The Effective Exchange Rate Index KIX - Theory and Practice

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1. INTRODUCTION[1]

In an open economy, the exchange rate of the domestic currency is an important factor affecting export and import prices. In Sweden, where exports and imports sum up to almost 90 percent of GDP, the exchange rate of the krona is of significant importance as one of the determinants of foreign demand for domestically produced goods and services and of domestic demand for imports.

Bilateral exchange rates can simultaneously change in different directions. For example, the Swedish krona can appreciate against the US dollar and at the same time depreciate against the euro. In order to assess the overall effect of these changes, a synthetic, aggregated measure is needed. This measure is called an *effective* exchange rate index. It is a weighted average of the bilateral exchange rates. The weighting scheme can be constructed in different ways, depending on what the index is supposed to measure.

The probably most widely used effective exchange rate index in Sweden is the TCW (Total Competitiveness Weights) index for the krona compiled daily by the Riksbank (the Swedish central bank). The index employs the TCW weights computed by the International Monetary Fund, based on data for 1989-91. The weights do not allow for the significant changes in the world trade patterns that have taken place in the last five to ten years[2]. Consequently, the index does not include the currencies of the up-coming developing economies of Asia and Eastern Europe.

The purpose of this paper is to present and describe in detail an alternative effective exchange rate index for the Swedish krona, called KIX. The index includes the currencies of 32 countries, namely 28 OECD countries (out of the 30 OECD member countries, the Swedish krona is for obvious reasons not included while Belgium and Luxemburg are added up together), China, Brazil, Russia, and India. The weights are updated annually and are based on trade flows data for manufactures and commodities.

The index is similar to the TCW index in its general design. It is also a competitiveness indicator, designed in the same spirit as the total competitiveness approach of the IMF. The main differences are that KIX is a chain index[3], while the TCW index is a Laspeyres (fixed-weight) index and that KIX includes more currencies. By definition of a chain index, KIX has variable weights which are updated each year and thus allow for the changes in the world trade pattern.

In the index, individual currencies are weighed with weights reflecting the patterns of world trade in goods. It would be desirable to include trade in services in this context. It was, however, deemed that problems of data availability and data quality were for the time being too large to make it worthwhile.

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[1] We are indebted to Jan Alsterlind for advice on a number of technical issues and to Juhana Vartiainen for valuable comments.

[2] An overhaul of the TCW index was recently undertaken at the IMF (cf. Bayoumi et al, 2005).To our knowledge, its results have not yet been implemented.

[3] This feature is new compared to the first version of the index, designed by Jan Alsterlind (cf. *The Swedish Economy, 2004).*

The outline of the paper is as follows. Chapter 2 surveys some theoretical foundations for real effective exchange rate indices. Chapter 3 presents the index formulae and discusses selected theoretical and practical problems connected with the index. Chapter 4 discusses the data used in the calculations and the data problems encountered. The results are presented in Chapter 5. Chapter 6 gives a brief summary.

2. SOME THEORY FOR REAL EXCHANGE RATE INDICES

Price relations between two countries are usually measured using the *real* exchange rate, which is the ratio of the foreign to the domestic price level expressed in a common currency by means of the nominal bilateral exchange rate. It is, thus, assumed that changes in exchange rates are passed on to the prices of goods and services traded internationally. A real *effective* exchange rate is defined as a weighted average of the bilateral real exchange rates. KIX can be seen as a component of the real effective exchange rate of the krona. In logs, we have:

$$\log(REER) = \sum_k w_k \log\left(\frac{P_k e_k}{P}\right) = \sum_k w_k \log\left(\frac{P_k}{P}\right) + \sum_k w_k \log(e_k) \qquad (2.1)$$

or

log(*REER*) = log(*foreign price index*) – log(*domestic price index*)
+ log(*effective nominal exchange rate index*)

where *REER* is the real effective exchange rate of the krona,
w_k is the weight attached to the competing country **k**,
P_k/P is the ratio of the price index in country **k** to the domestic price index[4],
e_k is the exchange rate index for currency **k** expressed as SEK per foreign currency unit.

The last term on the right-hand side of equation (2.1) is (the log of) an effective (nominal) exchange rate index; the next to last term is (the log of) an effective relative price index, which does not allow for exchange rate variation. As relative prices change relatively slowly in comparison to the exchange rates, the short-term variation in the nominal effective exchange rate can often be used as a proxy for the short-term changes in the real effective exchange rate. As can be seen above, both indices include the same weights.

[4] A price index compares the cost of a given basket of goods and services in two periods. In accordance with standard practice, price indices for different countries are compared even though they do not refer to the same basket.

2.1 The notion of competitiveness

Effective exchange rate indices can be defined in various ways depending on what they are supposed to measure. KIX is a competitiveness indicator in that it gives an overall measure of the changes in Sweden's competitiveness due to the variation in the bilateral exchange rates of the Swedish krona (SEK).

Appreciation *per se* is not synonymous with loss of competitiveness, although it most often is its cause. It refers to a change in the (real or nominal) exchange rate. Loss of competitiveness takes place only if the change in the exchange rate affects the demand for the country's output.

Like most – if not all – more elaborate effective exchange rate indices, KIX is based on a definition of competitiveness which represents the view of a producer competing for demand for his/her product. *Consumers are assumed to react to changes in the relative prices* of substitutable goods and services and the competitiveness of a country improves when its prices become lower in relation to those of its competitors. The importance of a competitor in each market is proportional to his/her share of this market.

Thus, competitiveness is here defined purely in terms of demand for a country's output (or exports), no supply element being included, as prices are assumed to be given. The theoretical basis for this approach was formulated by the IMF (see McGuirk, 1986) and is summarised below.

2.2 The IMF method for measuring competitiveness in trade in manufactures

A real effective exchange rate is primarily characterised by the weights employed. The IMF defined a *change in competitiveness as a change in the relative price that leads to a change in demand* (see McGuirk, 1986). Total competitiveness weights were subsequently derived from a complete system of demand equations as a demand-side concept, giving the change in demand implied by a given change in relative prices. As such, the weights implied "symmetric" effects, meaning that a 10 percent increase in the price level of one country would have the same effect (on real demand) as a ten percent decline in the price levels of all other countries (see McGuirk, 1986). The analysis in this and the subsequent two sections refers to manufactures only and so do the terms exports, imports, output, demand and price.

