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# Retailers and Consumers. The pass-through of import price changes*

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**Abstract**

This paper uses German household data on apparel purchases to show that, conditional on income, households differ with respect to their shopping outlets and the prices they pay. We estimate that high-price retailers are not affected by changes in import prices. By contrast, the pass-through for low-price retailers is 53% within 3 months. Consequently, pass-through rates for low-income households are 58%, significantly larger than those for high-income households. We then present one explanation for these observations in a theoretical model with vertical product differentiation due to bundling an otherwise homogeneous imported good with services. Following an import price shock, retailers who sell cheaper unbundled products change prices more than retailers who sell a higher-priced bundle of product and service.

Key words: Import prices, Pass-through, Retailers, Households

JEL codes: D12, D31, F10

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# 1 Introduction

In this paper we use household data on German apparel purchases by the GfK (Gesellschaft für Konsumforschung), a German market research institute, to show that households purchase at different shopping outlets and do not pay identical prices for apparel products. We combine this data set with apparel import data by Eurostat. We provide evidence that the aggregate pass-through of import price changes to consumer prices is incomplete. That is, a 1% change in the import price leads to a less than 1% change of the consumer price. In addition, pass-through rates differ across retailers and households. It implies that price effects of changes in international trade barriers do not affect all households equally. The portion of import prices in final consumer prices is dampened among other things by local cost components. In the literature, these local cost components generally explain up to 50% of the incomplete pass-through, as Hellerstein (2008) or Nakamura and Zerom (2010) have shown. We estimate that high-price retailers are not affected by changes in the import price. By contrast, import price changes are passed-through to low-price retailers at a rate of 53% within 3 months. Low- and high-income households differ in their expenditure shares across different retailers. Consequently, pass-through rates for low-income households are with 58% significantly larger than those for high-income households.

We then theoretically investigate the pass-through of import price changes into consumer prices, when retailers have the possibility to offer a service in addition to the imported good. Services include shop assistants providing advice to customers and retail environmental factors such as ambience (see for instance Grewal and Baker (1994)). The local cost for providing the service adds to the import price. This form of product differentiation causes final consumer prices to differ. Consumers are heterogeneous with respect to their willingness to pay for this extra service and services are preferably consumed by high-income households. Following a shock to the import price, the retailer who sells the good without a service changes final consumer prices by more than the retailer who sells a bundle of product and service. Consumers with a lower willingness to pay for services purchase from the former retailers and are thus affected more by import shocks.

The apparel sector provides a suitable framework for our analysis, as on January 1$^{st}$, 2005, the Agreement on Textiles and Clothing (ATC), which imposed quotas for imports of clothing and textiles from developing countries, expired.[1] This dramatically boosted

[1] The ATC had dominated international trade in clothing and textile products by imposing quotas for imports from developing countries for decades. The progressive integration into normal GATT rules,

especially imports from China. On the other hand, a current article in a German business magazine (Wirtschaftswoche, 2011) reports an increase in wages of Chinese workers. This brought the steady decrease of prices of China's textile products to a stop and thus triggered their recent export price increase. This raises the question, whether these price changes for German apparel imports are passed-through to consumers and to what extent. Benefits to or disadvantages for consumers may be distributed unequally. Buyer and consumer behavior, such as store choice, may determine to what extent savings accrue or - in the case of cost increases - spendings increase.

The general trade effects of the phasing-out of the ATC have been studied amongst others by Nordas (2004), Francois et al. (2007), and Francois and Woerz (2008). Francois et al. (2007) investigate the implications of the ATC phase-out for 15 European Union member states. They find that producer prices reacted similarly across countries and dropped by over 30% from 1996 to 2004. German consumer prices fell by about 13% in this period. In addition, consumer prices exhibit substantial variation across countries that is mainly driven by differences in the structure of retail markets.[2]

There is also a substantial literature on the pass-through of foreign cost shocks, mostly approximated by exchange rate changes, to domestic prices, see e.g. Burstein et al. (2003), Campa and Goldberg (2006, 2010), or Francois et al. (2010).[3] Typically, these studies document incomplete pass-through rates, i.e. goods prices change by less than real exchange rates between the respective countries. The degree of incomplete pass-through differs across countries. Empirical studies, though, suggest that about one fifth of an import price change is passed-through into consumer prices[4]. This leaves a large 80% of price changes to be explained. Recent studies using micro data try to provide explanations for this phenomenon and identify the exact components that yield incomplete pass-through rates. Suggested, potentially important factors include (but are

that is, the successive elimination of the respective import quotas for textile and clothing products, had proceeded over a 10 year transitional period (EU Commission (2000)). But it was in fact the final step that brought the massive liberalization. In the EU, which is the world's largest importer of textile and clothing products together with the United States, 94% of all clothing constraints had not been removed before January 2005 (see Nordas (2004)).

[2]Furthermore, Francois and Woerz (2008) estimate the trade cost equivalent of the ATC quotas and show that these still accounted for roughly 20% before the final phase-out in January 2005. This indicates that it was indeed the last step in 2005 that brought most of the trade liberalization.

[3]Burstein et al. (2003) as well as Campa and Goldberg (2006, 2010) explicitly consider distribution expenditure which add to import prices and can account for a large part of the final price. This channel dampens the pass-through of external shocks to consumer prices. Francois et al. (2010) provide an analysis for 12 EU member states and show significant heterogeneity in pass-through rates to consumers depending on the market structure in the distribution sector.

[4]For the US, this rate is between 7 and 25%, and for Germany it is 21%, see Campa and Goldberg (2010), Nakamura and Zerom (2010), and Hellerstein (2008).

not limited to) markup adjustment, local distribution costs, barriers to and frequency of price adjustment, the degree of competition and a product's quality (see Nakamura and Zerom (2010), Hellerstein (2008), Gopinath and Itskhoki (2010), Goldberg and Knetter (1997), Alessandria (2004), or Auer and Chaney (2009)).[5]

In general, several studies emphasize the importance of the retail and distribution sector for variations in pass-through rates, e.g. Burstein et al. (2003), Francois et al. (2010), Corsetti and Dedola (2005). Among the papers most closely related to our are Nakamura and Zerom (2010) and Hellerstein (2008). Nakamura and Zerom (2010) estimate an incomplete pass-through to consumer prices in the US coffee industry of 27%. They suggest that local cost and markup adjustments are important factors in causing these incomplete pass-through rate: Local costs account for 59% of incomplete pass-through. Also Hellerstein (2008), who investigates US beer prices, finds that retailers markup adjustments and local-cost components each account for one half of the incomplete pass-through. In sum, these studies emphasize that local costs dampen price reactions to any external shock that hits the economy simply because a smaller ratio of the final price is affected. This is exactly the mechanism that induces different pass-through rates in our theoretical model. Nakamura and Zerom as well as Hellerstein focus on pass-through rates for retailers. By contrast, we use the fact that our data consists of household purchases to provide further evidence for differential pass-through rates not only across retailers but also across households of different income.

Our analysis is structured as follows: To begin with, we show the evolution of import prices and final consumer prices of apparel products. We provide evidence that house-

[5] Gopinath and Itskhoki (2010) show that the higher is the frequency of price adjustments, the larger is a product's pass-through rate. Goldberg and Knetter (1997) suggest that incomplete pass-through rates are a consequence of imperfect competition. A significant portion of the price response can be attributed to destination-specific changes in markups, that is, to third-degree price discrimination, which requires a certain degree of market power. Alessandria (2004) links incomplete pass-through rates to search frictions. Firms set optimal prices by taking the consumers' threat of switching the supplier into account. This decreases the pass-through rate for importing firms. Auer and Chaney (2009) link pass-through rates to a product's quality. Based on a model of quality pricing under perfect competition they predict import prices of low-quality goods being more sensitive to exchange rate changes and a shift in the composition of exports towards the high-quality good. Testing these predictions for US import data, they find only weak empirical evidence for this.

For a discussion of how the market structure and the heterogeneity of firms affects the pass-through rates see, for instance, Raff and Schmitt (2009), Campos (2010), Garetto (2009), or Berman et al. (2011). Raff and Schmitt (2009) suggest that the degree of pass-through is underestimated, if the retail market structure is ignored. Campos (2010) argues that the extensive margin has a low impact on the degree of pass-through, but as prices charged by new entrants are higher, the degree of pass-through is reduced by the entry of new firms. Berman et al. (2011) find for French firm level data that following a depreciation, high-performance firms increase markups significantly more and increase less their export volume relative to firms with low productivity. With fixed costs for exporting, only the high productivity firms export and this selection effect can partly explain the observed low aggregate pass-through rates.

holds with different income differ in their choice of shopping stores. These stores, on the other hand, differ in their price level and we distinguish high- and low-price retailers. As retailers do not pass-through import price changes at an identical rate, the effects for households differ as well. In other words, pass-through rates of import price changes are heterogeneous across retailers and households.

