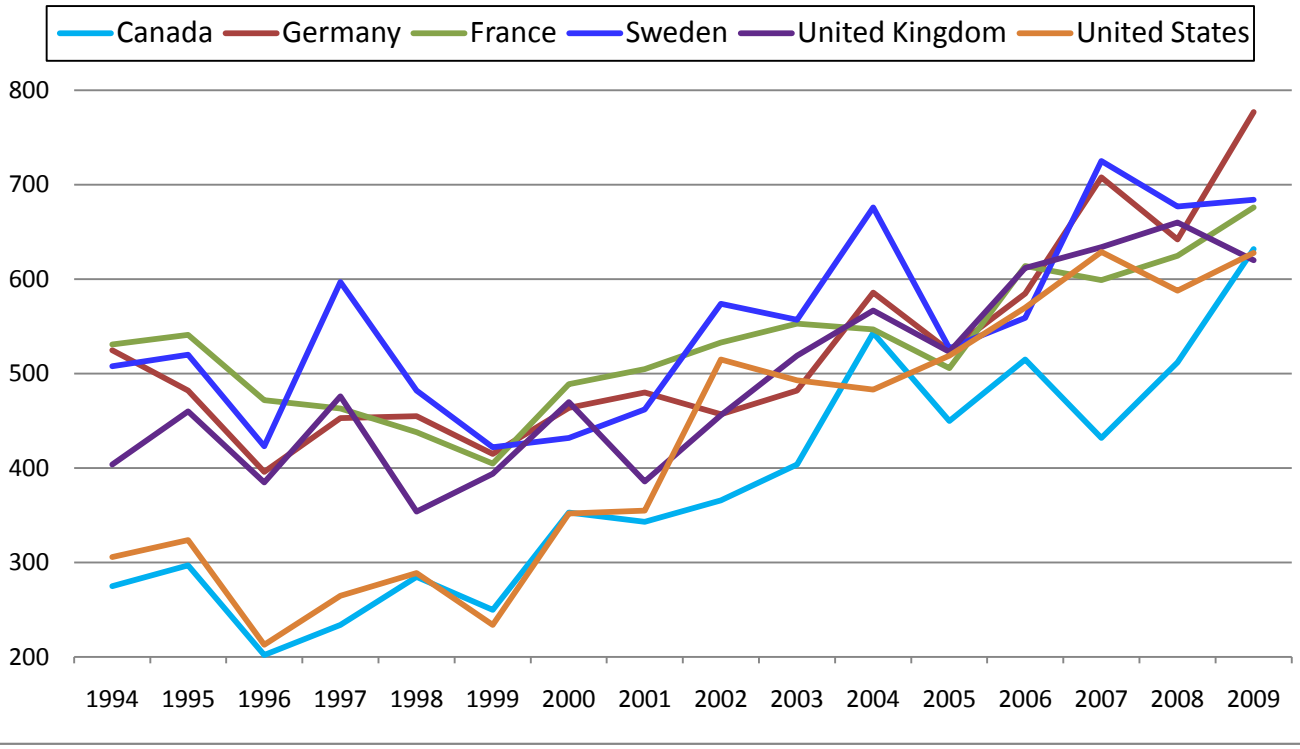
Figure 2-4: Product creation and destruction
Created
Destroyed
Distinct goods
3,000
2,500
2,000
1,500
1,000
500
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