The demand system employed was derived by Armington (1969) under the assumption that goods produced in one country are imperfect substitutes for the same goods produced in other countries (contradicting the law of one price). The same *good* (e.g. a motorbike) produced in two countries is considered as two country-specific *products* (e.g. a French and a Swedish motorbike). The demand for a product in a specific market is derived in two steps, assuming a separable utility function. In the first step, the overall demand for the good in question is determined upon maximisation of a utility function. In the second step, demand for a specific product (i.e. the good produced by a country) is derived by minimising the cost of purchasing the demanded quantity of this good, using a CES utility index (see McGuirk, 1986). The form of the utility index implies that the elasticity of substitution between any two producers of the same good in a market is the same. The derivation leads to a standard demand equation, explaining the demand for a single product in a specific market by the total expenditure on the good in question in the same market and all the product prices referring to the good in question.

Armington's demand equations, referring to the demand for a single product in a specific market, are subsequently aggregated upon a number of simplifying assumptions. Aggregate price indices[5] for the countries involved are used instead of product prices (e.g. prices of manufactures are used instead of prices of motorbikes). Furthermore, one and the same elasticity of substitution is postulated for any pair of suppliers (and all the products) in any market. It is also postulated that the total demand (expenditure) in each market does not change, which is reasonable when measuring changes in competitiveness due to relative price variation.

Taking the first difference of the demand equation and assuming that there is only one good, we finally obtain the result that the demand for the export of country **j** to the geographical market **k** varies with the relation of prices in country **j** to those in each competitor country exporting to **k**:

$$\Delta \log\left(D_j^k\right) = \sigma \sum_{l \neq j} s_l^k \Delta \log\left(\frac{P_l^k}{P_j^k}\right) \tag{2.2}$$

where, D_j^k is the demand for exports from country **j** to country (market) **k**, P_l^k / P_j^k is the relative price (in common currency[6]) of the products of countries **l** and **j** in market **k**, s_l^k is country **l** product's market share in market **k** (i.e. in **k**'s total demand), and σ is the elasticity of substitution (the same for all country pairs and markets). The summation goes over all the competitors of country **j** (including **k**) in market **k**.

It is here postulated that country **j** competes with country **k** in country **k**'s own market, i.e. that the market shares s_l^k take into account also the part of demand in market **k** that is satisfied by the domestic output of country **k**:

$$\Delta \log\left(D_j^k\right) = \sigma \sum_{l \neq j} s_l^k \Delta \log\left(\frac{P_l^k}{P_j^k}\right) = \sigma \sum_{l \neq j,k} s_l^k \Delta \log\left(\frac{P_l^k}{P_j^k}\right) + \sigma s_k^k \Delta \log\left(\frac{P_k^k}{P_j^k}\right) \tag{2.2'}$$

[5] Cf. footnote 4.

[6] For the sake of notational simplicity the exchange rate symbol will be omitted in this section.

where s_k^k is the share of country **k**'s domestic output in its own market (i.e. in total demand) and P_k^k is the price of country **k**'s domestic output in its own (domestic) market.

Equation (2.2) is further aggregated over all markets to obtain the change in total demand for the output of country **j**. This is done by weighting each market, including the domestic market in country **j**, by its share in country **j**'s total sales (output):

$$\Delta \log(D_j) = \sigma \sum_k w_j^k \sum_{l \neq j} s_l^k \Delta \log\left(\frac{P_l^k}{P_j^k}\right), \tag{2.3}$$

where w_j^k is the share of country (market) **k** in total sales of country **j**. The inclusion of the domestic market in the first summation in equation (2.3) implies that the producers in country **j** are postulated to compete with imports in their domestic market.

From equation (2.3), the total competitiveness weight attached to country **l** as a competitor of country **j**, representing the overall importance of country **l** for the price competitiveness of country **j**, TW_{jl}, is obtained as:

$$TW_{jl} = \sum_k w_j^k s_l^k \tag{2.4}$$

The constant term σ was eliminated in (2.4) since it does not affect the relations between the weights *TW*. In the weight TW_{jl}, the shares of country **l** in each market (s_l^k) are weighted by the market's share in country **j**'s output (sales), w_l^k. In other words, the total competitiveness weight depends on country **l**'s competitive position in each market (its market share in **k**) and the market's importance for country **j** (**k**'s share of **j**'s total sales).

The weight TW_{jl} can further be decomposed into two terms, the first representing the competitive importance of country **l** in all foreign markets (other than **j**) and the second one representing the competitive power of country **l** in **j**'s domestic market.

$$TW_{jl} = \sum_{k \neq j} w_j^k s_l^k + w_j^j s_l^j \tag{2.5}$$

The term w_j^j is the share of domestic production for domestic market in the total output of **j**. Equation (2.5) can be further rewritten as a convex combination of an export weight (XW_{jl}) and an import weight (MW_{jl}):

$$TW_{jl} = \lambda_j^X XW_{jl} + \lambda_j^M MW_{jl} \qquad (2.6)$$

where

$$XW_{jl} = \sum_{k \neq j} \frac{w_j^k}{(1-w_j^j)} s_l^k \ ,$$

$$MW_{jl} = s_l^j \ ,$$

and

$$\lambda_j^X = 1 - w_j^j \ ,$$

$$\lambda_j^M = w_j^j \ .$$

The export weight is a weighted sum of country **l**'s market shares in all the markets except **j**, the weights being equal to **j**'s export shares (since w_j^j is the share of domestic production for domestic market in **j**, $w_j^k/(1-w_j^j)$ is the share of exports to **k** in total exports of **j**). The import weight is country **l**'s market share in market **j.** Thus, XW_{jl} measures **l**'s competitiveness in **j**'s export markets, while MW_{jl} measures **l**'s competitiveness in **j**'s import market. The export and import weights are in turn weighted by the share of exports in **j**'s total output $\left(\lambda_j^X\right)$ and the share of domestic output for domestic market in **j**'s total output $\left(\lambda_j^M = 1 - \lambda_j^X\right)$**,** respectively.