Generally, our data has the three dimensions household ($k$), retailer ($r$) and time ($t$). However, as we focus on apparel products, which are not purchased as frequently as e.g. food, we do not obtain sufficient observations for each household at each retailer at each point in time. It is therefore not feasible to consider all dimensions at the same time. Instead, our empirical approach is the following: First, the dependent variable is constructed as the monthly price of a retailer $r$ averaged over all household purchases. In a second step, the monthly average price for the two household groups with high and low income are calculated for each retailer and we use this average price as dependent variable. Each of these variables is then regressed on changes in the import price in the apparel sector.

We estimate that high-price retailers (H-type retailer in the following) are not affected by changes in the import unit value. By contrast, import unit value changes are passed-through to L-type retailers, which have a low price level, at a rate of 53% within 3 months. The relative price ($p_H/p_L$) responds with an increase of $0.45 - 0.52\%$ given a one percent increase in the import price. Turning to households, we estimate that the pass-through of import price changes to the average prices paid by low-income households is 58% which is significantly higher than for high-income consumers. This is consistent with rich households shopping more frequently in high price stores that are less affected by trade-induced changes in the import price of apparel products.

We then emphasize the role of one possible explanation for price differences and different pass-through rates of retailers: locally supplied services. We consider the impact of a change in import prices in a theoretical model with a heterogenous demand side and vertical product differentiation based on Shaked and Sutton (1982). Two firms sell an identical imported product, but one firm bundles the good with a service, inducing product differentiation. Given an identical change in import prices, the retail price of the firm offering additional services changes less in relative terms.

This paper contributes to two strands of the literature. First, we provide further evidence for the incomplete pass-through of import price changes to domestic prices. This is in line with several other studies as, for instance, Campa and Goldberg (2006, 2010) or Francois et al. (2010). More importantly, we explicitly consider local distribution costs which we interpret as additional services offered with an otherwise identical good. The

heterogeneity of retailers has been shown amongst others by Raff and Schmitt (2011). In our paper, the firm heterogeneity with respect to the supply of services provides one possible explanation for differences in pass-through rates. Second, we add to the pass-through literature a new aspect: Household income. The shopping behavior of low- and high-income households differs with respect to the type of retailers they go to and these retailers differ in their price level and pass-through rates. One possible interpretation are the amount of local, non-traded cost shares in their final prices. In sum, this leads to different pass-through rates depending on a household's income.

The rest of the paper is organized as follows: Section 2 provides stylized facts of the data where we show the shopping behavior of households and the average prices of retailers. In section 3 we discuss our estimation strategy and the estimation results. Section 4 then presents our theoretical model and its predictions for a decrease in import prices and section 5 concludes.

## 2 Stylized facts

In this section we describe the data and provide stylized facts that motivate our theoretical model. We use monthly data on clothing purchases from the "Gesellschaft für Konsumforschung" (GfK), a German market research institute and its "Universalpanel" for the period January 2000 to December 2007. In this panel, participating households have to assign all their purchases to roughly 100 categories ranging from apparel products as well as electronic articles to housewares and specify the price and the retailer for each item. We focus on the 24 apparel categories, such as "trousers, men outerwear". Household characteristics, such as the buyer's age, his/her profession and education, and a household's net income and size, are reported as well. Data on German import unit values for apparel products is provided by Eurostat and covers the same periods.[6]

First, we show the impact of the ATC phase-out on German imports in the clothing sector. Figure 1 shows German import quantities separated by intra- and extra-EU trade. The vertical dashed lines mark the respective phase-out steps of the ATC. The dotted line of imports from countries within the EU fluctuates around a relative stable value of 100 million units per month. By contrast, we observe a steady increase in extra-EU imports, represented by the dashed line, following step 3 of the ATC phase-out by about one third. A spike in imported quantity occurs right after the final integration in

[6] Specifically, we consider all imports from outside the European Union in the combined nomenclature (CN) categories 61 (*Articles of apparel and clothing accessories, knitted or crocheted*) and 62 (*Articles of apparel and clothing accessories, not knitted or crocheted*) which report quantities and volumes. Prices are c.i.f. and in Euro.

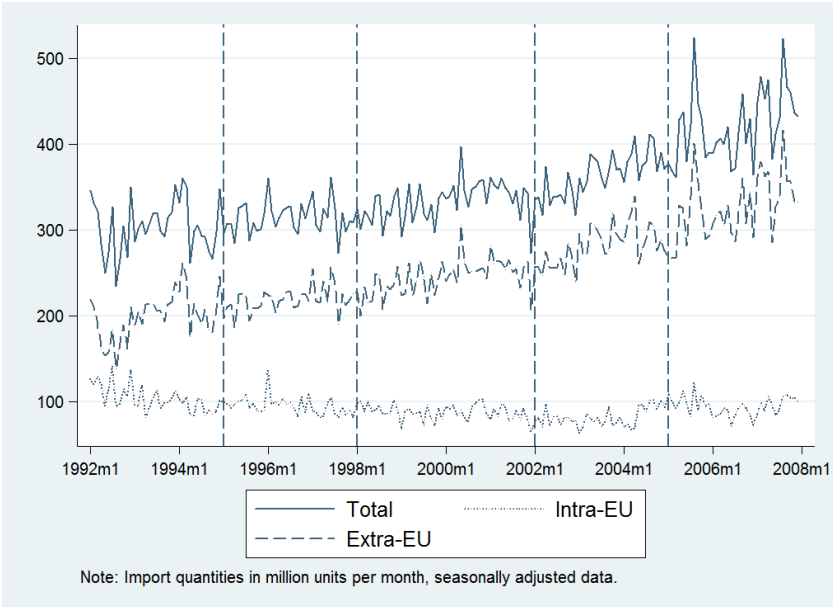


Figure 1: German clothing import quantities.

January 2005, even exceeding 400 million units in some months. So by far, the major part of apparel imports comes from outside the EU.[7] It is exactly these countries that benefited from the ATC phase-out. Additionally, if we only consider extra-EU trade the correlation between the seasonally adjusted import unit values and an overall average consumer price is high with a value of 0.75 in contrast to a correlation factor of 0.28 for intra-EU trade. This suggests that imports from outside the EU play an important role for German apparel retailers. In the following we will thus define import prices as the average unit value of all German extra-EU imports in a month $t$.

One explanation for incomplete pass-through of import prices into consumer prices are local cost components and include service costs. Services that some retailers offer are reflected in their higher prices. To this end, we construct a measure of the price level for each retailer. We first calculate $s_{rj} = \frac{p_{rj}}{P_j}$ over all periods, where $p_{rj}$ is the average price of retailer $r$ in GfK-category $j$ and $P_j$ is the average price in GfK-category $j$ over all retailers. Summing $s_{rj}$ over all $n$ categories and dividing by the number of categories yields $S_r = \frac{\sum s_{rj}}{n}$, our measure of the average price level of each retailer $r$. A value of $S_r \geqslant 1$ characterizes a retailer who charges prices above average. These retailers

[7] Another implicit observation of Figure 1 is that these imports replaced German domestic production of apparel goods. As found in Braakmann and Wagner (2009) and Raff and Wagner (2010), German production dropped by about 50% from 2000 to 2006.

are regarded as H-type retailers in the following. $S_r < 1$ implies a relatively lower price level, respectively, and we will refer to these as L-type retailers. We are well aware of the fact that other differences across retailers are included in this measure. Retailers might sell different products within the same GfK-categories. Differences in the distribution channel e.g. will imply that retailers with more efficient distributional organization can charge a lower price to customers. The smaller the distance to production facilities, the faster a retailer is able to react to changes in demand. This might be more important for seasonal clothing and to a lesser extent for basic equipment as T-shirts. If countries differ in their ability to produce high quality products, retailers offering higher quality could choose exactly these countries for sourcing their inputs. Products manufactured in Italy might have different quality requirements compared to goods from Bangladesh. The data does not say anything about where the retailers source their goods. There are at least three remarks to be made here. First, this information is not publicly available through business reports or firm homepages. Especially the clothing sector is affected by consumer's perception of the working conditions in their production plants. Thus, a lot of retailers are not willing to reveal their exact import sources.[8] Second, in 2008, the import share of Chinese clothing was about 30%. Including Turkey and Bangladesh increases this share to about 50%.[9] Given these amounts, it seems reasonable to assume that almost all retailers will source at least part of their goods from these countries.[10] Finally, we also run regressions with Eurostat's intra-EU-unit values as an explanatory variable and our results remain qualitatively unchanged. But regardless of where the price differences stem from, the crucial assumption is that the imported goods are identical across retailers. In this way, we are able to estimate the effect of an import price change on retailers with different price levels.

