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Abstract

Safe haven capital inflows, central bank policies, and other factors have produced large changes in the Swiss franc. We find that these exchange rate changes do not affect the volume of exports from Switzerland's most advanced sectors such as pharmaceuticals and watches, but matter for exports of medium-high-technology products such as capital goods and machinery. We also report that appreciations do not affect stock prices and goods prices for the pharmaceutical and watch industries, but cause both stock and goods prices to tumble for the capital and machinery goods sectors. We conclude with policy lessons for Switzerland, for other countries facing safe haven inflows, and for the rest of the world.

JEL classification: F10, F40

Keywords: Export sophistication, Exchange rate elasticities, Switzerland

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1. Introduction

During the Global Financial Crisis (GFC) and the Eurozone Crisis, safe haven capital inflows caused the Swiss franc (CHF) to appreciate. Between the fourth quarter of 2007 and the third quarter of 2011, the real effective exchange rate (reer) appreciated by 30 percent. In September 2011 the Swiss National Bank (SNB) set a floor of 1.2 francs to the euro. The reer then depreciated by 8 percent over the next quarter. In January 2015 the SNB abandoned the floor, and the franc soared. How does the franc's value affect Swiss exports and the Swiss economy?

The IMF (2011) estimated aggregate prices elasticities for Swiss exports using data from 1979 to 2009. Employing an error correction model and quarterly data, it reported that a 10 percent appreciation would reduce goods exports by between 9 and 13 percent and would not affect service exports.[1] These estimates imply that the 30 percent appreciation of the CHF between 2007 and 2011 should have devastated Swiss goods exports, something that has not happened.

To investigate why, we estimate export elasticities using more recent data. Employing cointegration techniques and quarterly data as the IMF (2011) did but over the 1989-2016 period, we find no evidence that exchange rate changes affect aggregate exports.

One reason why the IMF's (2011) finding and our finding may differ is because the Swiss export basket was different over the IMF's sample period and over our sample period. As Sauré (2015) observed, the Swiss export basket changed dramatically starting in the late 1980s. The share of pharmaceutical exports, after averaging less than 7 percent of Switzerland's exports in the 1980s, rose almost monotonically after 1989 and by 2011exceeded 25 percent. Sauré

[1] The IMF (2011) focused on the nominal effective exchange rate, but found similar results for the real effective exchange rate.

noted that pharmaceutical products are often essential and covered by employees' health insurance. Thus the price elasticity of demand for these goods should be low. The growing share of pharmaceutical exports in total exports may help explain the small aggregate price elasticities that we find.

Another reason why exchange rates might not matter is that price elasticities for technologically advanced exports may be small. The IMF (2013, p. 18) stated that Swiss "…exporting industries may be built around production of very specific items, which are particularly valued for their brands or special characteristics and hence face limited price competition."

We investigate the sophistication of Swiss exports and the Swiss export basket. To do this, we use the methods of Hausmann, Hwang, and Rodrik (2007) and Kwan (2002). They constructed product sophistication indices and country sophistication indices for a country's exports. They posited that products exported by richer countries tend to be more technologically advanced. As Lall, Weiss, and Zhang (2006) noted, one reason for this is that goods exported by wealthy countries have higher labor costs. To be competitive in world markets, they thus need to be produced using more sophisticated production processes.

We find that Switzerland has the most sophisticated export structure in the world in most years according to both Hausmann *et al*'s (2007) and Kwan's (2002) measures. Watches and pharmaceutical products rank first and third, respectively, in terms of product sophistication and 41 percent of Swiss exports in 2014 were in these two categories.[2] We also investigate Switzerland's export structure using OECD classifications. They categorize technology levels based on the ratio of R&D spending to value-added (see, e.g., Hatzichronoglou, 1997).

2 As discussed in Section 2, the 41 percent figure excludes exports of gold bars that were produced using imported gold bars.

According to this measure, 53 percent of Swiss manufacturing exports in 2014 were classified as high-technology goods. This was two to five times higher than the corresponding values for the G-7 countries. Given Switzerland's advanced export structure, one might expect that its goods do not compete primarily based on price and hence that exchange rate changes would only have a limited impact on exports.

We also investigate price elasticities for individual sectors. We find that exchange rates do not matter for the most sophisticated sectors, watches and pharmaceuticals. We do find, however, that appreciations significantly reduce exports of specialized machinery, precision instruments, machine tools, and other products employing Swiss engineering. The Swiss capital goods industry is thus vulnerable to appreciations.

To shed additional light on how exchange rates affect individual sectors, we investigate the ability of Swiss companies to pass-through exchange rate changes into export prices. We find that CHF watch prices are not affected. We also find that the appreciation between May 2010 and August 2011 triggered a large drop in CHF export prices relative to CHF costs for the capital goods and precision machinery sectors. Thus the appreciation squeezed profit margins in these industries.

To understand more about how exchange rates affect industry profitability, we estimate exchange rate exposures for individual sectors of the stock market. Theory posits that stock prices equal the expected present value of future net cash flows. Investigating how the CHF affects industry stock returns can thus indicate how industry profitability is affected. We find that the pharmaceutical sector is not affected but that industrial machinery and other industrial stocks are among the most harmed by an appreciation. This provides additional evidence that the most research-intensive, high-technology products are not affected by exchange rate changes but that medium-high-technology products are highly exposed.

Arbatli and Hong (2016) investigated the relationship between product sophistication and Singapore's exports. They calculated product sophistication using the methods of Hidalgo and Hausmann (2009). They estimated export functions with product specific fixed effects using the Mean Group estimator of Pesaran and Smith (1995) and annual data over the 1989-2013 period. They found that highly sophisticated sectors such as pharmaceuticals have lower price elasticities.

Auer and Sauré (2012) analyzed a panel of Swiss exports disaggregated along both regional and industry lines. They employed data on the 25 largest categories of Swiss exports to the 27 most important export markets over the 2005Q1-2010Q3 period. Using a gravity model, they reported that a 10% appreciation of the CHF against a trading partner's currency would decrease Swiss exports to that partner by 4.2% and a 10% increase in the trading partner's GDP would increase Swiss exports to that partner by 9.2%. In a related paper, Auer and Sauré (2011) provided two examples of high quality products (centrifuges and milling machinery) and two examples of competitive sectors (clothing and frozen fish fillets). They noted that exchange rate responses were smaller for Swiss exports of the two high quality products than for exports of the two competitive goods.

Héricourt, Martin, and Orefice (2014) investigated whether high-end French exports are less sensitive to exchange rate changes. They used annual panel data over the 1995-2010 period and measured the quality of products using export unit values. They did not find that higher-end exports were less sensitive to exchange rates than other exports.

The next section investigates Switzerland's export structure using the methods of Hausmann *et al.* (2007) and Kwan (2002). Section 3 estimates aggregate export elasticities for Switzerland using Johansen maximum likelihood and dynamic ordinary least squares (DOLS) estimation. Section 4 estimates sectoral trade elasticities using panel DOLS methods. Sections 5 and 6 use regression techniques to investigate how exchange rates affect export prices and stock returns. Section 7 draws policy implications and concludes.