The export weight (XW_{jl}) can in turn be expressed as a convex combination of two terms, the first representing the competition between the home country **j**'s exports and country **l**'s production in **l**'s own market (the *bilateral* export weight, BXW_{jl}) and the second representing the competition between **j** and **l** in all other foreign markets, i.e. all markets except **j** and **l** (the *third-market* export term, TXW_{jl}). From equation (2.6):

$$XW_{jl} = \sum_{k\neq j} [w_j^k/(1-w_j^j)]\, s_l^k = [w_j^l/(1-w_j^j)]\, s_l^l + \sum_{k\neq j,l} \{[w_j^k/(1-w_j^j)]\, s_l^k\} =$$

$$s_l^l\, [w_j^l/(1-w_j^j)] + (1-s_l^l) \sum_{k\neq j,l} \{[w_j^k/(1-w_j^j)]\, [s_l^k/(1-s_k^k)]\, [(1-s_k^k)]/(1-s_l^l)]\} \qquad (2.6')$$

or $XW_{jl} = \mu_j^X \, BXW_{jl} + (1- \mu_j^X) \, TXW_{jl}$.

The bilateral export weight, BXW_{jl}, is country **l**'s share in **j**'s exports. The third-country export weight, TXW_{jl}, is a weighted average of third countries' import shares in market **k** (the division by $1-s_k^k$ transforms market shares s_l^k into import shares) weighted by the market's share in **j**'s exports and rescaled by the factor $(1-s_k^k)/(1-s_l^l)$. The latter can be seen as a measure comparing the openness of the two economies, **k** and **l**. The weight μ_j^X is the share of domestic output for domestic market in **l**'s total demand (s_l^l).

The importance of this decomposition lies in exposing the role of the share of domestic output for domestic market, which for some countries is difficult to assess. In computing its CPI-based real effective exchange rates, the IMF assumes arbitrarily that these shares in all countries are equal to 0.5 (cf. Bayoumi et al, 2005). The factor $(1-s_k^k)/(1-s_l^l)$ in (6') above is then equal to 1, the weight μ_j^X to 0.5 and all computations can be performed on trade flow data (since export and import shares are needed rather than shares in total demand and output). In equation (2.6), the weights λ_j^X and λ_j^M are arbitrarily replaced by the shares of exports and imports in **j**'s total foreign trade (exports + imports) and MW_{jl} are defined as import shares.

2.3 Normalising the IMF weights

It can be seen from equation (2.3), that in each market **k**, the market shares included, s_l^k, do not sum to unity since the home country **j** is excluded from the summation. In fact,

$$\sum_{l \neq j} s_l^k = 1 - s_j^k \; . \qquad (2.7)$$

Thus, the sum of the total competitiveness weights, TW_{jl}, does not sum to unity either. As can be seen from equation (2.4):

$$\sum_{l \neq j} TW_{jl} = \sum_k w_j^k \left(1 - s_j^k\right). \qquad (2.8)$$

The IMF thus normalises the weights to sum to unity (cf. Zanello, A. and D. Desruelle, 1997), defining the new total competitiveness weights, W_{jl}, as

$$W_{jl} = \frac{TW_{jl}}{\sum_l TW_{jl}} = \frac{\sum_k w_j^k s_l^k}{\sum_k w_j^k (1 - s_j^k)} \, . \qquad (2.9)$$

A normalisation implies, however, a deviation from the original approach, since the information contained in the varying sum of weights in the second summation in equation (2.3) is lost.

It is important that the weights sum to unity, if TW_{jl} are seen as *weights* in a foreign price index, implicitly defined in equation (2.3), rather than as coefficients in a demand equation. The IMF method applies the *same* normalisation factor to all the markets. This factor can be interpreted as a weighted average of the market-specific factors $(1-s_j^k)$ (cf. equation (2.8)). A more natural approach appears to be to normalise the market shares, s_l^k, in each market **k** separately (see Lepron K. and P. Schreyer, 1998), using the market-specific factor $(1-s_j^k)$. This gives the normalised share of country **l** in market **k**, S_l^k:

$$S_l^k = \frac{s_l^k}{(1-s_j^k)} . \tag{2.10}$$

The total competitiveness weight, TW_{jl}, is then transformed into:

$$tw_{jl} = \sum_k w_j^k \frac{s_l^k}{(1-s_j^k)} , \tag{2.11}$$

and the component export and import weights get the form:

$$xw_{jl} = \sum_{k \neq j} \frac{w_j^k}{(1-w_j^j)} \frac{s_l^k}{(1-s_j^k)} , \tag{2.12}$$

$$mw_{jl} = \frac{s_l^j}{(1-s_j^j)} . \tag{2.12'}$$

The import weight, mw_{jl}, is **l**'s share in **j**'s imports (i.e. a pure import share), s_j^j being the share of domestic production in the total demand in **j**. Similarly, the first fraction in the export weight is **k**'s share in **j**'s exports, i.e. a pure export share (cf. equation (2.6)).

2.4 An alternative approach to measuring competitiveness in trade in manufactures

The main appeal of the IMF approach to real exchange rates lies in its demonstration of the reasoning behind the measurement of price competitiveness. The model itself is based on a number of clearly unrealistic assumptions and is therefore as arbitrary as any other method in use.

An alternative approach is to define a *change in competitiveness as a change in the relative price between the home country and its competitors* and simply to postulate the form of the real exchange rate index. In practice, this index will necessarily be in the spirit of the IMF approach, since there will still be an *implicit* assumption that changes in the relative price give rise to changes in demand.

A typical such index allows for the competitiveness in the export market and in the import market separately. These two competitiveness indices are subsequently weighted together, analogously to equation (2.6). In both the export and the import competitiveness indices, the home country's price is defined as the domestic price, which is assumed to be equal to the export price. The export competitiveness and import competitiveness weights depend on the way the competitor prices are constructed.