The average prices for H and L-type retailers reveal substantial differences, as the Figure 2 shows. We focus on deviations from the mean of each variable.[11] The solid line

[8] In Germany, public television and organizations such as the "Clean Clothes Campaign" (www.cleanclothes.org) try to provide information on working conditions to consumers. For instance, in 2008, reports were made about poor working conditions and physical punishment in factories supplying H&M or KiK (CCC (2008) or http://www.swr.de/report/-/id=233454/nid=233454/did=4039780/80hm8d/index.html). Such reports might heavily worsen the public image of these firms.

[9] Data published by the German Federal Statistical Office on its official website (see GENESIS online, Table 51000-0007).

[10] Another German television report provides more anecdotal evidence on the production of blue jeans, http://www.ndr.de/fernsehen/sendungen/45_min/hintergrund/bluejeans101.html. The authors conclude that regardless of the final consumer price category of the jeans working conditions are identical for Chinese workers. In other words, regardless if a jeans sells for 10€ or 150€, its production still takes place in China.

[11] Since the absolute difference between these prices is quite large, the deviations from the mean

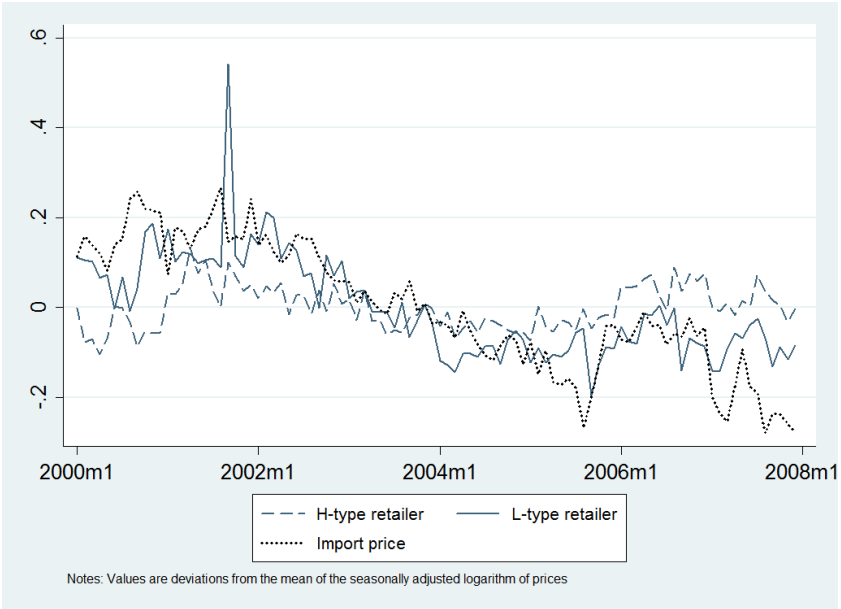


Figure 2: Import price and average prices for H- and L-type retailers

shows that L-type retailer's average price follows very closely the import price, which is represented by the dotted line. By contrast, the dashed line of H-type average prices seem to be much more isolated from the import price. Turning to Figure 3, which shows the relative price ($p_H/p_L$) as the dashed line and the import price as a dotted line, we observe a strictly negative correlation. A decreasing import price is accompanied by a steady increase of the relative price ($p_H/p_L$). As we will show later, this is driven by a decrease of $p_L$.

The GfK-data on household purchases provides 16 different income intervals and the size of the household. In order to calculate the per-capita income, we assume the mean of the respective interval as the household income and divide it by the scaled number of household members.[12] The lowest quartile of the per-capita income distribution defines the low-income group and the highest quartile the high-income group, respectively. Table 1 provides some stylized facts on these household types. In our sample, low-income

provide a much better view of the relative evolution of prices.

[12] Household size needs to be scaled in order to adjust for the non proportinal increase in needs with respect to household members. We use the OECD-modified scale of equivalence which applies a value of 1 for the first household member. Each additional person is asigned a value of 0.5, each child under the age of 14 a value of 0.3, respectively. Nevertheless, our results hold qualitatively for different specifications of the equivalence scales. For a review on equivalence scales, see for example De Vos and Zaidi (1997).

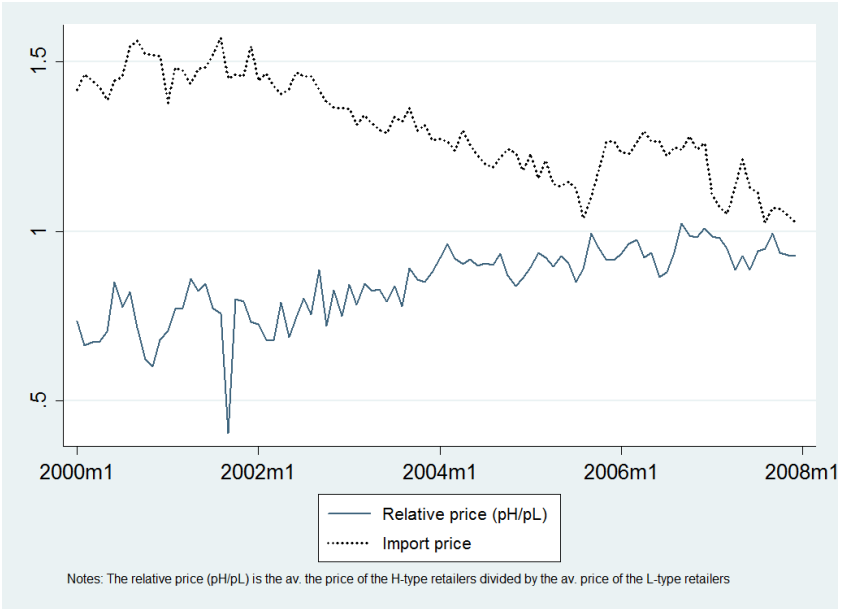


Figure 3: Import price and relative price of H- and L-type retailers

| | Children | Size | Education | pc-Income | Av. price | Total exp. |
|---|---|---|---|---|---|---|
| Low-income | 0.50 | 2.58 | 5.5 | 694 | 24.23 | 4,384,613 |
| High-income | 0.14 | 2.03 | 7.3 | 2,111 | 40.96 | 8,762,483 |

Table 1: Household sample information

households have more children[13] with an average of 0.50 children per household, a lower education level of 5.5[14], and the number of persons in a household is larger with a mean of 2.58. The average per-capita income of a high-income household is 2,111 Euro, more than twice that of the low-income household. Their total expenses are higher and they pay an average price of 40.96 Euro for apparel, compared to 24.23 Euro for a low-income household.

Next, we look at retail outlets of households with different income. Table 2 shows the relative importance of a selection of retailers for the different types of households. Households with a low per-capita income purchase relatively more goods and spend a greater share of their income in L-type retailers.[15] KiK, for instance, has a low price level

[13] According to the equivalence scales we use children are defined as aged 14 or younger.

[14] The official GfK data ranks education from 2 "basic schooling without vocational training" in six steps to 9 "university/college degree".

