Exchange Rate Shocks and Firm Competitiveness in Small, Export-Oriented Economies: The Case of Finland

Anand Bir Singh Gulati[⋆]
Hanken School of Economics
Department of Finance and Statistics
P. O. Box 287, 65101 Vaasa, Finland
anand.gulati@hanken.fi

Johan Knif
Hanken School of Economics
Department of Finance and Statistics
P. O. Box 287, 65101 Vaasa, Finland
johan.knif@hanken.fi

James W. Kolari
Texas A&M University
Mays Business School
Department of Finance
College Station, TX 77843-4218, USA
j-kolari@tamu.edu

Draft: 3 May 2010

[⋆] Corresponding author. The authors received valuable comments and suggestions from Julian Gaspar, Seppo Pynnönen, Kenneth Högholm, Yrjö Koskinen, Edgar Ortiz, Mara Madaleno, Bernard Dumas , Chien-Hsiu Lin, and Bambang Irawan, as well as participants at the 2005 Graduate School of Finance (GSF) Finland winter workshop, the 2008 Multinational Financial Society (MFS) conference, the 2009 Global Financial Association (GFA) conference, the 2009 Paris Finance International Meeting (AFFI-EUROFIDAI), and Hanken Seminars. Also, we could not have completed this research without the financial and facilities support of the Center for International Business Studies in Mays Business School at Texas A&M University, the Hanken Foundation, the Ella and Georg Ehrnrooth Foundation, and the Commerce and Industry Fund at Hanken.

Exchange Rate Shocks and Firm Competitiveness in Small, Export-Oriented Economies: The Case of Finland

Abstract

This study empirically examines how exchange rates affect firms' stock returns in small, export-oriented countries that compete closely with one another. Specifically, controlling for cross-country sector and industry effects between Finland and Sweden, we test the impact of exchange rate shocks on Finnish stock returns. In general, empirical tests reveal statistically significant exchange rate exposure of Finnish stock prices. Comparing pre- versus post-euro periods, equities' exchange rate exposure is much stronger after the introduction of the euro. Further results show that Finnish and Swedish sector and industries' stock values positively co-move with another, which implies market integration as opposed to competitiveness. However, interaction variables reveal that their co-movement is conditional on exchange rate movements for some sectors and industries, especially in the post-euro period. We conclude that countries with small, open economies can be prone to exchange rate movements that (dis)advantage firms relative to competing firms in other countries.

JEL: F15, F31, F36, G10, G11, G15

Keywords: Exchange Rate Exposure, Stock Returns, Cross-Country Industry Competition, Market Integration, Asymmetric Nonlinear Shocks

1. Introduction

Do exchange rate movements of a country's currency affect the competitiveness of its firms? Financial news reports frequently discuss the perceived economic consequences of currency movements on firms' international competitiveness. The main storyline is that exchange rate movements competitively (dis)advantage similar firms or industries in different countries -- hereafter the *forex competition hypothesis*.

A major problem in testing this hypothesis is that exchange rates can have diverse impacts on firms' input costs, output prices, business risks, etc. According to Adler and Dumas (1980, 1983, 1984), a comprehensive approach for capturing complex exchange rate effects on firms is to estimate the sensitivity of firms' stock prices to exchange rate movements (i.e., exposure coefficient). While a large body of literature has investigated the significance of exchange rate exposure for equity returns[1], few studies have examined the competitive effects of exchange rate movements on stock prices.

Closely related to the present study, Griffin and Stulz (2001) found that common shocks across industries in the U.S. and Japan were more important than exchange rate movements in explaining stock returns. Indeed, weekly exchange rate shocks explained little or no relative stock performance of industries. These and other results for large, industrial countries (i.e., Canada, the U.K., France, and Germany) led the authors to conclude that exchange rate shocks were not economically significant in explaining relative shareholder wealth effects across industries in different countries. Likewise, based on forex exposure analyses of German investors within European countries, De Santis, Gerard, and Hillion (2003) inferred that currency risks within Europe would have little economic impact (see also Sentana, 2002). By contrast, Williamson (2001) found significant exposure to exchange rate

[1] For example, see Adler and Dumas (1983, 1984), Jorion (1990, 1991), Bartov and Bodnar (1994), De Santis and Gérard (1998), Dumas and Solnik (1995), He and Ng (1998), Vassalou (2000), Allayannis and Weston (2001), Bodnar and Wong (2003), Chen, Naylor and Lu (2003), Doidge, Griffin and Williamson (2006), Dominguez and Tesar (2006), Bartram (2007), Kolari, Moorman, and Sorescu (2008), and others.

shocks among automotive firms in the U.S. and Japan. Time variation of exchange rate exposure as competitive conditions changed and variation in exposure among firms with different levels of foreign sales were consistent with the notion that multinational firms competing in global markets are sensitive to exchange rate movements. Additionally, based on evidence from eight non-U.S. countries, Dominguez and Tesar (2006) found that forex exposure was correlated with firm size, multinational status, foreign sales, international assets, and trade at the industry level. Unfortunately, only weak evidence of a link between international trade, competition, and exchange rate exposure on the firm level was found. In view of the potential importance of exchange rate movements to many firms' international competitiveness, the limited and mixed evidence on the forex competition hypothesis suggests that further study is warranted.

The present paper seeks to contribute new evidence on the forex competition hypothesis by examining evidence from Finland, a natural laboratory for testing due to its close competitive association with Sweden. Finland shares geographic proximity, similar industry structures, cross-border trade, and increasing company mergers with its neighbor Sweden. Both countries typically trade with the same countries within Europe, and many firms in Finland compete directly against counterparts in Sweden (e.g., the metal, forest and paper, and information technology industries). However, due to the fact that they use different reference currencies, the forex exposures of firms in Finland and Sweden differ. Finland joined the European Exchange Rate Mechanism (ERM) in 1996 and economic and monetary union (EMU) in 1999 by adopting the euro to replace the Finnish markka, whereas Sweden joined the European Union (EU) in 1995 but continues to use the krona. Consequently, Sweden sets its own monetary policy, including exchange rates, but Finland does not have similar privileges after joining the European single currency (see Appendix A for brief currency histories). Finally, because both countries are small, export-oriented

economies, exchange rate movements are expected to be important to their firms and associated stock prices.

In brief, consistent with its strong export orientation, we find that Finnish stock market returns increase in response to home currency depreciation. This exchange rate sensitivity increased considerably after Finland adopted the euro in 1999. Like Griffin and Stulz, we find that the excess stock returns of Finnish sectors and industries unconditionally co-move with counterpart Swedish excess stock returns, which implies integration rather than competitiveness. In this regard, after the euro was introduced, this integration tended to increase for some sectors and industries. Importantly, evidence on the co-movement of Finnish and Swedish excess stock returns conditional on exchange rate shocks and volatility tends to support the forex competition hypothesis. That is, exchange rate movements appear to have affected Finnish stocks' returns relative to their Swedish counterparts in a number of industries and sectors. Indeed, the total marginal effects of Swedish excess stock returns on Finnish stock returns become negative in some industries implying competitiveness rather than integration. We conclude that countries with small, open economies can be prone to exchange rate movements that (dis)advantage firms relative to competing firms in other countries.

This paper is organized as follows. Section 2 briefly reviews related literature on the euro. Section 3 presents the empirical methodology. Section 3 describes the data. Section 4 reports the empirical results. Section 6 concludes.

2. Brief Literature Review

A number of studies have sought to empirically document the economic and financial impacts of the 1999 introduction of the euro on European countries. Here we begin by overviewing European studies in general and then focus on relevant Scandinavian studies in particular.

In a comprehensive study of European firms, confirming Mundell's (1961, 1973, 2000) views about optimum currency area benefits, Baldwin (2006) found that the euro increased trade among European countries by 5% to 15% (i.e., about 9% on average). Further investigating trade gains in Europe to determine whether they were asymmetrically distributed among euro nations with respect to their size, Badinger and Breuss (2009) found stronger gains among small nations. On average, the euro triggered a reallocation of intra-euro area exports to small countries of approximately 6%.[2] Another study by Bris, Koskinen and Nilsson (2006) examined the effect of the adoption of the euro as the common currency on corporate investment rates. Using data from 16 European countries, including the euro members (i.e., the European Monetary Union or EMU), they found that the euro increased investments for firms from countries that previously had weak currencies. Relatedly, Hardouvelis, Malliaropulos, and Priestley (2006) ascertained that, in the second half of the 1990s, EMU stock markets became fully integrated. European integration was Eurozone specific (e.g., the United Kingdom showed no sign of increased integration with the EU stock market) and independent of possible simultaneous world market integration. Hence, they concluded that the euro was a driver of European stock market integration.

Further evidence by Bartram and Karolyi (2006) found that the euro decreased the volatility of trade-weighted exchange rates of European countries and was associated with a lower increase in stock market volatility in Europe compared to other countries. The latter reduction in market risk was primarily concentrated in firms with a high fraction of foreign sales or assets in Europe. Moreover, the euro led to a net absolute decrease in foreign exchange rate exposure of nonfinancial firms. Consistent with the forex competition hypothesis, changes in forex exposure coefficients of multinationals were shown to be a function of firm characteristics (e.g., the percentage of foreign sales), regional factors (e.g.,

[2] See also studies by Barr, Breedon, and Miles (2003), Micco, Stein, and Ordóñez (2003), Tenreyro and Barro (2003), and Bun and Klaassen (2007) that have reported increased trade within EMU countries due to the euro.

geography and currency strength), and industry characteristics (e.g., competition and traded goods).

Entorf, Moebert and Sonderhof (2007) examined the foreign exchange rate exposure of 27 nations. They found that national foreign exchange rate exposure coefficients are significantly related to the current trade balances of corresponding economies. Export leaders with positive exchange rate exposures profited from currency depreciation, and vice versa for import-oriented nations with negative exposures. Notably, the size of the exposure coefficient for Finland was about three times that of Sweden, and both nations appeared to be export-oriented. Based on 817 multinational European firms, another study by Muller and Verschoor (2006) documented that a depreciating (appreciating) euro against foreign currencies had a net negative (positive) impact on European stock returns. While short-term exposure is hedged for the most part, forex exposure increased with longer holding periods and firm size.[3] And, recent work by Bris, Koskinen, and Nilsson (2009) has reported increased Tobin's Q-ratios after the introduction of the euro among 11 countries adopting the common currency. Along with Ireland, Italy, Portugal, and Spain, Finland was identified as a weak euro country due to significant currency depreciations against the German mark during the currency crisis in the early 1990s. According to the authors, these countries in particular should benefit from euro adoption in terms of monetary commitment to prevent major devaluations. Indeed, noticeably larger corporate valuation increases in euro-adopting versus non-euro countries in Europe confirmed this supposition.[4]

Turning to Scandinavian research, consistent with optimum currency area theory, Jonung and Sjöholm (1999) argued that countries with similar industrial structures will be

[3] In a study of French companies, Nguyen, Faff and Marshall (2006) showed that the introduction of the euro was associated with a reduction in the number of firms with significant exchange rate exposures as well as the absolute size of exposures. Also, the use of foreign currency derivatives was associated with lower exchange rate exposure. See also Rees and Unni (2005), who investigated the pre-euro exposure to exchange rate movements of large firms in the United Kingdom, France, and Germany.

[4] Bris, Koskinen, and Nilsson (2009) provide an excellent survey of literature on the financial and economic impacts of the euro on EMU countries.

affected analogously by sector-specific asymmetrical disturbances. As such, countries that are members of a currency union should exhibit the same sort of industrial structure (Mundell (1961)). The authors inferred that, if the European monetary union led to increased trade (as evidenced by some of the aforementioned studies), Sweden and Finland should participate in the EMU instead of forming an independent currency union. As documented by Jonung and Sjöholm, these two countries have strong interdependencies with respect to their industrial structures.[5] Due to these parallels, they cautioned that, if Finland joined the EMU but not Sweden, economic and political tensions could increase between the two countries.

In a survey of Swedish exporters, Freiberg and Wilander (2008) investigated the currency denomination of exports. Their sample accounted for about 90% of Swedish goods exports. Export earnings were a large share of firms' earnings, and the EU was the most important export market. Local currency pricing in krona was the dominant practice among Swedish exporters, whereas three quarters of Swedish imports were denominated in foreign currencies. Mitigating Jonung and Sjöholm's concerns, the authors reported that most Swedish firms did not view potential competitors' choice of currency to be important.

Antell and Vaihekoski (2007) tested international asset pricing models (IAPT) for Finnish firms. Using data from 1970 to 2004, which encompasses the gradual liberalization of Finnish financial markets as well as several currency regimes from the gold standard to fixed and floating currency regimes ending with EMU membership, their results showed that the prices of world-market and local-market risks were time-varying. Relevant to our later analyses of exchange rate exposures of Finnish firms, currency risk was priced in the Finnish market but not time-varying.

The present study contributes to these and previously-cited papers in the introduction on the forex competition hypothesis by investigating the impact of exchange rate shocks on

[5] In this regard, Table B1 in Appendix B contains comparative information from their study.

the competitiveness of Finnish firms vis-à-vis counterpart Swedish firms before and after the introduction of the euro. Do unexpected changes in exchange rates make some Finnish industries better (worse) off relative to the market? Did Finnish firms' exposure to exchange risk change in response to EMU membership? And, do exchange rate shocks change the relationship between Finnish and Swedish firms' stock returns? The answers to these questions are worthwhile in light of the fact that the international competitiveness of many small, export-oriented countries around the world is potentially affected by exchange rate shocks.

2. Empirical Methodology

Following the empirical approach of Griffin and Stulz (2001), sector and industry returns are measured in excess of market returns. Consequently, a positive return indicates that the sector or industry performed better than the market on average over the return horizon.

Log-returns for Finnish stocks, $r_{i,t}^{FI}$, and Swedish stocks, $r_{i,t}^{SW}$, are computed as:

$$r_{i,t}^{FI} = ln\left(P_{i,t}^{FI}/P_{i,t-1}^{FI}\right) \tag{1}$$

and

$$r_{i,t}^{SW} = ln\left(P_{i,t}^{SW}/P_{i,t-1}^{SW}\right), \tag{2}$$

where $P_{i,t}^{K}$ represents the corresponding price indexes for country *K*. Both price indexes are denominated in local currency. Excess returns for the *i*th sector or industry in each country are computed as follows:

$$\tilde{r}_{i,t}^{FI} = r_{i,t}^{FI} - r_{m,t}^{FI} \tag{3}$$

and

$$\tilde{r}_{i,t}^{SW} = r_{i,t}^{SW} - r_{m,t}^{SW}, \tag{4}$$

where $r_{m,t}^{K}$ is log-return on the corresponding market portfolio for country *K*. Finnish sector and industry excess returns are expressed in terms of the Finnish mark (FIM) and later euro (EUR), and those for Swedish sectors and industries are expressed in Swedish krona (SEK).

Shocks to exchange rates are measured as log-returns of one currency relative to the other currency. If X_t is the exchange rate at time *t* in terms of the number of Swedish krona per Finnish mark, then the log-return on the currency, r_t^{FX}, is computed as:

$$r_t^{FX} = ln\left(X_t \ / X_{t-1}\right). \tag{5}$$

Hence, a positive return on the exchange rate indicates that the Finnish mark (euro) has appreciated against the Swedish krona.