In the home country's import market, the competitor price is defined as the home country's import price. This import price is defined as a weighted average of the competitors' export prices, with weights being equal to the competitor countries' shares in the home country's imports. The import weights obtained in this way are, in fact, identical to the import weights mw_{jl} defined in equation (2.12').

The competitor price in the home country's aggregate export market is defined in two steps. First, a market price is constructed for each market that the home country exports to. This price is equal to the weighted average of the export prices of the countries exporting to the market in question and the price of the domestic output in this market. The weights are equal to each country's share in this market (including domestic output for domestic market). The home country is excluded, since it does not compete with itself. In the second step, the market prices for all export markets computed in the first step are weighted together using the home country's export shares as weights[7]. The export weights obtained as a result of these two steps are identical to xw_{jl}, defined in equation (2.12).

As for weighting together the export and the import weights, this is done using the shares of exports and imports in total foreign trade (defined as the sum of exports and imports). (Cf. Lafrance and St-Amant, 1999 and Hargreaves and White, 1999). In this way, *the real exchange rate index reflects the importance of price changes for the home country's foreign trade*. The IMF approach, which postulates an explicit link between prices and output, attempts to measure the importance of price changes for the home country's output. This is achieved by weighting each market with its importance for total output (cf. equation (2.3)). Consequently, the import market is weighted by the share of domestic production for domestic market in total domestic output. The approach suggested here avoids the implicit – and not obvious – assumption that domestic output in the short term is fully substitutable by imports.

KIX is constructed in accordance with the approach suggested in this section.

[7] See section 3.7 for the intuition behind this approach.

2.5 Measuring competitiveness in trade in commodities

In contrast to manufactures, commodities are here assumed to be one homogeneous good with one world market and one world price. The Armington model is thus not applicable.

As before, competition is seen from the point of view of the producer. The basic model is analogous to equation (2.3), explaining changes in demand for commodities with the bilateral real exchange rates, P_l^k / P_j^k , defined in equation (2.2). Consumer countries are assumed to adjust their demand for commodities in relation to their real exchange rate. In a real exchange rate index, the weights discussed here are applied to general price indices, e.g. the CPI, and not to commodity prices. A country that experiences a real depreciation becomes relatively poorer (and also faces a higher commodity price in its own currency) and thus demands less commodities than before. For a given supply of commodities, their price in the world market is assumed to adjust to the variation in demand, leaving always the market in equilibrium. A loss in competitiveness for the home country takes thus the form of a loss of revenue from a given volume of exports.

In contrast to the case of manufactures, a supply element is also introduced here and the behaviour of the competing commodity producers is allowed for. A commodity producing country that experiences a real depreciation faces a higher commodity price in its own currency and thus starts producing more commodities, in accordance with the standard supply function. This results in a lower market equilibrium commodity price. Thus, a real depreciation experienced by both commodity consumers and the competing commodity producers results in a loss of competitiveness by the home country in the form of lower revenue from a given export volume.

The influence of a country on the world price of commodities depends on its share in the world market for commodities. A change of demand or supply from a country having a large share of the market affects the price more than when a country having a small share of the market is involved. Thus, the commodity weights employed are calculated as each competitor country's share of total world trade in commodities. The importance of country **l** for the home country **j**'s trade in commodities depends, consequently, on **l**'s share in world trade (exports + imports) in commodities (see Zanello and Desruelle, 1997):

$$cw_{jl} = \frac{XC_l + MC_l}{\sum_{i \neq j} (XC_i + MC_i)} \tag{2.13}$$

where cw_{jl} is the commodity weight of country **l** competing with the home country **j**, XC_i is country **i**'s exports of commodities and MC_i is country **i**'s import of commodities.

By analogy to the discussion in section 2.3 (cf. equation (2.10)), the weights are normalised to sum up to 1 for country *j*. This is obtained by eliminating country *j* from the sum in the denominator ($i \neq j$). This normalised formula constitutes the commodity weight in KIX.

Analogously to the approach presented in the previous section, the commodity weight is in turn weighted by the share of commodities in the home country's total foreign trade. In an effective exchange rate index allowing for patterns in trade in manufactures and commodities (*i.e.* goods), this weight is equal to the share of commodities in total foreign trade in goods.

3 THE STRUCTURE OF KIX

KIX is an effective nominal exchange rate index for the Swedish krona. It is a chain index of Laspeyres type. The weights in KIX reflect world trade patterns and are designed to measure by how much changes in bilateral real exchange rates affect the competitiveness of the Swedish foreign trade in goods. Trade in services is not allowed for due to data problems. The structure of KIX is explained in detail below.

3.1 The index formula.

KIX is an effective exchange rate index for the Swedish krona. On an annual basis, the index formula can be written as:

$$KIX_t = \prod_{l}^{N_t} \left(\frac{e_{l,t}}{e_{l,t-2}} \right)^{W_{l,t-2}} * KIX_{t-2} \,. \qquad (3.1)$$

In equation (3.1), KIX_t is the value of the index for period **t** as compared to period 1. $e_{l,t}$ is the bilateral exchange rate of SEK into currency **l** at period **t,** expressed as the amount of Swedish kronor per unit of currency **l**. An increase in e_l, thus, implies a depreciation of the krona against currency **l**. $W_{l,t}$ is a time-varying weight of country **l,** where $0 < W_{l,t} < 1$. The weights of the N_t competitor countries sum to one. The time index attached to the number of competitors, N_t, indicates the possibility of varying the number of currencies included in the index over time.

On an annual basis, the index is thus a chain index. Each year, new weights $W_{l,t-2}$ are employed and a Laspeyres type index is computed to obtain the index value in year **t** with the year **t-2** as the base year. The value of the chain index with year 1 as base year is obtained upon multiplication of the above Laspeyres index by the previous value of the chain index.