Figure 2-5: Product creation and product destruction

A. Product creation



B. Product destruction



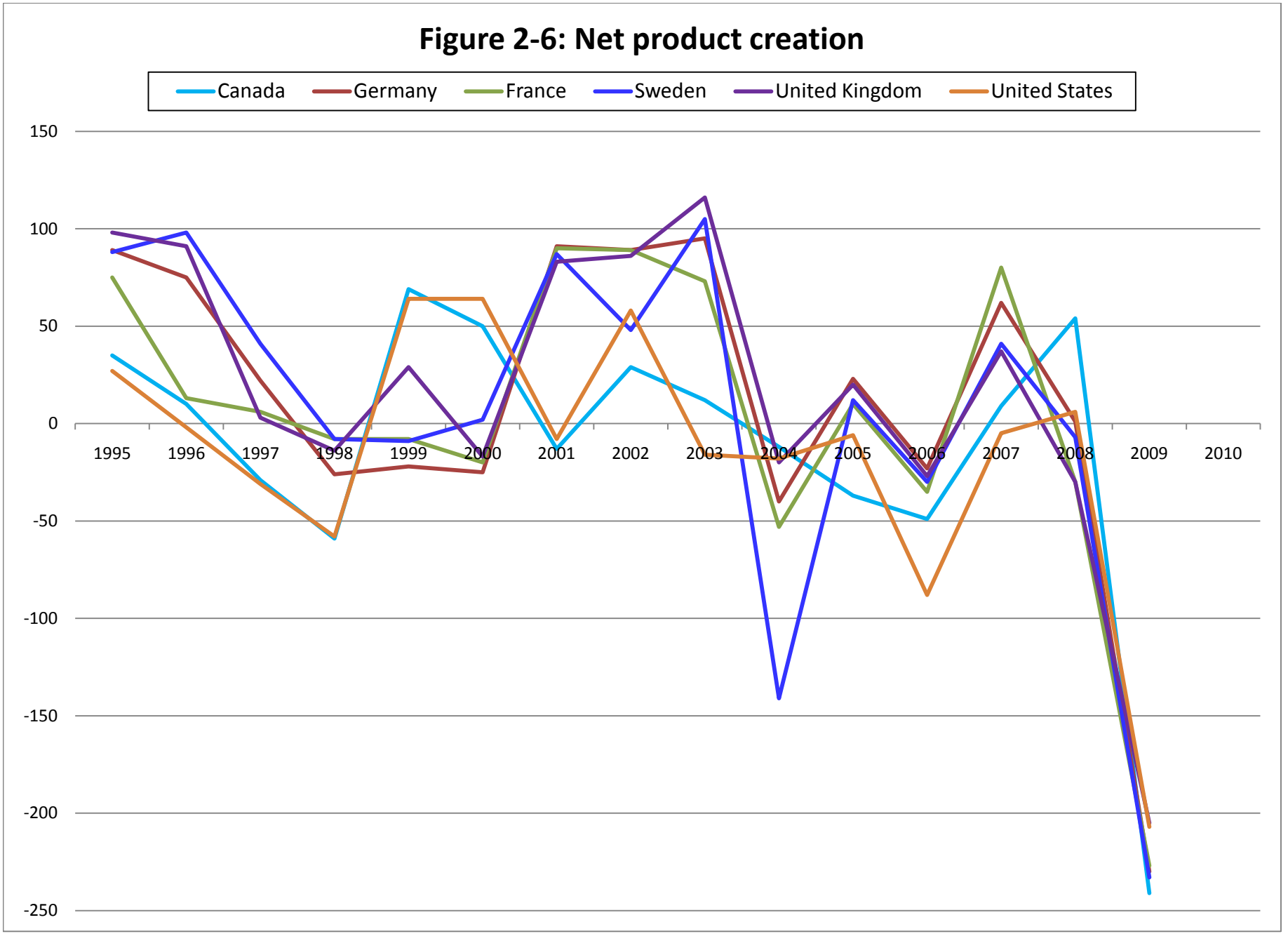


Figure 2-6: Net product creation
Canada
Germany
France
Sweden
United Kingdom
United States
150
100
50
0
-50
-100
-150
-200
-250
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010

Figure 2-7: Mean local currency prices

(Sweden: right-hand scale)

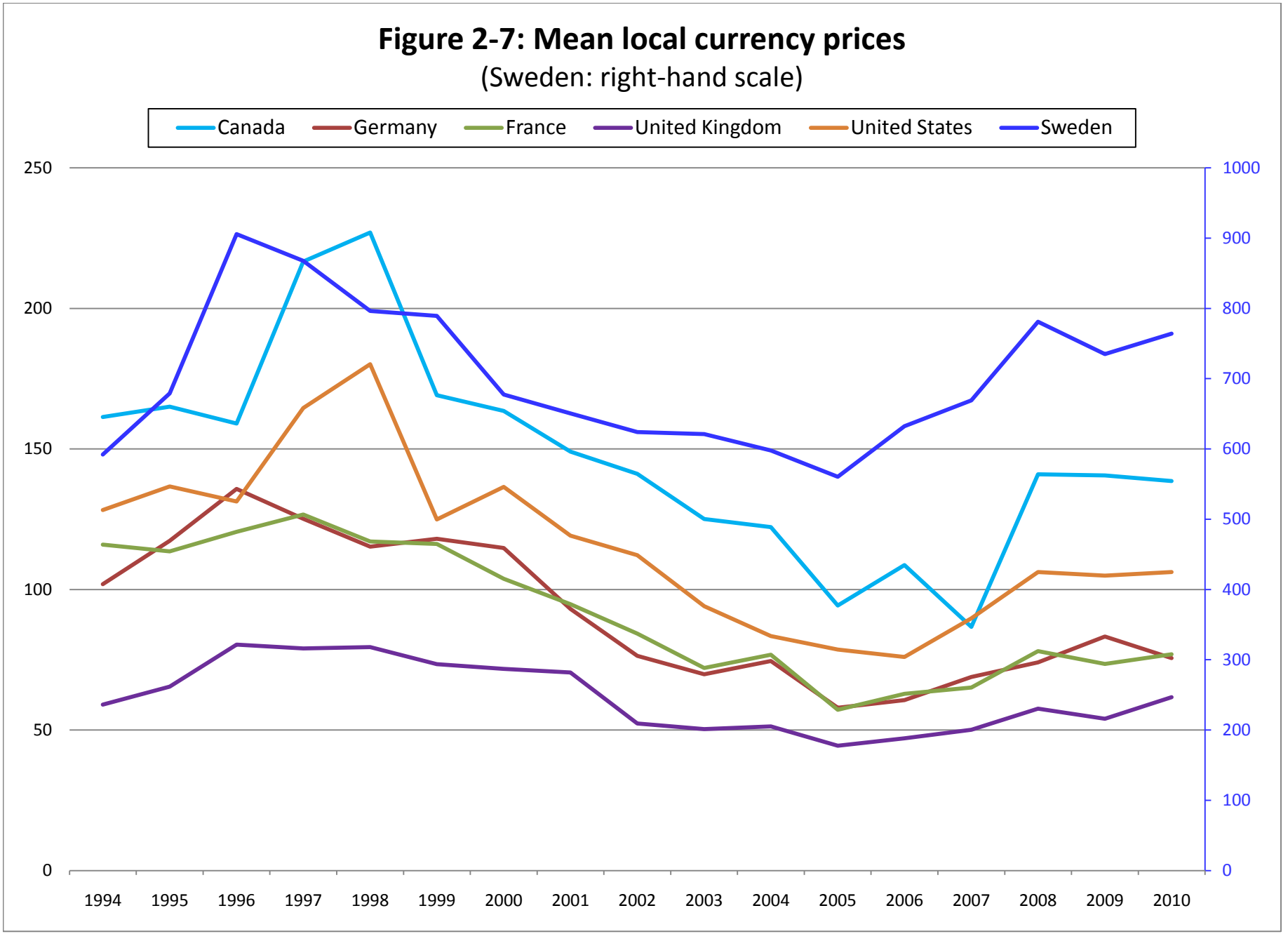


Figure 2-8: Mean price of catalog goods

(Swedish kronor, net of VAT)

