Endogenous Product Adjustment and Exchange Rate Pass-Through*

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Abstract

This paper documents how product quality responds to exchange rate movements and quantifies its role in aggregate pass-through into export prices. We analyze the period of substantial appreciation in Switzerland following the removal of the 1.20 CHF per euro lower bound using transaction-level export data representing a large share of total exports. We find that firms lower export prices in CHF but upgrade the quality of existing products. Furthermore, firms tend to disproportionately remove lower-quality products from their product range. The quality-upgrading effect is larger than the quality-sorting effect on exchange rate pass-through, accounting for approximately one-third and one-tenth of total pass-through, respectively. We cross-check our results using the micro data underlying the Swiss export price index, which includes an adjustment factor for quality based on firms' reported product replacements, and obtain qualitatively and quantitatively similar results.

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1 Introduction

Understanding the impact of exchange rate changes on the prices of exports and imports is a key question in international macroeconomics. Pass-through into the prices of internationally traded goods is usually found to be incomplete in the aggregate (see Burstein and Gopinath, 2013, for a survey). The margin of adjustment is that firms adjust prices by less than the exchange rate, for example, because of nominal rigidities in the invoicing currency, adjustment in markups, or local distribution costs in the importing country.[1]

Another possible margin of adjustment, which is less intensively documented, is that firms change the products they sell abroad, in addition to adjusting prices.[2] Adjusting products means that firms can change the quality of an existing product or adjust the set of products on the market toward products with a higher or lower level of quality. In this paper, we study how the product quality of exported goods in a small open economy responds to an exchange rate shock and the extent to which this adjustment of the set of exported products accounts for incomplete pass-through.

The exchange rate shock we study is the large, sudden, and unexpected appreciation of the Swiss franc on January 15, 2015. This was observed after the Swiss National Bank (SNB) removed the lower bound on the CHF against the euro, which it had maintained since its introduction on September 6, 2011. This period provides a very good natural experiment to study the effects of an exchange rate shock on a small open economy because it occurred after a period with very stable prices and an exchange rate that hardly fluctuated for more than three years before the shock.[3] Additionally, other macroeconomic aggregates, such as GDP growth, unemployment, and interest rates, were very stable in Switzerland during this

[1] See, for example, Engel (2002), Gopinath and Itskhoki (2010), Atkeson and Burstein (2008), or Burstein, Neves, and Rebelo (2003).

[2] For example, after the substantial appreciation of the Swiss franc in January 2015, the Swiss National Bank (SNB) conducted a survey of exporting firms to learn about their strategies to counter the negative effects of the exchange rate shock. Surveyed firms reported optimizing the mix of products as one of their main strategies for remaining competitive (SNB, 2015).

[3] See also Kaufmann and Renkin (2017, 2019), Bonadio, Fischer, and Sauré (2020), and Auer et al. (2018, 2019) , who study the effect of this exchange rate shock on prices. Funk and Kaufmann (2020) show the implications for wage adjustments in the aftermath of this exchange rate shock and the associated negative inflation rates.

three-year period, such that changes in prices or product quality adjustments are unlikely to be a result of the lagged effects of other large aggregate shocks. Furthermore, the decision to remove the exchange rate lower bound was triggered by external developments in the euro area (expectations of quantitative easing), not by developments in the domestic economy.

Using transaction-level export data from the Swiss Federal Customs Agency (FCA), covering a large share of all exports from Switzerland, we study two margins of quality adjustments of exported products to the exchange rate shock. First, products can upgrade (downgrade) in quality. Second, the distribution of products within a product category sorts toward products with higher (lower) quality; thus, products within a low (high) quality tend to exit disproportionately. We find that both quality adjustment margins are important and that Swiss exporting firms, which became less competitive following the currency appreciation, tended to improve the quality of their products (quality upgrading) and to remove products from the market that had relatively low quality within their product category (quality sorting).

We further quantify the effect of product quality adjustment on incomplete exchange rate pass-through (ERPT). In most indexes for export prices, prices are adjusted for quality. Thus, there could be pass-through, even without a change in the quality-unadjusted price, when the quality-adjusted price changes only because of product quality adjustment. We document how large this effect is, and we find that quality upgrading accounts for approximately one-third of the overall incomplete pass-through one year after the exchange rate shock. Using a counterfactual analysis, we furthermore show that another 7% of the incomplete pass-through is accounted for by quality sorting because products with low quality are more likely to exit the market.

Our results are robust to several aggregation approaches, and we cross-validate the results using the micro data underlying the Swiss export price index (EPI) from the Swiss Federal Statistical Office (SFSO). In these data, export prices are collected via surveys, and exporting firms are asked to indicate when the quality of their products changes. In this case, firms are asked about the current and, importantly, the last-period price of the new product with quality changes. This allows the statistical office to include corrections for quality changes in its official EPI. Since our purpose is to study the effect of these quality changes on pass-through, we exploit this variation between prices adjusted for quality and prices not adjusted for quality to quantify the effect of quality adjustments on pass-through into quality-adjusted prices. We find effects in the same direction, that quality tends to improve and that it accounts for up to 50% of the overall incomplete pass-through.

Our paper is related to the literature that focuses on the role of quality in ERPT. One strand of this literature relates pass-through at the product level to product quality. For example, Chen and Juvenal (2016) show that higher-quality goods tend to face a lower demand elasticity in the export market and therefore that exporters can pass through a larger share of an exchange rate change into prices.[4] Another strand of this literature endogenously relates the quality of traded products to exchange rates. For example, Auer and Chaney (2009) show theoretically that exports should shift toward higher quality after an exchange rate appreciation and find some weak evidence for that prediction in US data. Fauceglia, Plaschnick, and Maurer (2017) and Fauceglia (2020) show for the same period we study that Swiss exporters tend to export higher quality on average after the appreciation. Our findings that average product quality improves after exchange rate appreciation are consistent with these studies. However, our focus is on studying the effect of this endogenous quality adjustment on aggregate ERPT. We contribute to this literature by finding that product quality responds to an exchange rate appreciation, which suggests that firms endogenously adjust their product scope to cater to markets where demand elasticities are lower.[5]

One paper examines the endogenous response of product quality and its implications for pass-through: Goetz and Rodnyansky (2016) show that an online apparel retailer in Russia tended to offer lower quality in its domestic market after the 2014 depreciation of the ruble. They show that the retailer tended to import fewer high-quality products after the devaluation

[4]Related predictions can be derived from Atkeson and Burstein (2008), Melitz and Ottaviano (2008), Berman, Martin, and Mayer (2012a), Bernini and Tomasi (2015), Auer, Chaney, and Sauré (2018), Medina (2017), Bastos, Silva, and Verhoogen (2018) or Chen and Juvenal (2020). Some of these studies also relate pass-through to destination-country income via nonhomothetic preferences.

[5]Medina (2017) shows that increased competition in low-quality segments, which is likely what exporting firms experience after the appreciation of their home currency, induces firms to quality upgrade by reallocating idle factors.

relative to low-quality products due to a quality sorting effect, accounting for approximately 12% of aggregate pass-through. We show that their results also carry over to the case of a large appreciation, exported products, and a broad set of product categories. Furthermore, we decompose the aggregate ERPT into a pure price adjustment component and the effect of product upgrading, in addition to the effect of product sorting.

Our results are also related to the literature that highlights important differences between quality-adjusted and quality-unadjusted trade prices: Feenstra and Romalis (2014) show that much of the variation in export unit values is explained by quality.[6] Nakamura and Steinsson (2012) show that product replacement bias, which is related to product upgrading and sorting, is large and that pass-through estimates are significantly larger when accounting for such bias. We show that the quality-adjustment term is responsive to changes in the exchange rate, particularly in the medium run. It therefore confirms that using quality-adjusted prices or unit values is important not only for cross-country comparisons but also when studying ERPT.

This paper is structured as follows. In Section 2, we describe the two datasets and outline their complementary features. Section 3 explains the quality estimation and provides evidence on quality upgrading and quality sorting. Section 4 assesses the aggregate effects on ERPT, while Section 5 provides robustness checks. Section 6 concludes the paper.

2 Data

This section describes our datasets and presents descriptive statistics. Our main analysis is based on transaction-level trade data from the Swiss customs office. These data include quantities and unit values of the universe of trade flows and therefore allow us to distinguish product adjustments due to quality sorting from those due to quality upgrading. We show that quality adjustments are also more prevalent after the exchange rate shock in the micro data underlying the official Swiss EPI.

[6] See also Schott (2004, 2008), Hallak (2006), Hallak and Schott (2011),Khandelwal (2010), and Martin and Mejean (2014).