A complication arises when the index is to be computed on a monthly basis, since weights are generally based on annual data and can only be changed once a year. During the 11 months between two weight changes, the Laspeyres index above is computed with constant weights and a constant base period. On a monthly basis, the index formula takes the form[8]:

$$KIX_t = \prod_{l}^{N} \left(\frac{e_{l,t}}{e_{l,k-24}} \right)^{w_{l,k-24}} * KIX_{k-24} \; , \qquad (3.2)$$

where **k** is the month of the most recent change of weights and **k-12** is the month of the previous change. By analogy to the chain index described in equation (3.1), the monthly index in any month **t** of year **m** is computed using weights referring to year **m-2** and the month of the *pre-previous* weight change as the base period.

Assuming a weight change takes place in January each year, the value of KIX for e.g. May 1995 is computed as

$$KIX_{May'95} = \prod_{l}^{N} \left(\frac{e_{l,May'95}}{e_{l,Jan'93}} \right)^{w_{l,'93}} * KIX_{Jan'93} \qquad (3.2')$$

The weights $W_{l,'93}$ in the example above are the latest annual weights introduced in January 1995 and referring to 1993.

Typically, the lagged variables on the right-hand side of equations (3.1) and (3.2) are all lagged by one year rather than two years. The two-year lag was introduced because of the delays in publication of the data needed to compute the latest weights. This is discussed in more detail in Section 3.6 below.

3.2 To chain or not to chain[9]

The weights in KIX are updated annually. The reason for using time-varying weights is that trade patterns change over time (cf. Chart 3.1). A fixed-weight index does not capture this effect and its weights become gradually obsolete[10]. For example, the KIX weight for China was 0.56 in 1991, and it was six times larger 12 years later. Using fixed weights would lead either to an overestimation of the importance of China in the early 1990-ies (in case of a large weight) or to an underestimation of the importance of China in recent years (in case of a small weight).

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[8] Cf. Ellis (2001).

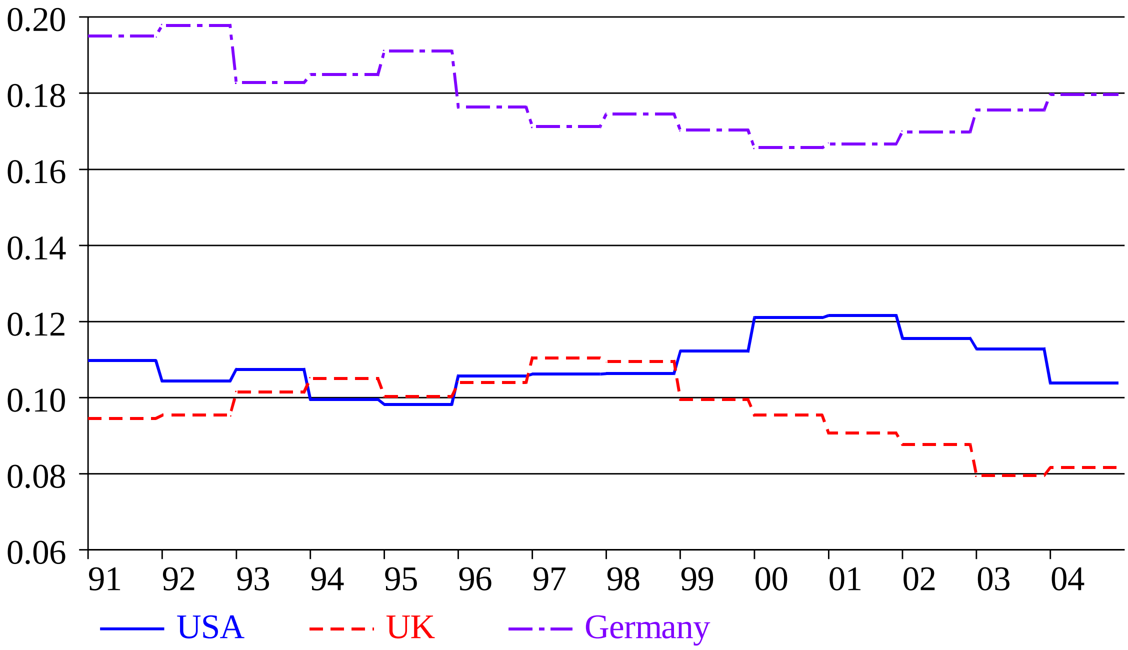
[9] Cf. Coughlin, Pollard, Betts (1998).

[10] Note that the problem does not depend on the choice of the period that the weights refer to as long as they are constant. For example, more recent weights are less appropriate for earlier years.

The most used index formulae are the Laspeyers and Paasche indices. Both indices have a fixed base period. The Laspeyres index involves fixed weights and the development of the index depends crucially on the choice of weights. A change in weights can change the history as described by the index. For example, the value of a Laspeyres version of KIX, using fixed 1992 weights and November 1992 as the base period, was in January 2006 120.7. The corresponding value calculated using 2003 weights was 116.6.

The problem of fixed weights is overcome in the Paasche index, which involves variable weights. The Paasche index depends, however, on the choice of the base period for the index. The history described by the index can change when a different base period is chosen. For example, the Swedish krona depreciated by 30.9 percent from November 1992 to September 2001, if November 1992 is used as the base period for KIX (in its Paasche form and including 28 countries). The corresponding value is 34.4.percent, if January 2004 is taken as the base period.