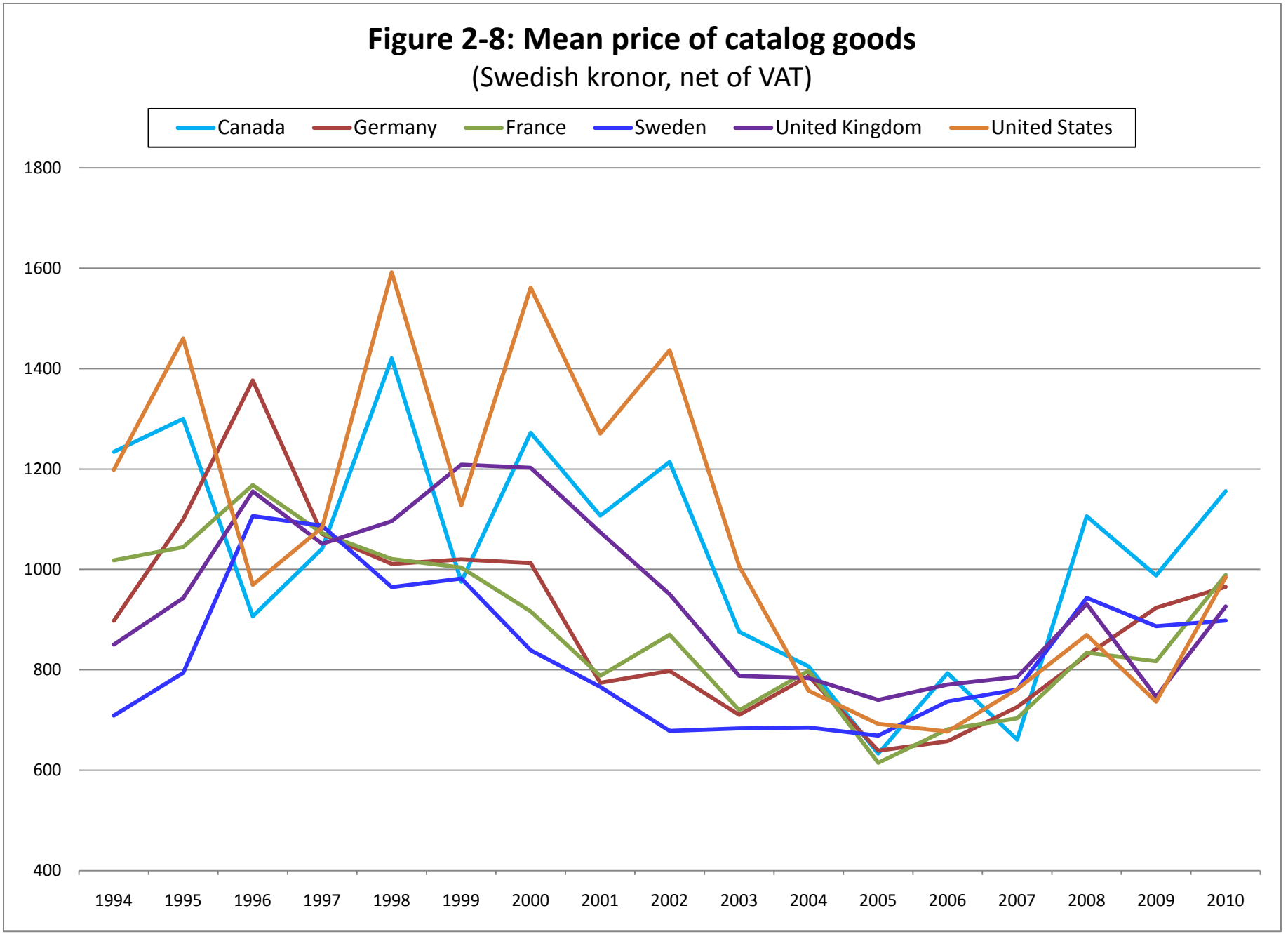


Figure 3-1: Distribution of non-zero price changes

A. Bins of 5% (center of bin on horizontal axis)

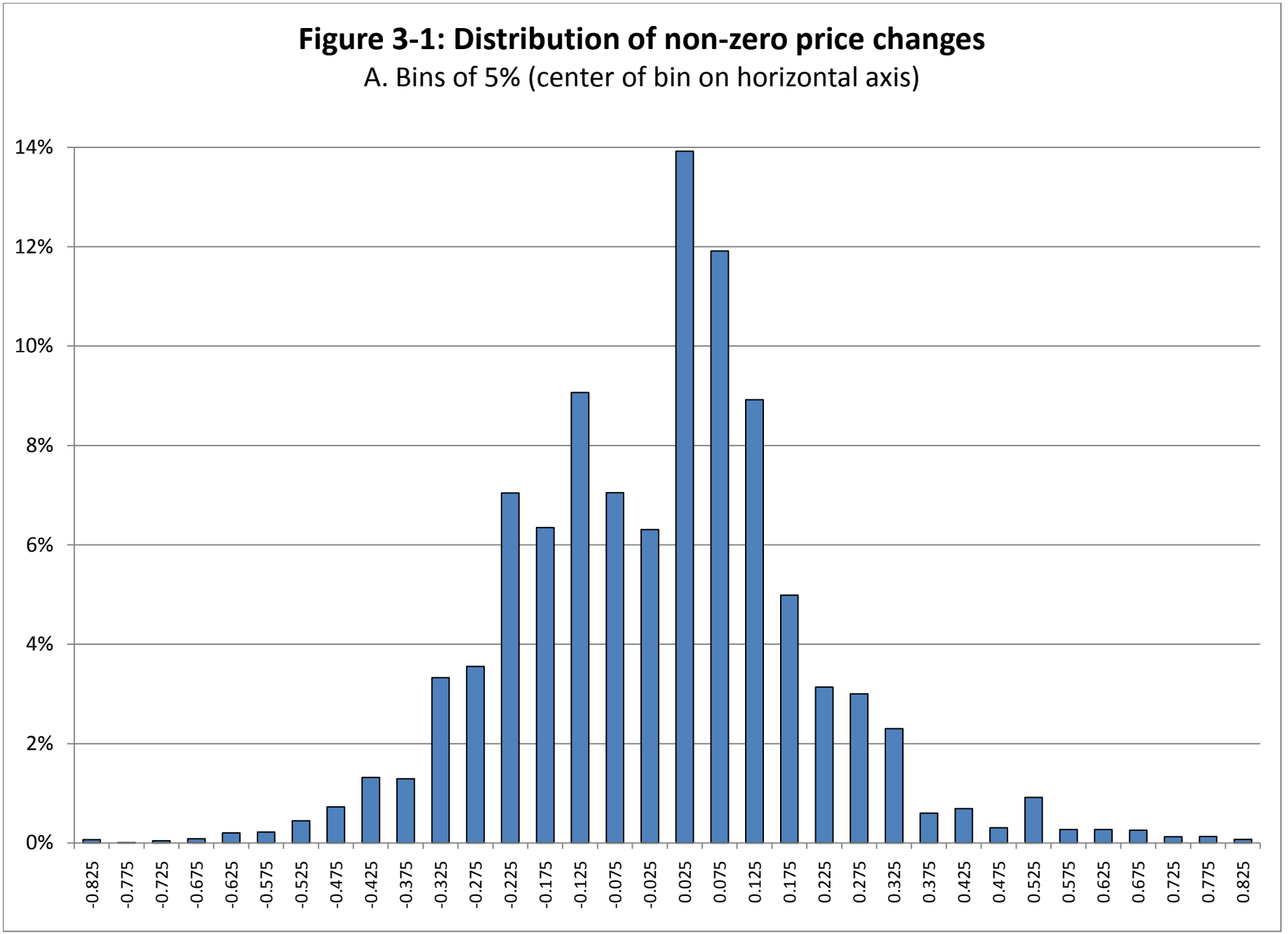