2. Measuring the sophistication of Swiss Exports

2.1 Data and Methodology

Kwan (2002) assumed that countries with higher incomes will export higher value added products. He constructed a product sophistication index (PSI) by calculating a weighted average of the per capita GDPs of the product's exporters, using the countries' shares of global exports as weights. For example, if machine tools are only exported by country A, country B, country C, and country D and if their respective shares of the global export market are 60%, 20%, 10%, and 10% and their respective per capita GDP values are $30,000, $20,000, $10,000, and $5,000 then the PSI for machine tools would be $30,000*60% + $20,000*20% + $10,000*10% + $5,000*10% = $23,500.

Formally, the product sophistication index for a product k can be written as:

$$PSI_k = \frac{\sum_j x_{jk} Y_j}{X_k}, \qquad (1)$$

where PSI_k is the product sophistication index for product k, x_{jk} are exports of product k by country j, Y_j is per capita gross domestic product in country j, and X_k are total world exports of product k. Equation (1) is thus a weighted average of the per capita GDPs of product k's exporters, using the countries' shares of global exports of k as weights.

A couple of examples can help to clarify equation (1). Medical equipment, International Standard Industrial Classification (ISIC) category 3311, includes sophisticated electronic machinery used for diagnoses and surgery and other advanced products. Textile fabric and fibers, ISIC category 1711, includes lower-technology goods such as cotton fabrics and spun fibers. For medical equipment, only two of the nineteen leading exporters in 2011 do not have per capita GDPs above USD 20,000. For textile fabrics and fibers, on the other hand, nine of the nineteen leading exporters do not have per capita GDPs above USD 20,000. The value of the PSI for medical equipment in 2011 is thus high ($33,896) while the value of the PSI for textile fabrics and fibers is low ($14,027).

Kwan calculated the country's sophistication index (CSI) by assuming that the larger the share of sophisticated products in a country's exports, the more advanced its export basket is. For example, if the PSI is $30,000 for machine tools, $27,000 for computers, and $10,000 for clothing and if a country's export basket is composed of 50% machine tools, 25% computers, and 25% clothing, then the country's sophistication index (CSI) would be $30,000*50% + $27,000 *25% + $10,000*25% = $24,250. A country that has a larger share of low PSI products in its export structure would thus have a lower CSI.

Formally, the sophistication index for country j can be written as:

$$CSI_j = \frac{\sum_k x_{jk} PSI_k}{X_j}, \qquad (2)$$

where CSI_j is the country sophistication index for country j, x_{jk} are exports of product k by country j, PSI_k is the product sophistication index for product k, and X_k are total exports of country j to the world. Equation (2) is thus a weighted average of the product sophistication indexes of the goods that country j exports, using the percentage of country j's total exports in each good as weights.

Hausmann *et al.* (2007) claimed that the weighting scheme in equation (1) gives too much weight to large countries. As an example, they observed that the value of US exports of blazers in 1995 equaled $28,800,000 while the value of Bangladeshi exports of blazers equaled $19,400,000. The value for the US amounted to 0.005 percent of its exports while the value for Bangladesh equaled 0.6 percent of its exports. While blazer exports are thus more important for Bangladesh than for the US, equation (1) would weigh US income more heavily than Bangladeshi income in calculating the PSI for blazers.

Hausmann *et al.* (2007) therefore proposed weighting per capita GDP in equation (1) by each country's revealed comparative advantage in product k. They called the resulting measure the productivity level of product k:

$$PRODY_k = \sum_j \frac{\left(\frac{x_{jk}}{X_j}\right)}{\sum_j \left(\frac{x_{jk}}{X_j}\right)} Y_j, \qquad (3)$$

where $PRODY_k$ is the productivity level of good k, x_{jk}/X_j is the share of commodity k in the country's overall export basket, and $\sum_j(x_{jk}/X_j)$ is the sum of the value shares across all countries j exporting product k, and Y_j is per capita GDP in country j. Equation (3) thus weighs a country's per capita GDPs by the country's revealed comparative advantage in product k.

Hausmann *et al.* (2007) then used PRODY to calculate each country's sophistication index. They called this measure the productivity level associated with a country's export basket (EXPY):

$$EXPY_j = \frac{\sum_k x_{jk} PRODY_k}{X_j}, \qquad (4)$$

where $EXPY_j$ is the productivity level associated with country j's export basket, $PRODY_k$ is the productivity level of good k, and the other variables are defined after equation (2).

We use both Kwan's (2002) approach (equations (1) and (2)) and Hausmann et al's (2007) approach (equations (3) and (4)) to measure PSI's for individual products and CSI's for each country's export basket. Exports are disaggregated at the four-digit ISIC level and are measured in U.S. dollars for the world's 89 leading exporters. Per capita GDP is also measured in (constant) US dollars. These data are obtained from the CEPII-CHELEM database.

We also investigate Switzerland's export structure using OECD classifications. They categorize technology levels based on the ratio of R&D spending to value-added (see Hatzichronoglou, 1997). Their measure provides independent evidence that we can compare with the results obtained using Kwan's (2002) and Hausmann *et al.*'s (2007) techniques.

2.2 Results

Table 1 presents the results over the 2001-2014 period. Results for earlier years are available on request. According to Kwan's (2002) measure Switzerland has the highest country sophistication index for every year but one in the table. According to Hausmann *et al*'s (2007) measure, Switzerland has the highest CSI for every year in the table.

Table 2 presents the percentage of Swiss exports in individual four-digit ISIC categories in 2014 and the associated product sophistication index calculated using Kwan's (2002) methodology. The results are similar when the PSI is calculated using Hausmann *et al*'s (2007) approach. We focus on the results in column (3) excluding ISIC category 2720 (precious and non-ferrous metals). This category averaged 3 percent of Switzerland's exports from 1989 to 2011 and then jumped to average 32 percent of Swiss exports between 2012 and 2014. Imports of this category also jumped to average 32 percent of imports between 2012 and 2014. This rise in imports and exports of precious metals reflects gold bars that are imported, processed in Switzerland, and then re-exported. Little of the value-added comes from Switzerland. We do not believe that including category 2720 provides an accurate measure of Switzerland's industrial structure.

Abstracting from ISIC category 2720, 48% of Swiss exports in 2014 were in categories with PSI's above $43,000. For the G-7 countries, the corresponding values were 5% for Canada, 9% for France, 8% for Germany, 7% for Italy, 2% for Japan, 10% for the U.K., and 7% for the U.S. Column (3) of Table 2 also indicates that 67 percent of Swiss exports were in categories with PSIs above $35,000. For the G-7 countries, the corresponding values were 9% for Canada, 25% for France, 15% for Germany, 13% for Italy, 11% for Japan, 19% for the U.K., and 13% for the U.S. The sophistication of Swiss exports is thus an outlier relative to other advanced economies.

Another way to measure the sophistication of Swiss exports is to examine the percentage of manufactured exports that are classified by the OECD as high-technology goods. For Switzerland, abstracting from ISIC category 2720, 53% of exports in 2014 are classified as high-technology goods based on this criterion. For the G-7 countries, the corresponding share of high-technology exports was 13% for Canada, 28% for France, 20% for Germany, 11% for Italy, 20% for Japan, 24% for the U.K., and 21% for the U.S.

