

## ABSTRACT

We document how product quality responds to exchange rate movements and quantify the extent to which these quality changes affect the aggregate pass-through into export prices. We analyze the substantial sudden appreciation of the Swiss franc post-removal of the 1.20-CHF-per-euro lower bound in 2015 using transaction-level export data representing a large share of total exports. We find that firms upgrade product quality after the appreciation. Furthermore, they disproportionately remove lower-quality products from product ranges. This quality upgrading and quality sorting effect accounts for approximately one-third and one-tenth of total pass-through one year after the appreciation, respectively. We cross-check our results with the microdata underlying the Swiss export price index, which includes an adjustment factor for quality based on firms' reported product replacements, and obtain similar results.

## MOTIVATION & CONTRIBUTION

### MOTIVATION:

- Pass-through into the prices of internationally traded goods is usually found to be incomplete.
- Firms have different margins of adjustment following a shock:
  - adjust the price of a product
  - adjust the product itself (upgrading)
  - adjust the set of products sold (sorting)

### CONTRIBUTIONS:

- We study how the product quality of exported goods in a small, open economy responds to an exchange rate shock.
- We estimate the extent to which this adjustment accounts for exchange rate pass-through.

## AGGREGATE EXCHANGE RATE PASS-THROUGH (ERPT)

- To compare the contribution of different adjustment margins, we estimate the ERPT for three counterfactuals:
  - observed prices ("with upgrading, with sorting")
  - observed and imputed prices for exited products ("with upgrading, no sorting")
  - observed and imputed quality-adjusted prices ("no upgrading, no sorting")

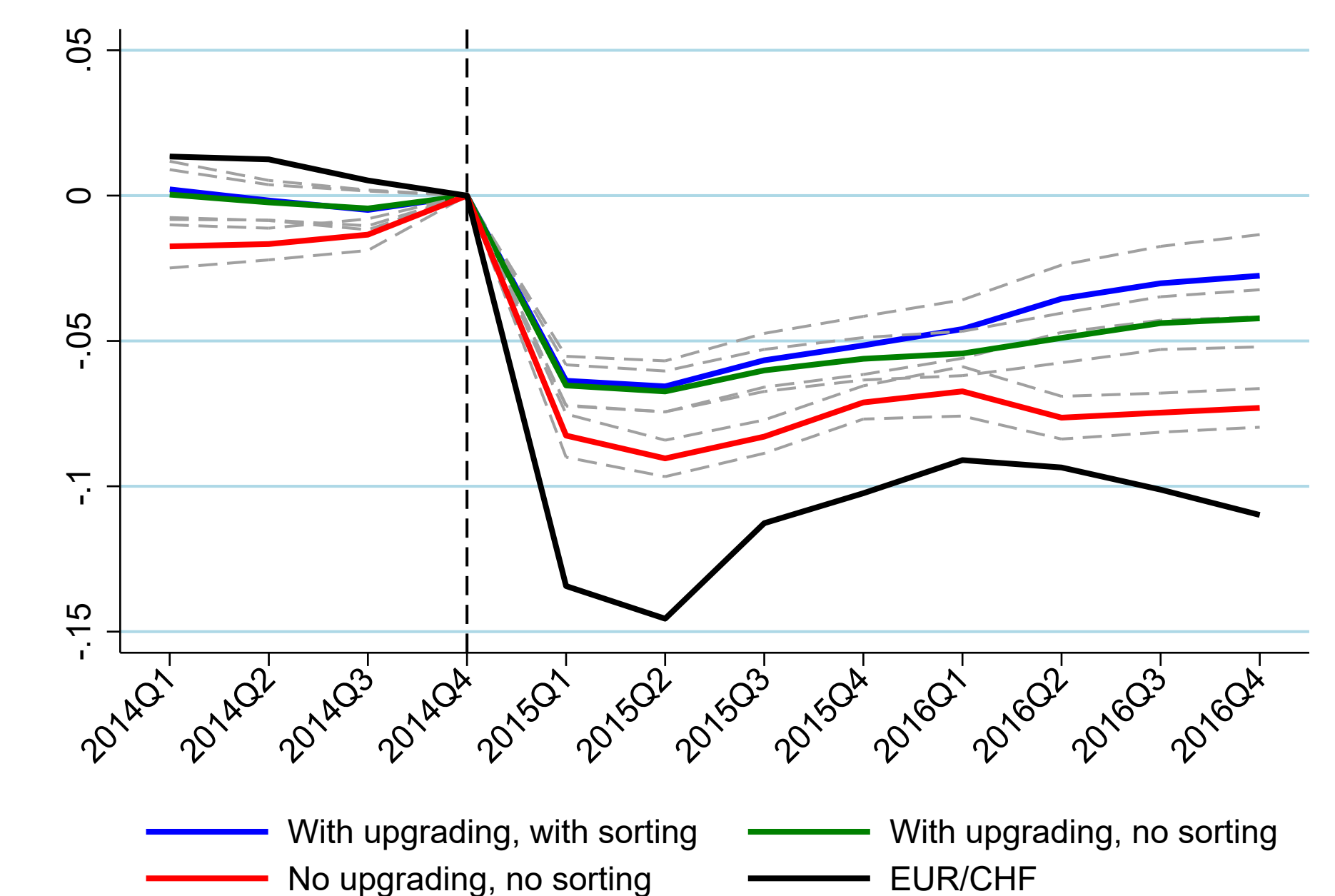
- We quality-adjust prices following Khandelwal, Schott and Wei (2013): If higher-quality products are demanded in larger quantities (*ceteris paribus*), the quality for each product-year observation can be derived from:
 