Figure 3-1: Distribution of non-zero price changes

B. Bins of 10% (center of bin on horizontal axis)

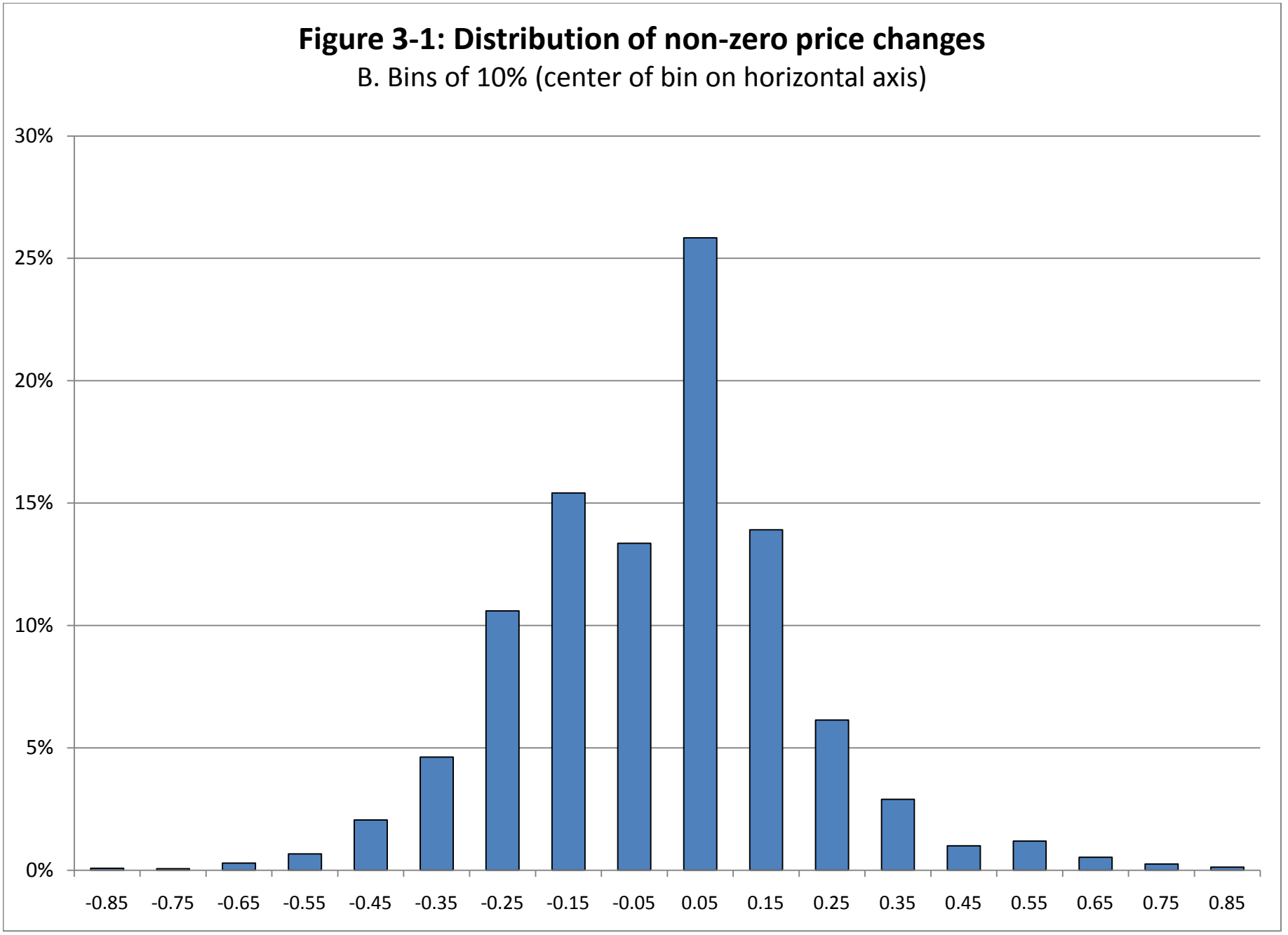