Table 2 indicates that 39% of exports are in ISIC category 24 (chemicals), 18% are in category 29 (machinery and equipment), and 11% are in category 33 (medical, precision, and optical instruments). Thus 70% of Swiss exports are from these three advanced industries.

By contrast, traditional lower-technology Swiss products make up a small share of exports. Chocolates equal only 0.6 percent of exports; cheeses and dairy products only 0.4 percent; wines only 0.04 percent; and fruits only 0.01 percent.

Table 2 also indicates that intermediate goods exports such as engines, electronic components, and parts for vehicles are not large. In total, intermediate goods accounted for 8% of Swiss exports and 10% of Swiss imports) in 2014. Thus cross-border supply chains are not as important in Switzerland as they are for East Asian countries, where the share of intermediate goods in exports and imports often exceeds 30%. In addition, Table 2 indicates that primary products exports are minuscule. Finally, although not shown in the table, abstracting from ISIC category 2720 exports, 76 percent of Swiss exports in 2014 went to OECD countries.

Thus Switzerland exports sophisticated products largely to developed economies. One might expect these to compete on quality more than on price, and thus for the price elasticities of exports to be small. We investigate this issue in the next section.

3. Estimating export elasticities using time series methods

3.1 Data and Methodology

To estimate trade elasticities we use the workhorse imperfect substitutes model (see Goldstein and Khan, 1985). Export functions can be written as:

$$ex_t = \alpha_1 + \alpha_2 reer_t + \alpha_3 y_t^* + \varepsilon_t \,, \qquad (5)$$

where ex_t represents real exports, $reer_t$ represents the real effective exchange rate, and y_t^* represents real foreign income.

We estimate equation (5) using dynamic ordinary least squares (DOLS). DOLS yields consistent and efficient estimates (Stock and Watson, 1993). The DOLS estimator also has smaller bias and root mean squared error than other cointegrating regression estimators in cases where the sample is not large enough to justify applying asymptotic theory (Montalvo, 1995).

DOLS estimates of the long run parameters α_1, α_2, and α_3 can be obtained from the following regression:

$$ex_t = \alpha_1 + \alpha_2 reer_t + \alpha_3 y_t * + \sum_{k=-K}^{K} \beta_{1,k} \Delta reer_{t+k} + \sum_{k=-K}^{K} \beta_{2,k} \Delta y_{t+k} * + \varepsilon_t \ , \qquad (6)$$

where K represents the number of leads and lags of the first differenced variables and the other variables are defined above. We use the Schwarz Criterion to determine the number of leads and lags.

Equation (5) can also be written in vector error correction form as:

$$\Delta ex_t = \beta_{10} + \varphi_1(ex_{t-1} - \alpha_1 - \alpha_2 reer_{t-1} - \alpha_3 y_{t-1}*) + \beta_{11}(L)\Delta ex_{t-1} + \beta_{12}(L)\Delta\ reer_{t-1} + \beta_{13}(L)\Delta y_{t-1}* + \nu_{1t} \qquad (7a)$$

$$\Delta reer_t = \beta_{20} + \varphi_2(ex_{t-1} - \alpha_1 - \alpha_2 reer_{t-1} - \alpha_3 y_{t-1}*) + \beta_{21}(L)\Delta ex_{t-1} + \beta_{22}(L)\Delta\ reer_{t-1} + \beta_{23}(L)\Delta y_{t-1}* + \nu_{2t} \qquad (7b)$$

$$\Delta y_t* = \beta_{30} + \varphi_3(ex_{t-1} - \alpha_1 - \alpha_2 reer_{t-1} - \alpha_3 y_{t-1}*) + \beta_{31}(L)\Delta ex_{t-1} + \beta_{32}(L)\Delta\ reer_{t-1} + B_{33}(L)\Delta y_{t-1}* + \nu_{3t}\ . \qquad (7c)$$

φ_1, φ_2 , and φ_3 are error correction coefficients that measure how quickly exports, the real exchange rate, and income respectively respond to disequilibria. If these endogenous variables move towards their equilibrium values, the corresponding correction coefficients will be negative and statistically significant. The L's represent polynomials in the lag operator. We estimate equations (7a) – (7c) using Johansen maximum likelihood methods.

Data on the volume of goods exports from Switzerland to the world are available from the IMF's International Financial Statistics (IFS) database. Quarterly data are available from

1989 to 2016.

CPI-deflated reer data are available from IFS and from the Bank for International Settlements (BIS). We use both measures.[3]

For rest of the world income (y_t*) we use quarterly data on real income in OECD countries. These data should be useful since the lion's share of Swiss exports goes to OECD countries. The data are seasonally adjusted and are obtained from the OECD.[4]

Augmented Dickey-Fuller tests indicate that the series are integrated of order one. The trace statistic and the maximum eigenvalue statistic then allow us to reject at the 5% level the null of no cointegrating relations against the alternative of one cointegrating relation.

3.2 Results

Table 3 presents the results from estimating equation (5). The first row presents the results using the IMF reer variable and the second row using the BIS reer measure. The first and third columns present results without a trend and the second and fourth columns present results with a trend.

The exchange rate elasticities are very small and not statistically significant in any specification. By contrast, the GDP elasticities are always significant at the 1 percent level and range from 1.55 to 1.73. The results indicate that a 10 percent increase in rest of the world GDP would increase exports by 16 to 17 percent.

Table 4 provides Johansen maximum likelihood estimates for equations (7a) – (7c) with a linear trend in the data. The exchange rate elasticities remain close to zero and are not statistically significant. The GDP elasticites range from 1.52 to 1.53 and are significant at the 1

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[3] The website for the IMF is www.imf.org. The website for the BIS is www.bis.org.
[4] The website for these data is http://stats.oecd.org

percent level. These findings indicate that a 10 percent increase in GDP would increase exports by 15 percent.

The error correction coefficients for exports are negative and statistically significant, indicating that exports return to their equilibrium values. The correction coefficients imply that the gap between the current value of exports and the equilibrium value closes at a rate of 38 or 39 percent per quarter. This implies that 85 percent of the gap between actual and predicted exports will close within a year. There is thus a tight relationship between exports and the dependent variables.

The error correction coefficients for the exchange rate is not statistically significant at the 5 percent level. This indicates that this variable is weakly exogenous. The estimated exchange rate elasticities can thus be interpreted as the response of exports to exogenous changes in reer.

The results reported here indicate that exchange rates do not affect aggregate exports. On the other hand, there is a strong and very precisely estimated relationship between exports and real GDP. The findings indicate that a slowdown in the rest of the world would cause a first order decline in Swiss exports.

4. Estimating export elasticities using panel data

4.1 Data and Methodology

In this section we use the Mark-Sul weighted DOLS estimator to estimate trade elasticities. We construct panel data sets including Switzerland's exports to its major importing countries over the 1989-2014 period.   We exclude countries that were minor importers over part of the sample period because these countries can have large percentage changes in imports due to idiosyncratic factors rather than due to the macroeconomic variables in equation (5). The major importing countries over the whole sample period are Austria, Belgium Canada, France, Germany, Hong Kong, Israel, Italy, Japan, Netherlands, Spain, Sweden, the United Kingdom, and the United States.