As a first step in the empirical analysis, we estimate a simple benchmark model, which takes into account the total market exposure with respect to the forex exposure. The estimated model is:

$$r_{m,t}^{FI} = a_i + b_i r_t^{FX} + \varepsilon_{i,t}, \tag{6a}$$

where the $r_{m,t}^{FI}$is the Finnish stock market index return (i.e., OMXH CAP return), and $r_{i,t}^{FX}$is the log-return on the SEK/FIM exchange rate (i.e., the change in the exchange rate of Swedish krona to one Finnish markka or euro). Equation (6a) estimates the average impact of exchange rate movements on Finnish stock returns under the assumption that they are contemporaneously incorporated into stock prices. Additionally, to account for sector/industry "excess exposure" over the market, or $\tilde{r}_{i,t}^{FI} = r_{i,t}^{FI} - r_{m,t}^{FI}$, the following model is estimated:

$$\tilde{r}_{i,t}^{FI} = a_i + b_i r_t^{FX} + \varepsilon_{i,t}, \tag{6b}$$

where the regression coefficient b_i reflects the exposure (i.e., sensitivity) of the *i*th sector/industry to changes in the exchange rate. For the market as a whole, a significant positive (negative) coefficient would suggest that an increase in the SEK/FIM exchange rate increases (decreases) stock returns. For individual sectors, a significant positive (negative) coefficient would suggest that an increase in the SEK/FIM exchange rate is more (less) beneficial for this sector than for the market as a whole. A coefficient close to zero would indicate that this sector is affected by the exchange rate shock in about the same way as the

market. Significant exposure sensitivity in equations (6a) and (6b) is weak evidence in favor of the forex competition hypothesis.

Like Griffin and Stulz, we estimate the following extended model for Finnish sectors and industries:

$$\tilde{r}_{i,t}^{FI} = a_i + b_i r_t^{FX} + d_i \tilde{r}_{i,t}^{SW} + \varepsilon_{i,t}. \quad (7)$$

In this equation, the excess return of the *i*th Swedish sector or industry over the Swedish market return, $\tilde{r}_{i,t}^{SW}$, is added as an explanatory variable. The estimated coefficient d_i measures the relation between market excess returns for the sector or industry of the two countries. A significant negative coefficient would be indicative of cross-border competitiveness between sectors or industries. That is, competitiveness implies that Finnish sector or industry returns (in excess of Finnish market returns) decrease when counterpart Swedish sector or industry returns (in excess of Swedish market returns) increase, and vice versa. If Finnish firms' returns move in the same direction as matched Swedish firms' returns over time (i.e., a positive $d_i$coefficient), competitiveness is not supported; instead, market integration is implied.

It is possible that the co-movement between Finnish and Swedish sector or industry stock returns is affected by exchange rate shocks. Does an exchange rate shock (dis-) advantage firms in Finland relative to comparable firms in Sweden? To test this forex competition hypothesis, as in Griffin and Stulz, the extended model is augmented with an interaction variable. This interaction component allows for dependencies between exchange rate movements and relative sector or industry competition (or market integration) between the two countries. The full extended model including this interaction variable is:[6]

$$\tilde{r}_{i,t}^{FI} = a_i + b_i r_t^{FX} + c_i |r_t^{FX}| + d_i \tilde{r}_{i,t}^{SW} + e_i r_t^{FX} \tilde{r}_{i,t}^{SW} + f_i |r_t^{FX}| \tilde{r}_{i,t}^{SW} + \varepsilon_{i,t}. \quad (8)$$

[6] As in Griffin and Stulz (2001, footnote 23), we model the variances of the regression residuals in equations (6) to (8). An EGARCH (1, 1) process is used for this purpose, which takes into account autocorrelation, heteroscedasticity, and asymmetry in volatility.

Note that another interaction variable using the absolute value of exchange rate shocks is added, which can be interpreted as a proxy for forex volatility. This interaction variable also accounts for any positive or negative asymmetry due to forex shocks. In this way co-movements between sector or industry stock returns in the two countries conditional on the effects of exchange rate shocks can be examined.

3. Data

Detailed information about the Finnish and Swedish economies is provided in Appendix B. Tables B1 and B2 makes economic comparisons between the two countries, and Figures B1 to B3 give import and export trade information. Both their industrial structures and trade dynamics are remarkably consonant.

Our data consists of three different sets of weekly returns: (1) stock market total return indexes (TRI[7]) for individual firms in Finland and Sweden, (2) aggregate stock market total index returns in both Finland and Sweden (i.e., the OMX Helsinki Cap index denoted OMXH CAP[8] and OMX Stockholm index denoted OMXS[9], respectively), and (3) exchange rate series for the Finnish (FIM) and Swedish (SEK) currencies expressed in U.S. dollars (USD). Graphs for the log-returns of aggregate stock market indexes and the exchange rate series are illustrated in Appendix C's Figures C1 and C2, respectively.[10]

[7] The total return index (TRI) data is used because it takes into account the time-varying adjustment of dividends for all available companies in both Finland and Sweden. However, in some cases, due to the unavailability of TRI series, the company closing price index was used.

[8] The Finnish OMXH CAP index is based on all listed shares on the Helsinki Stock Exchange. Unlike the Finnish OMXH index, market values of constituent firms are capped at a maximum of 10% of the total market value of the index. If one company's share dominates due to large weights in the index (e.g., Nokia accounted for 70% of the total market value of HEX in the last quarter of 2000), it is likely to over-represent that particular sector or industry and skew the index performance. Hence, OMXH CAP better reflects the general performance of the Finnish stock market than the OMXH.

[9] For Sweden, the series Sweden–DS total return index is selected, which is calculated by Datastream to reflect the total value-weighted return of the Swedish stock market. No other market portfolio series are available for the selected time period.

[10] For the post-euro period, a fixed exchange rate of 5.94573 FIM for 1 euro is used for currency conversion. Both the Finnish euro and Swedish krona depreciated against the dollar for about two years after the introduction of the euro in 1999 but at somewhat different rates over time. After this initial period, both currencies increased in value against the dollar, and their patterns of change were almost identical.

Global Industrial Classification Standard (GICS) codes are employed to classify sectors and industries.[11] We use sector and industry-group classifications due to data availability gaps for the two less aggregated classifications. Alternatively, a firm-level analysis could be conducted, but this level of detail is beyond the scope of the present paper. Data was available for the following six sectors: materials, industrials, consumer discretionary, consumer staples, financials, and information technology. Within each sector, industry groups are selected using level 2 GICS codes. Based on the availability of data, Table 1 shows the firm sample sizes for sectors and industries. Firms' market capitalizations are used to compute weighted log-returns for different sector and industry portfolios.[12]

[Insert Table 1]

Information about the export orientation of the sectors and industry groups for both Finland and Sweden is presented in Appendix D. While most sectors and industries are export-oriented, the consumer staples, consumer discretionary, and financials sectors in both countries appear to be primarily domestic in nature.

Our sample period is determined by the availability of comparable data for sector and industry classification in the period January 1, 1994 to June 1, 2009.[13] To take into account the introduction of the euro on January 1, 1999, we divided the sample period into pre- and post-euro series (i.e., January 1, 1994 to Dec 31, 1998 and January 1, 1999 to June 1, 2009, respectively). The final samples of companies contain 71 firms in Finland and 136 firms in Sweden. Descriptive statistics are shown in Table 2 for market index returns, sector excess returns, and exchange rate variables for Finland and Sweden in the pre- and post-euro sample

[11] GICS codes were developed by MSCI and Standard & Poor's in 1999 to provide a reliable, complete, and standard industry classification system for global sectors and industries. They are currently used in the OMXH and OMXH CAP (Helsinki Stock Exchange) as well as the OMXS (Stockholm Stock Exchange).
[12] Weights are calculated with respect to listed companies' share values, or market capitalizations, in both the Finnish (OMXH CAP) and Swedish (OMXS) market indexes. Market capitalization is measured annually from 1994 to 2009, and median values are used to compute the weights for each sector and industry.
[13] Data are obtained from various sources, including Thomson Financials, Datastream, and the Pacific Exchange Rate Service.

periods. Kurtosis and Jarque-Bera values indicate fat tails and non-normality for the return distributions, except for the Finnish financial sector in the pre-euro period (i.e., the kurtosis is less than 3.0). For Finnish stocks, kurtosis of the OMXH CAP increased in the post-euro period, whereas the OMXS kurtosis for Swedish stocks decreased from 10.96 to 6.90. Likewise, in the post-euro period, skewness increased for the OMXH CAP but decreased for the OMXS. Also, the OMXS series was positively skewed before the euro but became negatively skewed in the post-euro period.

[Insert Table 2]

4. Empirical Analyses

In the first step of the empirical analysis, we estimate the sensitivity of the Finnish equity market to exchange rate shocks using the simple regression in equation (6a) with the log-return on the Finnish market index series OMXH CAP, $r_{m,t}^{FI}$, as the dependent variable and the log-return on the SEK/FIM exchange rate, r_t^{FX}, as the explanatory variable. The results for the pre- and post-euro sample periods are presented in Table 3. As shown there, the estimated exposure coefficients ($\hat{b}$) are significant at the 1% level with negative signs in both sample periods. Confirming at least weak support for the forex competition hypothesis, depreciation of the FIM against the SEK positively affected Finnish stock market returns. This positive benefit of currency depreciation was more pronounced in the post-euro period, as the estimated coefficient almost doubled in magnitude with coincidently higher *z*-statistic and adjusted R^2 values. Apparently, Finnish stocks have become more sensitive to euro movements compared with Finnish mark fluctuations in earlier years. One plausible reason for this change is gradually increasing export activity of firms in Finland over time. Another possible explanation is that, given the euro is exogenous and not subject to central bank intervention to devalue and promote exports, Finnish firms may have become more sensitive to exchange rate movements than in the pre-euro period.

[Insert Table 3]

The results of estimating equation (6b) for the six sectors in the two sample periods are shown in Table 4. The dependent variable is now the excess return of the sector over the market return. During the pre-euro period in Panel A, the estimated exposure coefficients ($\hat{b}$) for industrials, consumer discretionary and financial are significant. Hence, in the pre-euro period, it appears that the market portfolio captures most of stocks' exchange rate exposure, but there is some differential exposure in selected sectors that reflects idiosyncratic differences from the negative market exposure (as evidenced above in Table 3). However, since the adjusted R^2 values are almost zero, we infer that the overall market in fact captures the majority of stocks' average exchange rate exposure.

In the post-euro period in Panel B, the results are similar in most respects with some differences. The estimated excess market exposure coefficients ($\hat{b}$) are now significant for four sectors, including industrials, consumer staples, financials and information technology. While the consumer discretionary sector in the pre-euro period had significantly lower negative exchange rate exposure compared to the Finnish market, it had no significant exposure in the post-euro period. By contrast, the information technology sector changed from no exposure to more negative exposure than the market in the pre- and post euro periods. Also, financials changed from negative to positive excess market exposure in the pre- and post-euro periods. Finally, industrials had less negative exposure than the market in both periods. Focusing on the post-euro period, our results suggest that an appreciating euro against the Swedish krona negatively affected Finnish stocks in general but was less (more) negative for financials, consumer staples, and industrials (information technology). Moreover, after the introduction of euro, individual sectors' exchange rate exposure tended to diverge to a greater extent from the overall market exposure than before the euro.

[Insert Table 4]

In order to test sector competitiveness (market integration), equation (7) is estimated in the pre- and post-euro periods. The estimated exposure coefficient ($\hat{b}$) results in Table 5 are similar to those for equation (1) in Table 4. As before, there is some significant evidence of excess exposure in the pre- and post-euro periods in selected sectors. More importantly, consistent with results in Griffin and Stulz, the predominance of significant positive estimated coefficients on Swedish excess sector returns ($\hat{d}$) supports market integration over competitiveness between sectors in the two countries. Also, in the pre-euro period, with the exception of the consumer discretionary sector, all Swedish sectors' estimated coefficients are significant at the 10% level or lower. In the post-euro period, all Swedish sectors' coefficients are highly significant at the 1% level and normally larger in magnitude than in the pre-euro period. These results imply a higher level of cross-border co-movements between sectors in the post-euro period, which suggests increasing market integration in recent years in line with earlier cited results by Jonung and Sjöholm (1999). However, for the information technology sector, the post-euro estimated $\hat{d}$ coefficients and adjusted R^2 values are reduced by about one-half of their values in the pre-euro period. Hence, this sector experienced less cross-border co-movement after the introduction of the euro.

[Insert Table 5]

Less aggregated industry group results are provided in Table 6. Similar to the sector results in Table 5, seven industry groups exhibit significant (and normally positive) excess exchange rate exposure ($\hat{b}$) in the pre-euro period compared with 11 industries (out-of-15 total) in the post-euro period. In the post-euro period, all exposure coefficients are significant and positive in sign[14], with the exception of the technology hardware and equipment industry.

[14] We should note that the negative exchange rate exposures in the pre-euro period for the financials sector reported in Tables 4 and 5 are probably driven by the insurance company Sampo. This company was included in the financial sector but not in any industry group, as there was no comparable Swedish counterpart. The median market capitalization for Sampo was 80% of the financial sector total market capitalization during our period.

The latter exception is likely attributable to Nokia and other multinational companies with a more global market orientation. Hence, most firms' stock valuations benefited from euro depreciation but less than the overall market.

[Insert Table 6]

Turning to the cross-border industry effects, with the exception of automobiles and components[15], the estimated coefficients ($\hat{d}$) are significantly positive, which implies market integration between Finnish industries and their Swedish counterparts in both pre- and post-euro periods. And, as in Table 5, a higher level of market integration in the post-euro period is suggested.

Tables 7 and 8 present the results for the full extended model with interaction terms in equation (8) with respect to sectors and industries, respectively. Table 7 shows that the estimated coefficients on the interaction variable between Swedish excess industry returns and exchange rate shocks ($\hat{e}$) are significant at the 10% level or lower for 4-out-of-6 sectors in the post-euro period but for only one sector in the pre-euro period. In the post-euro period, two significant sectors have negative signs and two have positive signs. Positive signs on the estimated coefficent $\hat{e}$ imply that the positive (integrated) relation between Finnish and Swedish stocks increased when the euro appreciated against the krona, and vice versa for negative signs. This interaction effect supports the forex competition hypothesis, as exchange rates shocks alter the competitive relationship between Finnish and Swedish sectors (i.e., increasing or decreasing their integration). Additionally, evidence for interaction between Swedish excess industry returns and exchange rate volatility as reflected by its estimated coefficient ($\hat{f}$) is fairly weak, with only one (two) significant sector coefficient(s) in the post-(pre-)euro period. Even so, we should note that the significant positive linear excess exchange exposure ($\hat{b}$) for the food beverage & tobacco industry in the pre-euro

[15] Since there is only one comparable company in both countries in this industry, our results may well not be representative for this industry group as a whole.

period reported in Table 6 is probably an approximation for nonlinear exposure, as it becomes insignificant when nonlinearity is introduced in Table 8.

[Insert Tables 7 and 8]

The results for the industry groups in Table 8 are similar for the most part, with only 3-out-of-15 significant estimated $\hat{e}$ coefficients in the pre-euro period compared with 6-out-of-15 significant coefficients in the post-euro period. Unlike Table 7, the estimated coefficients on the interaction between Swedish excess industry returns and exchange rates volatility ($\hat{f}$) are moderately significant, with 7(5)-out-of-15 significant industry coefficients in the post-(pre-)euro period. These results again tend to support the forex competition hypothesis, as exchange rate levels and volatility affect co-movements between a number of Finnish and Swedish industries to some extent.

We should comment that, as in Griffin and Stulz, the average adjusted R^2 values in Tables 7 and 8 are quite similar to those without interaction terms in Tables 5 and 6; thus, the magnitude of conditional exchange rate effects on Finnish and Swedish stock return co-movements is not large. However, since excess market returns should be unpredictable in an efficient market, low R^2 values are not unexpected. More importantly, given that multicollinearity arising from the inclusion of all constitutive terms in multiplicative models increases the size of standard errors and downward biases the significance of interaction variables (see Brambor, Clark, and Golder, 2005), we interpret the significance of interaction variables to mean that industries' relative integration is affected by exchange rate movements to some degree.