Figure 3-2: Distribution of non-zero price changes

Positive changes overlaid with absolute of negative changes of same size

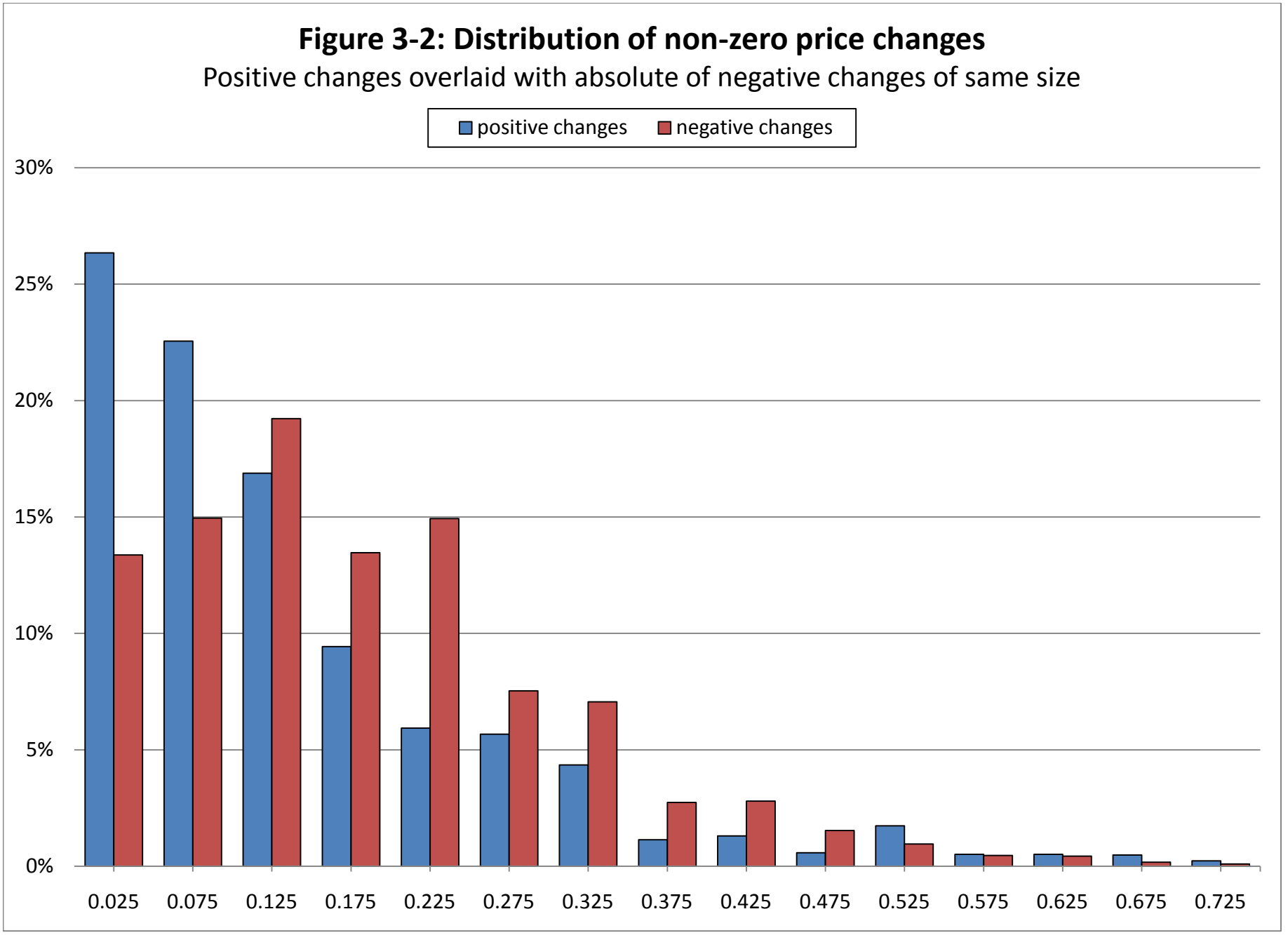