We obtain annual data on exports and real GDP from the CEPII-CHELEM database. Exports are measured in U.S. dollars. We deflate this using the product of the Swiss franc unit value index and the dollar/CHF exchange rate. These data are obtained from the IMF IFS database.

We employ the CEPII-CHELEM bilateral real exchange rate between Switzerland and each of the importing countries. An increase in the exchange rate represents an appreciation of the exporter's currency.

We perform a battery of panel unit root tests and Kao (1999) and Pedroni (2004) cointegration tests on the variables. The results provide some evidence of cointegrating relations among the variables.

We use Mark and Sul (2003) panel DOLS techniques to find trade elasticities. The estimated model takes the form:

$$ex_{i,j,t} = \beta_0 + \beta_1 rer_{j,t} + \beta_2 y_{j,t}^{\ *} + \sum_{k=-p}^{p} \alpha_{1,j,k} \Delta rer_{j,t-k} + \sum_{k=-p}^{p} \alpha_{2,j,k} \Delta y_{j,t-k}^{\ *} \qquad (8)$$
$$+ u_{i,j,t},$$
$$t = 1, \cdots, T; \qquad j = 1, \cdots, N.$$

Here $ex_{i,j,t}$ represents real exports from Switzerland to country *j*, $rer_{j,t}$ represents the bilateral real exchange rate between Switzerland and importing country *j*, and $y_{j,t}^{\ *}$ represents real income in country *j*. Cross-section specific lags and leads of the first differenced regressors are included to asymptotically remove endogeneity and serial correlation.[5] A sandwich estimator is employed to allow for heterogeneity in the long-run residual variances. Individual specific fixed effects and individual specific time trends are also included.

We also estimate elasticities for individual sectors. Economists since Orcutt (1950) have recognized the benefits of estimating trade elasticities for individual sectors, since aggregate estimates of price elasticities may be biased downwards. We investigate the following sectors: capital goods, consumption goods, non-pharmaceutical products, pharmaceutical product, and watches.[6] Data on sectoral exports come from the CEPII-CHELEM database and are deflated using the same measure as before.

4.2 Results

Table 5 present the findings. Column (1) presents the results for all goods and the subsequent columns are ordered from the industry least affected by exchange rates to the industry most affected. For all goods the exchange rate coefficient equals -0.44, and is statistically significant at the 1 percent level. This implies that a 10 percent exchange rate increase would decrease exports by 4.4 percent. This is very close to Auer and Sauré's (2012) findings with disaggregated data that indicated that a 10 percent appreciation would reduce exports by 4.2 percent. The GDP elasticity is not statistically significant, although it is for several individual sectors.

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[5] We employ one lead and one lag.

[6] As defined by the CEPII-CHELM database, capital and equipment goods come from the following product categories: aeronautics, agricultural equipment, arms, commercial vehicles, computer equipment, construction equipment, electrical apparatus, electrical equipment, precision instruments, ships, specialized machines, and telecommunications equipment. Consumption goods come from the following categories: beverages, carpets, cars, cereal products, cinematographic equipment, clocks, clothing, consumer electronics, domestic electrical appliances, knitwear, miscellaneous manufactured articles, optics, pharmaceuticals, photographic equipment, preserved fruit and vegetable products, preserved meat and fish products, soaps and perfumes (including chemical preparations), sports equipment, toiletries, toys, and watches.

Columns (2) and (3) report results for watches and pharmaceutical products. In both cases the exchange rate coefficients are not statistically significant, and for watches it is of the wrong sign. This suggests that the exchange rate does not matter for these sophisticated industries. In contrast, the GDP elasticity for pharmaceutical goods equals 2.96 and is significant at the 1 percent level. This indicates that a 1 percent increase in income in importing countries would increase pharmaceutical exports by 3 percent. This result may reflect the fact that, as countries become wealthier, they can purchase more cutting edge drugs.

Column (4) reports results for consumption goods. The trade elasticities are both significant at the 1 percent level. The results indicate that a 10 percent appreciation would reduce exports by 3 percent and that a 10 percent increase in rest of the world GDP would increase exports by 20 percent. Column (5) reports results for all exports other than pharmaceuticals. The exchange rate coefficient is significant at the one percent level. It indicates that a 10 percent appreciation would reduce non-pharmaceutical exports by 4 percent. The GDP coefficient is significant at the ten percent level. It indicates that a 10 percent increase in rest of the world GDP would increase exports by 6 percent.

The contrast between the GDP elasticity for pharmaceuticals and non-pharmaceuticals is interesting. The elasticity for pharmaceuticals is large (2.96) and highly significant while the elasticity for non-pharmaceuticals is small (0.6) and marginally significant. The tight link between exports and aggregate GDP reported in the last section may partly reflect the strong relationship between pharmaceutical exports and rest of the world GDP. In addition, the weak link between both pharmaceutical and watch exports and exchange rates may be one reason why the aggregate exchange rate elasticities reported in the previous section are small.

Column (6) reports elasticities for capital and equipment goods exports. The trade elasticities are both significant at the 1 percent level. The exchange rate coefficient indicates that a 10 percent appreciation would reduce capital goods exports by 6 percent and the GDP coefficient indicates that a 10 percent increase in rest of the world GDP would increase exports by 11.5 percent.

The important implication of these results is that the most sophisticated exports, watches and pharmaceutical products, are not sensitive to exchange rates. On the other hand Swiss capital goods exports, which are primarily medium high-technology products, are highly exposed to appreciations. The recent 30 percent appreciation of the exchange rate thus put significant downward pressure on capital goods exports.

5. The Pass-Through of Exchange Rate Changes to Export Prices

5.1 Data and Methodology

As Campa and Goldberg (2005) showed, export prices can be represented as the product of marginal costs and firms' markup. Employing their framework, Ceglowski (2010) expressed the first difference of export prices as a function of current and lagged values of the first difference of the exchange rate, foreign prices, domestic costs, and economic activity in the destination market:

$$\Delta p^{x}_{jt} = \beta_0 + \sum_{i=0}^{p} \beta_{1i} \Delta e_{jt-i} + \sum_{i=0}^{p} \beta_{2i} \Delta p^{f}_{t-i} + \sum_{i=0}^{p} \beta_{3i} \Delta c_{jt-i} + \sum_{i=0}^{q} \beta_{4i} \Delta y^{f}_{t-i} + u_t, \quad (9)$$

where p^{x}_{j} is the price of exports in industry *j*, e_j is the exchange rate, p^{f} measures foreign prices, c_j represents costs for industry *j* , and y^{f} represents economic activity in the export market.