The data from the Swiss FCA comprise the universe of export transactions registered at the Swiss customs office.[7] Each transaction includes the free on board (FOB) value in Swiss francs and volume of the transaction (mass or units)[8], a Harmonized System (HS) 8-digit product classification, where the first 6 digits define the international product group and the last two digits are Switzerland-specific product categories, and a 3-digit statistical key specific to the FCA dataset that further divides the HS8 classification. In addition, it includes the date of transaction, the zip code of the exporting firm and the country of destination. As the data do not contain a firm identifier, we follow Bonadio, Fischer, and Sauré (2016) and define product identifiers i using the combination of zip code, HS8 product classification, statistical key and destination country.[9]

We restrict our data to exports to countries within the euro area and drop transactions that either report no value or no information on volume.[10] We were provided with data from 2014 to 2016. The data are not at the same level of detail in earlier years, which is why we start our analysis in 2014. We move all dates backward by 14 days, such that the shock originally occurring on January 15, 2015 in our data occurred on January 1, 2015. Moreover, we assign each transaction on a Saturday or Sunday to the previous Friday. In this dataset, we refer to the price p of a product i in a transaction by constructing FOB unit values ($value/volume$).[11] Because we have to compare products over time, we cannot conduct our analysis at a very high (daily) frequency, as many products are neither exported nor adjusted on a daily or weekly basis. We therefore aggregate the product-level data to quarterly frequency by summing over each transaction. Hence, we compute quarterly unit values as total values over total volume per product in a given quarter, $p_i = \sum_q value_i / \sum_q volume_i$ (which is the weighted average of underlying prices across transactions).

[7] In total, we can observe 98.7% of total trade. See also Egger and Lassmann (2015), Egger and Erhardt (2016), and Bonadio, Fischer, and Sauré (2016) for applications and descriptions of the dataset.

[8] We consistently rely on the mass measure to ensure comparability across products. We exclude observations that miss information mass from the analysis (0.15% of transactions).

[9] Since exporting firms are likely to export a single product to more than one destination country, we also present robustness checks for product identifications that are based on zip code, HS8 product classification, and statistical key combinations only. The results are robust, see Section F.

[10] We restrict to the euro area because the Swiss franc's floor was defined in terms of the EUR/CHF exchange rate and the appreciation against the euro was thus very sharp and persistent.

[11] This definition has been used frequently in the trade literature, including, for example, Berman, Martin, and Mayer (2012b), Khandelwal, Schott, and Wei (2013), Chen and Juvenal (2016) or Manova and Yu (2017).

Our second data source, which we use in a cross-check of some of the key patterns in the data, is the data underlying the Swiss producer price index (PPI). This index includes a sub-index that comprises only exports, which is labelled the Swiss EPI. The advantage of these data, compared to the FCA data, is that they include prices, not unit values. They include price changes that are adjusted for quality and information on the quality adjustment, which is the variation we exploit. These data are also available for the years prior to 2014, thus allowing us to show that these main patterns are not a result of pre-trends. The data are collected using firm surveys (either online or via regular mail). Firms list their main products and associated selling prices. Firms complete a separate form for exports, such that export prices for a product can differ from prices in the domestic market. In the survey, firms are asked to indicate when they replace a product on the market with a new product. If firms indicate that the new product is similar to the old one but with different quality (for example, a new version of the old product), the new price is adjusted for quality by asking firms to indicate the last-period price of the new product, since two product lines usually co-exist for some months before the new product completely replaces the old product (see also SFSO (2016)).[12] In this case, the price series of the old and the new product are combined, where the price information in the overlapping period serves as an indicator of the quality difference between the two products. Based on this information, we construct two series: in the series "excl. quality adjustments", we follow the SFSO and construct a series tracking price changes only. In the series "incl. quality adjustments", we factor in the quality differences between the new and the old products. The SFSO data are published monthly, but most of the products are surveyed only on a quarterly basis, which is also the frequency we analyze.

We chose the FCA data for the main analysis because they allow us to distinguish quality sorting and quality upgrading and estimate the effect on aggregate ERPT. The information on quality sorting in the EPI is limited because it does not include the universe of exported products, as the FCA data do. It is therefore difficult to observe whether products are no longer traded or firms do not respond to the survey.

[12] If the new product is almost identical and of similar quality to the old, no product adjustment is recorded in the index construction. If the new product is not directly comparable to the old product, the price series of the old product is terminated, and a new series for the new product is initiated (SFSO, 2016).

The FCA data have the advantage that we can observe quantities per transaction, which allows us, as we describe below, to estimate quality and to distinguish quality upgrading from quality sorting. It furthermore includes the universe of transactions registered and is therefore very comprehensive. The disadvantage is that prices have to be proxied by unit values and that it is available only from 2014 onwards, making pre-trend analysis on this dataset difficult. This is an advantage of the SFSO dataset, which includes prices and not unit values and is already available in 2012. From 2012 to 2014, the exchange rate was very stable; therefore, we should expect that no strong pre-trends exist. The SFSO dataset also allows us to observe quality changes as indicated by firms themselves. However, we cannot use that dataset to make statements about quality sorting, since products enter and exit the panel with a longer lag. We therefore use the SFSO data as a cross-check of our main findings and to check for the robustness regarding unit values vs. prices and estimated vs. firm-indicated quality changes and to evaluate potential pre-trends.

Table 1: *Descriptive statistics*

A. FCA transaction-level data			
	2014	2015	2016
Number of products	489,526	514,670	528,784
Number of product classes	7,653	7,362	7,376
Number of observations	938,634	984,107	1,004,971
B. SFSO micro price data			
	2014	2015	2016
Number of products	2,574	3,710	2,800
Number of firms	708	941	812
Number of observations	27,450	33,320	31,009

Notes: The upper part reports the transaction-level data from the FCA. The lower part reports the micro data underlying the Swiss export price index collected by the SFSO.

In Panel A of Table 1, we report the number of products, product groups as defined by the combination of HS8 product code and statistical key, and quarterly observations for the FCA data. Overall, we observe approximately half a million products from more than 7,000 HS8 product groups. The number of observations is close to one million. The number of products and observations rises somewhat over time. In the empirical analysis below, we rely mainly on products that already existed in 2014 and are either upgraded or sorted out of the set of exported products. The corresponding data for the SFSO survey are reported in Panel B. Since this is a representative sample of export products, we observe a much lower number of products (between 2,574 and 3,710) from between 708 and 941 distinct firms, yielding between 27,450 and 33,320 quarterly observations per year.

3 Product changes

In this section, we describe how we estimate product quality in the FCA data and how we adjust prices for quality. We further show how we distinguish between quality upgrading and quality sorting.

3.1 Estimation of product quality

Here, we describe how we derive our quality estimate. Following Khandelwal, Schott, and Wei (2013), we assume that consumer preferences include quality. With the observations of prices and quantities at the product level, we can then pin down the level of quality. The main idea is that, under the assumption of a constant elasticity of substitution, when we compare two products in the same industry classification with the same price in the same period with different quality levels, the higher-quality product should sell larger quantities. Similar to Khandelwal, Schott, and Wei (2013), Martin and Mejean (2014) and Manova and Yu (2017), we estimate quality per product on annualized data. This is because seasonal factors may influence our quarterly estimates and quality adjusts more slowly than prices.[13] We implement this as follows.

[13]Moreover, Martin and Mejean (2014) argue that focusing on yearly quality changes limits the potential bias induced by unstable preferences.

First, we run the following OLS regression:

$$v_{i,y} + \sigma p_{i,y} = \alpha_{d,y} + \alpha_j + \epsilon_{i,y},$$

where y is the year, $v_{i,y}$ is the yearly log volume of product i, $p_{i,y}$ is the associated log price ($p_{i,y} = \sum_y value_i / \sum_y volume_i$), $\alpha_{d,y}$ is a destination-year dummy that controls for differences in destination country demand, and the HS6 product group (denoted by j, where $i \in j$) fixed effect α_j is included because levels of prices and quantities might not be comparable across product categories.[14] Moreover, we follow Manova and Yu (2017) and assume a demand elasticity of $\sigma = 5$. We then derive our measure of log quality as:

$$\hat{\lambda}_{i,y} = \frac{\hat{\epsilon}_{i,y}}{\sigma - 1}.$$

We use this quality estimate $\hat{\lambda}_{i,y}$ to construct the *quality-adjusted* prices for each product i and each quarter q as $p^{adj}_{i,q} = p_{i,q} - \hat{\lambda}_{i,y}$ (where $q \in y$).