[15] The share of units bought at each store is reported in the Appendix in Table 9.

| Retailer | Price level | Expenditure share Low income | High income | Ratio | Retailer information Sales volume | # of households | # of obs |
|---|---|---|---|---|---|---|---|
| Alba Moda | 1.81 | 0.08 | 0.24 | 0.36 | 39,233 | 169 | 531 |
| Anson's / P&C | 1.78 | 2.21 | 6.68 | 0.33 | 1,133,761 | 2,911 | 18,174 |
| Breuninger | 1.72 | 0.51 | 1.72 | 0.30 | 264,279 | 860 | 4,397 |
| C & A | 0.85 | 7.45 | 4.45 | 1.67 | 1,594,453 | 6,598 | 60,601 |
| H & M | 0.70 | 2.80 | 1.51 | 1.85 | 558,459 | 3,981 | 25,351 |
| Karstadt | 1.22 | 0.39 | 0.67 | 0.58 | 113,634 | 987 | 3,215 |
| KiK | 0.35 | 1.21 | 0.23 | 5.27 | 162,108 | 2,799 | 16,502 |
| SinnLeffers | 1.28 | 1.45 | 2.10 | 0.69 | 482,348 | 1,884 | 11,537 |
| Orsay | 0.76 | 0.44 | 0.16 | 2.84 | 77,287 | 1,015 | 3,061 |
| Pimkie | 0.81 | 0.27 | 0.10 | 2.74 | 48,492 | 748 | 2,059 |
| Sportscheck | 1.56 | 0.19 | 0.26 | 0.74 | 63,212 | 488 | 1,181 |
| Takko | 0.50 | 1.01 | 0.24 | 4.16 | 159,160 | 2,004 | 9,544 |
| Zara | 0.90 | 0.13 | 0.15 | 0.87 | 32,186 | 436 | 951 |

Table 2: Retailer information and household expenditure shares, selection of full sample

of 0.35. This is in-line with this retailer's strict strategy of low prices with no advisory services for their customers. Low-income households spend 1.21% of their expenditure at KiK, a value more than five times larger than the 0.23% for high-income households. In other words, households obviously do not purchase their goods in the same shops with identical intensity. The correlation of the relative expenditure ratio and the price level measure is negative with a value of $-0.47$. That is, high values of the ratio variable indicate a more important role of these retailers for low-income households and these are correlated with low values of the price level measure. As retailers differ in their price levels, the same import price shock will have different impacts on the final consumer prices of retailers and, thus, households.

# 3 Empirical strategy and results

We interpret changes in the import unit value as a change in import prices and estimate how these changes affect the prices of retailers and households. Generally, the data has the three dimensions household ($k$), retailer ($r$) and time ($t$). Since we focus on apparel products that are not purchased as frequently as, e.g. food, we do not obtain sufficient observations for each household at each retailer at each point in time. It is therefore not feasible to consider all dimensions at the same time. Instead, our empirical approach is the following: First, the dependent variable is constructed as the monthly price of a retailer $r$ averaged over all household purchases ($p_t^r$). We then calculate the relative price $(p_H/p_L)_t$. In a final step, the monthly average price of each of the two household

groups of high and low income are calculated for each retailer and we use this average price as dependent variable ($p_t^{h,r}$). Each of these variables is regressed on changes in the import price in the apparel sector ($p_t^i$).

### 3.1 Retailers

We consider a regression equation that is motivated by several other pass-through studies (see e.g. Campa and Goldberg (2005, 2006) or Gopinath et al. (2010)):

$$p_t^r = p_t^i + D' + \varepsilon_t^r, \tag{1}$$

where $p_t^r$ is the product price of retailer $r$, $p_t^i$, are import unit values and all prices are monthly averages. $D$ is a vector of additional control variables, $\varepsilon_t^r$ is the error term, and the subscript $t$ refers to time. For the purpose of this study, we rewrite equation (1) in first differences and add two lagged values of the import unit value to account for the stepwise adjustment to cost changes.[16] This yields the following estimation equation:

$$\Delta p_t^r = \sum_{j=0}^{2} \alpha_j \Delta p_{t-j}^i + \sum_{j=0}^{2} \beta_j \left(\Delta p_{t-j}^i * low\right) + \gamma_{low} low + \gamma' D + \varepsilon_t^r, \tag{2}$$

where the definition of the variables is the same as in (1). We add an interaction term of the import unit value and the dummy variable *low*, which equals 1 if the retailer has a price level smaller than 1. That is, the total impact of a change of the import unit value on the average price of an L-type retailer equals $\sum_{j=0}^{2} \left(\alpha_j + \beta_j\right)$. Other variables influencing retailer prices, such as dummy variables for the respective stages of the ATC phase-out or a time trend, are captured by the term $D$.

We now discuss some econometric issues that affect all regressions and all dependent variables. In our analysis, the import price is the average monthly unit value of all extra-EU imports of Germany within the 2-digit sectors 61 and 62. Relative to the global apparel economy, the German market is small and import prices are thus considered as given. Therefore, endogeneity of the import unit value is of lesser concern for our study.[17] The error terms of the regressions might be serially correlated. Hence, we consider this

[16] With the adpotion of two lagged values we thus refer to the short-run pass-through. We refrain from including more lagged values in order to reduce the size of our estimation equation. This is supported by studies as Gopinath et al. (2010), which show for the US that the main part of pass-through occurs in the first two quarters after an exchange rate with little further adjustments.

[17] We do not think that endogeneity stemming from global shocks that affect import and retail prices likewise is a problem. The major part of German imports originates in less developed economies, making this a reasonable assumption. However, we included a time trend to capture any remaing effects.

and report results for the Prais-Winsten estimator and in another specification included a lagged dependent variable. We tested all variables for the existence of unit-roots. The import unit value is integrated of order one (I(1)). We also performed Fisher's panel unit-root test for the average price of retailer $r$ and for the average price of household type $h$ at retailer $r$, respectively. The null-hypothesis that all series are non-stationary is rejected.[18] Therefore, all variables are in first differences to remove the non-stationarity of the import price.[19] Generally, all variables are separately seasonally adjusted using monthly dummies. Also, the error terms might be correlated within a retailer, but not across retailers, so in this case we cluster the data by retailer to correct for the potential problem of contemporaneous correlation (see Moulton (1990)).

Table 3 summarizes the results of regressions of equation 2. Except for column 1 all regressions consider the interaction term. The regressions differ with respect to the added fixed effects (3), the estimator (4, 5, and 9), and whether we add a lagged value of the dependent variable (6). In (7) we use the original data and seasonally adjust it by inserting monthly dummy variables in the regression and (8) uses levels of all variables. In the basic regression, we confirm the incomplete pass-through of import price changes into consumer prices of about 24%. Distinguishing retailers, the estimation results point to no price change for H-type retailers. By contrast, the average price of L-type retailers changes by about 0.53 percent given a 1 percent change in the import price. Compared to the incomplete pass-through of L-type retailers, the results would be interpreted as zero pass-through of import price changes for H-type retailers. While this is a little surprising, we do not want to emphasize the exact value of the coefficients given the characteristic of the data. Nonetheless, as is clear from Table (3), there is a significant difference across types of retailers. For all but one regression, L-type retailer's prices are affected significantly more by a change of the import unit value. The recent decline in import prices as we showed on the right hand side in Figure **??** is passed-through to a much higher level for L-type retailers.

Retailers might differ with respect to the country where they import from. In order to consider this possibility, we regress the average price of retailer $r$ on intra-EU import prices. If H-type retailers provide higher quality products which in turn are more likely to be manufactured within the European Union we would expect a positive correlation with the intra-EU import price. However, this is not the case. Although not reported here, the estimation results for these regressions always show a higher pass-through rate for L-type retailers. In addition, the coefficients are generally not statistically significant from

[18] We thus do not consider the existence of a cointegration relation among these variables as relevant.
[19] Confer the Appendix for more detailed results.

| | 1 | 2[1] | 3 | 4 | 5 | 6 | 7 | 8 | 9[2] |
|---|---|---|---|---|---|---|---|---|---|
| | basic | interact | add FE | FE est. | RE est. | lagged dep.var. | monthly dummies | levels | PW-est. |
| | Dependent variable: Average price of retailers ($\Delta p_t^r$) | | | | | | | | |
| Observations | 6,469 | 6,469 | 6,469 | 6,469 | 6,469 | 6,452 | 6,506 | 6,573 | 6,469 |
| Adj. R2 | 0.001 | 0.002 | -0.010 | 0.002 | 0.004 | 0.252 | 0.030 | 0.885 | -0.008 |
| F-Statistic | 1.916 | | | 3.794 | | | | | |
| Root MSE | 0.339 | 0.339 | 0.341 | | | 0.293 | 0.318 | 0.252 | 0.294 |
| All | 0.240 | | | | | | | | |
| All: Prob > F | 0.067 | | | | | | | | |
| H-type retailer | | -0.138 | -0.150 | -0.150 | -0.150 | -0.293 | 0.288 | 0.173* | -0.181 |
| H: Prob > F | | 0.410 | 0.382 | 0.379 | 0.379 | 0.165 | 0.086 | 0.010 | 0.298 |
| L-type retailer | | 0.545* | 0.530* | 0.530* | 0.530* | 0.638* | 0.263 | 0.669* | 0.447* |
| L: Prob > F | | 0.005 | 0.007 | 0.006 | 0.005 | 0.007 | 0.086 | 0.000 | 0.010 |
| Number of retailers | | | | 80 | 80 | | | | |

*Statistically significant at the 5%-level.