The Swiss franc price of exports by industry (p_j^x) is available from the Swiss Federal Customs Administration. The Swiss franc nominal effective exchange rate (e_j) is available from the IMF International Financial Statistics database. The foreign price measure (p^f) is calculated as the geometrically weighted average of the producer price index (PPI) in Switzerland's ten leading export destination, and the PPI data are obtained from the CEIC database. The time-varying weights used to calculate p^f are determined by the share of Swiss exports going to each of the countries. Costs (c_j) are represented by the PPI in Swiss industry *j*, with the data obtained from the Swiss Federal Statistical Office. Economic activity in export markets (y^f) is measured by a geometrically weighted average of industrial production (IP) in Switzerland's ten leading export destination, with the IP data sourced from the IMF International Financial Statistics database.

To estimate equation (9), we can only use sectors where corresponding data for both export prices and producer prices are available. We investigate the following sectors: (1) capital goods, (2) clothing, (3) consumer durables, (4) food, (5) precision instruments, clocks, & jewelry, and (6) watches & clocks. We also estimate equation (9) for all goods.

Individual sectoral data are available starting in April 2003 and data for all goods are available starting in April 2000. The sample period for the individual sectors thus extends from April 2003 to May 2016 and the sample period for all goods extends from April 2000 to May 2016. The estimation begins with six lags of e_j , p^f , and c_j and y^f . To avoid overfitting, the lag length is then progressively reduced by one down to a minimum of two lags and the Schwarz Criterion is used to choose between the models.

5.2 Results

Table 6 reports the sum of the coefficients on the contemporaneous first difference of the nominal effective exchange rate (ΔNEER) and lagged first differences of the NEER.[7] A negative coefficient implies that an appreciation would lower Swiss franc export prices. The table presents the findings for all goods first, and the other results are ordered from the industry where export prices fall the least following an appreciation to the industry where they fall the most.

The first row reports results for all goods. The coefficient on NEER equals -0.40, implying that a 10 percent appreciation of the franc would lower Swiss franc export prices by 4.0 percent. The coefficient is statistically significant at the 10 percent level.

Figure 1 sheds light on the relationship between the exchange rate and export prices for all goods. It shows that initially as the Swiss franc began appreciating during the GFC, Swiss franc export prices increased rather than decreased. However, in May 2010 as the Euro Crisis intensified and the franc appreciation accelerated, export prices tumbled. This fall continued until the Swiss National Bank set a floor on the exchange rate in the third quarter of 2011. The figure uses quarterly data, but the relationship is starker using monthly data. From May 2010 to August 2011, the NEER appreciated logarithmically by 25 percent and export prices fell by 14 percent. This fall in prices squeezed profit margins for Swiss exporters. Then as the SNB stabilized exchange rates in the third quarter of 2011, export prices began recovering.

[7] Results for the other variables are available on request.

The second row of Table 6 reports the results for watches and clocks. The coefficient on NEER equals -0.29, implying that a 10 percent appreciation of the franc would lower export prices by 2.9 percent. The coefficient is not statistically significant though. These results imply that an appreciation would have a small effect on average on export prices for watches. One reason why the coefficient is not more precisely estimated is probably because there is a range of watches, from high end ones produced by companies such as Rolex to lower end ones made by companies such as Swatch. Luxury brands may be better able to pass through exchange rate changes into foreign prices, whereas bargain brands may possess less pricing power.

The third row reports results for capital goods. The coefficient on NEER equals -0.37, implying that a 10 percent appreciation of the franc would lower export prices by 3.7 percent. The coefficient is statistically significant. Swiss manufacturing equipment and machine tools are well-engineered, and do not compete only on price. Nevertheless, the large fall in export prices during the Eurozone Crisis posed challenges for capital goods makers.

The fourth row presents results for precision instruments, clocks, & jewelry, the fifth row for clothing, the sixth row for consumer durables, and the seventh for food. The results for precision instruments are similar to the results for all goods. For consumer durables and food, the degree of exchange rate pass through is least. For food, for instance, a 10 percent appreciation will cause a 7.5 percent drop in Swiss franc export prices. Since consumer durables and especially food tend to be more homogeneous, it is not surprising that firms in these sectors have limited pricing power.

These results indicate that the CHF appreciation lowered Swiss franc export prices. Figure 2 plots Swiss franc export prices for capital goods and Swiss franc costs as proxied by the producer price index for capital goods. The figure indicates that prices tumbled relative to costs.

The important implication of these results is that the appreciation until 2011Q3 squeezed profit margins for Swiss companies. To shed further light on this, the next section investigates how exchange rate changes affect stock returns.

6. The Exchange Rate Exposure of Sectoral Stock Returns

6.1 Data and Methodology

We can investigate how exchange rates affect industry profitability by estimating exchange rate exposures (see, e.g., Chamberlain, Howe, and Popper, 1997, Dominguez and Tesar, 2006, or Jayasinghe and Tsui, 2008). This involves regressing industry stock returns ($\Delta R_{i,t}$) on exchange rate changes (Δe_t) and changes in aggregate stock market returns ($\Delta R_{M,t}$):

$$\Delta R_{i,t} = \alpha_i + \beta_{i,e}\,\Delta e_t + \beta_{i,M}\,\Delta R_{M,t} + \varepsilon_{i,t} \quad . \qquad (7)$$

We estimate this model for a cross section of industries.

Stock return data are obtained from the Datastream database. Industry stock returns are calculated as the daily change in the natural log of the industry stock index. The daily change in the exchange rate is calculated as the daily change in the natural log of the Swiss franc to euro nominal exchange rate. The variable ΔR_M is measured as the daily change in the natural log of the Swiss Market Index (SMI). The SMI is a value-weighted aggregate index that covers 90 percent of the market capitalization of Swiss companies.

The sample period extends from 1 June 2001 to 3 June 2016. There are 3915 observations.

6.2 Results

Table 7 presents the results. Only indexes with statistically significant exchange rate exposures are listed. Column (2) presents the exchange rate exposures and column (3) presents the market exposure. Positive values of the exchange rate exposure in column (2) implies that a weaker Swiss franc raises stock returns. In other words, the larger the coefficient in column (2), the more the sector is harmed by an appreciation of the Swiss franc.

The results indicate that the financial services industry is heavily exposed to a CHF appreciation. Seven categories of financial services have statistically significant exposures. Listed from the most exposed to the least exposed, these are: asset managers, specialty finance, investment services, equity investment instruments, investment companies, real estate investment services, and real estate holding & development. Across all industries, the category asset managers is the most exposed and the category specialty finance is the fifth most exposed. For asset managers, the results indicate that a 1 percent depreciation of the Swiss franc would increase returns by 0.40 percent and for specialty finance the results indicate that a 1 percent depreciation of the franc would raise returns by 0.32 percent.

The retail sector is also exposed to an appreciation of the Swiss franc. Food retailers & wholesalers, general retailers, and drug retailers all have statistically significant exposures. For food retailers & wholesalers, a 1 percent depreciation of the Swiss franc would increase returns by 0.25 percent. The exposure of retailers could reflect the fact that many customers can respond to an appreciation of the franc by going to neighboring countries and buying goods in euros.

Industrial machinery and diversified industrial stocks are also among the most harmed by an appreciation. This could reflect the findings in the previous section indicating that a CHF appreciation squeezed the profit margins of sectors such as capital good. The results indicate that a 1 percent Swiss franc depreciation would increase returns on industrial machinery by 0.31 percent.