Figure 4-1: Mean deviations from law of one price

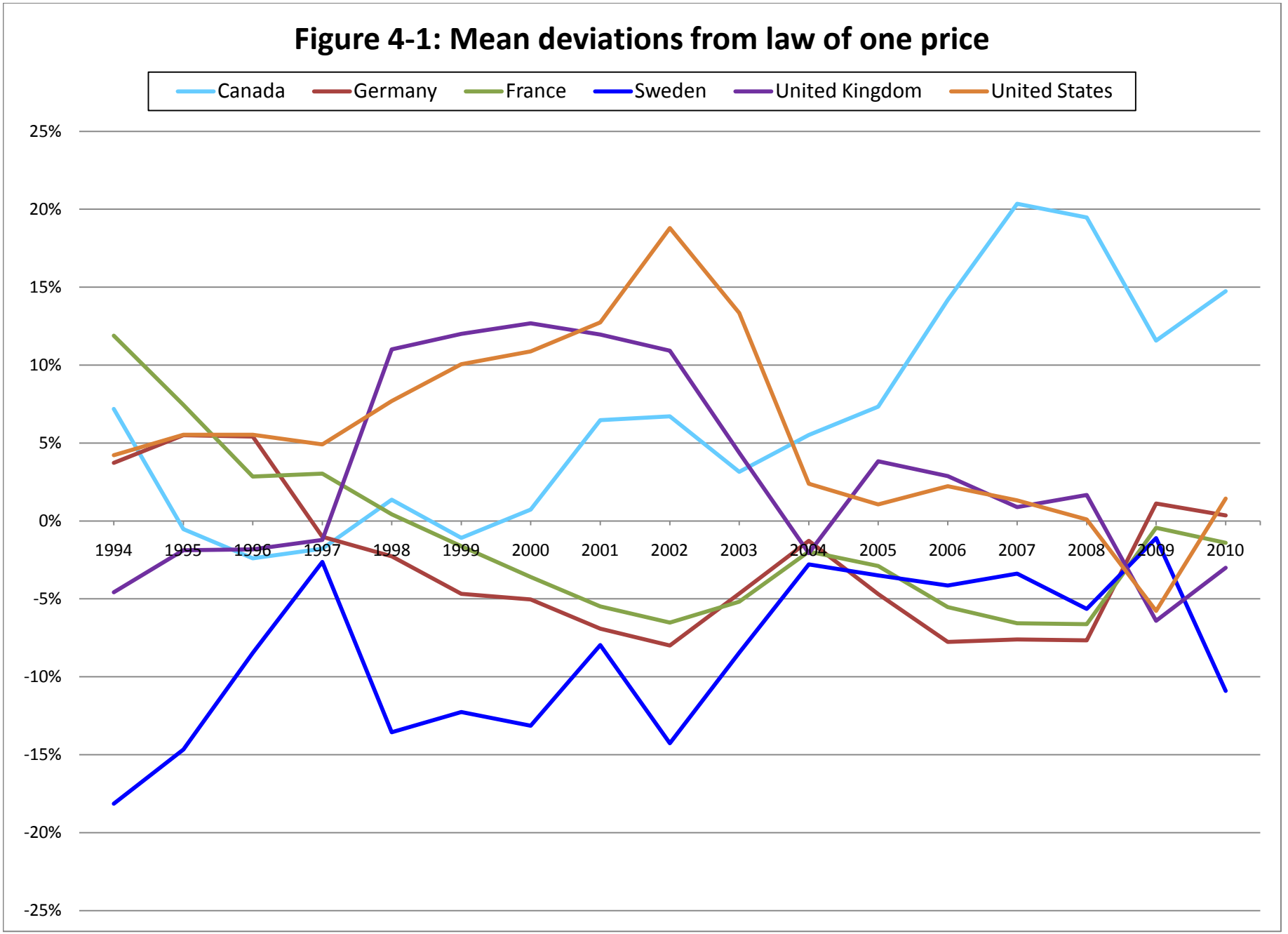


Figure 4-2: LOP deviations, common goods

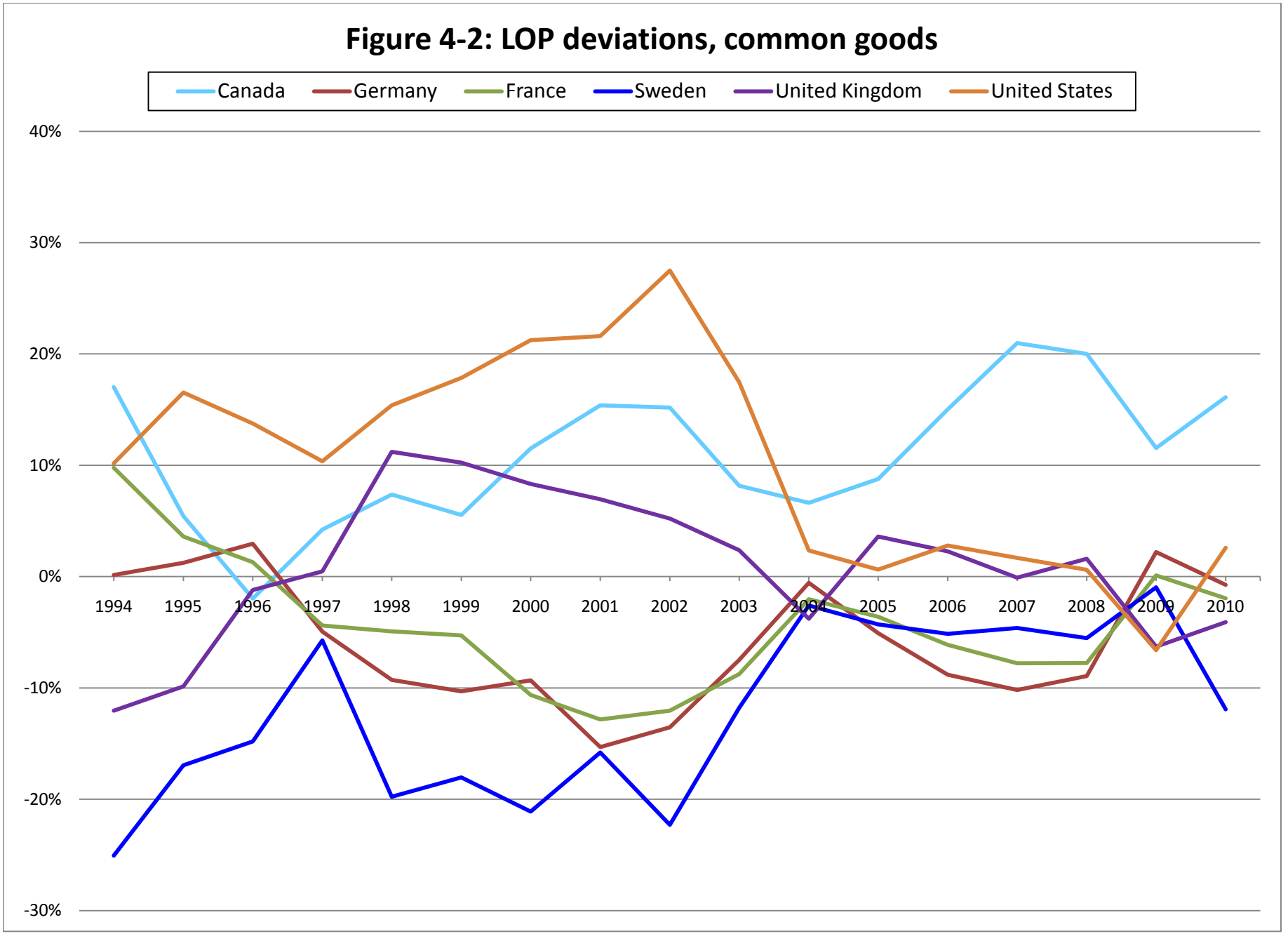