[1] Columns 2-9 include an interaction term of the dummy variable "low" (=1 if L-type retailer) and $\Delta p_{t-j}^i$.

[2] Prais-Winsten estimator.

Table 3: Pass-through into average prices for L- and H-type retailers

| | 1 | 2[1] | 3 | 4[1] | 5[2] |
|---|---|---|---|---|---|
| | $\Delta$ | $\Delta$ | *Levels* | *Levels* | $PW - est.$ |
| | Dependent variable: (H-type price / L-type price) $\Delta\left(p_H/p_L\right)_t$ | | | | |
| Variables[3] | | | | | |
| $\Delta p_t^{import}$ | 0.153 | 0.143 | 0.103 | 0.122 | 0.139 |
| | (0.193) | (0.193) | (0.180) | (0.165) | (0.194) |
| $\Delta p_{t-1}^{import}$ | -0.516* | -0.451* | -0.560* | -0.588* | -0.521* |
| | (0.219) | (0.149) | (0.227) | (0.228) | (0.194) |
| $\Delta p_{t-2}^{import}$ | -0.099 | -0.321 | -0.143 | 0.089 | -0.067 |
| | (0.138) | (0.164) | (0.104) | (0.106) | (0.155) |
| $(p_1/p_2)_{t-1}$ | | -0.453* | | 0.366* | |
| | | (0.166) | | (0.134) | |
| Constant | | | 1.634* | 1.031* | |
| | | | (0.073) | (0.221) | |
| Observations | 93 | 93 | 94 | 94 | 93 |
| Adj. R2 | 0.094 | 0.273 | 0.616 | 0.665 | 0.112 |
| F-Statistic | 2.123 | 3.318 | 45.470 | 49.970 | 3.287 |
| Root MSE | 0.075 | 0.067 | 0.066 | 0.062 | 0.067 |
| Cumulative effect | -0.463 | -0.629* | -0.600* | -0.376* | -0.448* |
| Prob > F | 0.103 | 0.023 | 0.000 | 0.000 | 0.032 |

*Statistically significant at the 5%-level. Robust standard errors in parentheses.
[1]Columns 2 and 4: added lagged dependent variable. [2] Prais-Winsten estimator.
[3]Variables in differences and levels, respectively.

Table 4: Relative price of H- and L-tpye retailers and import price

zero which again points to the importance of extra-EU imports in the apparel retailing sector. We then run the same regression with only the price for Chinese imports as explanatory variable. To assume that imports from one country are homogeneous seems to be a less strong assumption. But again, the ranking of the pass-through rates remains identical.

Now we calculate the average price of all H- and L-type retailers in order to obtain the relative price $(p_H/p_L)_t$ for each period $t$. The right part of Figure **??** shows a clear negative correlation. That is, a decrease of import prices, instrumented by the import unit value, should lead to an increase of $(p_H/p_L)$. We therefore regress $\triangle\left(p_H/p_L\right)$ on import price changes. Table 4 provides the estimation results. The lagged first-difference of the import unit value is statistically significant and has a value between $-0.52$ to $-0.45$. More importantly, the cumulative effect of the first three lags, although not statistically significant in every case, confirms the predicted negative correlation. The corresponding increase in the relative price $p_H/p_L$ is thus driven by a decrease of $p_L$.

### 3.2 Households

In this section, we focus on low- and high-income households and examine whether they are affected differently by changes in the import unit value. First, we calculate average monthly prices paid by low- and high-income households, respectively, at each retailer $r$ in our sample. We then regress these average prices on changes in the import price.

In line with the estimation equation in section (3.1), $p_t^{h,r}$ is the average price of purchases of household type $h$ ($h = 1, 2$) at retailer $r$, $p_t^i$ are import unit values and all prices are monthly averages. $D$ is a vector of additional control variables, $\varepsilon_t^{h,r}$ is the error term, and the subscript $t$ refers to time. Again, we use first differences and add two lagged values of the import unit value. This yields the estimation equation:

$$\Delta p_t^{h,r} = \sum_{j=0}^{2} \alpha_j \Delta p_{t-j}^i + \sum_{j=0}^{2} \beta_j \left(\Delta p_{t-j}^i * low\right) + \gamma_{low} low + \gamma' D + \varepsilon_t^{h,r}. \tag{3}$$

We add an interaction term of the import price and the dummy variable $low$, which equals 1 for households with low income. That is, the total average impact of a change in the import unit value on a low-income household equals $\sum_{j=0}^{2} \left(\alpha_j + \beta_j\right)$. If changes in the import price $p_t^i$ lead to unequal effects on the household price $p_t^{h,r}$, we would expect $\beta_j$ to be statistically different from zero. More specifically, $\beta_j > 0$ implies that households with a lower per-capita income are affected more by changes in the import price. Table 5 summarizes our results for different specifications. About 58% of a change in the import price is passed-through into average prices of a low-income household. These results are statistically significant for all specifications. By contrast, in all specifications high-income households are affected less and the coefficients are never significantly different from zero.

Summarizing the results from Table 3 and 5 we observe that pass-through rates of import price changes across households can be explained by two things. First, the purchasing behavior differs by household type: High- and low-income households do not shop at the same stores with the same intensity. Total spending and the relative importance of retailers measured by a household's expenditure share differ across households. Second, retailers differ in their price levels. This results in differences in the pass-through rates across retailers which in turn imply different pass-through rates for low- and high-income households. Therefore it is crucial to consider the role of retailers to correctly analyze trade effects on consumer prices when households are heterogenous with respect to income. In the next section, we provide a theoretical model that explains this effect.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Dependent variable: Average price of household group $h$ at retailer $r$ $\left(\Delta p_t^{h,r}\right)$ | | | | | | | | |
| Observations | 10,594 | 10,594 | 10,594 | 10,594 | 10,594 | 10,594 | 10,594 | 11,051 |
| Adj. R2 | 0.021 | 0.254 | 0.254 | 0.033 | 0.250 | 0.250 | 0.245 | 0.251 |
| F-Statistic | 13.52 | 191.1 | 190.2 | 5.021 | 39.38 | | 189.5 | |
| Root MSE | 0.487 | 0.425 | 0.425 | 0.426 | 0.427 | 0.427 | | |
| High income | 0.232 | 0.199 | 0.199 | 0.193 | 0.275 | 0.275 | 0.284 | 0.278 |
| H: Prob > F | 0.328 | 0.337 | 0.210 | 0.249 | 0.200 | 0.105 | 0.188 | 0.195 |
| Low income | 0.612* | 0.512* | 0.512* | 0.396* | 0.576* | 0.576* | 0.578* | 0.580* |
| L: Prob > F | 0.010 | 0.013 | 0.001 | 0.018 | 0.007 | 0.000 | 0.007 | 0.007 |
| Number of groups | | | | | | | 141 | 141 |
| Included: | | | | | | | | |
| $\Delta p_{t-1}^{h,r}$ | | yes | yes | | yes | yes | yes | yes |
| Time trend | | | | yes | yes | yes | yes | yes |
| Retailer fixed effects | | | | yes | yes | yes | yes | yes |
| Clustered by retailer | | | yes | | | yes | | |
| Estimator | OLS | OLS | OLS | PW[1] | OLS | OLS | FE[2] | RE[3] |

*Statistically significant at the 5%-level.

[1]Prais-Winsten, [2]Fixed effects, [3]Random effects

Table 5: Pass-through into average prices of high and low-income households

# 4 The Model

Theoretically, several potential explanations for differences in prices and pass-through rates across retailers emerge, for instance, markup adjustment, frequency of price adjustment, and local distribution costs.[20] As pointed out before, retailers also might sell different products but this channel is no going to be necessary for explaining differences in pass-through rates. In our model, we stress another important factor: an additional local service sold together with a good. This involves for example shop assistants providing advice to customers or retail environmental factors such as ambience. If two firms offer homogeneous imported products, then bundling this product with services is a means to differentiate the product from the competitor's product. The cost for providing the service adds to the import price and this form of product differentiation causes final consumer prices to differ. Given a shock to the import price, relative consumer price reactions are smaller for the bundle of good and service. The addition of the service thus dampens any shock to the import price, regardless of its direction. As a consequence, if households differ in their willingness to pay for such services, they are not affected identically by trade shocks.[21]

To make this point, we apply a simple model, following Shaked and Sutton (1982), in which two retailers sell homogeneous imported goods, but bundling the good with a service constitutes a form of product differentiation. Consider a market with two retailers, each distributing a simple good with a constant import price $p^i$. Both firms have the possibility to offer the product with a service. We will show that firms will always choose to differentiate their products, i.e. one firm will offer a service and the other not. Let us denote the bundle of the good and the additional service and the firm offering it as $b$ and let us denote the good without the service and the firm selling it as $u$.