We can also learn from the industries that are not listed in Table 7 and thus do not have a statistically significant exposure to exchange rate changes. One of these is the pharmaceutical sector. Being so research-intensive and sophisticated, it may be able to maintain profit margins in response to an appreciation of the Swiss franc. Another is specialty retail. Stores selling specialized goods such as Swiss army knives may be less exposed to customers going to neighboring countries to buy goods.

Table 7 also indicate that food producers and reinsurance companies benefit from CHF appreciations. For food producers, this may reflect the fact that appreciations reduce the prices of imported inputs. For instance, the cost of imported cocoa beans will fall as the CHF appreciates. For reinsurance companies, this may reflect an imbalance between assets and liabilities such that a stronger franc increases their net worth.

7. Conclusion

Switzerland produces sophisticated products, runs budget surpluses, maintains low inflation, possesses a strong currency, and excels at wealth management. These factors make it attractive to investors in times of turmoil, and has led to safe haven capital inflow and CHF appreciations since the Global Financial Crisis. This paper investigates how exchange rates affect the Swiss economy.

The results indicate that Swiss exports are very sensitive to rest of the world GDP. In addition, companies exporting high-end watches and research-intensive pharmaceutical products are able to weather appreciations well. However, companies exporting medium-high-technology capital goods face shocks to profitability and export volume when the Swiss franc soars.

Several policy lessons flow from the findings reported here. First, the results indicate that there is a tight relationship between Swiss exports and rest of the world GDP. The Swiss economy is dependent on exports because of its small domestic market. Therefore Switzerland has a strong interest in the economic welfare of its trading partners. It should foster this by, for instance, maintaining free trade and scientific exchanges with developed countries and by sharing its expertise in areas such as healthcare and education with developing economies.

Second, the findings indicate that the most advanced industries can maintain their exports and their profitability in the face of exchange rate appreciations while medium-high- technology industries suffer tumbling exports and stock prices. Japan, like Switzerland, experienced safe haven capital inflows and exchange rate appreciations during the GFC. Japan's export structure contains fewer high-technology products and more medium high-technology products than Switzerland's does. The Japanese electronics sector, once the flagship of its economy, was devastated by the strong yen after 2007 (see, e.g., Sato *et al*., 2013). The results here suggest that if Japan could upgrade its industrial structure to include more high-technology goods, it would be better able to handle the appreciations that accompany safe haven inflows. Japan does not necessarily need to upgrade to the same goods that Switzerland produces, but rather produce advanced goods that are consistent with Japan's comparative advantage.

Finally, if the exchange rate is so important for Switzerland's economy, how much more important it must be for economies exporting labor-intensive goods and other lower-technology products. Politicians in each country thus have a strong incentive to pursue stealth devaluations to gain a larger share of limited world demand.[8] This will likely lead to currency wars.

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[8] Rodrik (2008) reported that exchange-rate undervaluations increase economic growth. He found that exchange-rate undervaluations raise the share of the tradeable sector in total output. He then reported that the tradeable sector in developing countries tends to be inefficiently small because of government or market failures. He thus concludes that an undervalued exchange rate that increases the size of the tradeable sector will stimulate growth.

Economists should focus on how to reform the international monetary system to encourage policymakers to pursue longer-run cosmopolitan interests rather than short-run nationalistic agendas.

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Table 1. Switzerland country sophistication index and world ranking, 2001-2014

Year	Country sophistication index (Kwan's measure)	Ranking	Country sophistication index (Hausmann et al's measure)	Ranking
2014	32,301	2	40,311	1
2013	35,635	1	40,665	1
2012	35,175	1	40,447	1
2011	34,976	1	40,359	1
2010	34,169	1	39,725	1
2009	35,033	1	39,331	1
2008	34,951	1	41,193	1
2007	34,977	1	41,229	1
2006	34,067	1	40,460	1
2005	32,717	1	39,427	1
2004	31,688	1	38,931	1
2003	30,517	1	38,436	1
2002	29,935	1	38,453	1
2001	29,341	1	38,094	1

Note: The country sophistication index (CSI) is calculated using the methods of Kwan (2002) and Hausmann *et al.* (2007). Higher values of CSI indicate that the export basket is more sophisticated.
Source: CEPII-CHELEM database and calculations by the authors.

Table 2. Percent of Switzerland's exports by product category in 2014

	(1)	(2)	(3)	(4)
Product category (four-digit ISIC classification)	Product sophistication index	Percent of Switzerland's exports in this sector	Percent of Switzerland's exports in this sector (excluding ISIC 2720)	Technological intensity of export category (OECD measure)
Watches & Clocks (3330)	61,076	7.9	10.8	High
Dramatic arts & music (9214)	47,871	0.8	1.1	NA
Pharmaceutical products (2423)	47,721	23.1	31.3	High
Medical equipment (3311)	43,418	3.3	4.5	High
Aeronautics (3530)	42,513	0.8	1.1	High
Engines & turbines (2911)	41,305	0.7	1	Medium-High
Other specialized machinery (2929)	41,106	1.6	2.2	Medium-High
Paints & Ink (2422)	40,179	0.4	0.6	Medium-High
Machinery for food (2925)	40,029	0.4	0.6	Medium-High
Pulp & paper (2101)	39,858	0.4	0.5	Low
Soft drinks (1554)	39,447	0.5	0.7	Low
Chemical products (2429)	39,364	1.5	2	Medium-High
Measuring instruments (3312)	39,042	1.6	2.2	High
Other food products (1549)	38,593	1.2	1.6	Low
Precious & non-ferrous metals (2720)	37,354	26.4	NA	Medium-Low

Machine tools (2922)	37,282	1.7	2.3	Medium-High
Soap & perfumes (2424)	36,127	0.7	0.9	Medium-High
Pumps (2912)	36,069	1.3	1.7	Medium-High
Railway (3520)	35,981	0.4	0.6	Medium-High
Chocolates & sugar (1543)	35,744	0.4	0.6	Low
Primary plastic (2413)	35,313	0.6	0.7	Medium-High
Pesticides (2421)	34,981	0.4	0.5	Medium-High
Electricity (4010)	34,419	0.4	0.5	NA
Parts for vehicles (3430)	34,378	0.6	0.8	Medium-High
Basic chemicals excluding fertilizer (2411)	33,800	3.1	4.2	Medium-High
General purpose machinery (2919)	33,437	1	1.4	Medium-High
Electrical distribution and control devices (3120)	33,322	1.3	1.8	Medium-High
Plastic products (2520)	32,143	1.3	1.8	Medium-High
Cutlery tools (2893)	31,663	0.5	0.7	Medium-Low
Machinery for textiles (2926)	31,569	0.4	0.6	Medium-High
Other metal products (2899)	30,005	0.9	1.2	Medium-Low
Iron metallurgy (2710)	29,882	0.6	0.9	Medium-Low
Electrical motors (3110)	29,746	1	1.3	Medium-High
Refined petroleum products (2320)	29,453	0.7	1	Medium-Low
Electrical components (3210)	26,938	0.4	0.6	High
Jewelry (3691)	26,735	4.5	6.1	Medium-Low
Computer equipment (3000)	20,630	0.4	0.5	High

Note: The product sophistication index (PSI) is calculated using the method of Kwan (2002). Higher values of the PSI indicate more sophisticated products. The technology intensity measure is calculated by the OECD (see, e.g., Hatzichronoglou, 1997).
Source: CEPII-CHELEM database and calculations by the authors.