To further investigate the effect of exchange rate shocks on the relation between Finnish and Swedish sectors' and industries' excess stock returns, we utilize the full extended model in

equation (8) to compute the following total marginal effect of Swedish excess stock returns:

$$\partial \tilde{r}_{i,t}^{FI} \Big/ \partial \tilde{r}_{i,t}^{SW} = d_i + e_i \tilde{r}_t^{FX} + f_i |\tilde{r}_t^{FX}|, \quad \tilde{r}_{i,t}^{SW} > 0. \tag{9}$$

Comparing this total marginal effect to the unconditionally estimated coefficient on Swedish excess stock returns ($\hat{d}$) enables a better understanding of the conditional influence of exchange rates shocks on the Finnish/Swedish stock return relation. Equation (9) is estimated at both mean and median values of exchange rate shocks $\tilde{r}_t^{FX}$ for sectors and industries in Tables 9 and 10.

[Insert Tables 9 and 10 here]

The sector results in Table 9 demonstrate that interaction exchange rate shocks noticeably change the relation between Finnish and Swedish excess stock returns. For example, in the pre-euro period the estimated $\hat{d}$ for the industrial sector was not significant with a coefficient of only 0.027, but the total marginal effect (at mean $\tilde{r}_t^{FX}$) is 0.306, or more than 10 times the unconditional effect of Swedish returns on Finnish returns. Strikingly, in some sectors (viz., consumer discretionary and financials in the pre-euro period as well as consumer discretionary and information technology in the post-euro period), the estimated $\hat{d}$ is positive implying market integration but the total marginal effect is negative suggesting sector competitiveness. Table 10 gives similar results for industries. Notice that total marginal effects are negative in the transportation and banking industries in the pre-euro period as well as the automobiles & components, consumer durables & apparels, diversified financials, and technology hardware & equipment industries in post-euro period. Thus, industry competitiveness appears to have increased in the latter post-euro period. Highlighting these results, in many months, total marginal effects will be considerably greater than those reported in Tables 9 and 10. Total marginal effects are estimated there using the mean (and median) values of exchange rate shocks, which are very small, viz., 0.00035

(0.00066) and 0.00025 (0.00046) in the pre- and post-euro periods, respectively, due to the near-zero, stationary properties of exchange rate returns. By comparison, the standard deviations of monthly exchange rate returns were 0.00950 and 0.00908 in the pre- and post-euro periods, respectively, or over 35 times the magnitudes of their mean values. As such, negative $\hat{e}$ and $\hat{f}$ coefficients for interactions variables can readily produce negative total marginal effects. Casual inspection of these coefficients' signs in Table 9 and 10 suggests that negative total marginal effects are more prevalent than implied by mean exchange rate shocks. These results indicate that conditional competitive effects associated with exchange rate shocks strengthen support for the forex competition hypothesis.

In sum, taking into account dependencies between exchange rate movements and stock co-movements in the two countries, we infer increased competitive sensitivity of Finnish firms to exchange rate movements in the post-euro period compared with the pre-euro period, which is consistent with our more general finding of increasing forex sensitivity in the post-euro period shown in Table 3.

5. Conclusion

This study has attempted to test the forex competition hypothesis that posits relative changes in competitiveness between similar firms in different countries in response to exchange rate changes. We focus on the case of Finland due to its close competitive relationship with Sweden. Both countries have small, export-oriented economies that compete head-to-head due to similarities in industry structure and export markets. However, Finland adopted the euro in 1999, whereas Sweden retained the krona as its national currency. This dichotomy affords an opportunity to gain some insight into how the euro affected the competitiveness of EMU countries relative to non-EMU countries.

Using matched samples of Finnish and Swedish firms in the period 1994 to 2009, controlled tests by sector and industry show that Finnish stocks' value tend to rise as the

home currency depreciates against the Swedish krona. This sensitivity increased considerably in the post-euro period after 1999 compared with the pre-euro period. Further tests revealed that Finnish sectors and industries positively co-move with their Swedish counterparts, which implies market integration rather than competitiveness. While the two countries' stock returns are unconditionally integrated, exchange rate movements can substantively alter their co-movement, especially in the post-euro period with heightened sensitivity to exchange rates and associated volatility. Like Griffin and Stulz, industry effects outweigh exchange rate effects on stock returns. However, based on total marginal effects of Swedish stock returns on Finnish stock returns, competitive exchange rate effects do appear to exist in the case of Finland. We conclude that countries with small, open economies, such as Finland, can be prone to exchange rate movements that (dis)advantage their firms relative to competing firms in other countries. By implication, firms in other export nations may well be exposed to competitive pressures from exchange rate shocks. Further research is recommended to corroborate our findings and document the competitive effects of exchange rate fluctuations on firms.

References

Adler, M., and Dumas, B., 1980, The exposure of long-term foreign currency bonds, *Journal of Financial and Quantitative Analysis* 15, 973–994.

Adler, M., and Dumas, B., 1983, International portfolio choice and corporate finance: A synthesis, *Journal of Finance* 38, 925–984.

Adler, M., and Dumas B., 1984, Exposure to currency risk: Definition and measurement, *Financial Management* 13, 41–50.

Allayannis, G., and Weston, J. P., 2001, The use of foreign currency derivatives and firm market value, *Review of Financial Studies* 14, 243–276.

Antell, J., and Vaihekoski, M., 2007, International asset pricing models and currency risk: Evidence from Finland 1970–2004, *Journal of Banking and Finance* 31, 2571–2590.

Badinger, H., and Breuss, F., 2009, Country size and the trade effects of the euro, *Review of World Economies* 145, 207–223.

Baldwin, R., 2006, The euro's trade effects, European Central Bank, Working Paper 594.

Barr, D., Breedon, F., and Miles, D., 2003, Life on the outside: Economic conditions and prospects outside Euroland, *Economic Policy* 18, 573-613.

Bartov, E., and Bodnar, G. M., 1994, Firm valuation, earnings expectations, and the exchange-rate exposure effect, *Journal of Finance* 49, 1755–1785.

Bartram, S. M., 2007, Corporate cash flow and stock price exposures to foreign exchange rate risk, *Journal of Corporate Finance* 13, 981–994.

Bartram, S. M., and Karolyi, G. A., 2006, The impact of the introduction of the euro on foreign exchange rate risk exposures, *Journal of Empirical Finance* 13, 519–549.

Blomstrom, M., and Kokko, A., 2002, From natural resources to high-tech production: The evolution of industrial competitiveness in Sweden and Finland, Scandinavian Working Papers in Economics, Economic Research Institute, Stockholm School of Economics.

Bodnar, G. M., and Wong, M. H. F., 2003, Estimating exchange rate exposures: Issues in model structure, *Financial Management* 32, 35–67.

Brambor, T., Clark, W. R., and Golder, M., 2005, Understanding interaction models: Improving empirical analyses, *Political Analysis* 14, 63–82.

Breuss, F., 2005, Austria, Finland and Sweden after 10 years in the EU: Expected and achieved integration effects, Europainstitut, University of Economics and Business Administration Vienna Working Paper, 65.

Bris, A., Koskinen, Y., and Nilsson, M., 2006, The real effects of the euro: Evidence from corporate investments, *Review of Finance* 10, 1–37.

Bris, A., Koskinen, Y., and Nilsson, M., 2009, The euro and corporate valuations, *Review of Financial Studies* 22, 3171–3209.

Bun, M. J. G., and Klaassen, F. J. G. M., 2007. The euro effect on trade is not as large as commonly thought, *Oxford Bulletin of Economics and Statistics* 69,473–496.

Campbell, J. Y., 1991, A variance decomposition of returns, *Economic Journal* 101, 157-179.

Chen J., Naylor, M., and Lu, X., 2004, Some insights into the foreign exchange pricing puzzle: Evidence from a small open economy, *Pacific-Basin Finance Journal* 12, 41–46.

Chow, E. H., Lee, W. Y., and Solt, M. E., 1997, The exchange-rate risk exposure of asset returns, *Journal of Business* 70, 105–123.

De Santis, G., and Gérard, B. 1998, How big is the premium for currency risk, *Journal of Financial Economics* 49, 375–412.

De Santis, G., Gerard, B., and Hillion, P., 2003, The relevance of currency risk in the EMU, *Journal of Economics and Business* 55, 427–462.

Doidge, C., Griffin, J., and Williamson, R., 2006, Measuring the economic importance of exchange rate exposure, *Journal of Empirical Finance* 13, 550–576.

Dominguez, K. M. E., and Tesar, L. L., 2006, Exchange rate exposure, *Journal of International Economics* 68, 188–218.

Doukas, J. A., Hall, P. H., and Lang, L. H. P., 2003, Exchange rate exposure at the firm and industry level, *Financial Markets, Institutions and Instruments* 12, 291–346.

Dumas, B., and Solnik, B. 1995, The world price of foreign exchange risk, *Journal of Finance* 50, 445–479.

Entrof, H., Moebert, J., and Sonderhof, K., 2007, The foreign exchange rate exposure of nations, Centre of European Economic Research, Darmstadt University of Technology, Germany, ZEW Discussion Paper 07–005.

Entrof H., Moebert J., and Sonderhof, K., 2007, The foreign exchange rate exposure of nations, Centre of European Economic Research, Darmstadt University of Technology, Germany, ZEW Discussion Paper 07–005.

Gikas, A.H., Dimitrios, M., and Richard, P., 2006, EMU and European stock market integration, *Journal of Business* 79, 365–392.

Griffin, J. M. and Stulz, R. M., 2001, International competition and exchange rate shocks: A cross-country industry analysis of stock returns, *Review of Financial Studies* 14, 215–241.

Géczy, C., Minton, B. A., and Schrand, C., 1997, Why firm use currency derivatives, *Journal of Finance* 52, 1323–1355.

He, J. and Ng, L. K., 1998, The foreign exchange exposure of Japanese multinational corporations, *Journal of Finance* 53, 733–753.

Hardouvelis, G., Malliaropoulos, D., and Priestley, R., 2006, EMU and European stock market integrations, *Journal of Business* 79, 369–392.

Jonung, L. and Sjöholm, F., 1999, Should Finland and Sweden form a monetary union?, *The World Economy* 22, 683–700.

Jorion, P., 1990, The exchange-rate exposure of U.S. multinationals, *Journal of Business* 63, 331–345.

Jorion, P., 1991, The pricing of exchange rate risk in the stock market, *Journal of Financial and Quantitative Analysis* 26, 363–376.

Kolari, J. W., Moorman, T. C., and Sorescu, S. M., 2008, Foreign exchange risk and the cross-section of stock returns, *Journal of International Money and Finance* 27, 1074–1097.

Korhonen, T., 2001, Finnish monetary and foreign exchange policy and the changeover to the euro, Economics Department, Bank of Finland Discussion Papers No. 25.

Liikanen E., 2006, Finland, the EMU and the introduction of the euro, Governor of the Bank of Finland, at the Economic Forum of Hospodarske Noviny Club, Bratislava, 20 October 2006, Bank of International Settlement (BIS), Central Banker's Speeches (October 23rd).

Micco, A., Stein, E., and Ordóñez, G., 2003, The currency union effect on trade: Early evidence from EMU, *Economic Policy* 18, 315-356.

Muller, A. and Verschoor, W. F. C., 2006, European foreign exchange risk exposure, *European Financial Management* 12, 195–220.

Mundell, R. A., 1961, A theory of optimum currency areas, *American Economic Review* 51, 509–517.

Mundell, R. A., 1973, Uncommon arguments for common currencies, in H.G. Johnson and A.K. Swoboda, *The Economics of Common* Currencies, George Allen & Unwin Ltd., 114–132.

Mundell, R. A., 2000, Currency areas, volatility and intervention, *Journal of Policy Modeling* 22, 281–299.

Nguyen, H., Faff, R., and Marshall, A., 2007, Exchange rate exposure, foreign currency derivatives and the introduction of the euro: French evidence, *International Review of Economics and Finance* 16, 563–577.

Oikarinen E., 2009, Interaction between housing prices and household borrowing: The Finnish case. *Journal of Banking and Finance* 33, 747–756.

Rees, W. and Unni, S., 2005, Exchange rate exposure among European firms: Evidence from

France, Germany and the UK, *Accounting and Finance* 45, 479–497.

Sentana, E., 2002, Did the EMS reduce the cost of capital?, *The Economic Journal* 112, 786–809.

Tenreyro, S., and Barro, R. J., 2003, Economic effects of currency unions, NBER Working Paper No. 9435.

Vassalou, M., 2000, Exchange rate and foreign inflation risk premiums in global equity returns, *Journal of International Money and Finance* 19, 433–470.

Williamson, R., 2001, Exchange rate exposure and competition: Evidence from the automotive industry, *Journal of Financial Economics* 59, 441–475.

Table 1. Selected Sectors and Industries Based on GICS Codes

SECTORS	GICS Level-1 Codes	Number of Firms [1]		INDUSTRIES	GICS Level-2 Sub-Codes	Number of Firms [2]	
		Finland	Sweden			Finland	Sweden
Materials	15	9	6	Materials	1510	9	6
Industrials	20	27	33	Capital Goods	2010	21	25
				Commercial Services & Supplies	2020	3	6
				Transportation	2030	3	2
Consumer Discretionary	25	13	10	Automobiles & Components	2510	1	1
				Consumer Durables & Apparels	2520	3	7
				Consumer Services	2530	2	1
				Media	2540	6	1
				Retailing	2550	1	2
Consumer Staples	30	6	2	Food & Staples Retailing[3]	3010	1	0
				Food Beverage & Tobacco	3020	5	2
				Household & Personal Products[3]	3030	0	0
Financials	40	12	25	Banks	4010	1	4
				Diversified Financials	4020	6	13
				Insurance[3]	4030	1	0
				Real Estate	4040	4	8
Information Technology	45	4	11	Software & Services	4510	1	3
				Technology Hardware & Equipment	4520	3	8
Total Companies		71	87				

[1] Sectors are selected based on GICS level-1 aggregation. Due to insufficient data, we excluded some sectors, including energy, health, telecommunication services, and utilities.

[2] Industry groups are selective based on GICS level-2 aggregation.

[3] Due to insufficient data, we excluded some industries from forthcoming analyses, including food and staples retailing, household and personal products, and insurance.