Consumers obtain a higher utility from the bundle of good and service, which is

[20] Also, the degree of competition in the two market segments may drive differences in prices and pass-through rates. But firms being able to sustain price differences implies a different willingness to pay for specific goods and hence certain degree of product differentiation. Thus, differences in the degree of competition cannot explain differences in the prices by itself but in combination with differences on the demand side.

[21] Furthermore, especially in the clothing sector, brands and the importance of a brand's image also determine prices. We do not have information on brands. However, we think that this is not a major concern and we assume that service and brand image can be used interchangeably. The basic part of a T-shirt of, say, "Adidas" is the T-shirt itself and this is produced abroad. Commercials and other marketing activities that establish the brand image of "Adidas" are not produced abroad. Instead, they are supplied locally. That is, this works exactly in the same way as our definition of services. Retailers who offer "Adidas" T-shirts thus sell a bundle of the basic shirt and some additional local service. As a consequence, prices in this retailer will be higher compared to retailers selling a "no-name" brand.

captured by a premium $\delta$ in consumer valuation. Also, a lower brand image of the retailer distributing the good without a service may contribute to a lower quality perception of the unbundled good, but this is not necessary for the results derived from the model.

Consumers differ with respect to their gross valuation $\theta$, which is uniformly distributed on the unit interval. Each consumer demands either one or zero units of the most preferred good. The utility derived from no purchase is zero, while a consumer who buys one unit of the good obtains a net utility

$$U(\theta, \delta, p_j) = \begin{cases} \delta\theta - p_b^r & if\ j = b \\ \theta - p_u^r & if\ j = u \\ 0 & otherwise, \end{cases} \tag{4}$$

where $\delta > 1$ reflects the additional utility obtained from the service, $p_b^r$ is the final price of the bundled good and $p_u^r$ is the price of the unbundled good. For $\delta = 1$, the bundled and unbundled good are considered perfect substitutes. A consumer with a positive net utility of the good will choose the most preferred version of the good by trading off perceived quality against the price. The higher the gross valuation $\theta$, the higher the willingness to pay for the service. The consumer heterogeneity can be interpreted as differences in willingness to pay for an additional local service or differences in income.[22] Note that $\theta$ can also be interpreted as the marginal rate of substitution between income and quality (see Tirole (1988)).

The marginal consumer indifferent between purchasing the bundled and unbundled good has gross valuation $\theta^*$, which is given by

$$\delta\theta^* - p_b^r = \theta^* - p_u^r \Leftrightarrow \theta^* = \frac{p_b^r - p_u^r}{\delta - 1}. \tag{5}$$

The marginal consumer indifferent between purchasing the unbundled good and not buying has valuation $\theta^{**}$, which is given by

$$\theta^{**} - p_u^r = 0 \Leftrightarrow \theta^{**} = p_u^r. \tag{6}$$

Hence, demand for the bundled good and the unbundled good respectively is given as

$$q_b = 1 - \frac{p_b^r - p_u^r}{\delta - 1},\ q_u = \frac{p_b^r - p_u^r}{\delta - 1} - p_u^r. \tag{7}$$

[22] A consistent interpretation with our empiricial observation is that higher $\theta$ corresponds to higher income for a household.

Marginal cost for distributing the good is $c$ for both firms, which is normalized to zero. In addition, firm $b$ incurs marginal cost $w$ for offering the service together with the good. We analyze the following two-stage game: In the first stage, firms choose whether to bundle the good with the service or to sell only the good. In the second stage, firms compete in prices.

Firms' profits are given as

$$\pi_b = \left(p_b^r - p^i - w\right)\left(1 - \frac{p_b^r - p_u^r}{\delta - 1}\right), \ \pi_u = \left(p_u^r - p^i\right)\left(\frac{p_b^r - p_u^r}{\delta - 1} - p_u^r\right). \tag{8}$$

Starting with the second stage, equilibrium prices are

$$p_b^r = \frac{3p^i\delta + 2w\delta + 2\delta\left(\delta - 1\right)}{4\delta - 1}, \ p_u^r = \frac{p^i\left(1 + 2\delta\right) + w + \left(\delta - 1\right)}{4\delta - 1}. \tag{9}$$

Prices are strategic complements. Thus, although only firm $b$ offers the service, also the price of firm $u$, $p_u^r$, increases in service costs $w$.

Equilibrium quantities are

$$q_b = \frac{\left(2\delta - p^i\right)\left(\delta - 1\right) - w\left(2\delta - 1\right)}{\left(4\delta - 1\right)\left(\delta - 1\right)}, \ q_u = \frac{\delta\left(\left(1 - 2p^i\right)\left(\delta - 1\right) + w\right)}{\left(4\delta - 1\right)\left(\delta - 1\right)}, \tag{10}$$

and profits are

$$\begin{aligned} \pi_b &= \frac{\left(2\delta\left(\delta - 1\right) - w\left(2\delta - 1\right) - p^i\left(\delta - 1\right)\right)^2}{\left(\delta - 1\right)\left(4\delta - 1\right)^2}, \\ \pi_u &= \frac{\delta\left(\left(\delta - 1\right) - 2p^i\left(\delta - 1\right) + w\right)^2}{\left(\delta - 1\right)\left(4\delta - 1\right)^2}, \end{aligned} \tag{11}$$

with $\pi_b > \pi_u$, if $w < \left(\sqrt{\delta} - 1\right)\left(p^i + \sqrt{\delta}\right)$. That is, if the cost for providing the service is sufficiently low, the profit is higher for the firm bundling the good with the service.

Turning to stage 1, Table 6 shows profits for both firms, conditional on the simultaneous choice whether to bundle the good with a service or to offer only the good.

| Firm 1, 2 | offering only the good, no service | bundling good and service |
|---|---|---|
| offering only the good, no service | 0, 0 | $\frac{\delta\left((\delta-1)-2p^i(\delta-1)+w\right)^2}{(\delta-1)(4\delta-1)^2}$, $\frac{\left(2\delta(\delta-1)-w(2\delta-1)-p^i(\delta-1)\right)^2}{(\delta-1)(4\delta-1)^2}$ |
| bundling good and service | $\frac{\left(2\delta(\delta-1)-w(2\delta-1)-p^i(\delta-1)\right)^2}{(\delta-1)(4\delta-1)^2}$, $\frac{\delta\left((\delta-1)-2p^i(\delta-1)+w\right)^2}{(\delta-1)(4\delta-1)^2}$ | 0, 0 |

Table 6: Firm profits in a simultaneous game

Nash equilibria are (no service, service) and (service, no service), that is, in equilibrium, firms will differentiate, one firm will bundle the good with a service, the other one will offer only the good. In other words, the point that exactly one firm is offering a service is not an exogenous assumption, but an endogenous result of the model. If firms decide sequentially, the first mover will choose to provide a service along with the good, if $w < (\sqrt{\delta} - 1)(p^i + \sqrt{\delta})$. The second mover then will choose to offer only the good.

**Pass-through of Import Price Changes** Now consider the effects of a decrease in the import price. The elasticity of retail prices with respect to the import price is positive for both firms:

$$\begin{aligned} \eta_{p_b,p^i} &= \frac{\partial p_b^r}{\partial p^i}\frac{p^i}{p_b^r} = \frac{3p^i}{3p^i + 2w + 2(\delta - 1)} > 0, \\ \eta_{p_u,p^i} &= \frac{\partial p_u^r}{\partial p^i}\frac{p^i}{p_u^r} = \frac{p^i(1+2\delta)}{p^i(1+2\delta) + w + (\delta - 1)} > 0. \end{aligned} \tag{12}$$

Consequently, a decrease of the import price results in retail price decreases for both firms. In absolute terms, the import price-elasticity is higher for the unbundled good as $\eta_{p_b,p^i} < \eta_{p_u,p^i}$. In other words, the pass-through of import price changes to consumer prices is higher for firm $u$, which is driven by the higher import price share for the unbundled good $\left(\frac{p^i}{p_b^r} < \frac{p^i}{p_u^r}\right)$.