3.2 Product upgrading

We first examine in a simple descriptive analysis whether existing products tend to be upgraded on average after the exchange rate appreciation. To do so, we regress the (yearly) change in the quality estimate $\hat{\lambda}_{iy}$ on a constant and product classification/destination fixed effects α_{jd} to control for differences in product groups and destination countries:

$$\hat{\lambda}_{i,y} - \hat{\lambda}_{i,y-1} = \beta + \alpha_{jd} + \epsilon_{i,y},$$

The key parameter we report is β, since it indicates the extent to which, after controlling for HS6 product classification/destination fixed effects α_{jd}, the quality of products that existed in 2014 rose in 2015. We also compare this to differences in quality between 2015 and 2016.

[14] To perform a quality comparison, the products must be comparable in terms of quantities consumed and utility provided. Similar to Martin and Mejean (2014), we use the HS6 product classification as the basis for the quality comparison instead of HS8. HS6 is the most detailed level based on the international HS system, and digits 7-8 of the HS system refer to the customs regime and are not related to product characteristics.

Table 2: *Evidence for quality upgrading*

	Δ quality 2015 vs 2014	Δ quality 2016 vs 2014	Δ quality 2016 vs 2015
Constant	0.02***	0.03***	0.00
	(0.00)	(0.00)	(0.00)
HS6/destination FE	Yes	Yes	Yes
R^2	0.06	0.07	0.06
No. of observations	253,007	228,769	262,136

Standard errors in brackets, clustered at HS-8 product level; *** p<0.01, ** p<0.05, and * p<0.1.

Table 2 shows the results. Quality upgrades are positive between 2014 and 2015, suggesting that quality largely improved after the exchange rate shock for products exported before and after the appreciation. Furthermore, quality upgrades between 2014 and 2015 (where the difference in the exchange rate was on average 5%) are significant and on average approximately ten times larger than the insignificant increase between 2015 and 2016 (where the difference in the exchange rate was on average 0.3%). The difference between 2014 and 2016 shows that the effect is persistent. We thus conclude that, on average, firms tend to upgrade their products. A robustness check with an alternative quality measurement in Appendix A also shows an increase in the average quality of exports. Whether this is large or small cannot be evaluated from this simple statistic. We will evaluate the role of upgrading in aggregate ERPT in Section 4.[15]

3.3 Product sorting

To evaluate whether exporters tend to sort their product scope toward products with higher quality, we first check that a positive correlation between quality and revenue exists, which would suggest that firms follow quality sorting strategies (Manova and Yu, 2017). Tables B.1 and B.2 in the Appendix show a positive correlation between prices (quality) and revenues across products within a destination/product-group and a zip code, respectively, which indicates that Swiss exporters follow quality sorting as opposed to efficiency sorting.

[15] We further show in Appendix C that exports to destination countries with a higher GDP per capita tend to upgrade quality by more than exports to destination countries with a lower GDP per capita, consistent with models of nonhomothetic preferences. Similar effects are found for quality sorting.

In line with the notion of quality sorting, we then show that high-quality products are less likely to exit the export market after the exchange rate shock, while low-quality products are more likely to exit.

To do so, we run the following regression on the 2014 data:

$$I_{i,q}^{y}(D=1) = \beta_0 + \beta_1 X_{i,q}^{2014} + \alpha_j + \epsilon_{i,q}$$

where $I_{i,q}^{y}(D=1)$ is a dummy that is equal to 1 if the product-quarter observations are not exported in year $y \in 2015, 2016$. Depending on the specification, $X_{i,q}^{2014}$ is the quality estimate $\hat{\lambda}_{i,2014}$, the price $p_{i,q,2014}$ or the quality-adjusted price $p_{i,q,2014}^{adj}$ before the appreciation. We run these 3 specifications for each set of dummies $\{2015, 2016\}$. α_j is the HS6 product group dummy. We cluster at the zip-code level.

Table 3 shows that high-quality products are less likely to cease being exported in the years 2015 and 2016 (columns (1) and (2)). Furthermore, we find that the same applies for more expensive products (columns (3) and (4)). High *quality-adjusted* prices, however, are more likely to be dropped (columns (5) and (6)), which is in line with the intuition that products with high quality-adjusted prices are less competitive.

Table 3: *Relationship between quality and dropout*

	Exit dummy					
	2015	2016	2015	2016	2015	2016
Quality	-0.04***	-0.04***				
	0.00	0.00				
Price			-0.01***	-0.01***		
			0.00	0.00		
Quality-adjusted price					0.10***	0.09***
					0.00	0.00
HS-6 productgroup FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.10	0.10	0.07	0.07	0.12	0.11
No. of observations	938,437	938,437	938,437	938,437	938,437	938,437

Constant not shown. The first (second) column in each dependent variable corresponds to exited in 2015 (2016). Clustered at the zip-code level; *** p<0.01, ** p<0.05, and * p<0.1.

4 Aggregate effects on ERPT

In this section, we estimate the contribution of product adjustments to aggregate ERPT. In particular, we show how prices evolve and compare them to prices adjusted for quality (which shows the effect of quality upgrading on ERPT) and how prices would have evolved had products with lower quality not dropped out of the set of export products (which shows the effect of quality sorting on ERPT).

4.1 Counterfactual with no quality sorting

To examine the effect of quality sorting on pass-through, we ask how ERPT would have evolved without quality sorting, i.e. had products not exited. To do so, we extrapolate transactions that occurred in 2014, but not in 2015/2016, to create a counterfactual series of products that no longer existed in 2015 and 2016. We construct these under the assumption that prices had evolved as for other products in the same product group, while we assume that the quality of these products remained unchanged. We thus impute prices for these products if they exited. We do not include product entries in our analysis since product sorting largely concerns dropping products from a firm's product line.

We impute the price of exiting products by adjusting the price observed in 2014 with the median price change of products in the same product group. As a product can be exported in multiple quarters within a year, we first calculate the weighted average price change between y and $y+1$ across all exports of product i for each quarterly observation iq in $y+1$:

$$\Delta\tilde{p}_{iq,y} = \sum_{k=Q1}^{Q4} \omega_{ik,y+1}(p_{ik,y+1} - p_{iq,y})$$

where $\omega_{ik,y+1}$ is the fraction of quarter k in all exports of product i in year $y+1$.

Second, we calculate the weighed average price change across quarters within a product i in year y:

$$\Delta\tilde{p}_{i,y} = \sum_{q=Q1}^{Q4} \omega_{iq,y} \Delta\tilde{p}_{iq,y}$$

where $\omega_{iq,y}$ is the fraction of quarter q in all exports of product i in year y.

Finally, we use the median yearly price change across products i within an HS6 product group j ($\Delta\tilde{p}_{j,y}$) to approximate the price change between y and $y+1$ for products that were observed before the shock but exited thereafter. Hence, we impute the price in year $y+1$ for each exiting product in each quarter it was exported in year y as $\hat{p}_{iq,y+1} = p_{iq,y} + \Delta\tilde{p}_{j,y}$. To derive the quality-adjusted price for imputed exports, we assume constant quality and use the quality estimate from the previous year: $\hat{p}^{adj}_{iq,y+1} = \hat{p}_{iq,y+1} - \hat{\lambda}_{i,y}$. We repeat this procedure sequentially for 2015 and 2016.

4.2 ERPT estimation

In this subsection, we report estimates of ERPT and the contributions of quality sorting and quality upgrading to it. To do so, we report pass-through estimates for three (counterfactual) series of export prices. The first is pass-through into prices adjusted for quality, including imputed prices for products that exited in 2015 or 2016. This series provides a counterfactual pass-through if product upgrading and quality sorting had not occurred. We label this the ERPT in a scenario with “no upgrading, no sorting” (scenario 1). Since we adjust prices for quality, the effect of quality upgrading on prices is thus removed from the data. Therefore, we label it “no upgrading”. Later, we will compare the differences between the two series. If we compare a series for prices unadjusted for quality and one for prices adjusted for quality, the difference between the two will quantify the effect of quality upgrading on prices and pass-through. Second, we report pass-through into prices not adjusted for quality, including the counterfactual prices of products that were dropped from the set of exported goods. This series gives us the pass-through into prices that includes effects of quality upgrading but does not include the effects of quality sorting. We label this the ERPT in a scenario “with upgrading, no sorting" (scenario 2). Third, pass-through into prices that are unadjusted for quality and where product exits are, as in reality, not included in the data. This is the series of observed prices not adjusted for quality. We label this the ERPT in a scenario with "with upgrading, with sorting" (scenario 3).

The pass-through rate for each of the three series explained above is estimated by running the regression

$$p_{i,q}^{scen.1,2,3} = \alpha_i + \sum_{q=2014Q1}^{2016Q4} \beta_q Q_q + \epsilon_{i,q}, \tag{1}$$

where $p_{iq}^{scen.1,2,3}$ is the (counterfactual) price series of scenario 1, 2, or 3, as explained in the paragraph above. α_i are product fixed effects, and Q_q is a quarterly dummy that is equal to 1 for a given quarter, zero otherwise. 2014Q4 is chosen as the baseline quarter. Standard errors are clustered at the zip-code level. The β_q coefficients provide estimates for the average price difference between period q and 2014Q4 (in percent).