Table 2. Descriptive Statistics, Weekly Data

	Mean	Median	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Jarque-Bera	*p*-Values
Panel A: Pre-Euro (January 1994 – December 1998) Stock Excess Returns in Finland									
OMXH CAP Market Index	0.00304	0.00460	0.13210	-0.09865	0.02781	-0.06241	4.97615	42.47045	0.0000
Materials	-0.00134	-0.00177	0.07618	-0.08616	0.02133	0.14446	4.27466	18.50574	0.0000
Industrials	0.00159	0.00160	0.12558	-0.09280	0.02134	0.65907	8.86515	392.3920	0.0000
Consumer Discretionary	0.00323	0.00215	0.27873	-0.14064	0.03763	1.40332	14.4238	1507.909	0.0000
Consumer Staples	0.00150	0.00123	0.24567	-0.02020	0.04307	0.60140	9.73386	506.9090	0.0000
Financials	0.00072	-0.00040	0.08893	-0.07782	0.03112	0.03132	2.82380	0.378863	0.8274
Information Technology	0.00816	0.00722	0.22573	-0.21243	0.04433	-0.00808	7.00184	173.5053	0.0000
Panel B: Post-Euro (January 1999 – June 2009) Stock Excess Returns in Finland									
OMXH CAP Market Index	0.00110	0.00431	0.10273	-0.20051	0.03100	-0.83074	6.52207	343.6000	0.0000
Materials	-0.00081	-0.00260	0.16403	-0.10951	0.03300	0.35227	5.17764	118.7387	0.0000
Industrials	-0.00003	-0.00024	0.09413	-0.07401	0.02427	-0.01210	4.26881	36.50334	0.0000
Consumer Discretionary	0.00004	-0.00070	0.11070	-0.12062	0.02882	0.09371	4.50877	51.71252	0.0000
Consumer Staples	0.00003	0.00045	0.13334	-0.22834	0.03848	-0.52956	6.95201	379.1640	0.0000
Financials	0.00180	-0.00050	0.15346	-0.09710	0.03048	0.58334	5.53031	175.8600	0.0000
Information Technology	-0.00085	0.00032	0.17083	-0.19441	0.05110	-0.28652	4.62580	67.35503	0.0000
Panel C: Pre-Euro (January 1994 – December 1998) Stock Excess Returns in Sweden									
OMXS Market Index	0.00390	0.00600	0.20077	-0.08674	0.02880	0.90261	10.9660	721.9792	0.0000
Materials	-0.00245	-0.00370	0.14275	-0.13438	0.03395	0.24090	4.85410	39.73087	0.0000
Industrials	0.00166	0.00091	0.19640	-0.08767	0.03153	0.80788	8.25681	326.9540	0.0000
Consumer Discretionary	0.00418	0.00241	0.13334	-0.11604	0.03153	0.34061	5.03524	50.87187	0.0000
Consumer Staples	0.00205	-0.00370	1.08802	-0.14046	0.07547	11.5243	166.400	295003.2	0.0000
Financials	0.00062	-0.00224	0.10251	-0.08184	0.02715	0.37851	3.94024	15.76515	0.0000
Information Technology	0.00211	0.00330	0.10201	-0.12827	0.03103	-0.56874	5.09378	61.51034	0.0000
Panel D: Post-Euro (January 1999 – June 2009) Stock Excess Returns in Sweden									
OMXS Market Index	0.00094	0.00414	0.11866	-0.22860	0.03466	-0.77920	6.90803	399.4421	0.0000
Materials	0.00106	-0.00142	0.13666	-0.14306	0.03558	0.26786	4.37040	49.07334	0.0000
Industrials	0.00036	0.00033	0.19021	-0.11071	0.03125	0.41824	6.43301	283.0833	0.0000
Consumer Discretionary	0.00050	0.00053	0.17557	-0.30387	0.03747	-0.80535	14.8078	3213.707	0.0000
Consumer Staples	0.00125	-0.00044	0.12263	-0.11778	0.03804	0.15576	3.55810	9.259728	0.0000
Financials	0.00020	0.00006	0.18764	-0.10382	0.02631	0.66583	9.30607	935.8593	0.0000
Information Technology	-0.00254	-0.00111	0.20505	-0.24678	0.05066	-0.40655	7.82362	542.3777	0.0000
Panel E: Pre-Euro (January 1994 – December 1998) Exchange Rate Series									
SEK/FIM	1.50740	1.48500	1.72631	1.40537	0.08044	1.09165	3.27608	52.46564	0.0000
RFX (SEK/ FIM)	0.00036	-0.00065	0.03100	-0.02790	0.01051	0.41905	3.61733	11.73445	0.0000
Panel F: Post-Euro (January 1999 – June 2009) Exchange Rate Series									
SEK/FIM	1.54801	1.54407	1.95064	1.36524	0.08282	1.66040	8.27984	881.8327	0.0000
RFX (SEK/ FIM)	0.00025	0.00045	0.05380	-0.04618	0.00908	0.31875	8.44435	681.1730	0.0000

Note: Samples sizes are $N = 71$ Finnish firms and $N = 87$ Swedish firms. The total number observations in the pre- and post-euro periods are $N = 260$ and $N = 544$, respectively..

Table 3. Finnish Market Index Returns Regressed on Exchange Rate Shocks, Weekly Data

	$\hat{a}$	$\hat{b}$	Adjusted R^2
Panel A: Pre-Euro (January 1994 – December 1998)			
OMXH CAP	0.0036**	-0.5284***	0.0383
	(2.30)	(-3.50)	
Panel B: Post-Euro (January 1999 – June 2009)			
OMXH CAP	0.0033***	-0.9828***	0.1178
	(3.07)	(-6.84)	

Note: Asterisks ***, **, and * denote 1%, 5%, and 10% significance levels, respectively (*z*-statistics in parenthesis). The total number observations in the pre- and post-euro periods are $N = 260$ and $N = 544$, respectively.

The estimated model is: $\tilde{r}^{FI}_{OMXH\ CAP,t} = a_i + b_i\, \tilde{r}^{FX}_t + \varepsilon_{i,t}$, where $\tilde{r}^{FI}_{OMXH\ CAP,t}$ is the log-return on the Finnish stock market index, and $\tilde{r}^{FX}_t$ is the log-return on the SEK/FIM exchange rate (i.e., the change in the exchange rate in terms of Swedish krona to one Finnish mark or euro). EGARCH (1, 1) process coefficients are significant for both pre-and post euro period, which indicates that autocorrelation, heteroscedasticity, and asymmetry in the volatility of the error term are taken into account.

Table 4. Finnish Sector Excess Returns Regressed on Exchange Rate Shocks, Weekly Data

Panel A: Pre-Euro (January 1994 – December 1998)			
Sectors	$\hat{a}$	$\hat{b}$	Adjusted R^2
Materials	-0.0014	-0.2216	-0.0010
	(-1.12)	(-1.53)	
Industrials	0.0012	0.3735***	-0.0120
	(0.84)	(2.94)	
Consumer Discretionary	0.0015	0.5660***	-0.0021
	(0.71)	(3.21)	
Consumer Staples	0.0015	-0.1017	-0.0231
	(0.61)	(-0.42)	
Financials	0.0027	-0.4335**	-0.0078
	(1.47)	(-2.36)	
Information Technology	0.0084	0.1981	-0.0216
	(3.47)	(0.72)	
Panel B: Post-Euro (January 1999 – June 2009)			
Materials	-0.0017	-0.1208	-0.0088
	(-1.46)	(-0.90)	
Industrials	-0.0006	0.4881***	0.0538
	(-0.72)	(4.70)	
Consumer Discretionary	-0.0003	0.2236	0.0005
	(-0.30)	(1.62)	
Consumer Staples	0.0011	0.4378***	0.0131
	(0.78)	(3.04)	
Financials	0.0014	0.2187*	-0.0061
	(1.33)	(1.71)	
Information Technology	-0.0018	-0.5624***	-0.0043
	(-0.83)	(-2.76)	

Note: Asterisks ***, **, and * denote 1%, 5%, and 10% significance levels, respectively (*z*-statistics in parenthesis). There are N = 71 Finnish firms and N = 87 Swedish firms. The total number observations in the pre- and post-euro periods are N = 260 and N = 544, respectively.

The estimated model is: $\tilde{r}_{i,t}^{FI} = a_i + b_i \tilde{r}_t^{FX} + \varepsilon_{i,t}$, where $\tilde{r}_{i,t}^{FI}$ is the Finnish sector return in excess of the Finnish stock market return, and $\tilde{r}_t^{FX}$ is the log-return on the SEK/FIM exchange rate (i.e., the change in the exchange rate in terms of Swedish krona to one Finnish mark or euro). EGARCH (1, 1) process coefficients are significant for both pre-and post euro period, which indicates that autocorrelation, heteroscedasticity, and asymmetry in the volatility of the error term are taken into account.

Table 5. Finnish Sector Weekly Excess Returns Regressed on Exchange Rate Shocks and Swedish Sector Excess Returns

Panel A: Pre-Euro (January 1994 – 31 December 1998)				
Sectors	$\hat{a}$	$\hat{b}$	$\hat{d}$	Adjusted R^2
Materials	-0.0005	-0.3212***	0.2834***	0.1615
	(-0.41)	(-2.81)	(11.36)	
Industrials	0.0012	0.3874***	0.0688*	0.0010
	(0.82)	(2.94)	(1.73)	
Consumer Discretionary	0.0015	0.5670***	0.0033	-0.0060
	(0.67)	(3.21)	(0.05)	
Consumer Staples	0.0010	-0.0596	0.1531**	0.0550
	(0.40)	(-0.24)	(2.28)	
Financials	0.0027	-0.3872*	0.0905	-0.0018
	(1.42)	(-1.92)	(1.45)	
Information Technology	0.0081	0.1626	0.4543***	0.1325
	(3.21)	(0.60)	(5.03)	
Panel B: Post-Euro (January 1999 – June 2009)				
Materials	-0.0017*	-0.1980	0.3565***	0.2227
	(-1.73)	(-1.58)	(15.25)	
Industrials	-0.0007	0.4495***	0.0930***	0.0730
	(-0.87)	(4.38)	(3.55)	
Consumer Discretionary	-0.0004	0.2170	0.0801***	0.0106
	(-0.34)	(1.60)	(2.66)	
Consumer Staples	0.0016	0.1370	0.2884***	0.0772
	(1.15)	(0.93)	(8.15)	
Financials	0.0017	0.2196*	0.2580***	0.0890
	(1.65)	(1.81)	(6.52)	
Information Technology	-0.0010	-0.5191**	0.2220***	0.0543
	(-0.50)	(-2.66)	(8.21)	

Note: Asterisks ***, **, and * denote 1%, 5%, and 10% significance levels, respectively (*z*-statistics in parenthesis). There are N =71 Finnish firms and N = 87 Swedish firms. The total number observations in the pre- and post-euro periods are N = 260 and N = 544, respectively.

The estimated model is: $\tilde{r}_{i,t}^{FI} = a_i + b_i\tilde{r}_t^{FX} + d_i\tilde{r}_{i,t}^{SW} + \varepsilon_{i,t}$, where $\tilde{r}_{i,t}^{FI}$ is the Finnish sector return in excess of the Finnish stock market return, $\tilde{r}_t^{FX}$ is the log-return on the SEK/FIM exchange rate (i.e., the change in the exchange rate in terms of Swedish krona to one Finnish mark or euro), and $\tilde{r}_{i,t}^{SW}$ is the corresponding Swedish sector return in excess of the Swedish stock market return. EGARCH (1, 1) process coefficients are significant for both pre-and post euro period, which indicates that autocorrelation, heteroscedasticity, and asymmetry in the volatility of the error term are taken into account.

Table 6. Finnish Industry Excess Returns Regressed on Exchange Rate Shocks and Swedish Industry Excess Returns, Weekly Data

Sectors	Industries	$\hat{a}$	$\hat{b}$	$\hat{d}$	Adjusted R^2
Panel A: Pre-Euro (January 1994 – December 1998)					
Materials	Materials	-0.0005	-0.3212***	0.2834***	0.1615
		(-0.41)	(-2.81)	(11.36)	
Industrials	Capital Goods	-0.0003	0.2835**	0.0002	-0.0183
		(-0.21)	(2.75)	(0.00)	
	Commercial Services & Supplies	0.0013	0.6767***	0.0370	-0.0357
		(0.60)	(3.22)	(0.46)	
	Transportation	0.0020	0.1998	0.0522	-0.0150
		(1.00)	(1.10)	(1.25)	
Consumer Discretionary	Automobiles & Components	0.0012	0.2863	-0.1363***	-0.0290
		(0.60)	(1.20)	(-3.80)	
	Consumer Durables & Apparels	2.29E-05	0.2294	-0.0158	-0.0160
		(0.01)	(1.05)	(-0.28)	
	Consumer Services	0.0157***	0.4511	0.7000***	-0.0127
		(4.70)	(1.58)	(16.45)	
	Media	-0.0006	0.8560***	0.1220	0.0221
		(-0.21)	(3.31)	(2.53)	
	Retailing	0.0011	-0.0631	0.1008**	-0.0014
		(0.50)	(-0.36)	(2.00)	
Consumer Staples	Food Beverage & Tobacco	0.0005	0.6242*	0.2557***	0.0766
		(0.15)	(1.72)	(4.30)	
Financials	Banks	0.0018	0.6417**	0.0713	0.0036
		(0.74)	(2.20)	(0.93)	
	Diversified Financials	-0.0020***	0.2570	0.3821***	0.0010
		(-4.50)	(1.20)	(1.93)	
	Real Estate	-3.84E-05	0.6792***	0.2937**	0.0057
		(-0.01)	(3.10)	(2.46)	
Information Technology	Software & Services	0.0046	0.2830	0.0701***	0.0027
		(1.42)	(0.97)	(2.85)	
	Technology Hardware & Equipment	0.0081***	0.1450	0.4657***	0.1344
		(3.21)	(0.54)	(5.30)	
Panel B: Post-Euro (January 1999 – June 2009)					
Materials	Materials	-0.0017*	-0.1980	0.3565***	0.2227
		(-1.73)	(-1.58)	(15.25)	
Industrials	Capital Goods	-0.0003	0.4586***	0.0630***	0.0380
		(-0.40)	(3.84)	(2.00)	
	Commercial Services & Supplies	0.0006	0.6561***	0.2526***	0.0750
		(0.43)	(4.10)	(5.30)	
	Transportation	-0.0020	0.6634***	0.0833***	0.0267
		(-1.64)	(4.73)	(4.45)	
Consumer Discretionary	Automobiles & Components	0.0018	0.3951*	0.0954**	-0.0042
		(0.84)	(1.66)	(2.31)	
	Consumer Durables & Apparels	-0.0004	0.3417**	0.0450	0.0178
		(-0.25)	(2.70)	(1.45)	
	Consumer Services	-0.0010	0.6552***	0.2368***	0.0778
		(-0.58)	(3.06)	(6.02)	
	Media	-0.0008	0.2081	0.0531**	0.0052
		(-0.63)	(1.43)	(2.72)	
	Retailing	-0.0010	0.5794**	0.1150**	0.0320
		(-1.24)	(2.70)	(2.33)	
Consumer Staples	Food Beverage & Tobacco	0.0002	0.1918	0.3060***	0.0650
		(0.17)	(1.36)	(7.30)	
Financials	Banks	0.0026	0.9661***	0.2721***	0.0551
		(1.44)	(5.92)	(5.31)	
	Diversified Financials	0.0018	0.5110***	0.0003	-0.0141
		(1.46)	(3.62)	(0.01)	
	Real Estate	0.0008	1.0161***	0.0551***	0.0942
		(0.60)	(7.10)	(5.71)	
Information Technology	Software & Services	-0.0055**	-0.3207	0.0774**	-0.0143
		(-2.30)	(-1.16)	(2.20)	
	Technology Hardware & Equipment	-0.0010	-0.5194**	0.2212***	0.0541
		(-0.50)	(-2.70)	(8.20)	

Note: Asterisks ***, **, and * denote 1%, 5%, and 10% significance levels, respectively (*z*-statistics in parenthesis). There are N = 71 Finnish firms and N = 87 Swedish firms. The total number observations in the pre- and post-euro periods are N = 260 and N = 544, respectively.

The estimated model is: $\tilde{r}_{i,t}^{FI} = a_i + b_i\tilde{r}_t^{FX} + d_i\tilde{r}_{i,t}^{SW} + \varepsilon_{i,t}$, where $\tilde{r}_{i,t}^{FI}$ is the Finnish industry return in excess of the Finnish stock market return, $\tilde{r}_t^{FX}$ is the log-return on the SEK/FIM exchange rate (i.e., the change in the exchange rate in terms of Swedish krona to one Finnish mark or euro), and $\tilde{r}_{i,t}^{SW}$ is the corresponding Swedish industry return in excess of the Swedish stock market return. EGARCH (1, 1) process coefficients are significant for both pre-and post euro period, which indicates that autocorrelation, heteroscedasticity, and asymmetry in the volatility of the error term are taken into account. An EGARCH (1,2) model has been used to account for an outlier in the diversified financial pre-euro series.