The relative price decreases more for firm $u$: $\frac{\frac{\partial p_b^r}{\partial p^i}}{p_b^r} < \frac{\frac{\partial p_u^r}{\partial p^i}}{p_u^r}$. The derivative of the relative price $\frac{p_b^r}{p_u^r}$ with respect to $p^i$ is negative:

$$\frac{\partial\left(\frac{p_b^r}{p_u^r}\right)}{\partial p^i} = -\frac{\delta(4\delta-1)(w+\delta-1)}{\left(p^i(1+2\delta)+w+(\delta-1)\right)^2} < 0. \tag{13}$$

Decreasing import prices thus induce a larger proportional decrease of $p_u^r$ relative to $p_b^r$, which results in a decrease of $\frac{p_b^r}{p_u^r}$. That is exactly, what we observe in the data: H-type retailers pass-through import price changes to a lesser extent than L-type retailers, resulting in a decrease of the relative price.

**Change in the Valuation of the Service** Consumers may assign different values to an additional service for different products. Advice by a shop assistant may be valued differently depending on the frequency with which a good is purchased or whether the fit of the product is of particular importance. For instance, suits are generally purchased less often than T-shirts and shop assistants might provide better help when it comes to the fit. In general, the valuation of the service determines only the magnitude of price effects, qualitative changes are independent of it. In particular, an increase of the valuation factor $\delta$ amounts to the bundled and unbundled becoming more remote substitutes. This results in an increase of the price for the bundle:

$$\frac{\partial p_b^r}{\partial \delta} = \frac{2\left(1 - 2\delta + 4\delta^2\right) - 2w - 3p^i}{(4\delta - 1)^2} > 0, \tag{14}$$

while the price for the unbundled good increases (decreases) if $w$ is relatively small (high):

$$\begin{aligned} \frac{\partial p_u^r}{\partial \delta} &= \frac{3(1 - 2p^i) - 4w}{(4\delta - 1)^2} > 0 \\ \text{if } w &< \frac{3}{4}\left(1 - 2p^i\right). \end{aligned} \tag{15}$$

The valuation of the service also determines the magnitude of changes in prices and markups following a cost shock. When bundled and unbundled good are remote substitutes, i.e. the consumer valuation factor $\delta$ is high, a decrease of the import price results in lower price reductions (the price elasticities in equation (12) both decrease in $\delta$). Nevertheless, the pass-through remains lower for the firm offering the bundle of product and service.

# 5 Conclusion

A substantial literature analyzes the role of local costs in explaining incomplete pass-through of import price shocks to consumer prices. In this paper, we explicitly consider the price level of retailers and emphasize differences across retailers and households. We

show that households purchase at different shopping outlets and do not pay identical prices for apparel products. We estimate that H-type retailers which have a high price level are not affected by changes in the import price. By contrast, import price changes are passed-through to L-type retailers at a rate of 53% within 3 months. The relative price ($p_H/p_L$) responds with an increase of $0.45 - 0.52\%$ given a one percent increase in import prices. As a consequence, the pass-through into consumer prices depends on the shopping behavior of households. We show how this behavior differs across households and thus leads to differential impacts of trade shocks. Trade induced changes in the import price pass-through to low-income households at a rate of 58%. By contrast, high-income households have a pass-through rate that is statistically not different from zero. We then provide a theoretical model with a heterogenous demand side and vertical product differentiation stemming from the possibility to bundle an identical imported good with services. This generates heterogeneous effects across retailers with respect to a change in import prices. Retailers who bundle a good with services pass-through import price changes to a lesser extent. In addition, the ranking of the pass-through rates is independent of the valuation of the service, which might be different for specific products such as T-shirts or suits.

Our results thus point into the direction that price effects of changes in international trade barriers do not affect all households equally. Thus, in periods of price decreases, such as the ATC phase-out we consider, low-income households benefit relatively more. However, they are also hurt more intensively by periods of import price increases.

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# A Appendix

## A.1 Unit-root Tests

We tested for unit-roots with the Augmented-Dickey-Fuller test (ADF-test). The number of included lags has been chosen according to the Akaike information criterion provided by Stata. The results for the import price are given in Table 7. The import price is tested to be integrated of order one. Average prices for each retailer $r$ ($p_t^r$) and average price of household type $h$ at retailer $r$ $\left(p_t^{h,r}\right)$ are tested with Fisher's unit-root test for unbalanced panels using both, the ADF and the Phillips-Perron test. As Table 8 indicates, the null hypothesis that all series are non-stationary is clearly rejected.

| Variable | no. of lags$^+$ | test statistic | cr. Values 1% | 5% | 10% | order of integration |
|---|---|---|---|---|---|---|
| Import price | 5 | -0.140 | -3.524 | -2.898 | -2.584 | I(1) |

$^+$according to Akaike information criteria in Stata

Table 7: Unit-root test

| | ADF-Test p-value | ADF-Test test statistic | Phillips-Perron Test p-value | Phillips-Perron Test test statistic | # of panels |
|---|---|---|---|---|---|
| Av. price of retailer r ($p_t^r$) | 0 | 1,961 | 0 | 3,890 | 80 |
| Av. price of household type h at retailer r $\left(p_t^{h,r}\right)$ | 0 | 4,316 | 0 | 7,450 | 141 |

Table 8: Panel unit-root test

## A.2 Share of Items purchased at a Retailer

Table 9 shows the number of items a household group bought at a specific retailer. For instance, for Anson's / P&C it reveals that 1.12% of all items of the low-income households were bought at this retailer and 3.85% of all items of the high-income household. This corresponds to a prive level of Anson's / P&C of 1.78, a value indicating a high-price retailer.

| Retailer | Prive level | Item share low income | Item share high income | Ratio |
|---|---|---|---|---|
| Alba Moda | 1.81 | 0.04 | 0.11 | 0.36 |
| Anson's / P&C | 1.78 | 1.12 | 3.85 | 0.29 |
| Breuninger | 1.72 | 0.27 | 1.04 | 0.26 |
| C & A | 0.85 | 7.69 | 6.50 | 1.18 |
| H & M | 0.70 | 3.43 | 2.56 | 1.34 |
| Karstadt | 1.22 | 0.32 | 0.70 | 0.45 |
| KiK | 0.35 | 3.17 | 0.96 | 3.31 |
| SinnLeffers | 1.28 | 1.01 | 1.77 | 0.57 |
| Orsay | 0.76 | 0.48 | 0.23 | 2.03 |
| Pimkie | 0.81 | 0.29 | 0.16 | 1.79 |
| Sportscheck | 1.56 | 0.11 | 0.18 | 0.59 |
| Takko | 0.50 | 1.58 | 0.61 | 2.61 |
| Zara | 0.90 | 0.11 | 0.16 | 0.69 |

Table 9: Share of items bought at a specific retailer, selection of full sample

### A.3 Markups

Absolute markups for both firms are

$$\begin{aligned} \mu_b &= p_b^r - p^i - w = \frac{2\delta(\delta-1) - p^i(\delta-1) - w(2\delta-1)}{4\delta-1}, \\ \mu_u &= p_u^r - p^i = \frac{\delta - 1 - 2p^i(\delta-1) + w}{4\delta-1}, \end{aligned} \tag{16}$$

with $\mu_b > \mu_u$, if $w < \frac{(\delta-1)(2\delta-1)+p^i(\delta-1)}{2\delta}$.

Relative markups are

$$\begin{aligned} \frac{\mu_b}{p_b^r} &= \frac{p_b^r - p^i - w}{p_b^r} = \frac{2\delta(\delta-1) - p^i(\delta-1) - w(2\delta-1)}{3p^i\delta + 2w\delta + 2\delta(\delta-1)}, \\ \frac{\mu_u}{p_u^r} &= \frac{p_u^r - p^i}{p_u^r} = \frac{(\delta-1) - 2p^i(\delta-1) + w}{p^i(1+2\delta) + w + (\delta-1)}. \end{aligned} \tag{17}$$

with $\frac{\mu_b}{p_b^r} > \frac{\mu_u}{p_u^r}$, if $w < \frac{1}{2}(1 - 2p^i - \delta + \sqrt{(\delta-1)^2 + 4p^i\delta(p^i + 2(\delta-1))})$. That is, if the cost for providing the service is sufficiently low, both relative and absolute markups are higher for the firm selling the bundle of the good and the service.