Figure 4-3: Price deviations for new vs. continuing goods

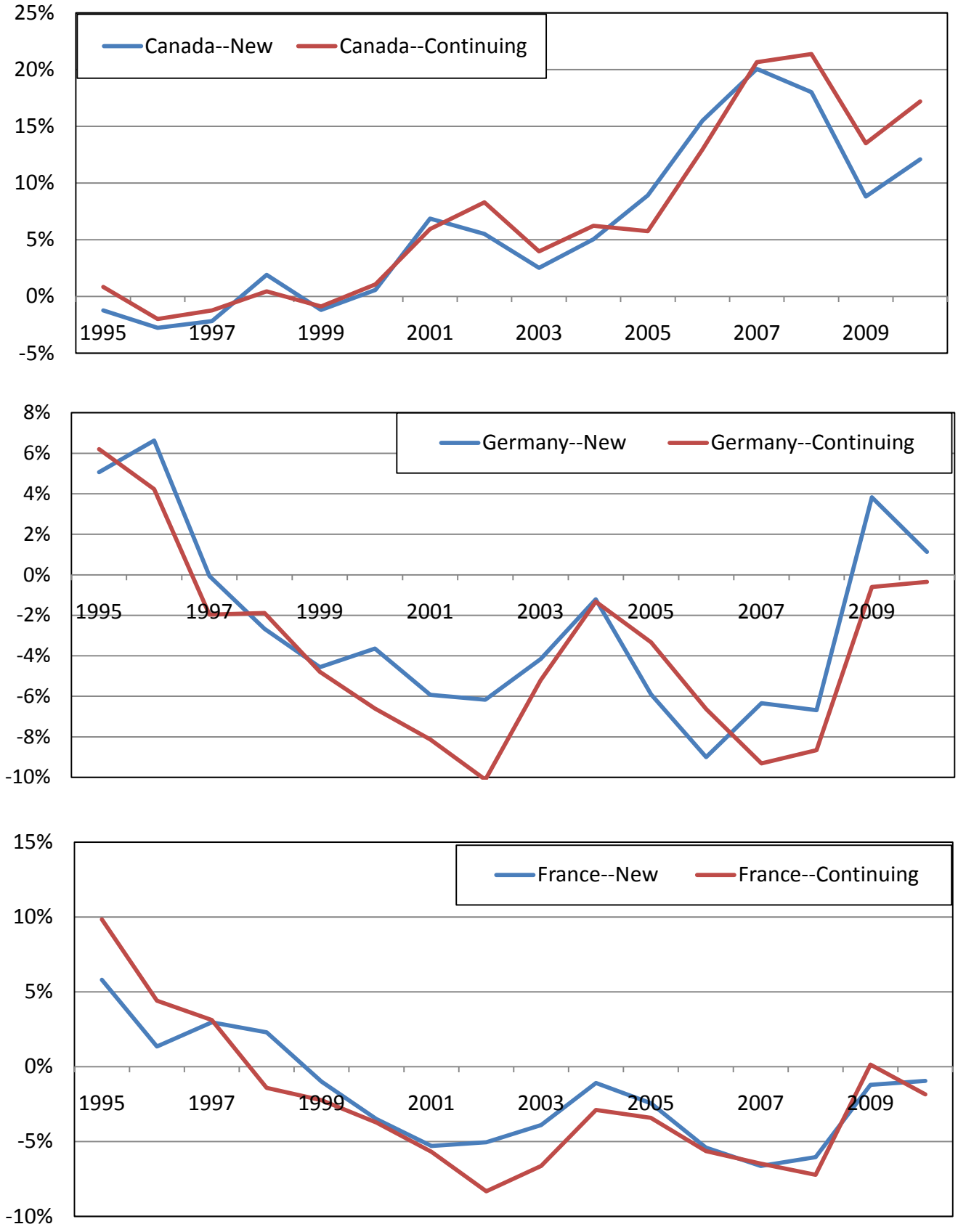


Figure 4-3, cont'd: Price deviations for new vs. continuing goods

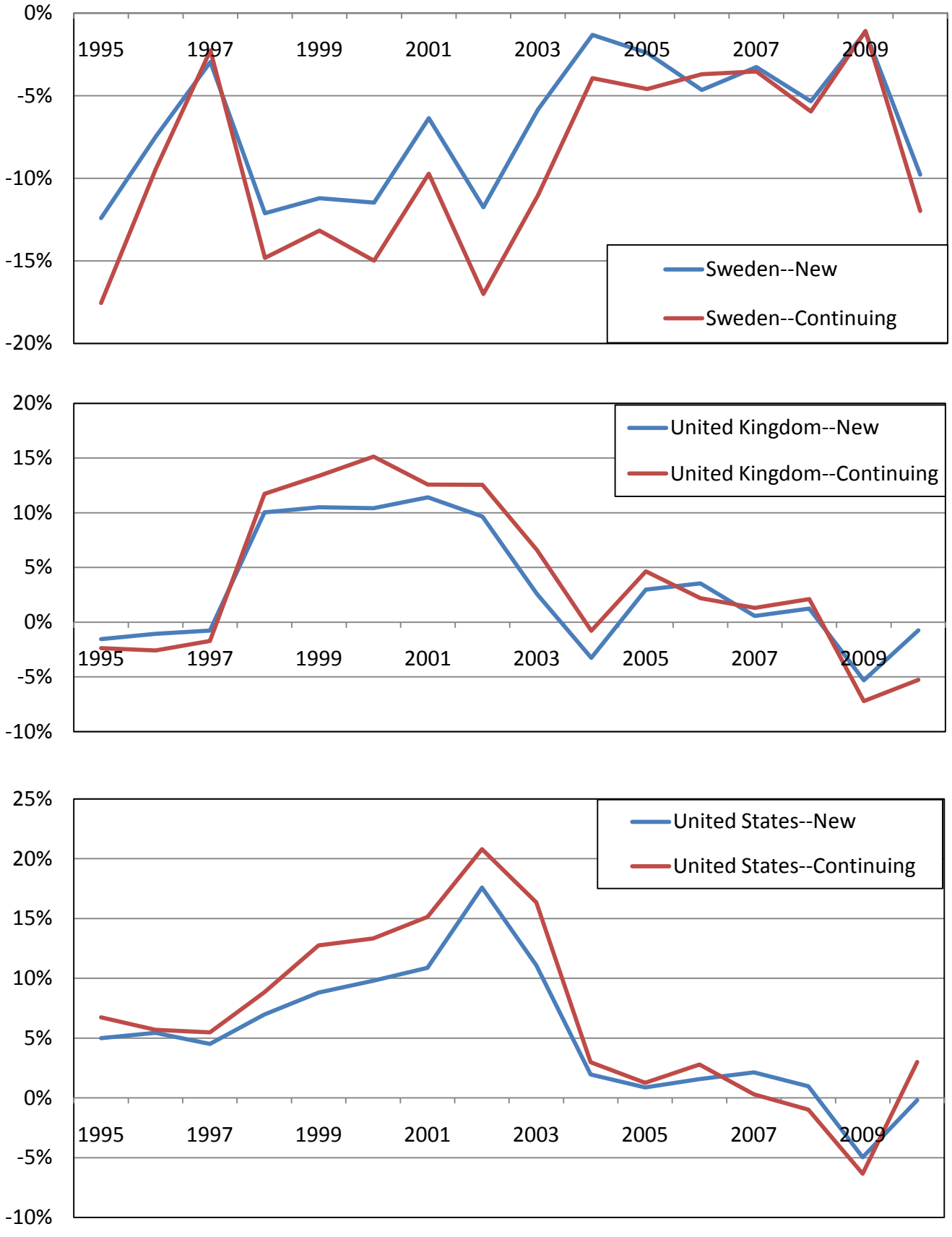