Table 7. Finnish Sector Excess Returns Regressed on the Exchange Rate Shocks and Swedish Sector Excess Returns Plus Interaction Variables, Weekly Data

Sectors	$\hat{a}$	$\hat{b}$	$\hat{c}$	$\hat{d}$	$\hat{e}$	$\hat{f}$	Adjusted R^2
Panel A: Pre-Euro (January 1994 – December 1998)							
Materials	-0.0041*	-0.3633***	0.1910*	0.3321***	6.7490	-12.8125	0.1630
	(-1.70)	(-2.92)	(1.70)	(8.14)	(1.20)	(-1.54)	
Industrials	0.0021	0.3710**	-0.0541	0.0267	3.0242	14.1741**	-0.0004
	(0.76)	(2.41)	(-0.42)	(0.50)	(0.64)	(1.96)	
Consumer Discretionary	0.0004	0.4882	0.0780	0.0400	20.9222**	-10.3515	-0.0280
	(0.11)	(2.80)	(0.42)	(0.41)	(1.90)	(-0.52)	
Consumer Staples	0.0003	-0.1043	0.0420	0.1264	3.7418	14.5743	0.0477
	(0.05)	(-0.41)	(0.20)	(1.30)	(0.33)	(0.81)	
Financials	0.0031	-0.4177**	-0.0912	0.3262***	-11.3415	-58.5001***	0.0174
	(0.82)	(-2.10)	(-0.53)	(3.30)	(-0.82)	(-2.82)	
Information Technology	0.0126**	0.1032	-0.2475	0.5040***	-0.7862	-1.4116	0.1337
	(2.24)	(0.35)	(-1.06)	(3.80)	(-0.07)	(-0.10)	
Panel B: Post-Euro (January 1999 – June 2009)							
Materials	-0.0016	-0.2036*	-0.0024	0.3581***	-4.9540	-0.2042	0.2190
	(-0.80)	(-1.64)	(-0.02)	(10.72)	(-0.75)	(-0.03)	
Industrials	-0.0005	0.4136***	-0.0006	0.0662*	-6.2473	10.7456	0.0710
	(-0.30)	(3.90)	(-0.01)	(1.81)	(-1.22)	(1.40)	
Consumer Discretionary	0.0008	0.2203*	-0.1507	0.1215***	20.6170***	-10.8630	0.0180
	(0.42)	(1.64)	(-1.22)	(3.00)	(2.83)	(-1.08)	
Consumer Staples	-0.0030	0.0864	0.3704**	0.2834***	-11.8080*	2.2453	0.0721
	(-1.02)	(0.51)	(1.94)	(5.94)	(-1.63)	(0.22)	
Financials	0.0008	0.1682	0.0855	0.3260***	10.1290*	-16.9621	0.0935
	(0.40)	(1.26)	(0.62)	(5.10)	(1.72)	(-1.60)	
Information Technology	-0.0060	-0.5095**	0.3275*	0.3836***	-18.1088***	-42.3668***	0.0740
	(-1.61)	(-2.41)	(1.66)	(8.92)	(-3.30)	(-4.91)	

Note: Asterisks ***, **, and * denote 1%, 5%, and 10% significance levels, respectively (z-statistics in parenthesis). There are $N = 71$ Finnish firms and $N = 87$ Swedish firms. The total number observations in the pre- and post-euro periods are $N = 260$ and $N = 544$, respectively.

The estimated model is: $\tilde{r}_{i,t}^{FI} = a_i + b_i\tilde{r}_t^{FX} + c_i|\tilde{r}_t^{FX}| + d_i\tilde{r}_{i,t}^{SW} + e_i\tilde{r}_t^{FX}\tilde{r}_{i,t}^{SW} + f_i|\tilde{r}_t^{FX}|\tilde{r}_{i,t}^{SW} + \varepsilon_{i,t}$, where $\tilde{r}_{i,t}^{FI}$ is the log-return on the SEK/FIM exchange rate (i.e., the change in the exchange rate in terms of Swedish krona to one Finnish mark or euro), and $\tilde{r}_{i,t}^{SW}$ is the corresponding Swedish sector return in excess of the Swedish stock market return. EGARCH (1, 1) process coefficients are significant for both pre-and post euro period, which indicates that autocorrelation, heteroscedasticity, and asymmetry in the volatility of the error term are taken into account.

Table 8. Finnish Industry Excess Returns Regressed on Exchange Rate Shocks and Swedish Industry Excess Returns Plus Interaction Terms, Weekly Data

Sectors	Industries	$\hat{a}$	$\hat{b}$	$\hat{c}$	$\hat{d}$	$\hat{e}$	$\hat{f}$	Adjusted R^2
Panel A: Pre-Euro (January 1994 – December 1998)								
Materials	Materials	-0.0041*	-0.3633***	0.1910*	0.3321***	6.7490	-12.8125	0.1630
		(-1.70)	(-2.92)	(1.70)	(8.14)	(1.20)	(-1.54)	
Industrials	Capital Goods	0.0061**	0.3112**	-0.2678**	0.0280	-12.5242	42.2680**	0.0160
		(2.07)	(2.13)	(-2.30)	(0.40)	(-1.21)	(2.62)	
	Commercial Services & Supplies	0.0008	0.6226**	0.0070	-0.0256	1.6095	14.5185	-0.0418
		(0.20)	(2.67)	(0.04)	(-0.22)	(0.15)	(0.90)	
	Transportation	0.0035	0.1746	-0.0744	0.0986	5.1470	-9.7590	-0.0162
		(0.90)	(0.90)	(-0.44)	(1.53)	(1.23)	(-1.03)	
Consumer Discretionary	Automobiles & Components	0.0103**	0.3654*	-0.5320***	-0.1280	-13.1105	-4.6731	-0.04680
		(2.51)	(1.75)	(-3.30)	(-1.60)	(-1.13)	(-0.30)	
	Consumer Durables & Apparels	-0.0118***	-0.1640	0.6052***	-0.2051**	-42.3425***	30.0380**	0.0193
		(-3.30)	(0.71)	(3.83)	(-2.40)	(-5.10)	(2.17)	
	Consumer Services	-0.0007	1.4800***	0.6057**	0.7115***	25.2151***	-6.9061	-0.0170
		(-0.10)	(4.53)	(2.23)	(7.10)	(2.90)	(-0.41)	
	Media	0.0012	0.8095***	-0.0310	-0.0011	-14.9544	36.3542***	0.0409
		(0.23)	(3.04)	(-0.12)	(-0.02)	(-1.50)	(3.00)	
	Retailing	-0.0034	-0.1110	0.1276	0.0307	3.5067	18.0066	-0.0026
		(-0.90)	(-0.53)	(0.80)	(0.50)	(0.36)	(1.31)	
Consumer Staples	Food Beverage &Tobacco	-0.0017	0.5664	0.0600	0.2517**	31.9678*	-3.4741	0.0834
		(-0.25)	(1.50)	(0.20)	(2.76)	(1.83)	(-0.15)	
Financials	Banks	0.0075	0.6423**	-0.3170*	0.2355**	6.6261	-45.1844**	0.0142
		(1.60)	(2.14)	(-1.62)	(2.14)	(0.93)	(-2.00)	
	Diversified Financials	0.0063**	0.2300	-0.3482**	0.4100**	7.9234	-14.2283	-0.0153
		(2.06)	(1.05)	(-2.70)	(2.23)	(0.50)	(-0.40)	
	Real Estate	0.0014	0.8570***	-0.0280	0.0743	17.2020	47.6714*	-0.0112
		(0.22)	(3.21)	(-0.10)	(0.50)	(1.23)	(1.80)	
Information Technology	Software & Services	0.0016	0.0217	0.1725	0.0030	15.1273**	27.7236**	0.0450
		(0.30)	(0.10)	(0.65)	(0.04)	(2.20)	(2.30)	
	Technology Hardware & Equipment	0.0126**	0.1030	-0.2475	0.5037***	-0.8205	-1.5060	0.1341
		(2.24)	(0.35)	(-1.06)	(3.80)	(-0.10)	(-0.10)	

Table 8, continued

Sectors	Industries	$\hat{a}$	$\hat{b}$	$\hat{c}$	$\hat{d}$	$\hat{e}$	$\hat{f}$	Adjusted R^2
Materials	Materials	-0.0016	-0.2036*	-0.0024	0.3581***	-4.9540	-0.2042	0.2190
		(-0.80)	(-1.64)	(-0.02)	(10.72)	(-0.75)	(-0.03)	
Industrials	Capital Goods	-0.0020	0.4640***	0.1365	0.0703	2.5765	-0.6644	0.0375
		(-1.04)	(3.70)	(1.10)	(1.50)	(0.35)	(-0.10)	
	Commercial Services & Supplies	-0.0017	0.5164***	0.2424	0.1481**	-21.9800***	33.1543***	0.0905
		(-0.70)	(3.20)	(1.56)	(2.40)	(-2.96)	(2.80)	
	Transportation	0.0010	0.7064***	-0.2700	0.0902***	2.3153	-2.3163	0.0307
		(0.33)	(4.60)	(-1.31)	(3.20)	(0.50)	(-0.30)	
Consumer Discretionary	Automobiles & Components	-0.0054	0.2370	0.5460**	0.1575	3.0383	-11.6650	-0.0141
		(-1.50)	(0.93)	(2.54)	(2.20)	(0.43)	(-1.03)	
	Consumer Durables & Apparels	-0.0002	0.3370**	-0.0012	0.0907**	-0.8700	-13.9270*	0.0170
		(-0.10)	(2.67)	(-0.10)	(2.11)	(-0.13)	(-1.85)	
	Consumer Services	-0.0077**	0.5305**	0.5576**	0.1470***	-11.9067**	29.6012***	0.0921
		(-2.33)	(2.40)	(2.65)	(3.26)	(-1.94)	(3.80)	
	Media	-0.0010	0.2070	0.0483	0.0430	-4.1070	2.3437	0.0030
		(-0.45)	(1.35)	(0.30)	(1.55)	(-1.33)	(0.50)	
	Retailing	-0.0020	0.3910*	0.0552	0.0446	17.2086	29.9182*	0.0436
		(-0.60)	(1.85)	(0.30)	(0.70)	(1.60)	(1.82)	
Consumer Staples	Food Beverage & Tobacco	-9.11E-05	0.1365	0.0072	0.2581***	1.1237	9.3804	0.0607
		(-0.04)	(0.84)	(0.04)	(4.40)	(0.13)	(0.85)	
Financials	Banks	-0.0052*	0.8410***	0.5073***	0.3882***	16.7801**	-23.5283*	0.0690
		(-1.75)	(4.70)	(3.10)	(4.86)	(1.94)	(-1.80)	
	Diversified Financials	0.0026	0.5140***	-0.0643	0.1110	21.3806**	-36.1356**	-0.0101
		(1.24)	(3.34)	(-0.43)	(1.34)	(1.96)	(-2.32)	
	Real Estate	0.0006	0.9235***	-0.0781	0.2633***	29.4160***	-14.9140	0.1321
		(0.30)	(6.00)	(-0.50)	(4.52)	(6.05)	(-1.36)	
Information Technology	Software & Services	-0.0153***	0.1107	0.4856***	0.0611*	4.2476	16.5004	-0.0274
		(-6.60)	(0.45)	(3.85)	(1.80)	(0.81)	(1.55)	
	Technology Hardware & Equipment	-0.0060	-0.5103**	0.3271*	0.3827***	-18.0740***	-42.2650***	0.0737
		(-1.60)	(-2.41)	(1.66)	(8.90)	(-3.30)	(-4.90)	

Note: Asterisks ***, **, and * denote 1%, 5%, and 10% significance levels, respectively (*z*-statistics in parenthesis). There are $N = 71$ Finnish firms and $N = 87$ Swedish firms. The total number observations in the pre- and post-euro periods are $N = 260$ and $N = 544$, respectively.

The estimated model is: $\tilde{r}_{i,t}^{FI} = a_i + b_i\tilde{r}_t^{FX} + c_i|\tilde{r}_t^{FX}| + d_i\tilde{r}_{i,t}^{SW} + e_i\tilde{r}_t^{FX}\tilde{r}_{i,t}^{SW} + f_i|\tilde{r}_t^{FX}|\tilde{r}_{i,t}^{SW} + \varepsilon_{i,t}$, where $\tilde{r}_{i,t}^{FI}$ is the Finnish industry return in excess of the Finnish stock market return, $\tilde{r}_t^{FX}$ is the log-return on the SEK/FIM exchange rate (i.e., the change in the exchange rate in terms of Swedish krona to one Finnish mark or euro), and $\tilde{r}_{i,t}^{SW}$ is the corresponding Swedish industry return in excess of the Swedish stock market return. EGARCH (1, 1) process coefficients are significant for both pre-and post euro period, which indicates that autocorrelation, heteroscedasticity, and asymmetry in the volatility of the error term are taken into account.

Table 9. Total Marginal Effect of Swedish Excess Stock Return Changes on Finnish Excess Stock Returns by Sector

Sectors	Total Marginal Effect: $d_i + e_i\tilde{r}_t^{FX} + f_i\lvert\tilde{r}_t^{FX}\rvert$	When $\tilde{r}_t^{FX}$ and $\lvert\tilde{r}_t^{FX}\rvert$ Are Mean Returns	When $\tilde{r}_t^{FX}$ and $\lvert\tilde{r}_t^{FX}\rvert$ Are Median Returns
Panel A: Pre-Euro (January 1994 – December 1998)			
Materials	0.033+6.750 $\tilde{r}_t^{FX}$-12.813 $\lvert\tilde{r}_t^{FX}\rvert$	0.0831	0.1137
Industrials	0.027+3.024 $\tilde{r}_t^{FX}$+14.174 $\lvert\tilde{r}_t^{FX}\rvert$	0.3060	0.2614
Consumer Discretionary	0.040+20.922 $\tilde{r}_t^{FX}$-10.352$\lvert\tilde{r}_t^{FX}\rvert$	-0.1558	-0.1467
Consumer Staples	0.126+3.742 $\tilde{r}_t^{FX}$+14.574 $\lvert\tilde{r}_t^{FX}\rvert$	0.4137	0.3673
Financials	0.036-11.342 $\tilde{r}_t^{FX}$-58.500 $\lvert\tilde{r}_t^{FX}\rvert$	-0.8255	-0.6433
Information Technology	0.504-0.7862 $\tilde{r}_t^{FX}$-1.412 $\lvert\tilde{r}_t^{FX}\rvert$	0.4760	0.4810
Panel B: Post-Euro (January 1999 – June 2009)			
Materials	0.358-4.954 $\tilde{r}_t^{FX}$-0.204 $\lvert\tilde{r}_t^{FX}\rvert$	0.3540	0.3534
Industrials	0.066-6.247 $\tilde{r}_t^{FX}$10.746 $\lvert\tilde{r}_t^{FX}\rvert$	0.2168	0.1920
Consumer Discretionary	0.122+20.617 $\tilde{r}_t^{FX}$-10.863 $\lvert\tilde{r}_t^{FX}\rvert$	-0.0272	0.0010
Consumer Staples	0.283-11.808 $\tilde{r}_t^{FX}$+2.245 $\lvert\tilde{r}_t^{FX}\rvert$	0.3122	0.3048
Financials	0.326+10.130 $\tilde{r}_t^{FX}$-16.962 $\lvert\tilde{r}_t^{FX}\rvert$	0.0883	0.1276
Information Technology	0.384-18.110 $\tilde{r}_t^{FX}$-42.367 $\lvert\tilde{r}_t^{FX}\rvert$	-0.2208	0.1319

Note: There are N = 71 Finnish firms and N = 87 Swedish firms. The total number observations in the pre- and post-euro periods are N = 260 and N = 544, respectively.