Chart 3.1 KIX weights – time series for selected countries

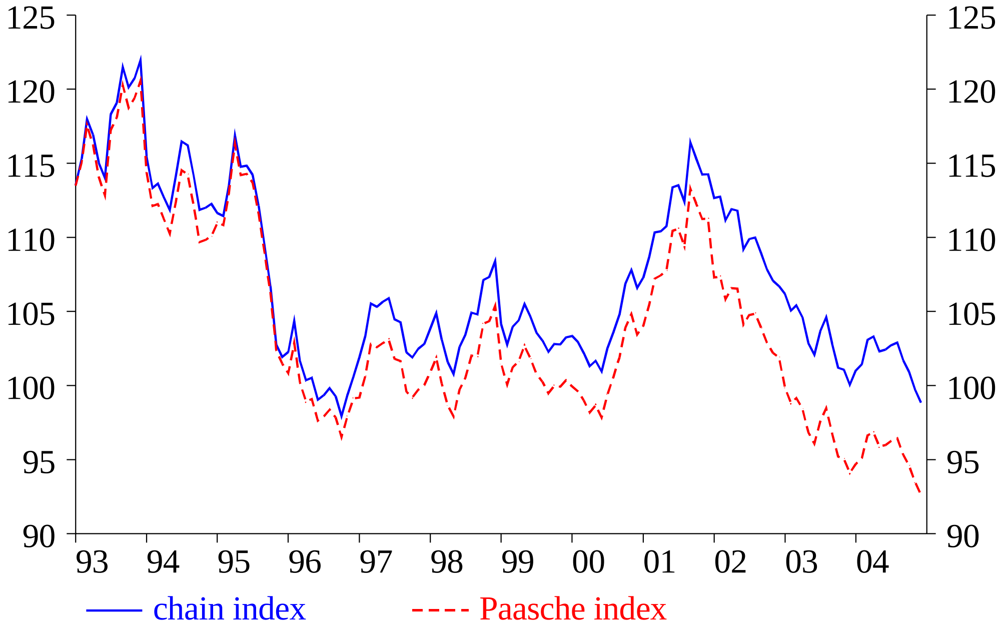


Thus, the history of a Laspeyers index changes if weights are changed, while the history of a Paasche index changes if the base period is changed. These problems are eliminated in the chain index which links together a series of Laspeyres (or Paasche) indices in which the weights and base period change every period.

An important advantage of the chain index is that new weights never result in a modified index value when the component exchange rates are unchanged (cf. Alsterlind (2006)). In traditional indices, whenever the weights are changed it is not clear to what extent the new index value is due to the change in weights and to what extent to changes in the bilateral exchange rates.

Based on the above arguments, KIX - that in its first version was a Paasche index – is now defined as a chain index (cf. Chart 3.2). The level of the Paasche index gives the effective exchange rate as compared to its level in November 1992, which is the base period.[11] In principle, the index should only be used for comparison with this period. In practice, however, effective exchange rate indices – whatever their definition - are used to describe the development of the effective exchange rate over time in comparison to many different periods.

Chart 3.2 KIX in the form of Paasche index and of chain index, 1992m11 = 100.



The level of the chain index, (multiplicatively) cumulates the assessments of changes in the effective exchange rate in *consecutive periods*. Thus, in principle, it should be employed for comparisons of periods **t** and **t-1**. Since the chain index gives a correct picture of period-to-period changes, it is better suited than the Paasche index for the many practical uses such an index is subject to. In the case of trending weights, this index form is less useful for comparison of two periods which are distant in time.

3.3 The weights in KIX.

The weights in KIX involve the total competitiveness weights for manufactures, tw_{jl}, and commodity weights, cw_{jl}, discussed in section 2.2 above. The weight for currency **l** in equation (3.1) is defined as

[11] More exactly, the 18th November 1992.

$$W_{l,t}=\frac{XC_t^s+MC_t^s}{X_t^s+M_t^s}cw_{l,t}+\frac{XM_t^s}{X_t^s+M_t^s}xw_{l,t}+\frac{MM_t^s}{X_t^s+M_t^s}mw_{l,t}, \quad (3.3)$$

where XC^s, MC^s are, respectively, Swedish exports and imports of commodities, XM^s, MM^s are, respectively, Swedish exports and imports of manufactures, and

$$X^s=XC^S+XM^S,\quad M^S=MC^S+MM^S \quad (3.4)$$

$$cw_{l,t}=\frac{XC_{l,t}+MC_{l,t}}{\sum_i (XC_{i,t}+MC_{i,t})}, \quad (3.5)$$

$$mw_{l,t}=S_{l,t}, \quad (3.6)$$

$$xw_{l,t}=\sum_k w_t^k \frac{s_{l,t}^k}{(1-s_t^k)}. \quad (3.7)$$

$XC_{l,t}$ and $MC_{l,t}$ are country **l**'s exports and imports, respectively, of commodities in period **t** (the summation in equation (3.5) excluding Sweden), $S_{l,t}$ is country **l**'s share in Swedish imports of manufactures in period **t**, w_t^k is the share of Swedish exports to country **k** in total Swedish exports of manufactures in period **t**, $s_{l,t}^k$ and s_t^k are the shares of imports from country **l** and Sweden, respectively, in country **k**'s total demand for manufactures in period **t**. Thus, the ratio $s_{l,t}^k/(1-s_t^k)$ is the share of imports from country **l** in the sum of country **k**'s domestic output for domestic market and imports of manufactures *excluding imports from Sweden* in period **t**. The summation in (3.5) and (3.7) covers all the competitor countries included in the index.

The weights $W_{l,t}$ are calculated each year using the latest data on bilateral trade flows and domestic output sold on the domestic market. While data on trade in goods are readily available, data on trade in services are not. Consequently, KIX weights refer to trade in goods only, as is the case with most existing effective exchange rate indices. A notable exception here is the new version of the Bank of England effective exchange rate index for the pound sterling (ERI), which includes trade in services. However, ERI-weights for services are only based on bilateral trade with the UK. Third market effects cannot be calculated since many countries do not publish bilateral service trade data (cf. Lynch and Whitaker (2004)). The proposal for a new definition of the IMF's TCW index includes also trade in tourism (see Bayoumi, Lee and Jayanthi, 2005).

3.4 Should the weights refer to countries or currencies?

An effective nominal exchange rate index relates by definition to foreign currencies. However, if the nominal exchange rate index is conceived as part of an effective *real* exchange rate index, as shown in equation (2.1) above, the weights of the index relate to foreign prices. International trade in manufactures is usually analysed in terms of countries competing through prices. Price competition can take place even between countries whose currencies are irreversibly pegged to each other. Thus, KIX weights refer to countries rather than currencies. Members of the euro zone, being independent countries, are therefore given separate weights.