$$v_{i,y} + \sigma p_{i,y} = \alpha_{d,y} + \alpha_j + \epsilon_{i,y},$$

where  $v_{i,y}$  is the volume of product  $i$ ,  $p_{i,y}$  is its price,  $\sigma$  is the demand elasticity and  $\alpha_{d,y}$  ( $\alpha_j$ ) are destination (product group) fixed effects.

- We estimate the pass-through rate for each of the three counterfactuals by running:

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

Figure 1: Aggregate effects on pass-through



## DATA & IDENTIFICATION

### DATA:

- Quarterly trade transaction data
  - Includes quantities and unit values of the universe of trade flows.
- Microdata underlying the Swiss PPI
  - Includes an indicator when firms replace a product with a new product.

### IDENTIFICATION:

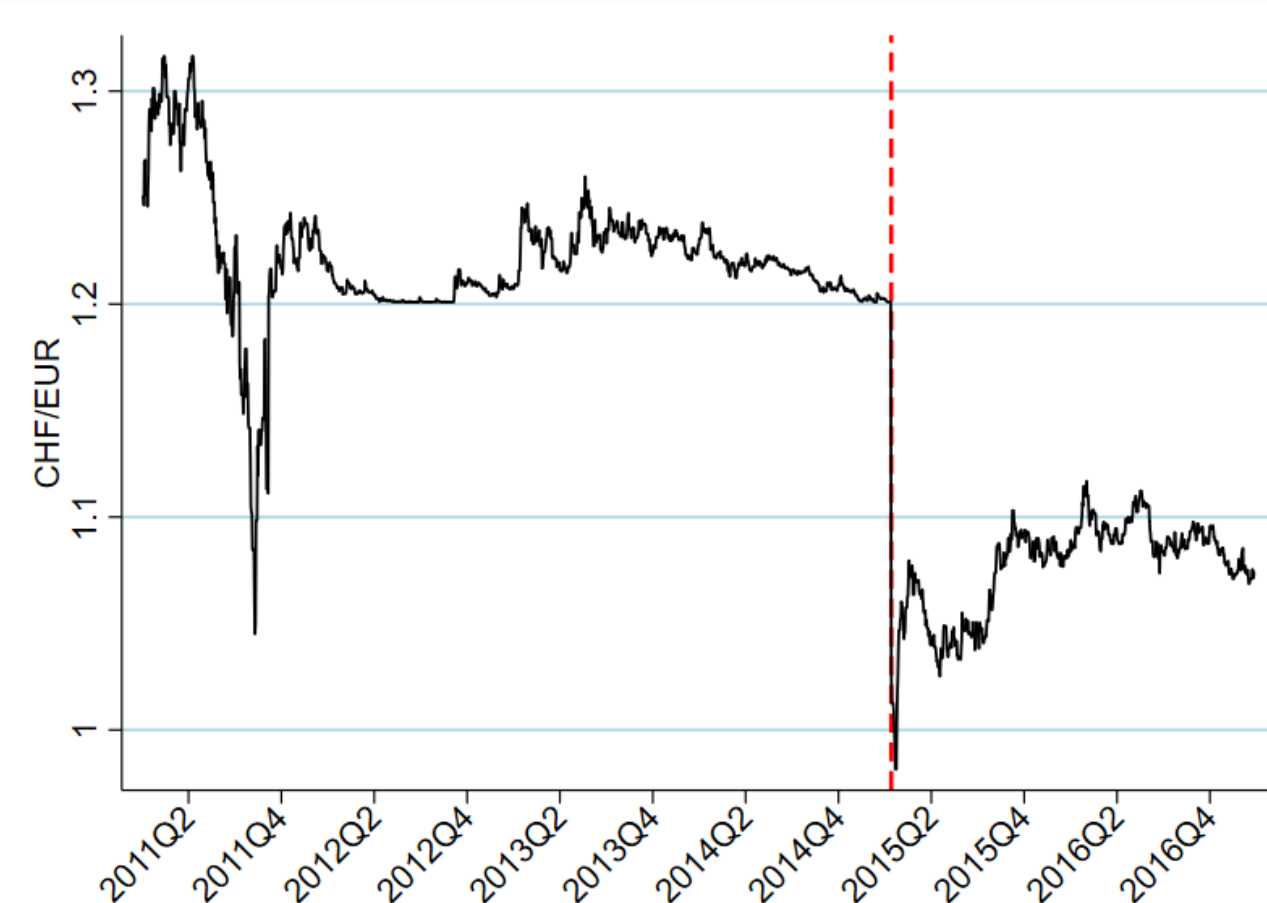
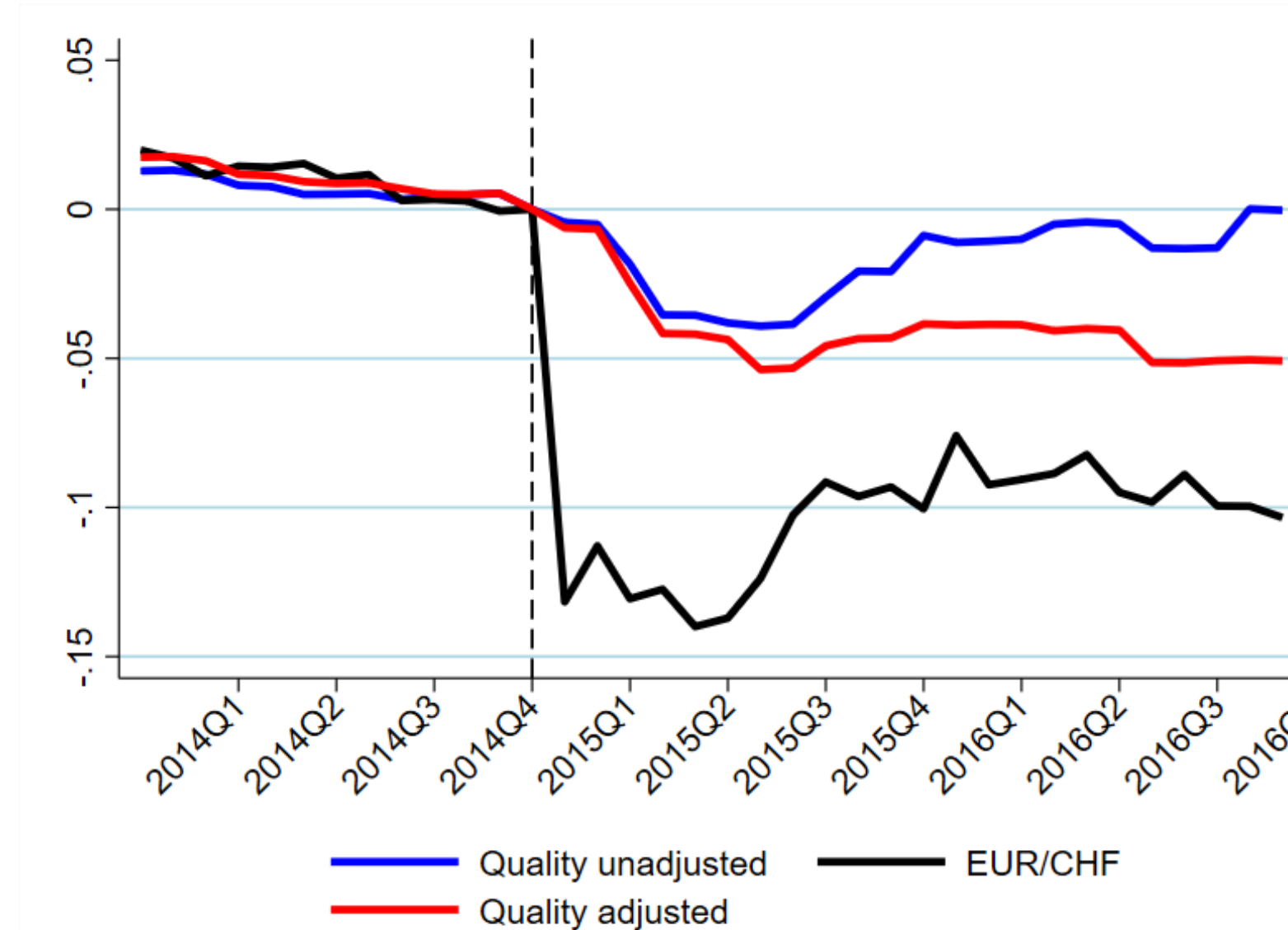


Figure 2: CHF/EUR exchange rate

## CROSS-VALIDATION

- We cross-check our results using microdata on export prices underlying the PPI.
- Based on information about prices and price changes of products that change quality, we construct two series: one where we adjust prices for quality, as in the official price index, and one where we do not adjust prices for quality.
- Confirming our aggregate result, we observe higher long-run pass-through if we adjust prices for quality.

Figure 3: Pass-through in the export price index



## DISCUSSION

- These findings help to reconcile the observations that larger and long-lived exchange rate appreciations seemed to raise firm productivity (which is often associated with quality).
- More research is needed to understand how firms achieve the improvement in quality in their production, for example, by substitution of higher-quality intermediate inputs.

## CONCLUSION

- These findings suggest that the adjustment of products and the product scope are important margins of adjustment of firms in response to exchange rate shocks.
- Approximately one-third of aggregate pass-through into Swiss export prices after the large appreciation in 2015 came from two margins of product adjustment:
  - products improved quality (upgrading)
  - low-quality products disproportionately exited the market (sorting)

## CONTACT INFORMATION

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