The estimated model is: $\tilde{r}_{i,t}^{FI} = a_i + b_i\tilde{r}_t^{FX} + c_i\lvert\tilde{r}_t^{FX}\rvert + d_i\tilde{r}_{i,t}^{SW} + e_i\tilde{r}_t^{FX}\tilde{r}_{i,t}^{SW} + f_i\lvert\tilde{r}_t^{FX}\rvert\tilde{r}_{i,t}^{SW} + \varepsilon_{i,t}$, where $\tilde{r}_{i,t}^{FI}$ is the Finnish sector return in excess of the Finnish stock market return, $\tilde{r}_t^{FX}$ is the log-return on the SEK/FIM exchange rate (i.e., the change in the exchange rate in terms of Swedish krona to one Finnish mark or euro), and $\tilde{r}_{i,t}^{SW}$ is the corresponding Swedish sector return in excess of the Swedish stock market return. EGARCH (1, 1) process coefficients are significant for both pre-and post euro period, which indicates that autocorrelation, heteroscedasticity, and asymmetry in the volatility of the error term are taken into account. The total marginal effects of Swedish excess stock return changes on Finnish excess stock returns for each sector are computed as:

$$\partial\tilde{r}_{i,t}^{FI} \Big/ \partial\tilde{r}_{i,t}^{SW} = d_i + e_i\tilde{r}_t^{FX} + f_i\lvert\tilde{r}_t^{FX}\rvert, \quad \tilde{r}_{i,t}^{SW} > 0.$$

The mean (median) values of $\tilde{r}_t^{FX}$ and $\lvert\tilde{r}_t^{FX}\rvert$ in the pre-euro period are 0.00035 (0.00066) and 0.01962 (0.01670), respectively, and in the post-euro period they are 0.00025 (0.00046) and 0.01416 (0.01197), respectively.

Table 10. Total Marginal Effect of Swedish Excess Stock Return Changes on Finnish Stock Returns by Industry

Sectors	Industries	Total Marginal Effect: $d_i + e_i\tilde{r}_{i,t}^{FX} + f_i\lvert\tilde{r}_t^{FX}\rvert$	When $\tilde{r}_{i,t}^{FX}$ and $\lvert\tilde{r}_t^{FX}\rvert$ Are Mean Returns	When $\tilde{r}_{i,t}^{FX}$ and $\lvert\tilde{r}_t^{FX}\rvert$ Are Median Returns
Panel A: Pre-Euro (January 1994 – December 1998)				
Materials	Materials	0.033+6.750 $\tilde{r}_t^{FX}$-12.813 $\lvert\tilde{r}_t^{FX}\rvert$	0.0831	0.1137
Industrials	Capital Goods	0.028-12.524 $\tilde{r}_t^{FX}$+42.268 $\lvert\tilde{r}_t^{FX}\rvert$	0.8530	0.7421
	Commercial Services & Supplies	-0.026+1.610 $\tilde{r}_t^{FX}$+14.520 $\lvert\tilde{r}_t^{FX}\rvert$	0.2598	0.2158
	Transportation	0.099+5.147 $\tilde{r}_t^{FX}$-9.760 $\lvert\tilde{r}_t^{FX}\rvert$	-0.0911	-0.0678
Consumer Discretionary	Automobiles & Components	-0.128-13.111 $\tilde{r}_t^{FX}$-4.673 $\lvert\tilde{r}_t^{FX}\rvert$	-0.2243	-0.1974
	Consumer Durables & Apparels	-0.205-42.343 $\tilde{r}_t^{FX}$+30.038 $\lvert\tilde{r}_t^{FX}\rvert$	0.3694	0.3245
	Consumer Services	0.712+25.215 $\tilde{r}_t^{FX}$-6.906 $\lvert\tilde{r}_t^{FX}\rvert$	0.5848	0.5795
	Media	-0.001-14.954 $\tilde{r}_t^{FX}$+36.354 $\lvert\tilde{r}_t^{FX}\rvert$	0.7070	0.6160
	Retailing	0.031+3.507 $\tilde{r}_t^{FX}$+18.007 $\lvert\tilde{r}_t^{FX}\rvert$	0.3852	0.3291
Consumer Staples	Food Beverage & Tobacco	0.252+31.968 $\tilde{r}_t^{FX}$-3.474 $\lvert\tilde{r}_t^{FX}\rvert$	0.1947	0.1726
Financials	Banks	0.236+6.626 $\tilde{r}_t^{FX}$-45.184 $\lvert\tilde{r}_t^{FX}\rvert$	-0.6487	-0.5235
	Diversified Financials	0.410+7.923 $\tilde{r}_t^{FX}$-14.228 $\lvert\tilde{r}_t^{FX}\rvert$	0.1336	0.1672
	Real Estate	0.0743+17.202 $\tilde{r}_t^{FX}$+47.671 $\lvert\tilde{r}_t^{FX}\rvert$	1.0156	0.8591
Information Technology	Software & Services	0.003+15.127 $\tilde{r}_t^{FX}$+27.724 $\lvert\tilde{r}_t^{FX}\rvert$	0.5522	0.4560
	Technology Hardware & Equipment	0.504-0.821 $\tilde{r}_t^{FX}$-1.506 $\lvert\tilde{r}_t^{FX}\rvert$	0.4740	0.4791

Table 10, Continued

Panel B: Post-Euro (January 1999 – June 2009)				
Materials	Materials	0.358-4.954 $\tilde{r}_t^{FX}$-0.204 $\lvert\tilde{r}_t^{FX}\rvert$	0.3540	0.3534
Industrials	Capital Goods	0.070+2.577 $\tilde{r}_t^{FX}$-0.664 $\lvert\tilde{r}_t^{FX}\rvert$	0.0615	0.0635
	Commercial Services & Supplies	0.148-21.980 $\tilde{r}_t^{FX}$+33.154 $\lvert\tilde{r}_t^{FX}\rvert$	0.6121	0.5348
	Transportation	0.090+2.315 $\tilde{r}_t^{FX}$-2.316 $\lvert\tilde{r}_t^{FX}\rvert$	0.0580	0.0635
Consumer Discretionary	Automobiles & Components	0.158+3.038 $\tilde{r}_t^{FX}$-11.665 $\lvert\tilde{r}_t^{FX}\rvert$	-0.0070	0.0193
	Consumer Durables & Apparels	0.091-0.870 $\tilde{r}_t^{FX}$-13.927 $\lvert\tilde{r}_t^{FX}\rvert$	-0.1067	-0.0764
	Consumer Services	0.147-11.907 $\tilde{r}_t^{FX}$+29.601 $\lvert\tilde{r}_t^{FX}\rvert$	0.5632	0.4958
	Media	0.043-4.107 $\tilde{r}_t^{FX}$+2.344 $\lvert\tilde{r}_t^{FX}\rvert$	0.0752	0.0692
	Retailing	0.045+17.210 $\tilde{r}_{i,t}^{FX}$+29.918 $\lvert\tilde{r}_t^{FX}\rvert$	0.4725	0.4106
Consumer Staples	Food Beverage & Tobacco	0.258+1.124 $\tilde{r}_t^{FX}$+9.380 $\lvert\tilde{r}_t^{FX}\rvert$	0.3912	0.3709
Financials	Banks	0.388+16.780 $\tilde{r}_t^{FX}$-25.528 $\lvert\tilde{r}_t^{FX}\rvert$	0.0309	0.0903
	Diversified Financials	0.111+21.381 $\tilde{r}_t^{FX}$-36.136 $\lvert\tilde{r}_t^{FX}\rvert$	-0.3953	-0.3117
	Real Estate	0.263+30.416 $\tilde{r}_t^{FX}$-14.914 $\lvert\tilde{r}_t^{FX}\rvert$	0.0595	0.0983
Information Technology	Software & Services	0.061+4.248 $\tilde{r}_t^{FX}$+16.500 $\lvert\tilde{r}_t^{FX}\rvert$	0.2958	0.2606
	Technology Hardware & Equipment	0.383-18.074 $\tilde{r}_t^{FX}$-42.265 $\lvert\tilde{r}_t^{FX}\rvert$	-0.2203	-0.1315

Note: There are N = 71 Finnish firms and N = 87 Swedish firms. The total number observations in the pre- and post-euro periods are N = 260 and N = 544, respectively.

The estimated model is: $\tilde{r}_{i,t}^{FI} = a_i + b_i\tilde{r}_t^{FX} + c_i|\tilde{r}_t^{FX}| + d_i\tilde{r}_{i,t}^{SW} + e_i\tilde{r}_t^{FX}\tilde{r}_{i,t}^{SW} + f_i|\tilde{r}_t^{FX}|\tilde{r}_{i,t}^{SW} + \varepsilon_{i,t}$, where $\tilde{r}_{i,t}^{FI}$ is the Finnish industry return in excess of the Finnish stock market return, $\tilde{r}_t^{FX}$ is the log-return on the SEK/FIM exchange rate (i.e., the change in the exchange rate in terms of Swedish krona to one Finnish mark or euro), and $\tilde{r}_{i,t}^{SW}$ is the corresponding Swedish industry return in excess of the Swedish stock market return. EGARCH (1, 1) process coefficients are significant for both

pre-and post euro period, which indicates that autocorrelation, heteroscedasticity, and asymmetry in the volatility of the error term are taken into account. The total marginal effects of Swedish excess stock return changes on Finnish excess stock returns for each industry are computed as:

$$\partial \tilde{r}_{i,t}^{FI} \Big/ \partial \tilde{r}_{i,t}^{SW} = d_i + e_i \tilde{r}_t^{FX} + f_i |\tilde{r}_t^{FX}|, \quad \tilde{r}_{i,t}^{SW} > 0.$$

Marginal effects are evaluated at the mean and median values of forex returns The mean (median) values of $\tilde{r}_t^{FX}$ and $|\tilde{r}_t^{FX}|$ in the pre-euro period are 0.00035 (0.00066) and 0.01962 (0.01670), respectively, and in the post-euro period they are 0.00025 (0.00046) and 0.01416 (0.01197), respectively.

Appendix A. Brief Currency Histories of Finland and Sweden

Finland pegged the mark (FIM) to the U.S. dollar until the early 1970s. Thereafter the Bank of Finland began to fix the external value of the FIM based on a trade-weighted currency index, which was occasionally adjusted. Currency band limits within 3% on both sides of a central rate were used. In practice, the exchange rate generally remained (or was kept) fairly steady within the band. Because Finland's inflation rate normally exceeded (albeit modestly) that of its trading partners, the FIM had to be devalued at roughly 10-year intervals by 10% to 30%. A devaluation cycle spanning two business cycles was generally accepted as a means to compensate for lost price competitiveness.

On June 7, 1991, the FIM was linked to the European Currency Unit (ECU). The ECU link was motivated by market pressures to emulate Norway (October 18, 1990) and Sweden (May 17, 1991). The move aroused intense interest despite its modest economic impact. All of the European currencies were linked via differing mechanisms but were effectively pegged to the German mark, which served to anchor the system. The ECU became the precursor of the new single European currency, the euro, which was introduced on January 1, 1999. The conversion rate between the ECU and the euro was one to one (1 ECU = 1 euro). The introduction of the euro as a single currency sought to (among other things) stabilize inflation and eliminate large exchange-rate fluctuations between European countries.

Both Sweden and Finland became members of the EU in 1995 at the same time as Austria. Finland and Austria later joined the single currency, but Sweden did not. In a September 14, 2003 referendum, Sweden resoundingly affirmed its rejection of the euro. Thus, Sweden can set its own monetary policy, including exchange rates, whereas Finland does not have the same discretionary power. An excellent historical discussion of Finland's adoption of the euro is provided by Liikanen (2006).

Appendix B. Economic and Trade Comparisons Between Finland and Sweden

Table B1. Industrial Similarity Between Finnish and Swedish Economies

Panel A. Degree of Similarity in Industrial Structure, 1993			
Finnish Production Differences		Swedish Production Differences	
Europe		*Europe*	
Sweden	0.85	Finland	0.85
Norway	0.84	Germany	0.83
Austria	0.79	Norway	0.81
Netherlands	0.78	Austria	0.80
Germany	0.76	Great Britain	0.78
Great Britain	0.76	France	0.78
France	0.75	Netherlands	0.76
Denmark	0.74	Italy	0.74
Italy	0.70	Denmark	0.71
Average Europe	77.4	Average Europe	78.4
Rest of the world		*Rest of the world*	
USA	0.77	USA	0.86
Canada	0.75	Canada	0.79
Japan	0.73	Japan	0.79
Australia	0.71	Australia	0.73
Total average	0.76	Total average	0.79

Source: Jonung and Sjöholm (1999).

Note: Jonung and Sjöholm constructed an index for Finland and Sweden based on OECD data that shows the degree of similarity or differences in their industrial structure. Their index is defined as the degree of absolute difference in countries' sector fraction of total industrial production. For Finland the index is constructed as follows:

$$\text{Production difference (country j)} = 1 - \sum_{i=1}^{n} \left| \frac{VA_{i,Finland}}{\sum_{i=1}^{n} VA_{i,Finland}} - \frac{VA_{i,j}}{\sum_{i=1}^{n} VA_{i,j}} \right| \times \frac{1}{2},$$

where $i = 1,....,n$ refers to industries, and *VA* is the value added. A high value of the index, which can have values between 0 and 1, indicates the industrial structure is similar to Finland. The production difference measure was calculated for the difference between Finland/Sweden and 12 other OECD countries. The results in the table indicate that Finland's manufacturing structure is most similar to Sweden, followed by Norway, Austria, and the Netherlands. Also, Sweden's manufacturing structure is quite similar to the USA, followed by Finland, Germany, Norway, and Austria.