Table 3 Dynamic OLS estimates for Swiss goods and services exports to the world

	(1)	(2)	(3)	()4
REER Elasticity	-0.05	0.04		
(IMF REER)	(0.08)	(0.07)		
REER Elasticity			-0.06	-0.01
(BIS REER)			(0.08)	(0.16)
Income Elasticity	1.55***	1.73***	1.55***	1.66***
	(0.03)	(0.32)	(0.03)	(0.32)
Time		0.00		0.00
		(0.00)		(0.00)
No. of Leads and Lags	2,2	2,2	2,2	2,2
Adjusted R-squared	0.988	0.988	0.988	0.988
No. of observations	104	104	104	104
Sample Period	1989:4-2015:3	1989:4-2015:3	1989:4-2015:3	1989:4-2015:3

Notes: DOLS estimates. Heteroskedasticity-consistent standard errors are in parentheses. Columns (1) and (2) use CPI-deflated real effective exchange rates obtained from the IMF International Financial Statistics. Columns (3) and (4) use CPI-deflated real effective exchange rates obtained from the Bank for International Settlements. An increase in the REER implies an appreciation of the Swiss franc. The predicted sign of the coefficient is negative. No. of leads and lags refers to the numbers of leads and lags of the first differenced variables. Seasonal dummies

are included in the regressions.
*** denotes significance at the 1% level.

Table 4. Johansen MLE estimates for Swiss goods and services exports to the world

	Number of cointegrating vectors	Number of observations	REER elasticity	Income elasticity	Error correction coefficients		
					Exports	REER	Income
Swiss Goods Exports	1,1	107	-0.04	1.52***	-0.38***	0.13*	-0.06***
			(0.08)	(0.03)	(0.10)	(0.07)	(0.01)
(CPI-deflated IMF REER. Lags: 1; Sample: 1989:3-2016:1; Linear trend in the data, intercept in the cointegrating equation and vector autoregression)							
Swiss Goods & Services Exports	1,1	107	-0.05	1.53***	-0.39***	0.13*	-0.06***
			(0.07)	(0.03)	(0.10)	(0.08)	(0.01)
(CPI-deflated IMF REER. Lags: 1; Sample: 1989:3-2016:1; Linear trend in the data, intercept in the cointegrating equation and vector autoregression)							

Notes: Johansen maximum likelihood estimates. Lag length was selected based on the Schwarz Criterion. Number of Cointegrating Vectors indicates the number of cointegrating relations according to the trace and maximum eigenvalue tests at the 5% level. IMF REER refers to the CPI-deflated real effective exchange rate obtained from the IMF International Financial Statistics. BIS REER refers to the CPI-deflated real effective exchange rate obtained from the Bank for International Settlements. An increase in the REER implies an appreciation of the Swiss franc. The predicted sign of the coefficient is negative.
*** (*) denotes significance at the 1% (10%) level.

Table 5. Panel DOLS Estimates of Switzerland's Exports to 14 Countries

	(1)	(2)	(3)	(4)	(5)	(6)
	All Goods	Watches	Pharma-ceuticals	Consumption Goods	Non-pharmaceuticals	Capital Goods
Bilateral Real	-0.44***	0.23	-0.27	-0.32***	-0.36***	-0.61***
Exchange Rate	(0.12)	(0.15)	(0.19)	(0.12)	(0.14)	(0.13)
Real GDP	0.41	0.71*	2.96***	1.97***	0.60*	1.15***
(ULC-deflated)	(0.30)	(0.41)	(0.42)	(0.27)	(0.32)	(0.32)
Adjusted R-squared	0.972	0.988	0.979	0.985	0.969	0.986
S.E. of regression	0.155	0.15	0.181	0.123	0.167	0.12
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Heterogeneous Linear Trend	Yes	Yes	Yes	Yes	Yes	Yes
Sample Period	1990-2014	1990-2014	1990-2014	1990-2014	1990-2014	1990-2014
No. of Observations	350	350	350	350	350	350

Notes: One lag and one lead of the first differences of the independent variables are used. An increase of the bilateral real exchange rate implies an appreciation of the Swiss franc. The predicted sign of the coefficient is negative.
*** (*) denotes significance at the 1% (10%) level.

Table 6. The Effect of Exchange Rate Changes on Swiss Franc Export Prices for Various Sectors.

Sector	Sum of Coefficients	Standard Error
All Goods	-0.40*	0.23
Watches & Clocks	-0.29	0.27
Capital Goods	-0.37**	0.15
Precision Instruments, Clocks & Jewelry	-0.42*	0.23
Clothing	-0.49	0.39
Consumer Durables	-0.50*	0.27
Food	-0.75***	0.13

Notes: The values in the second column are the sum of the coefficients on the contemporaneous first difference of the nominal effective exchange rate (NEER) and lagged first differences of the NEER. The number of lags is determined by the Schwarz criterion. Swiss franc costs are proxied by the domestic corporate goods price index for the relevant industry. Data on Swiss franc export prices and costs come from the CEIC database. The sample period for all goods extends from April 2000 to May 2016. The sample period for the individual sectors extends from April 2003 to May 2016. Heteroskedasticity-consistent standard errors are in parentheses.
*** (**) [*] denotes significance at the 1% (5%) [10%] level.

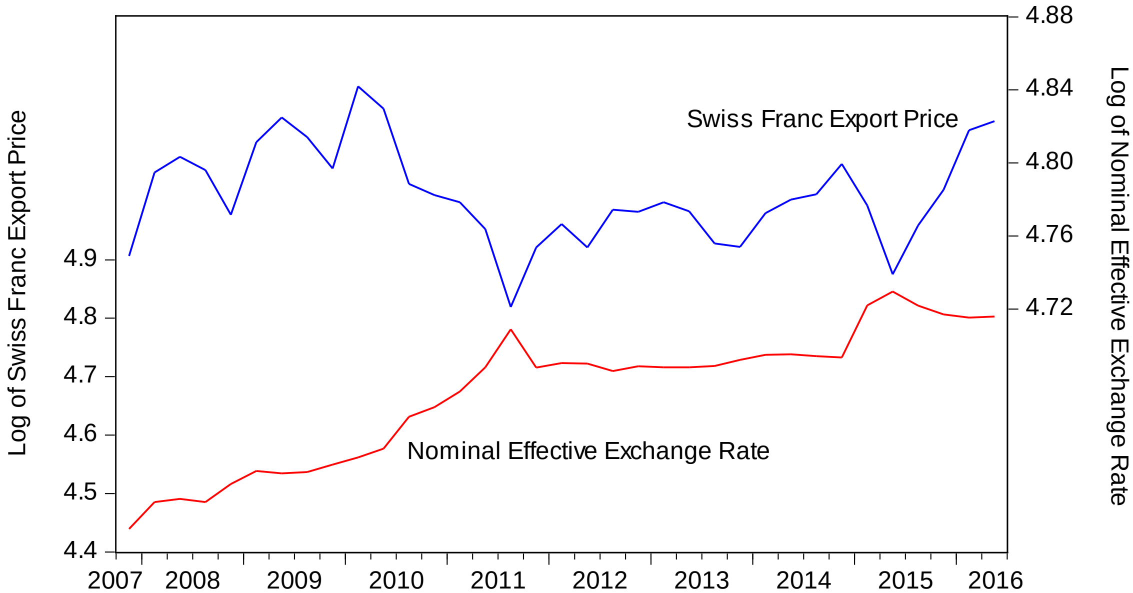
Table 7. Exchange Rate Exposure by Sector