3.5 Country coverage

KIX includes currently 33 countries. There are, however, only 32 weights as Belgium and Luxemburg are treated as one entity in order to avoid the extremely small numbers for Luxemburg alone. The index comprises all the OECD countries[12] (except Sweden), China, Brazil, India and Russia[13]. The countries included allowed for almost 89 percent of Swedish exports of manufactures and more than 93 percent of Swedish imports of manufactures in 2004. While some of the countries included in KIX have very small shares in exports from and imports to Sweden in 2004 (cf. Table 3.1), the countries excluded all have export and import shares below 1 percent, with the exception of Hong Kong whose import share is 1.22 percent.

All OECD countries were included for completeness of analysis, given the fact that trade-flow data for these countries were readily available. The four emerging economies were included because of their growing importance for the world trade. China and Russia are already relatively important Swedish export markets. Russia and Brazil are also important producers of commodities (see Panel (vi) of Table 3.2).

The number of markets included in the export weights for manufactures, $xw_{l,t}$ (cf. equation (3.7)), could, in principle, exceed the number of countries included in the index (N_t in equation (3.1)). A case in point is here the narrow index for the euro compiled by the ECB, which includes 12 currencies and 38 markets for export competition (cf. Buldorini et. al. (2002)). In the case of KIX, however, the countries included allow for almost 90 percent of Swedish exports, there was therefore no greater need to include additional markets.

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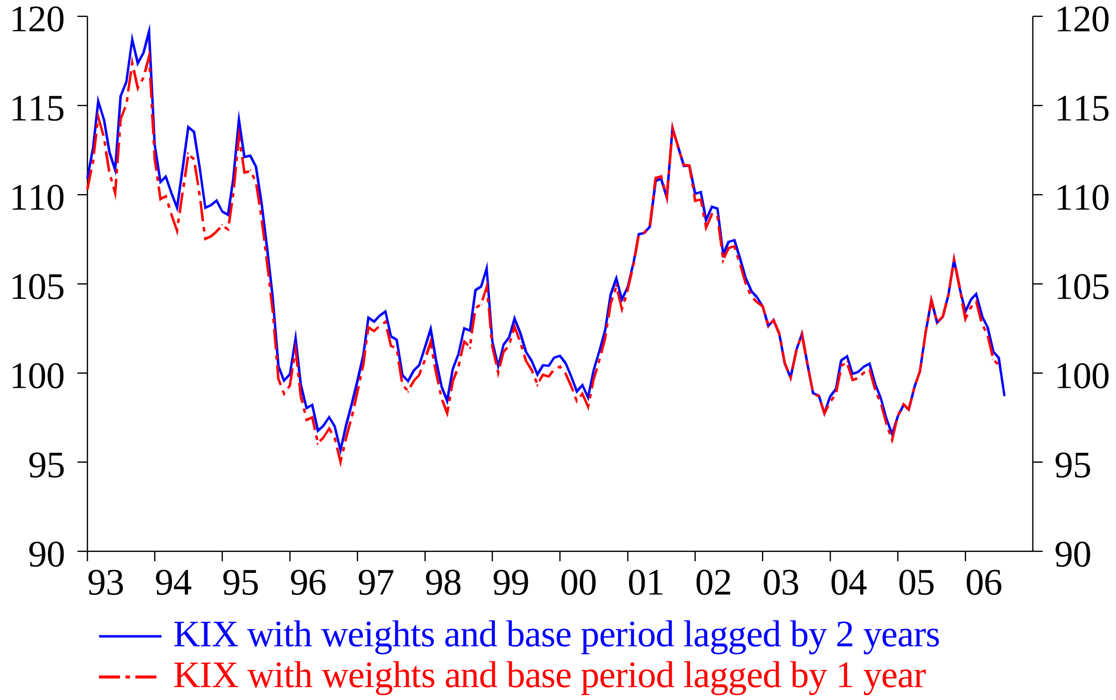
[12] Australia, Austria, Belgium and Luxemburg, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Mexico, Netherlands, Norway, New Zeeland, Slovak Republic, South Korea, Poland, Portugal, Spain, Switzerland, Turkey, UK, USA.

[13] Brazil, India and Russia, were not included in the first version of KIX.

3.6 The latest available weights

KIX was intended to become a chain index of Laspeyres type. The weights were supposed to refer to the year preceding the current one (**t-1** if the current year is **t**). However, due to publication lags, bilateral trade-flow data for any year **t** are only available two years later. The publication lag is even longer for data on production for domestic market. Since the shares of domestic output in total domestic demand are usually relatively stable, they can be assessed, in case of late publication of data, with acceptable precision (cf. Chapter 4 below). Such an assessment is, however, less straightforward in the case of international trade flows. This means that in practice, the latest weights available in *e.g.* 2006 are those for 2004. Moreover, these weights are not based on final statistics and include some elements of assessment.

Chart 3.3 KIX computed using weights and base periods lagged by one and two years



Two approaches were available if KIX were to be computed up to and including the current year. We could either have both the weights and the base period lagged by two years[14] or we could keep the base period lagged by one year and use weights lagged by two years. The latter option would be easily acceptable if the annual changes in the weights were consistently inconsequential for the index value. This was, however not the case. We opted therefore for the first alternative, which means that the chain index involves Laspeyres indices reflecting exchange rate variation over two years[14]. As can be seen in Chart 3.3,

[14] Strictly speaking, the lag is exactly two years only in the month when new weights are introduced. As shown in equation (3.2), in the following months it increases up to 2 years and 11 months.

there is very little difference in the development of KIX defined in this way as compared to KIX based on Laspeyres indices reflecting exchange rate variation over *one* year.

3.7 The structure of KIX weights: an example

The structure of KIX weights and the relative importance of the component weights are illustrated in Table 3.2, which shows the actual data for the year 2004.