Following a decrease of the import price, absolute markups increase for both firms:

$$\frac{\partial \mu_b}{\partial p^i} = -\frac{\delta-1}{4\delta-1} < 0, \ \frac{\partial \mu_u}{\partial p^i} = -2\frac{\delta-1}{4\delta-1} < 0. \tag{18}$$

The absolute markup increases by more for firm 2: $\left|\frac{\partial \mu_b}{\partial p^i}\right| < \left|\frac{\partial \mu_u}{\partial p^i}\right|$. Also, the relative markup increases for both firms:

$$\begin{aligned}
\frac{\partial \frac{\mu_b}{p_b^r}}{\partial p^i} &= -\frac{(4\delta-1)\left(2\left(\delta-1\right)-w\right)}{\delta\left(3p^i+2w+2\left(\delta-1\right)\right)^2}, \\
\frac{\partial \frac{\mu_u}{p_u^r}}{\partial p^i} &= -\frac{(4\delta-1)\left(w+\left(\delta-1\right)\right)}{\left(p^i\left(1+2\delta\right)+w+\left(\delta-1\right)\right)^2}.
\end{aligned} \tag{19}$$

The change of relative markup is higher for firm 2, if the import price is sufficiently low: $\left|\frac{\partial \frac{\mu_b}{p_b^r}}{\partial p^i}\right| < \left|\frac{\partial \frac{\mu_u}{p_u^r}}{\partial p^i}\right|$ if $p^i < p^{i*} = \frac{2(\delta-1)^3+(4\delta-1)\sqrt{-\delta(w+\delta-1)^3(w-2\delta+2)}+w(10\delta-1)(\delta-1)+w^2(8\delta+1)}{(\delta-1)\left(2-\delta+8\delta^2\right)-w\left(13\delta+4\delta^2+1\right)}$.

## A.4 Welfare Analysis

Here, we investigate the welfare implications of a decrease of the import price for firms and consumers. Decreasing prices increase the total quantity sold:

$$\begin{aligned}
\frac{\partial q_b}{\partial p^i} &= -\frac{1}{4\delta-1} < 0 \\
\frac{\partial q_u}{\partial p^i} &= -\frac{2\delta}{4\delta-1} < 0.
\end{aligned} \tag{20}$$

Of this additional market size, i.e. quantity sold, firm $u$ gains more than firm $b$ as $\frac{\partial q_b}{\partial p^i} < \frac{\partial q_u}{\partial p^i}$. The firm offering the good without a service is more exposed to changes in the import price. A decrease of the import price induces a higher price decrease and a higher quantity increase. On the other hand, firm $u$ is also more vulnerable to import price increases.

For both firms, a decreasing import price increases profits:

$$\begin{aligned}
\frac{\partial \pi_b}{\partial p^i} &= -\frac{2\left(2\delta\left(\delta-1\right)-w\left(2\delta-1\right)-p^i\left(\delta-1\right)\right)}{\left(4\delta-1\right)^2}, \\
\frac{\partial \pi_u}{\partial p^i} &= -\frac{4\left(\delta-1\right)\delta\left(\left(\delta-1\right)-2p^i\left(\delta-1\right)+w\right)}{\left(\delta-1\right)\left(4\delta-1\right)^2}.
\end{aligned} \tag{21}$$

The profit for firm $b$ increases by more if $w < p^i\left(\delta-1\right)$. Whether import price decreases induce higher profit changes for firm $b$ or firm $u$, depends on the cost of providing the service. If the service cost is relatively small, firm $b$ gains more from import price decreases in terms of profit, if the service cost is relatively high, firm $u$ increases its profit by more.

For consumers, a decrease of the import price is associated with lower prices for both

the bundle of good and service and the unbundled good. In addition, both quantities sold increase, implying that some consumers change from the unbundled to the bundled good and some consumers with a low gross valuation $\theta$ who did not buy before now purchase the unbundled good.

Denoting variables after the change in the import price by a tilde ($\tilde{}$), the increase in consumers surplus is given as:

$$\Delta CS = \left( \int_{\widetilde{\theta}^*}^{1} (\delta\theta - \widetilde{p}_b^r) d\theta - \int_{\widetilde{\theta}^{**}}^{\widetilde{\theta}^*} (\theta - \widetilde{p}_u^r)\, d\theta \right) - \left( \int_{\theta^*}^{1} (\delta\theta - p_b^r) d\theta - \int_{\theta^{**}}^{\theta^*} (\theta - p_u^r)\, d\theta \right) > 0, \tag{22}$$

which can be decomposed into four effects:

$$\Delta CS = \underbrace{\int_{\theta^*}^{1} (p_b^r - \widetilde{p}_b^r) d\theta}_{I} + \underbrace{\int_{\widetilde{\theta}^*}^{\theta^*} (\delta\theta - \widetilde{p}_b^r - (\theta - p_u^r))\, d\theta}_{II} + \underbrace{\int_{\theta^{**}}^{\widetilde{\theta}^*} (p_u^r - \widetilde{p}_u^r)\, d\theta}_{III} + \underbrace{\int_{\widetilde{\theta}^{**}}^{\theta^{**}} (\theta - \widetilde{p}_u^r)\, d\theta}_{IV}. \tag{23}$$

Part I of the decomposition exhibits the change in consumer surplus for those consumers who bought $b$ before the change of the import price and now pay a lower price for it. Part II indicates the change in consumer surplus for the consumers who switch from $u$ to $b$, providing them with a higher gross utility. The price of $b$ after the change of the import price may be still higher than the price of $u$ before, but net utility is higher by a revealed preference argument. Part III exhibits the change in utility of those consumers who continue to buy $u$, but pay a lower price for it. Part IV indicates the change in consumer surplus for the consumers who did not buy before but are now able to afford $u$.

For a marginal decrease of the import price, i.e. $\widetilde{p}_b^r = p_b - \frac{\partial p_b^r}{\partial p^i}$ and $\widetilde{p}_u^r = p_u^r - \frac{\partial p_u^r}{\partial p^i}$, the change in consumer surplus for these four subgroups of consumers is given respectively as:

$$\begin{aligned}
\int_{\theta^*}^{1} (p_b - \widetilde{p}_b^r) d\theta &= \frac{3\delta \left( \left(2\delta - p^i\right)(\delta - 1) - w\,(2\delta - 1) \right)}{(4\delta - 1)^2 (\delta - 1)} \\
\int_{\widetilde{\theta}^*}^{\theta^*} (\delta\theta - \widetilde{p}_b^r - (\theta - p_u^r))\, d\theta &= \frac{(5\delta + 1)}{2\,(4\delta - 1)^2} \\
\int_{\theta^{**}}^{\widetilde{\theta}^*} (p_u^r - \widetilde{p}_u^r)\, d\theta &= \frac{(2\delta + 1)\left(1 + \delta\left(w + (\delta - 2) - 2p^i(\delta - 1)\right)\right)}{(4\delta - 1)^2 (\delta - 1)} \quad \text{and} \\
\int_{\widetilde{\theta}^{**}}^{\theta^{**}} (\theta - \widetilde{p}_u^r)\, d\theta &= \frac{\left((w + \delta)(2\delta - 1) + p^i(\delta - 1) + 2\right)^2}{2\,(4\delta - 1)^2}.
\end{aligned} \tag{24}$$

Comparing consumer surplus for the consumers who bought $b$ before the change in the import price (Part I) and for the consumers who bought $u$ before (Part II and III), the initial size of the import price determines which group of the consumers gains more from a decrease of the import price:

$$\begin{aligned} \int_{\theta^*}^{1} (p_b^r - \widetilde{p}_b^r) d\theta &> \int_{\widetilde{\theta}^*}^{\theta^*} (\delta\theta - \widetilde{p}_b - (\theta - p_u))\, d\theta + \int_{\theta^{**}}^{\widetilde{\theta}^*} (p_u - \widetilde{p}_u)\, d\theta \\ \text{if } p^i &> \frac{4w\delta(4\delta - 1) + 1 - \delta(\delta(8\delta - 11) + 4)}{2\delta(4\delta - 1)(\delta - 1)}. \end{aligned} \tag{25}$$

If the import price is relatively high, the increase of consumer surplus is higher for consumers who bought the bundle before. That is, the effect from the price decrease of $b$ exceeds the effect from a higher gross utility and a price decrease of $u$ for the consumers who bought the unbundled good before. As a consequence, although the pass-through rate is higher for $u$, consumers buying $b$ can gain more from import price decreases in terms of consumer surplus.

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