Table B1, continued

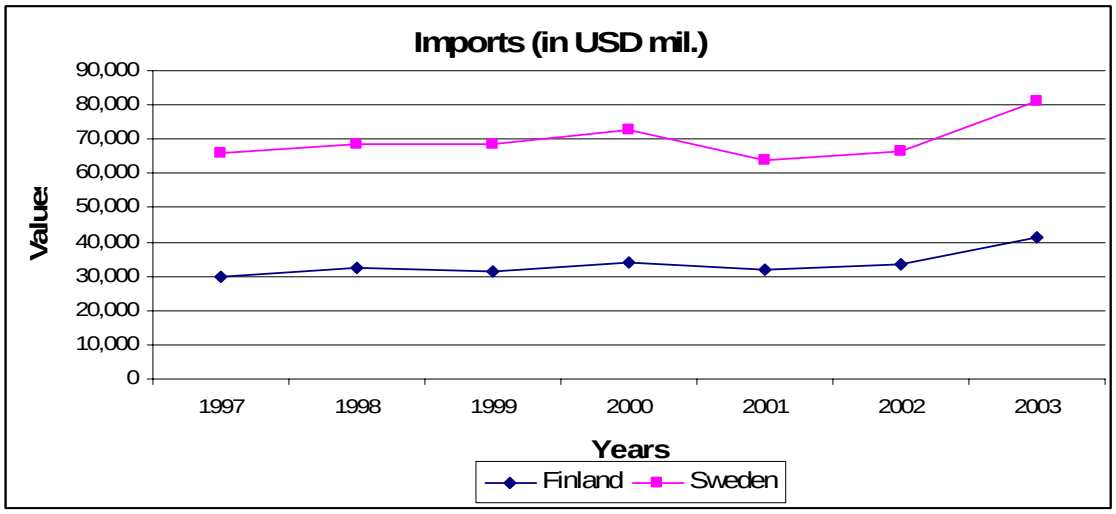
Panel B. Correlation of Annual Growth Rates of Finnish and Swedish Industrial Production with Other Countries, 1980-1997

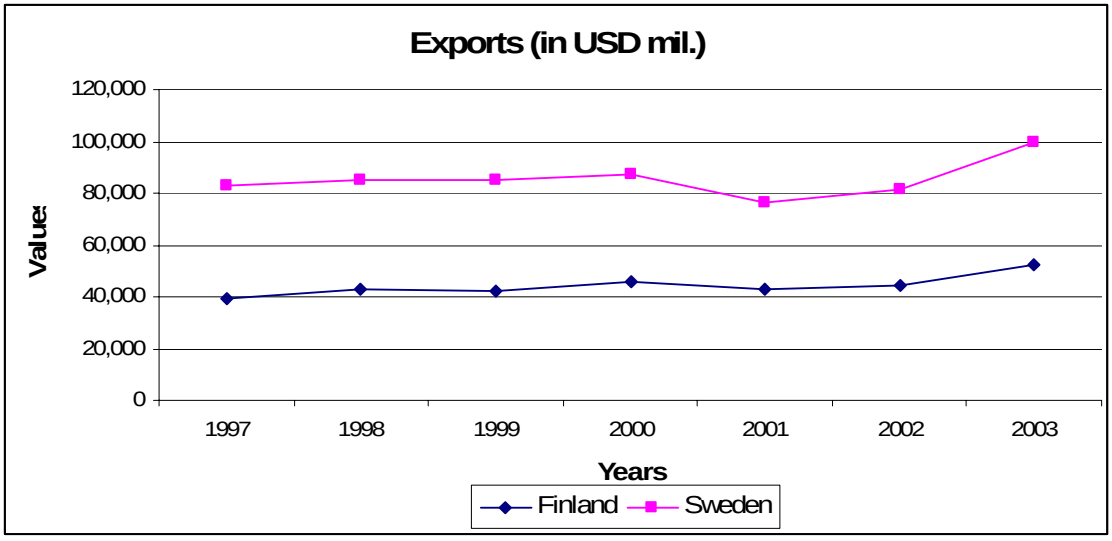
Finland		Sweden	
Europe		*Europe*	
Sweden	0.79	Finland	0.79
Great Britain	0.67	Ireland	0.75
Ireland	0.54	Spain	0.68
Italy	0.48	Italy	0.63
Spain	0.43	Netherlands	0.57
Switzerland	0.39	Austria	0.56
Greece	0.38	Belgium	0.55
Norway	0.34	Great Britain	0.53
Belgium	0.29	Switzerland	0.48
Denmark	0.27	Denmark	0.47
France	0.20	Norway	0.44
Austria	0.17	France	0.42
Netherlands	0.17	Greece	0.39
Germany	-0.06	Germany	0.32
Portugal	-0.12	Portugal	0.05
Average Europe	0.33	Average Europe	0.51
Rest of the world		*Rest of the world*	
USA	0.62	USA	0.63
Canada	0.60	Canada	0.62
Australia	0.58	Australia	0.40
New Zealand	0.51	New Zealand	0.38
Japan	0.07	Japan	0.34
Total average	0.37	Total average	0.50

Source: Jonung and Sjöholm (1999).

Note: Estimated coefficients greater than a 0.47 critical value are significant (at the 5% level). Jonung and Sjöholm (1999) define covariation in economic activity by the correlation between production growth in different countries. The table shows the correlations between Finland, Sweden, and 17 other OECD countries' annual growth rates of industrial production. Growth in Finland's industrial production is highly correlated with that of Sweden, and vice versa. Finland also has high correlation with the Great Britain, Ireland, and Italy, but low (negative) correlation with Germany and Portugal.

Figure B1. Imports, Exports, and Balance of Trade of Finnish and Swedish Economies





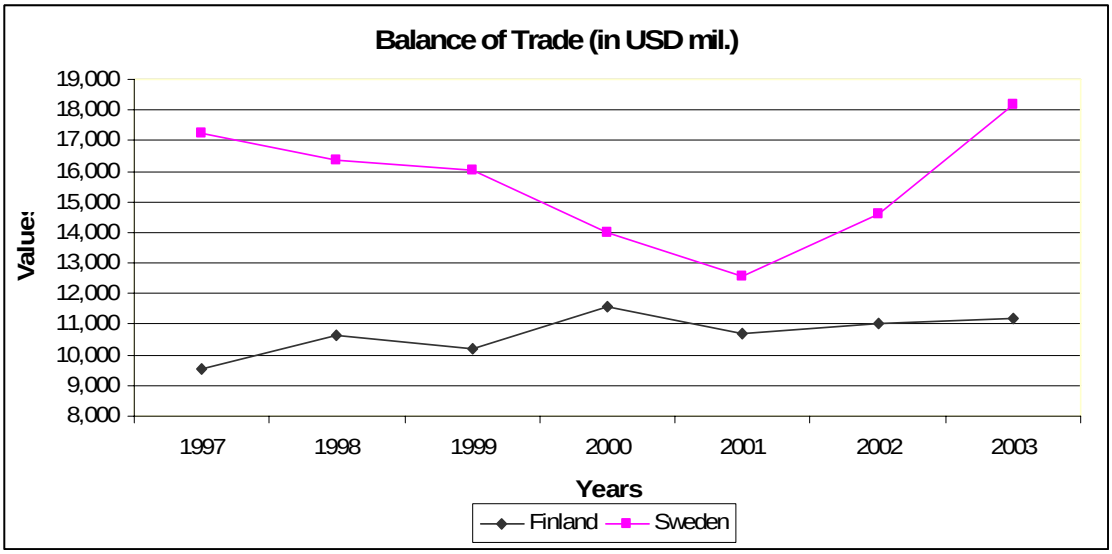
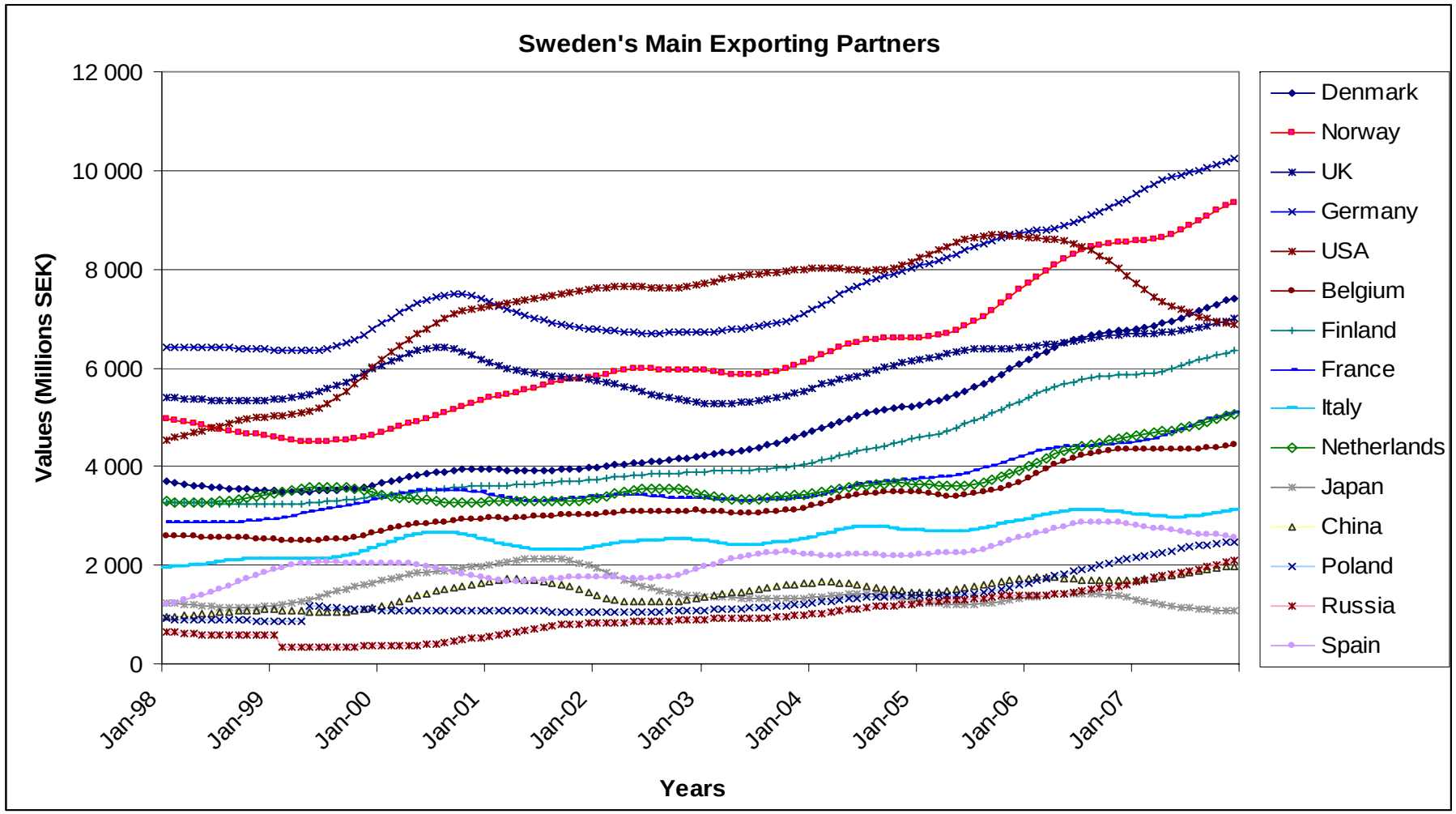