Figure 1 shows the estimates of the price changes in percent (relative to 2014Q4) of each of the three scenarios together with the percentage change in the EUR/CHF exchange rate (relative to Q42014). The red line plots the coefficient estimates of the βs for each quarter for quality-adjusted prices, including imputed prices for products that exited (scenario 1, no upgrading and no sorting). Table 4 shows the associated pass-through estimates in the second row (estimates of β divided by the first row). The first row of the table shows the difference in exchange rate between 2014Q4 and the quarter indicated in the column header. Pass-through in the first four quarters after the shock would have been on average 66% (74% in 2016) had no products sorted out of the market and quality changes were removed from the price series.

If quality changes were not taken into account but imputed prices for products that exit the market were included (scenario 2, with upgrading and no sorting), pass-through would be lower (green line in Figure 1, estimates reported in row three of Table 4). The interesting part is the difference between scenario 1 and scenario 2 because it quantifies the effect of the quality adjustment of products that remain in the market on aggregate pass-through. The difference between the pass-through rates shows the effect of quality upgrading. The pass-through would be 51%, thus 15 percentage points lower in 2015 (48% and 26 percentage points lower in 2016).

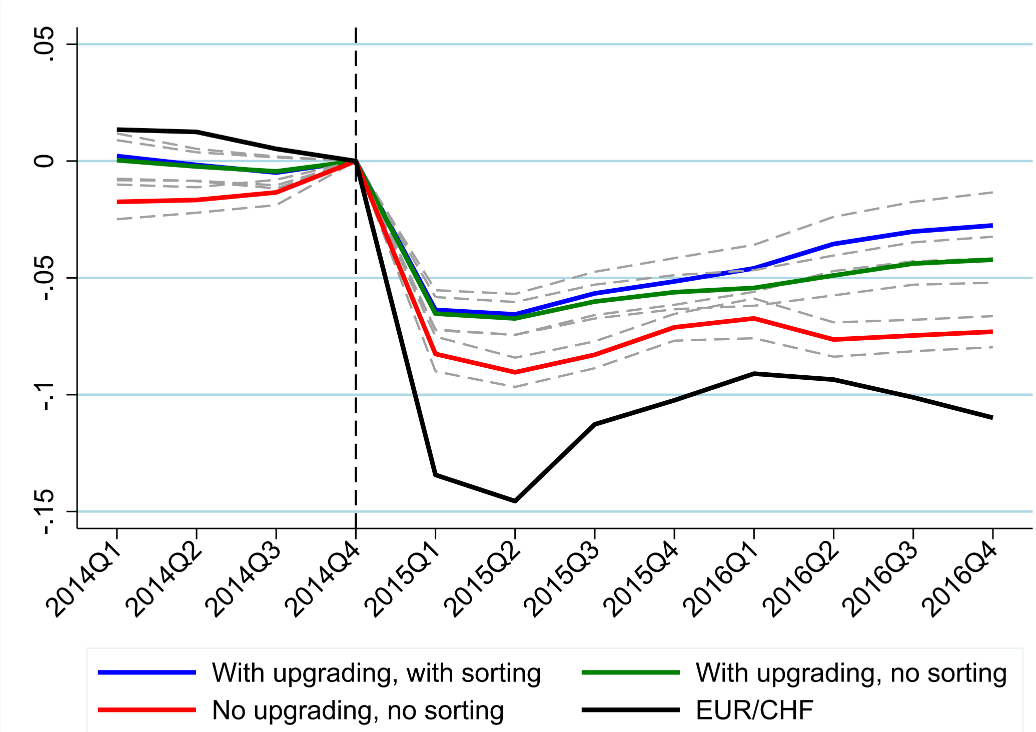
Table 4: *ERPT accounting for product adjustment margins*

	2015Q1	2015Q2	2015Q3	2015Q4	2016Q1	2016Q2	2016Q3	2016Q4
EUR/CHF	-13.43	-14.56	-11.27	-10.24	-9.10	-9.35	-10.12	-10.99
No upgrading, no sorting	0.62	0.62	0.74	0.7	0.74	0.82	0.74	0.66
Upgrading, no sorting	0.49	0.46	0.53	0.55	0.6	0.52	0.43	0.38
Upgrading, with sorting	0.47	0.45	0.5	0.5	0.5	0.38	0.3	0.25

If quality changes were included in prices and product sorting were also included (scenario 3, with upgrading and with sorting), the pass-through rate would be 48% in 2015 (36% in 2016). The difference between scenario 3 and scenario 2 thus quantifies the role of product sorting. The difference in pass-through rates is 3 percentage points in 2015 and 12 percentage points in 2016. These estimates suggest that quality sorting tends to occur some time after the exchange rate shock, possibly because it takes more time for firms to bring new, higher-quality products to market (quality sorting) than to adjust existing products (quality upgrading). This is in line with Bonadio, Fischer, and Sauré (2020), who use daily data and report no unusual exits around the time of the shock. Short-run pass-through estimates, such as the daily estimates for the six-month period in the aftermath of the exchange rate appreciation documented in Bonadio, Fischer, and Sauré (2020), are thus not significantly affected by quality changes and are largely a result of price adjustments of existing products.

Taken together, the effect of quality sorting and quality upgrading is reflected in the difference between scenario 1 and scenario 3. The pass-through including both adjustment margins is 18 percentage points lower in 2015 (38 percentage points lower in 2016).

Figure 1: *Aggregate effects on ERPT*



This figure shows the regression coefficients β_q and 95% CI of regression 1. The series "with upgrading, with sorting" uses observed prices, the series "with upgrading, no sorting" uses observed and imputed prices and the series "no upgrading, no sorting" includes observed and imputed quality-adjusted prices. The dashed line indicates the pre-shock quarter 2014Q4.

How much of the aggregate pass-through into export prices is due to quality upgrading and quality sorting? To answer this question, we decompose the total incomplete pass-through (the difference between the exchange rate change and the blue line in Figure 1) into pass-through that is due to incomplete price adjustments and incomplete pass-through that is due to quality adjustments. Since the effect of quality upgrading is shown in the difference between scenarios 1 and 2 and the effect of quality sorting in the difference between scenarios 2 and 3, we can use a simple decomposition to quantify the effect of each margin of adjustment (price adjustment, quality upgrading, quality sorting). For example, the incomplete pass-through that includes both price adjustments and quality adjustments after 3 quarters is $ln(0.5)$. The contribution of price adjustments is $ln(0.74)/ln(0.5)$, the contribution of quality upgrading is $ln(0.53/0.74)/ln(0.5)$, and the contribution of quality sorting is $ln(0.5/0.53)/ln(0.5)$. This results in the observation that after 3 quarters, 43% of the incomplete pass-through is due to incomplete price adjustments, 48% is due to quality upgrading, and 8% is due to quality sorting. [16]

Table 5 shows the results of this decomposition. Of the total incomplete pass-through in 2015, on average, 56% is due to incomplete pass-through into prices (adjusted for quality, including imputed prices for product exits), 37% is due to quality upgrading, and 7% is due to quality sorting. In 2016, these are 30%, 40%, and 30%, respectively. Thus, while in the short run, adjustment of prices is the most important source of incomplete pass-through, the effect of quality adjustments is more important in the medium run (after one year).[17]

Table 5: *Contribution of margins of adjustment*

	2015Q1	2015Q2	2015Q3	2015Q4	2016Q1	2016Q2	2016Q3	2016Q4
No upgrading, no sorting	0.65	0.60	0.45	0.53	0.44	0.21	0.25	0.30
Upgrading, no sorting	0.31	0.37	0.47	0.35	0.31	0.46	0.44	0.40
Upgrading, with sorting	0.03	0.03	0.09	0.12	0.25	0.33	0.31	0.31

5 Cross-validation in alternative data

In this section, we cross-check our results in the micro data underlying the Swiss EPI from the SFSO. Section 2 explains the data in greater detail. In the survey that collects export price information, the SFSO asks firms to indicate whether a product has changed quality. The information on price changes for both the old and new product then allows the SFSO to back out the change in prices due to a change in quality (quality adjustment factor). This is the information we use, since it is information about quality upgrading. We do not have good information about quality sorting in that dataset because product prices are often imputed if a product is missing for a given survey round. We can therefore only compare the effect of quality upgrading on export prices in the following analysis.

[16] We use values that are not rounded to compute the values in Table 5, which yields slightly different numbers. The corresponding values in Table 5 are 45%, 47% and 9%, respectively.