Figure 4-4: LOP deviations by price category of good

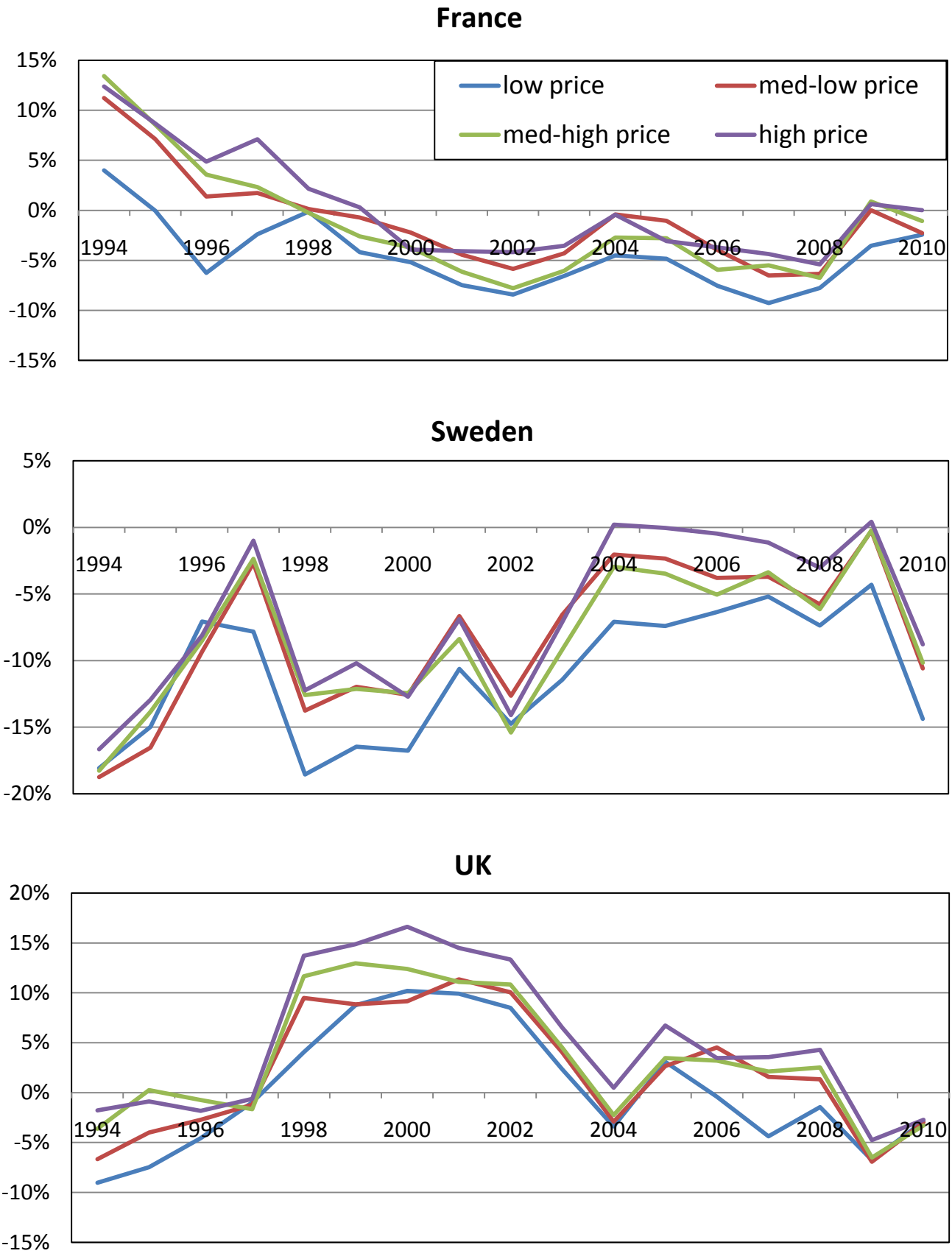


Figure 4-4,cont'd: LOP deviations by price category of good