(1)	(2)	(3)
Industry	CHF/EURO	SWISS MARKET INDEX
ASSET MANAGERS	0.3982***	0.5203***
	(0.1167)	(0.0301)
IRON AND STEEL	0.3976**	0.7303***
	(0.1744)	(0.0623)
MEDICAL SUPPLIES	0.3605***	0.6044***
	(0.1049)	(0.0352)
MARINE TRANSPORTATION	0.3457***	0.6592***
	(0.0736)	(0.0362)
SPECIALITY FINANCE	0.3167***	0.6882***
	(0.0676)	(0.0297)
INDUSTRIAL MACHINERY	0.3137***	0.7588***
	(0.0603)	(0.0338)
INVESTMENT SERVICES	0.2894***	0.7750***
	(0.0806)	(0.0341)
SOFTWARE	0.2832**	0.9974***
	(0.1321)	(0.0712)
DIVERSIFIED INDUSTRIALS	0.2590***	0.5555***
	(0.0754)	(0.0317)
FOOD RETAIL & WHOLESALE	0.2488***	0.4721***
	(0.0844)	(0.0302)
BIOTECHNOLOGY	0.2249**	0.7137***
	(0.0995)	(0.0306)
GENERAL RETAILERS	0.2163***	0.6138***
	(0.0661)	(0.0274)
CONSUMER DISCRETIONARY	0.2070***	1.0449***
	(0.0798)	(0.0227)
ELECRICAL COMPONENTS & EQUIPMENT	0.2039***	0.3517***
	(0.0517)	(0.0277)
CLOTHING & ACCESSORIES	0.2034**	1.1746***
	(0.0874)	(0.0273)

DELIVERY SERVICES	0.2004**	0.8117***
	(0.0926)	(0.0512)
BASIC MATERIALS	0.1990***	0.7526***
	(0.0387)	(0.0178)
SPECIALTY CHEMICALS	0.1960***	0.7726***
	(0.0407)	(0.0187)
DRUG RETAILERS	0.1829***	0.3954***
	(0.0596)	(0.0323)
TRAVEL & LEISURE	0.1827**	0.5316***
	(0.0723)	(0.0344)
EQUITY INVESTMENT INSTRUMENTS	0.1820***	0.3237***
	(0.0646)	(0.0246)
INVESTMENT COMPANIES	0.1820***	0.3237***
	(0.0646)	(0.0246)
BUILDING MATERIALS & FIXTURES	0.1505***	0.9226***
	(0.0446)	(0.0283)
CONSUMER ELECTRONICS	0.1473***	0.2384***
	(0.0478)	(0.0270)
ELECTRICITY	0.1409***	0.2320***
	(0.0466)	(0.0254)
BUSINESS SUPPLIES & SERVICES	0.1334**	0.7582***
	(0.0557)	(0.0338)
REAL ESTATE INVESTMENT SERVICES	0.0644**	0.2158***
	(0.0294)	(0.0131)
REAL ESTATE HOLDING & DEVELOPMENT	0.0607**	0.2157***
	(0.0288)	(0.0131)
CONSUMER STAPLES	-0.0814**	0.7218***
	(0.0390)	(0.0155)
FOOD PRODUCERS	-0.0849**	0.7256***
	(0.0401)	(0.0157)
REINSURANCE	-0.2443**	1.3640***
	(0.0949)	(0.0424)

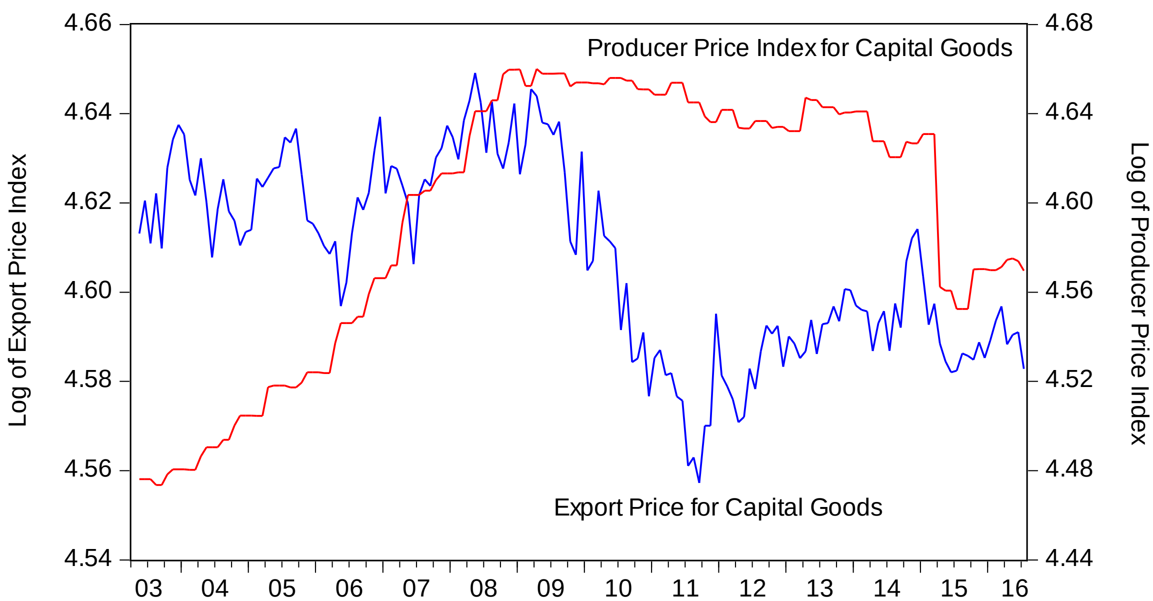
Notes: The coefficients come from a regression of daily stock returns on the daily CHF/euro exchange rate and the daily Swiss Market Index. The data come from Datastream. The sample period for the estimation extends from 6/01/2001 to 6/03/2016. There are 3915 observations. Heteroroskedasticity-consistent standard errors are in parentheses.
*** (**) [*] denotes significance at the 1% (5%) [10%] level.

Figure 1. The Swiss Nominal Effective Exchange Rate and Swiss Franc Export Prices



Source: Swiss Federal Customs Administration and IMF International Financial Statistics database.

Figure 2. Swiss Franc Export Prices and Swiss Franc Costs for the Capital Goods Sector



Note: Costs are proxied by the producer price index for capital goods.
Source: Swiss Federal Customs Administration and Swiss Federal Statistical Office.