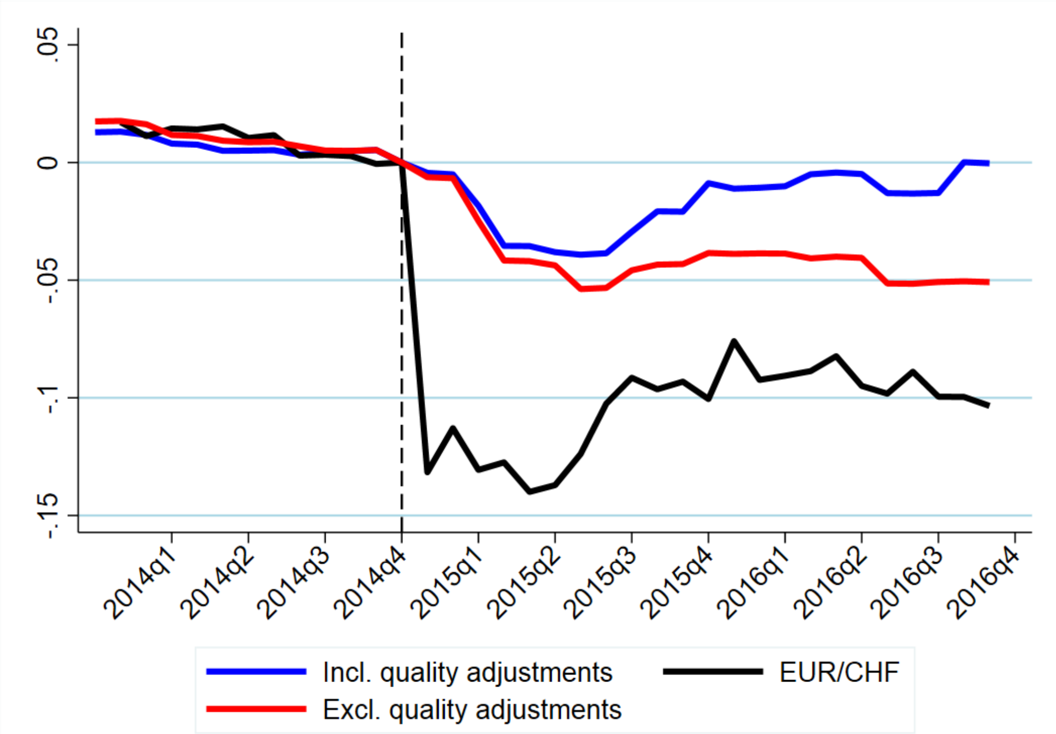
[17] As a robustness check, we compute the same decomposition while excluding imputed observations in Table D.2, and the dynamics are similar.

Figure 2 plots the data on the official EPI as a red line (prices adjusted for quality, comparable to the line "no upgrading, no sorting").[18] It shows a similar pattern as our baseline data in Figure 1 with a pass-through rate of on average 35% in 2015 and 48% in 2016 (Table 6). Although with a slightly muted dynamic (due to the lower data collection frequency), most of the decrease in both indexes occurred during 2015.

To reconstruct a series that does not adjust prices for quality, we use the price series as they are in the micro data and do not add the quality adjustment factor. We then aggregate the micro price data into an aggregate figure as for the official index. In this series (prices not adjusted for quality, comparable to the line "with upgrading, no sorting"), prices revert almost entirely back to their pre-shock level by the end of 2016 (blue line in Figure 2 and last row in Table 6).

[18] This is our reconstruction of the official index based on the micro data because we had to use more aggregate weights than the official index and we drop the oil-related product category 19 (Mineralölprodukte) from the analysis to avoid confounding effects due to falling oil prices during the period under investigation. Therefore, our reconstruction only resembles the official index, but the differences are very small. Figure H.1 provides a comparison.

Figure 2: *Dynamics of the export price index*



The reference period for data collection is the 1st - 8th of a given month. For expository purposes, the indexes are shifted by one month, such that January 2015 corresponds to prices collected from February 1-8. The ticks on the x-axis refer to the end of the quarter.

Table 6: *ERPT in SFSO data*

	2015Q1	2015Q2	2015Q3	2015Q4	2016Q1	2016Q2	2016Q3	2016Q4
EUR/CHF	-13.43	-14.56	-11.27	-10.24	-9.10	-9.35	-10.12	-10.99
Excl adjustments	0.27	0.34	0.39	0.38	0.44	0.51	0.50	0.46
Incl adjustments	0.22	0.27	0.21	0.10	0.07	0.11	0.04	0.00

Table 7 shows the corresponding decomposition. In line with our findings in the FAC dataset above, we can attribute approximately 50% (88%) of the incomplete ERPT to product (scope) adjustments 1 (2) year(s) after the shock. Again in line with the prior findings, we observe a significant increase in the share of products with at least one recorded quality change within one (two) year(s) after the appreciation compared to the (one) two year(s) prior. [19] Similar to the FAC results, we observe relatively stable price dynamics if we exclude product

[19] The Pearson χ^2 test of the one (two) year window is $p < .001$ ($p = .001$).

(scope) adjustments, while prices including adjustments revert almost entirely back to their pre-shock level after 2 years. This is similar to our results in the FCA dataset and underlines the importance of quality adjustment in the aggregate, in particular for the long-run ERPT. Additionally, the SFSO data allow us to study the two series over a longer horizon than the customs data. Figure G.1 in Section G confirms that there are no pre-trends prior to the appreciation.

Table 7: *Contribution of margins of adjustment*

	2015Q1	2015Q2	2015Q3	2015Q4	2016Q1	2016Q2	2016Q3	2016Q4
EUR/CHF	-13.43	-14.56	-11.27	-10.24	-9.10	-9.35	-10.12	-10.99
Excl adjustments	0.87	0.80	0.60	0.42	0.31	0.31	0.22	0.13
Incl adjustments	0.13	0.20	0.40	0.58	0.69	0.69	0.78	0.87

6 Conclusion

The main adjustment mechanism of prices to exchange rates (exchange rate pass-through) is usually modeled as an (incomplete) adjustment of prices. However, firms have other margins for adjusting to exchange rate shocks. One is by changing the quality of their products, thereby affecting pass-through into quality-adjusted prices. Another margin is to remove products from their product line.

In this paper, we document that one year after the surprise large appreciation of the CHF in January 2015, approximately one-half of aggregate pass-through into quality-adjusted prices comes from two margins of product adjustment: first, products tend to have improved quality (quality upgrading), and second, low-quality products tend to disproportionately exit the market. The other half is due to price adjustment of existing products.

These findings suggest that the adjustment of product scope is a margin that firms use to respond to exchange rate shocks and that estimates of pass-through are partially due to this product adjustment rather than the adjustment of the prices of existing products. Furthermore, if firms shift their set of products toward products for which demand is less sensitive to exchange rate changes, these findings also help to reconcile the observations that larger exchange rate appreciations do not necessarily harm the economic performance of a country as much as might be expected in a standard Mundellian logic, as also pointed out in Amstad and di Mauro (2017).

While this paper focuses on the contributions of these product adjustments to aggregate estimates of exchange rate pass-through, we have not shown how firms achieve the average improvement in quality in their production, for example, via the substitution of higher-quality intermediate inputs. We leave this for future research.

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Appendix to "Endogenous Product Adjustment and Exchange Rate Pass-Through"

A Alternative quality measure

In this section, we use an alternative measure of quality changes. Following the approach developed by Aw and Roberts (1986) and Boorstein and Feenstra (1987) and recently outlined by Martin and Mejean (2014), we focus on consumption baskets and examine changes in market shares to measure changes in aggregate quality following the appreciation. The intuition of this approach is that the mean quality of exports increases when consumption reallocates toward expensive products that deliver more utility for the consumer.

To be consistent with Martin and Mejean (2014), we aggregate our data to yearly observations y and use the HS6 definition to define a product group j. We do so by summing value and volume over all transactions in a given year. We then measure the change in quality within a product-destination group jd between years as:

$$\Delta log\lambda_{jdy} = \sum_{z}(\omega^{N}_{zjd,y-1} - \omega^{R}_{zjd,y-1})\Delta\omega^{R}_{zid,y}$$

where we sum across zip codes z, $\omega^{N}_{zid,y-1}$ is the nominal market share of zip code z in product-destination group jd in year $y-1$ and $\omega^{R}_{zjd,y-1}$ is the real market share.

Under the assumption that the price and quality of a product are positively correlated, this measure is positive if demand shifted toward those zip codes that have a larger market share in nominal than in ream terms ($\omega^{N}_{zjd,y-1} > \omega^{R}_{zjd,y-1}$). These are particularly exporters with high prices (Martin and Mejean, 2014). Assuming a positive correlation between prices and quality, this implies that exports reallocate toward high-quality exporters between years y and $y-1$, which increases the average quality of exports.