Figure B2. Overview of Swedish Exports and Import Dynamics



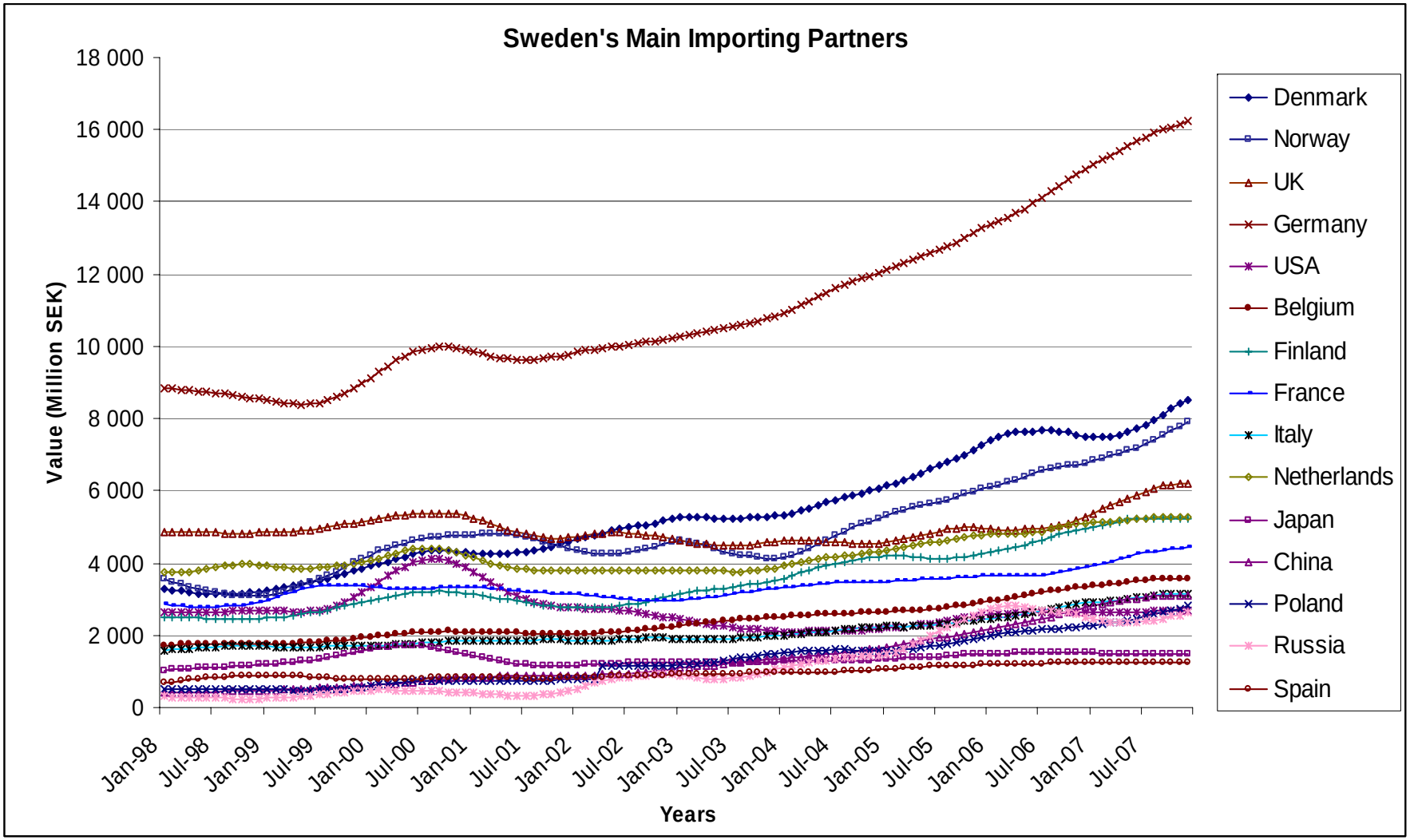
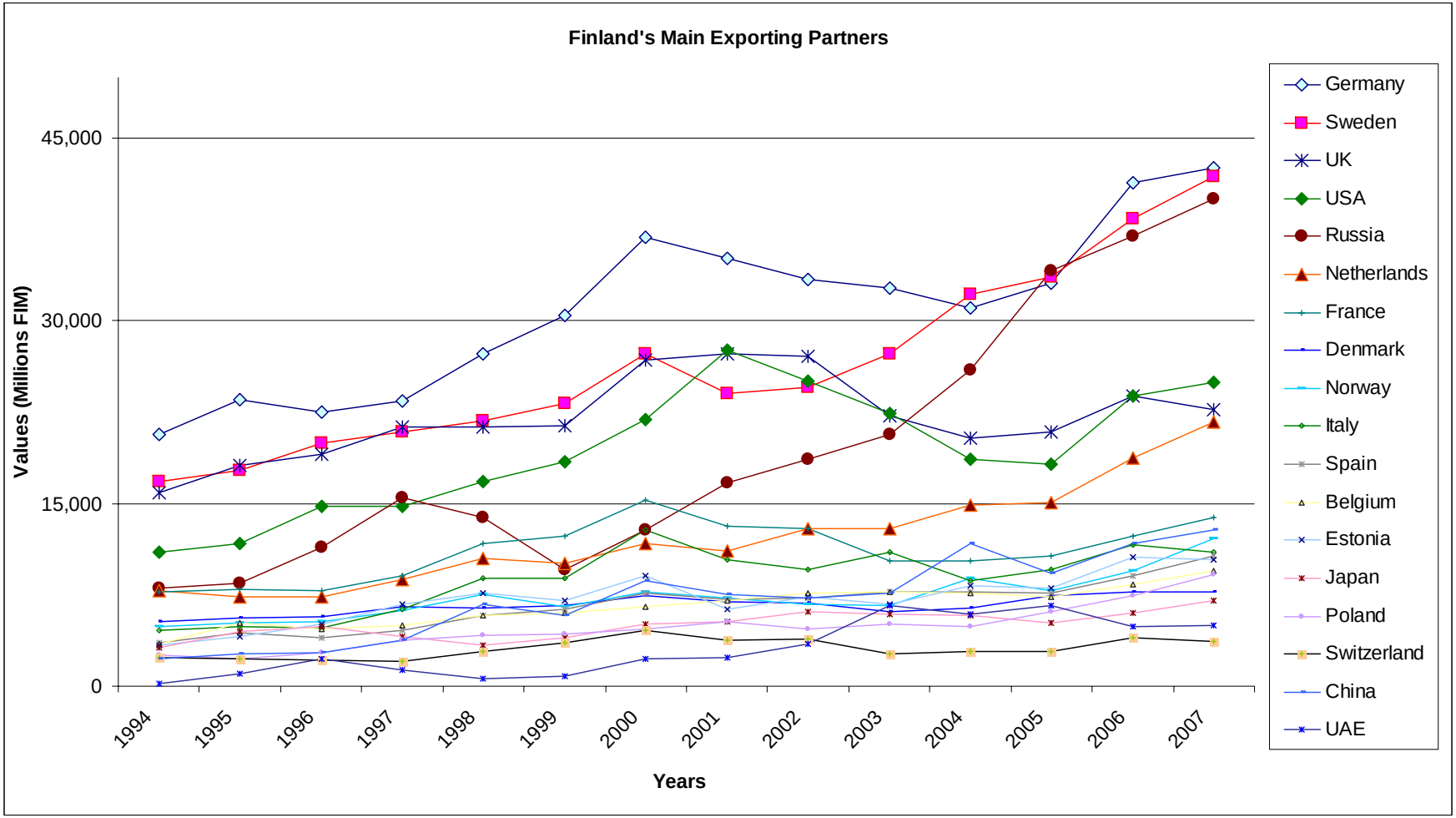
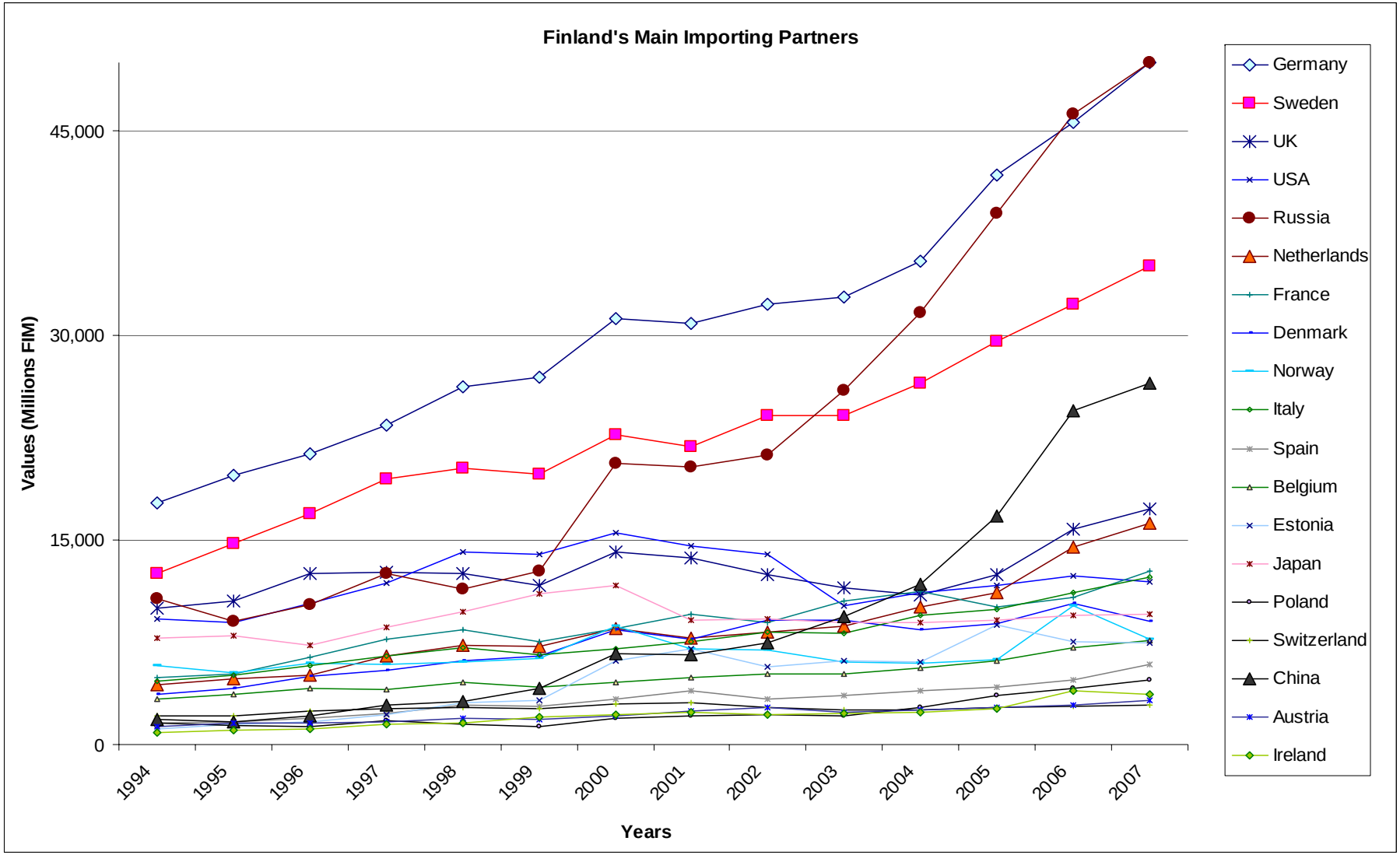

Sweden's Main Importing Partners
Value (Million SEK)
18 000
16 000
14 000
12 000
10 000
8 000
6 000
4 000
2 000
0
Jan-98
Jul-98
Jan-99
Jul-99
Jan-00
Jul-00
Jan-01
Jul-01
Jan-02
Jul-02
Jan-03
Jul-03
Jan-04
Jul-04
Jan-05
Jul-05
Jan-06
Jul-06
Jan-07
Jul-07
Years
Denmark
Norway
UK
Germany
USA
Belgium
Finland
France
Italy
Netherlands
Japan
China
Poland
Russia
Spain

Figure B3. Overview of Finnish Exports and Import Dynamics

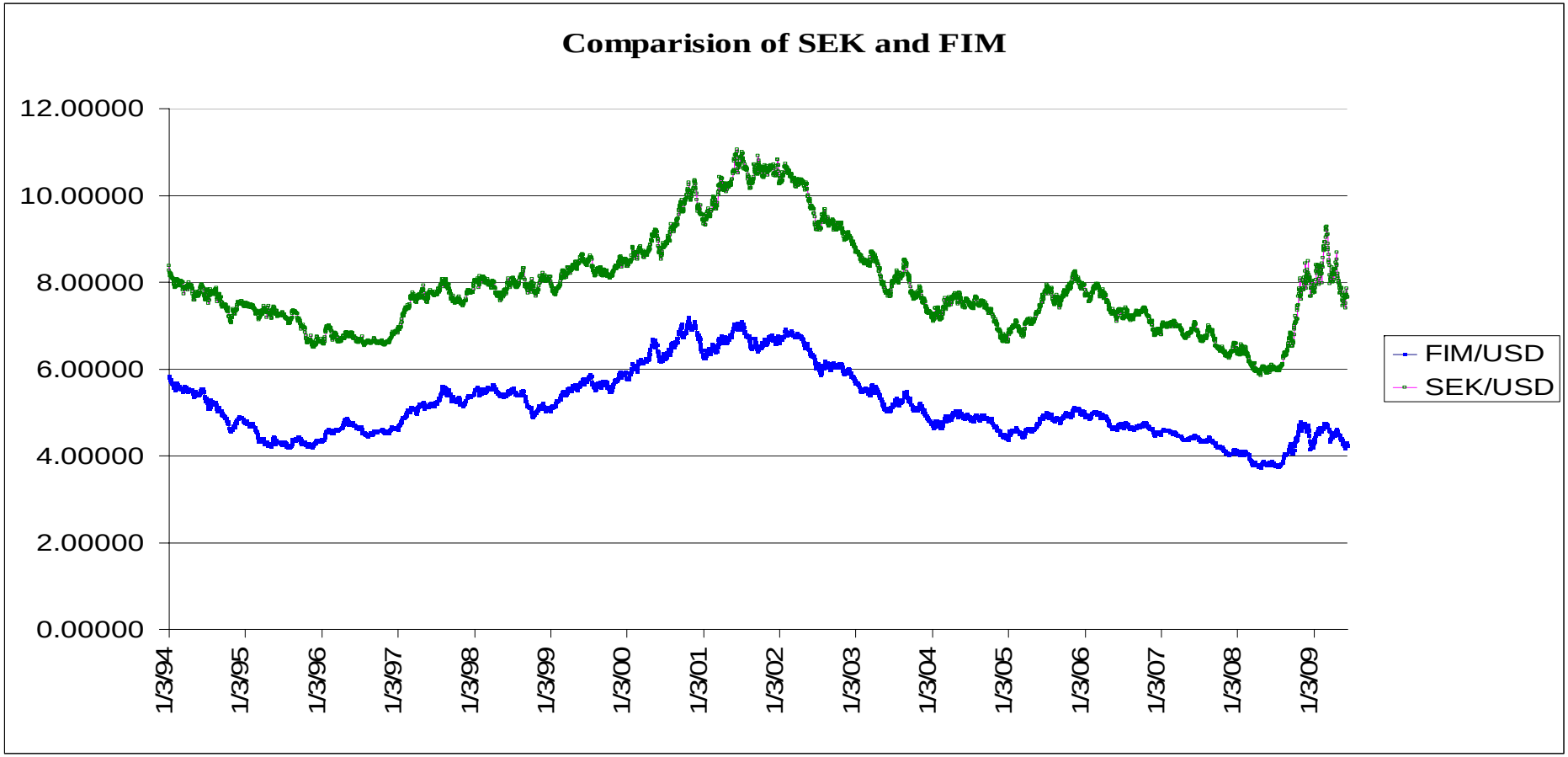



Finland's Main Importing Partners
Values (Millions FIM)
45,000
30,000
15,000
0
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
Years
Germany
Sweden
UK
USA
Russia
Netherlands
France
Denmark
Norway
Italy
Spain
Belgium
Estonia
Japan
Poland
Switzerland
China
Austria
Ireland

Appendix C. Stock Market and Exchange Rate Comparisons Between Finland and Sweden

Figure C1. Finnish and Swedish Stock Market (Log) Returns, Weekly Data

Figure C2. Finnish Mark (FIM) and Swedish Krona (SEK) Exchange Rates Relative to the U.S. Dollar, Daily Data



Appendix D. Export Comparisons by Sectors and Industries in Finland and Sweden

Table D1. Export-Based Sectors and Industry Groups in Finland

Sectors	Industries	GICS Level 1&2 Codes	(1) Domestic Oriented	(2) Export Oriented	(2.1) Exports Within Europe	(2.2) Exports Outside Europe
Materials		15				
	Materials	1510	12%	**88%**	**66%**	22%
Industrials		20	29%	**71%**	**53%**	18%
	Capital goods	2010	25%	**75%**	37.5%	37.5%
	Commercial Services & Supplies	2020	**100%**	0%	0%	0%
	Transportation	2030	25%	75%	50%	25%
Consumer Discretionary		25	**67%**	33%	0%	33%
	Automobiles & Components (*NA*)	2510				
	Consumer Durables & Apparels	2520	25%	**75%**	0%	**75%**
	Consumer Services (*NA*)	2530				
	Media	2540	**100%**	0%	0%	0%
	Retailing	2550	**100%**	0%	0%	0%
Consumer Staples		30	**73%**	27%	24%	3%
	Food & Staples Retailing	3010	**70%**	30%	25%	5%
	Food Beverage & Tobacco	3020	**75%**	25%	23%	2%
Financials		40	**91%**	9%	9%	0%
	Banks	4010	**100%**	0%	0%	0%
	Diversified Financials	4020	**100%**	0%	0%	0%
	Real Estate	4030	**100%**	0%	0%	0%
	Insurance	4040				
Information Technology		45	17%	**83%**	**50%**	33%
	Software & Service	4510	0%	**100%**	**100%**	0%
	Technology Hardware & Equipment	4520	20%	**80%**	**60%**	40%

Notes: Numbered columns have the following definitions: (1) number of firms exporting less than 50% of total sales in the world, or domestic firms; (2) number of firms exporting more than 50% of total sales in the world, or exporting firms; (2.1) number of firms having more than 50% of their sales exports (1) within Europe, excluding Russia and Finland; and (2.2) number of firms having more than 50% of export sales (1) outside Europe (including Russia). The sum (1) + (2) = total sales of the firm, and the sum (2.1) + (2.2) = (2), which indicates that exports within and outside Europe equal the total percentage of exports in (2). Most sectors are export oriented, with the exceptions of consumer discretionary and financials. Export-oriented sectors have the majority of sales within Europe. Bold face values indicate more than 50%, and *NA* denotes insufficient data.

Table D2. Export-Based Sectors and Industry Groups in Sweden

Sectors	Industries	GICS Level 1&2 Codes	(1) Domestic Oriented	(2) Export Oriented	(2.1) Exports Within Europe	(2.2) Exports Outside Europe
Materials		15	0%	**100%**	**80%**	20%
	Materials	1510				
Industrials		20	19%	**81%**	**44%**	37%
	Capital goods	2010	20%	**80%**	37%	**43%**
	Commercial Services & Supplies	2020	17%	**83%**	0%	83%
	Transportation	2030	0%	**100%**	0%	0%
Consumer Discretionary		25	**84%**	16%	10%	6%
	Automobiles & Components (*NA*)	2510		**100%**		
	Consumer Durables & Apparels	2520	0%		50%	50%
	Consumer Services (*NA*)	2530		0%		
	Media	2540	**100%**	33%	0%	0%
	Retailing	2550	**67%**		33%	0%
Consumer Staples		30	**68%**	32%	25%	7%
	Food & Staples Retailing	3010	**70%**	30%	25%	5%
	Food Beverage & Tobacco	3020	**65%**	35%	25%	10%
Financials		40	**72%**	38%	30%	8%
	Banks	4010	-	-	-	-
	Diversified Financials	4020	33%	67%	67%	0%
	Real Estate	4030	86%	14%	14%	0%
	Insurance	4040	-	-	-	-
Information Technology		45	27%	**73%**	**55%**	18%
	Software & Service	4510	40%	**60%**	30%	30%
	Technology Hardware & Equipment	4520	16%	84%	42%	42%

Notes: Numbered columns have the following definitions: (1) number of firms exporting less than 50% of total sales in the world, or domestic firms; (2) number of firms exporting more than 50% of total sales in the world, or exporting firms; (2.1) number of firms having more than 50% of their sales exports (1) within Europe, excluding Russia and Finland; and (2.2) number of firms having more than 50% of export sales (1) outside Europe (including Russia). Level-1 GICS codes refer to sectors, and level-2 sub-codes refer to industry-groups. The sum (1) + (2) = total sales of the firm, and the sum (2.1) + (2.2) = (2), which indicates that exports within and outside Europe equal the total percentage of exports in (2). Most sectors are export oriented, with the exceptions of consumer discretionary and financials. Export-oriented sectors have the majority of their sales within Europe. Bold face values indicate more than 50%, and *NA* denotes insufficient data.