To test for a quality increase, we regress the (yearly) change in the quality estimate $\Delta log\lambda_{jdy}$ on a constant and destination fixed effects α_d to control for differences in destination countries:

$$\Delta log\lambda_{jdy} = \beta + \alpha_d + \epsilon_{idy},$$

The key parameter we report is β, which indicates the extent to which, after controlling for destination fixed effects α_d, our aggregate quality measure increased for firms exporting in year y and $y - 1$.

The results in Table A.1 confirm that we observe, on average, a quality increase across destination markets.

Table A.1: *Destination country and quality upgrading*

	$\Delta log\lambda\_jd, 2015, 2014$	$\Delta log\lambda\_jd, 2016, 2015$	$\Delta log\lambda\_jd, 2016, 2014$
β	0.07***	0.06***	0.06***
	(0.00)	(0.00)	(0.00)
Destination FE	Yes	Yes	Yes
No. of observations	30,675	30,707	28,919

Standard errors in brackets, clustered at HS-6 product group; *** p<0.01, ** p<0.05, and * p<0.1.

However, this approach does not allow us to derive quality-adjusted prices.

B Further evidence for quality sorting

To test whether Swiss exporters follow quality sorting, we first show that quality sorting is consistent with a positive correlation of export prices and export revenues across products within a zip code and across zip code-destinations within a product group. We run the following regression:

$$\bar{p}_{i,q} = \beta_0 + revenue_{i,q} + \alpha_{x,q} + \epsilon_{i,q}$$

where $\bar{p}_{i,q}$ are quarterly demeaned prices, $revenue_{i,q}$ are log quarterly sales, and $\alpha_{x,q}$ is either a product-quarter fixed effect or a zip code-quarter fixed effect, depending on the specification. We cluster standard errors at the zip-code level.

Across zip code-destinations within a product group-quarter, Table B.1 shows a positive correlation between prices (quality) and revenues, which indicates that Swiss exporters follow quality sorting as opposed to efficiency sorting (Manova and Yu, 2017).

Table B.1: *Relationship between revenues and prices - across firms*

	(log) prices (HS-8)	(log) prices (HS-6)	Quality
(log) revenue	0.03***	0.03***	0.33***
	(0.00)	(0.00)	(0.01)
Product/quarter FE	Yes	Yes	Yes
R^2	0.09	0.13	0.25
No. of observations	2,796,904	2,797,359	2,916,432

Constant not shown. In the first (second) column, prices are demeaned with the quarterly average across HS8-statistical-key product groups (HS6 product category). Standard errors in brackets, clustered at the zip-code level; *** p<0.01, ** p<0.05, and * p<0.1.

Across product-destinations within a zip code-quarter, Table B.2 shows a positive correlation between prices (quality) and revenues, which again is in line with Swiss exporters following quality sorting as opposed to efficiency sorting (Manova and Yu, 2017).

Table B.2: *Relationship between revenues and prices*

	(log) prices (HS-8)	(log) prices (HS-6)	Quality
(log) revenue	0.02***	0.02***	0.28***
	(0.00)	(0.00)	(0.00)
Zip code/quarter FE	Yes	Yes	Yes
R^2	0.09	0.09	0.26
No. of observations	2,803,285	2,803,797	2,923,329

Constant not shown. In the first (second) column, prices are demeaned with the quarterly average across HS8-statistical-key product groups (HS6 product category). Standard errors in brackets, clustered at the zip-code level; *** p<0.01, ** p<0.05, and * p<0.1.

C Quality adjustments and destination country income

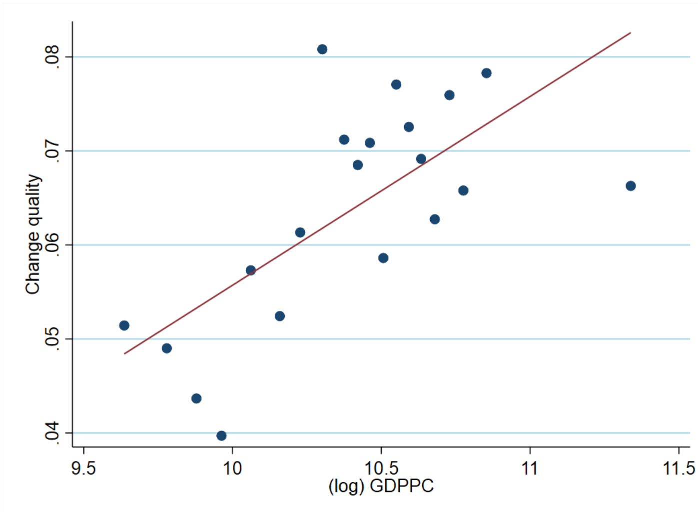
In this section of the appendix, we show that there is a positive relationship between the extent of quality upgrading and the export destination country's GDP per capita (GDPPC).

To do so, we estimate the equation

$$\Delta\lambda_{id} = \beta_0 + \beta_j + \alpha * ln(GDPpc_d) + \epsilon_{id}$$

where λ_{id} is the estimate of quality based on the methodology outlined in Appendix A. $GDPpc_d$ is the GDPPC from destination country d (data taken from the World Bank World Development indicator database). We depict the estimated relationship in Figure C.1. The coefficient α is estimated at 0.02 (robust standard error 0.005).

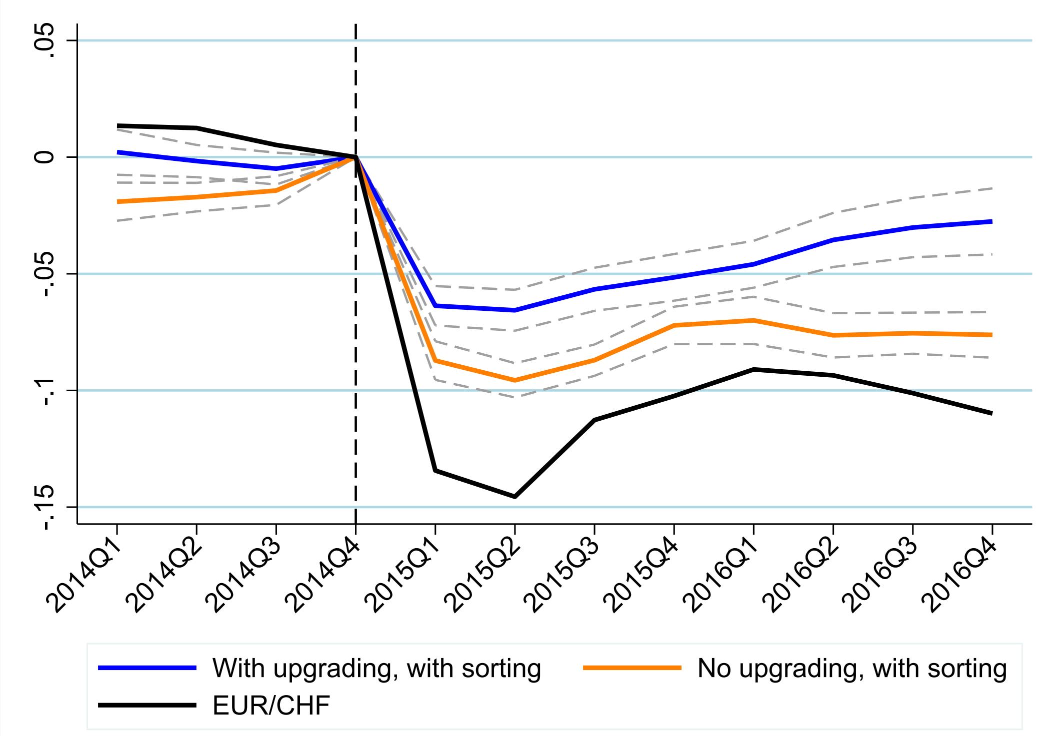
Figure C.1: *Correlation between quality upgrading and destination country GDP per capita*



D ERPT estimation, excl. imputed observations

Figure D.1 shows our ERPT decomposition excluding imputed observations.

Figure D.1: *Aggregate effects on ERPT: No imputed observations*



This figure shows the regression coefficients β_q and 95% CI of regression 1. The series "with upgrading, with sorting" uses observed prices, and the series "no upgrading, with sorting" includes observed quality-adjusted prices. The dashed line indicates the pre-shock quarter 2014Q4.

Table D.1: *ERPT accounting for product adjustments: No imputed observations*

	2015Q1	2015Q2	2015Q3	2015Q4	2016Q1	2016Q2	2016Q3	2016Q4
EUR/CHF	-13.43	-14.56	-11.27	-10.24	-9.10	-9.35	-10.12	-10.99
No upgrading, with sorting	-8.72	-9.57	-8.70	-7.21	-7.00	-7.64	-7.55	-7.62
Upgrading, with sorting	-6.37	-6.56	-5.66	-5.15	-4.59	-3.55	-3.02	-2.76

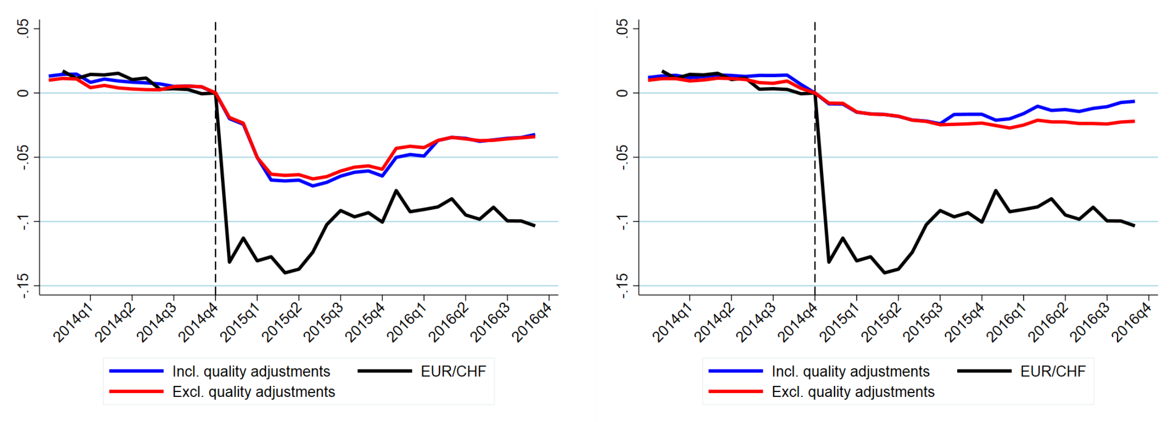
Table D.2: *Contribution of margins of adjustment: No imputed observations*

	2015Q1	2015Q2	2015Q3	2015Q4	2016Q1	2016Q2	2016Q3	2016Q4
EUR/CHF	-13.43	-14.56	-11.27	-10.24	-9.10	-9.35	-10.12	-10.99
No upgrading, with sorting	0.58	0.53	0.38	0.51	0.38	0.21	0.24	0.26
Upgrading, with sorting	0.42	0.47	0.62	0.49	0.62	0.79	0.76	0.74

E Dynamics of price indexes: Domestic and import

In this section, we show our counterfactuals corresponding to Figure 2 for the import and the domestic price index, in Figure E.1. In the left panel for imports, we observe no difference between our series including and excluding quality adjustments. However, import data have the caveat that the buyer and not the producer of the product reports adjustments to the SFSO, which potentially influences the observed dynamics. In the right panel, we observe a similar dynamic for domestic product adjustments as for exports but of a smaller magnitude. [A1] A main reason for the smaller response may be simultaneous domestic demand effects.

Figure E.1: *Dynamics of import price index*



(a) Imports (b) Domestic

The reference period for data collection is the 1st - 8th of a given month. For expository purposes, the indexes are shifted by one month, such that January 2015 corresponds to prices collected from February 1-8. The ticks on the x-axis refer to the end of the quarter.

[A1] We exclude quality adjustments reported in January 2016 due to the revision of the index in December 2015.

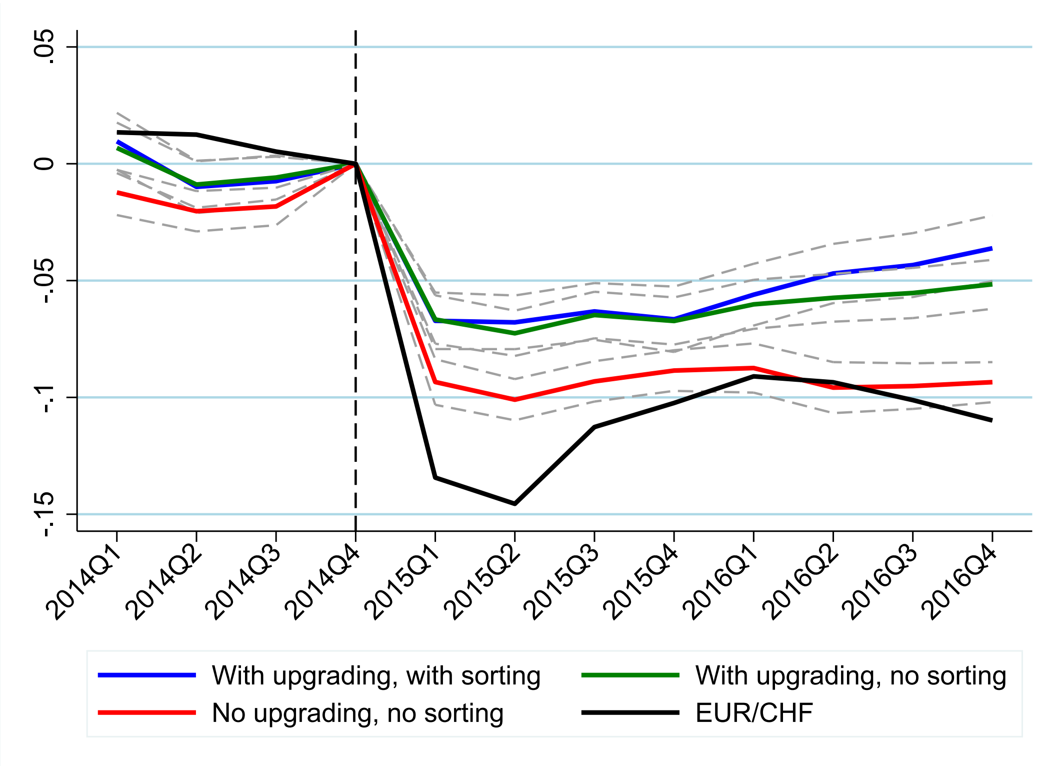
F Main results excluding destination country

As a robustness check, Figure F.1 shows our ERPT result if we exclude the destination country from the product definition and the quality estimation. That is, our product i is defined by the combination of zip code, HS8 product classification and statistical key, and our quality estimate is based on the residual of the regression:

$$v_{i,y} + \sigma p_{i,y} = \alpha_y + \alpha_j + \epsilon_{i,y},$$

If anything, the results in Figure F.1 indicate an even stronger role of quality upgrading and a greater ERPT into adjusted prices when excluding quality upgrading and quality sorting.

Figure F.1: *Aggregate effects on ERPT: excl. destination country*

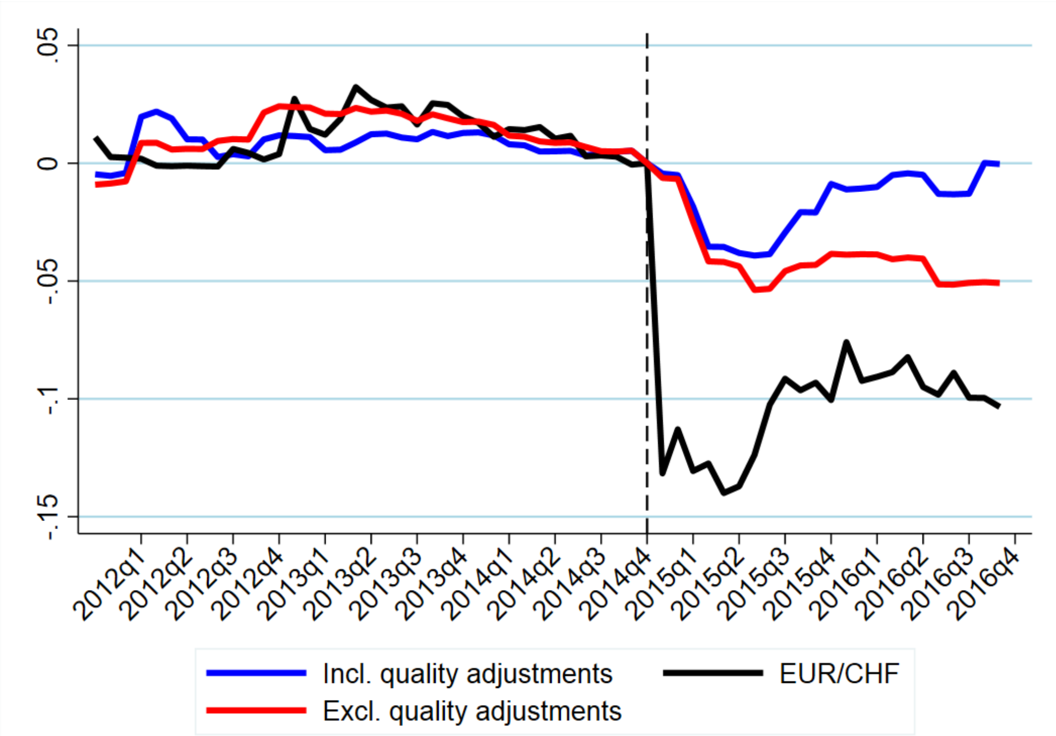


This figure shows the regression coefficients β_q and 95% CI of regression 1. The series "with upgrading, with sorting" uses observed prices, the series "with upgrading, no sorting" uses observed and imputed prices, and the series "no upgrading, no sorting" includes observed and imputed quality-adjusted prices. The dashed line indicates the pre-shock quarter 2014Q4.

G Pre-trends in the export price index

Figure G.1 shows the dynamics of the EPI including quality adjustments (in blue) and excluding quality adjustments (in red) for a longer time horizon. We do not observe any pre-trends prior to the appreciation.

Figure G.1: *Dynamics of the export price index*

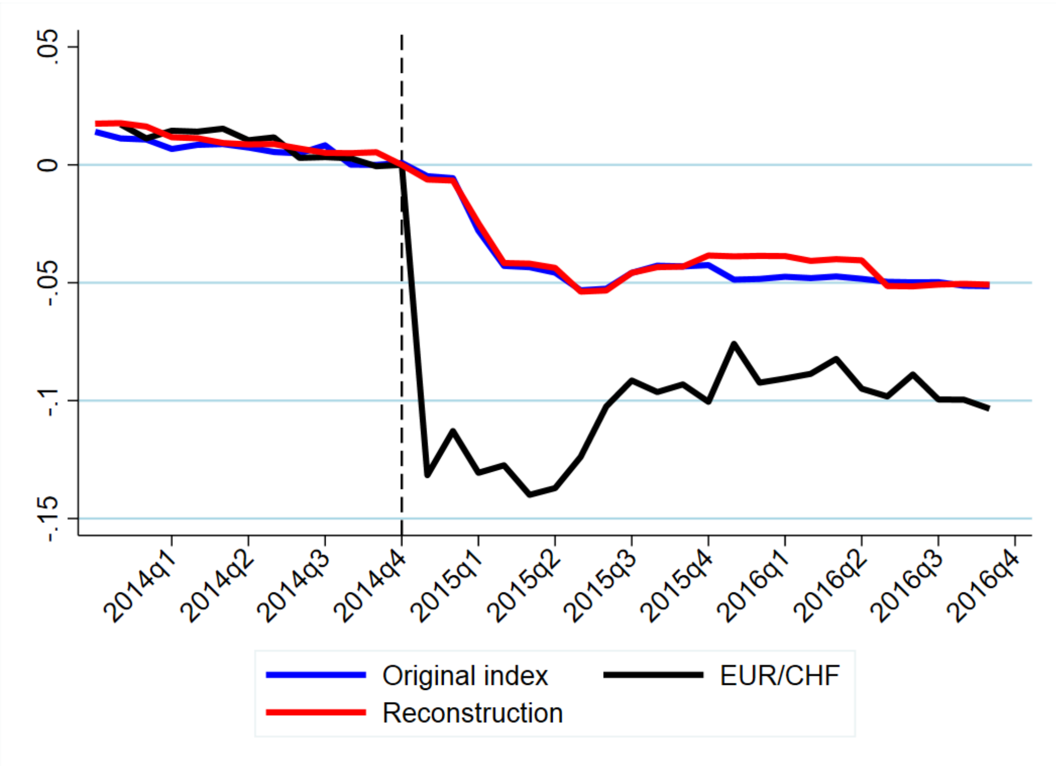


The reference period for data collection is the 1st - 8th of a given month. For expository purposes, the indexes are shifted by one month, such that January 2015 corresponds to prices collected from February 1-8. The ticks on the x-axis refer to the end of the quarter.

H Comparison export price index

Figure H.1 shows the dynamics of the official EPI in blue and our reconstruction (excl. quality adjustments) in red.

Figure H.1: *Export price index*



The reference period for data collection is the 1st - 8th of a given month. For expository purposes, the indexes are shifted by one month, such that January 2015 corresponds to prices collected from February 1-8. The ticks on the x-axis refer to the end of the quarter. Source original index: SNB

I Export share by HS2 sector

Table I.1: *Largest HS2 sectors' yearly export share*

Sector	2014	2015	2016
Pharmaceutical products	19	21	22
Natural, cultured pearls; precious, semi-precious stones; precious metals, metals clad with precious metal, and articles thereof; imitation jewellery; coin	12	12	13
Organic chemicals	11	12	13
Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	9.4	10	10
Raw hides and skins (other than furskins) and leather	7.8	0.08	0.07
Optical, photographic, cinematographic, measuring, checking, medical or surgical instruments and apparatus; parts and accessories	6.2	7.1	7.1
Clocks and watches and parts thereof	5.4	5.4	4.6
Electrical machinery and equipment and parts thereof; sound recorders and reproducers; television image and sound recorders and reproducers, parts and accessories of such articles	5.0	5.3	5.1
Plastics and articles thereof	2.9	3.1	3.0
Iron or steel articles	1.6	1.8	1.7
Vehicles; other than railway or tramway rolling stock, and parts and accessories thereof	1.4	1.6	1.5
Coffee, tea, mate and spices	1.3	1.4	1.3
Essential oils and resinoids; perfumery, cosmetic or toilet preparations	1.3	1.4	1.3
Aluminium and articles thereof	1.3	1.5	1.5
Chemical products n.e.c.	0.9	1.0	0.8
Iron and steel	0.9	0.9	0.8
Paper and paperboard; articles of paper pulp, of paper or paperboard	0.8	0.9	0.7
Tools, implements, cutlery, spoons and forks, of base metal; parts thereof, of base metal	0.8	0.8	0.8
Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints, varnishes; putty, other mastics; inks	0.8	0.8	0.8
Aircraft, spacecraft and parts thereof	0.7	0.9	0.7
Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, n.e.c.; illuminated signs, illuminated name-plates and the like; prefabricated buildings	0.5	0.6	0.5
Copper and articles thereof	0.5	0.4	0.4
Miscellaneous edible preparations	0.4	0.5	0.5
Railway, tramway locomotives, rolling-stock and parts thereof; railway or tramway track fixtures and fittings and parts thereof; mechanical (including electro-mechanical) traffic signalling equipment of all kinds	0.4	0.4	0.5
Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	0.4	0.4	0.4
Cocoa and cocoa preparations	0.4	0.5	0.5
Apparel and clothing accessories; not knitted or crocheted	0.4	0.7	0.6
Beverages, spirits and vinegar	0.4	0.4	0.4
Wood and articles of wood; wood charcoal	0.4	0.4	0.4
Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	0.4	0.2	0.2
Works of art; collectors' pieces and antiques	0.4	0.5	0.5
Preparations of cereals, flour, starch or milk; pastrycooks' products	0.3	0.3	0.3
Soap, organic surface-active agents; washing, lubricating, polishing or scouring preparations; artificial or prepared waxes, candles and similar articles, modelling pastes, dental waxes and dental preparations with a basis of plaster	0.3	0.3	0.3
Apparel and clothing accessories; knitted or crocheted	0.3	0.3	0.4
Albuminoidal substances; modified starches; glues; enzymes	0.2	0.3	0.2
Metal; miscellaneous products of base metal	0.2	0.3	0.2
Inorganic chemicals; organic and inorganic compounds of precious metals; of rare earth metals, of radio-active elements and of isotopes	0.2	0.2	0.2
Miscellaneous manufactured articles	0.2	0.3	0.2
Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans	0.2	0.6	0.5
Glass and glassware	0.2	0.2	0.2
Rubber and articles thereof	0.2	0.2	0.2
Stone, plaster, cement, asbestos, mica or similar materials; articles thereof	0.2	0.2	0.2
Footwear; gaiters and the like; parts of such articles	0.2	0.2	0.3
Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	0.2	0.2	0.2
Food industries, residues and wastes thereof; prepared animal fodder	0.1	0.2	0.2
Textiles, made up articles; sets; worn clothing and worn textile articles; rags	0.1	0.2	0.2
Man-made filaments; strip and the like of man-made textile materials	0.1	0.1	0.1
Textile fabrics; impregnated, coated, covered or laminated; textile articles of a kind suitable for industrial use	0.1	0.1	0.1
Cotton	0.1	0.1	0.10
Arms and ammunition; parts and accessories thereof	0.1	0.09	0.1

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