Table 3.2 contains six panels. Panel (i) shows the share of Swedish exports going to each of the 32 countries[15] (w_t^k in equation (3.7)). They are expressed in percent such that the export shares of the 32 countries sum to 100. The matrix in Panel (ii) shows the market shares of all the countries in each market, corresponding to $s_{l,t}^k / (1 - s_t^k)$ in equation (3.7). For example, the first column of Panel (ii) shows how demand for manufactured goods in Australia is split between the goods produced in the 32 countries. In this case, 74.2 percent of demand is satisfied by domestic output, while 5.41 percent of total demand is imported from the US. Hence, the market share of the US in Australia is 5.41 percent. Each column of the matrix in Panel (ii) sums to 100 which means that demand is here defined only in terms of the countries included.

Panels (i) and (ii) are used to calculate the export weights - $xw_{l,t}$ in equation (3.7) - which are shown in Panel (iii). For example, the export weight attached to Germany is obtained as a vector product of the numbers in Panel (i) and the sixth row of Panel (ii): (1.39%*2.20%) + (1.21%*31.1%) + (5.47%*13.2%) + … + (1.18%*1.21%) = 14.7%. The intuition behind this procedure is as follows: Sweden competes with Germany in virtually all markets, in particular also in Australia, which is the first country in the matrix. 1.39 percent of Swedish exports of manufactures go to Australia and this is the measure of the importance of the Australian market for Sweden. Germany's market share in Australia is 2.20 percent and this number measures the importance of Germany in the Australian market. The product of 1.39 and 2.20 is a measure of Germany's importance for Sweden as a competitor in the Australian market. Summing over all markets, the total export competition weight attached to Germany is 14.7 percent (see Panel (iii)). Out of this, 11.4%*64.9% = 7.40 percent reflect the importance of the competition in the German market. The remaining 7.3 percent are due to competition between Swedish and German firms in third markets[16].

Panel (iv) shows the import weights - $mw_{l,t}$ in equation (3.6) - which are the included countries' shares in Swedish imports of manufactures, expressed in percent and summing up to 100. Panels (iii) and (iv) are used to calculate the total competitiveness weights for manufactures, shown in Panel (v). To this end, the

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[15] In KIX, Belgium and Luxemburg are together treated as one "country".

[16] This is the distribution of XW_{jl} into bilateral and third-country export weights given in equation (2.6').

export and import weights are weighted by their respective share in Sweden's total foreign trade in manufactures (i.e. by their share in the sum of exports and imports). In 2004, the share of exports in total Swedish trade in manufactures was about 56 percent[17].

Panel (vi) shows the commodity weights - $cw_{l,t}$ in equation (3.5) - which correspond to the shares of the included countries in total trade in commodities undertaken by these countries. The shares are expressed in percent and sum up to 100. Finally, the KIX weights in Panel (vii) are obtained by weighting together the total competitiveness weights for manufactures in Panel (v) and the commodity weights in Panel (vi), using their respective shares in total Swedish foreign trade in goods as weights. In 2004, trade in manufactures made up about 85 percent of total Swedish trade in goods.

4. THE DATA

This chapter gives a description of the data used in the calculation of KIX weights. It starts with a general discussion of data definitions and sources. A more detailed account of data problems and the solutions chosen is given in the subsequent sections.

4.1 Data definitions and sources

Index weights were compiled for the period 1991-2004. Bilateral trade data at one-digit level were taken from the *Annual Trade by Commodity Statistics* database of the OECD. SITC groups 0 to 4 were classified as commodities and SITC groups 5 to 9 were classified as manufactures. The OECD database does not cover the bilateral trade between India, Brazil, and Russia. The trade flows between these three countries were taken from the United Nations' database *Comtrade*.

Exports from one country to another can be measured either as part of the first country's exports or as part of the second country's imports. Total competitiveness weights for manufactures in KIX are based on bilateral *export* data. This means that, for example, Austrian imports of manufactures are defined as the sum of other countries' exports of manufactures to Austria. The OECD database includes also import data, which do not always tally the export numbers. Export data were in this case considered as more reliable while the first version of KIX was based on import data. The practical effects of the change of data source on the time series for the index were rather limited.

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[17] In the example, export and import weights are first weighted by their shares in foreign trade in manufactures to obtain the total competitiveness weight for manufactures. The latter is subsequently weighted together with the commodity weight by their respective weights in total foreign trade in goods. This procedure is equivalent to the weighting scheme shown in equation (3.3).

For each country, the domestic production of manufactures supplied to the domestic market was calculated as the difference between gross production (NB! not value added) of manufactures and exports of manufactures. This approach can result in an underestimation of the output for domestic market for countries whose reported export data include re-exports (i.e. exports of imported goods). This is true in particular of Belgium and the Netherlands, which have major seaports employed as transfer points for cargo. For these two countries, the share of domestic production of manufactures in total domestic demand for manufactures was assessed directly upon comparison with the numbers for other countries.

The majority of data on gross production and exports of manufactures were taken from the *STAN* database of the OECD. Unfortunately, China, Turkey, Russia, India and Brazil are not covered by the database. For China, data comparable to those in *STAN* were provided directly by the OECD. For Turkey, Russia, India, and Brazil the shares of domestic production of manufactures sold on the domestic market were compiled using national data.

Trade-flow and domestic production data for manufactures were combined into a balance-of-resources matrix. Each row of the matrix refers to one country and shows how the total manufacturing production of this country is divided into exports, distributed by country, and production for the domestic market. A corresponding column, referring to the same country shows how the country's demand for manufactures is divided between imports, also distributed by country, and domestically produced manufactures. The balance-of-resources shown in the matrix is, however, incomplete as exports to and imports from Sweden are excluded. Upon dividing each column by the sum of its elements, the matrix is transformed to show the shares in the country's total demand for manufactures (excluding imports from Sweden). The off-diagonal elements of the matrix were computed using bilateral trade flows and correspond to $s_{l,t}^{k} / \left(1 - s_{t}^{k}\right)$ for $l \neq k$ in equation (3.7). The elements in the main diagonal correspond to $s_{k,t}^{k} / \left(1 - s_{t}^{k}\right)$ in equation (3.7) and show the share of total demand for manufactures in a country (excluding imports from Sweden) that is satisfied with goods produced domestically. The balance-of-resources matrix for 2004 is shown in Panel (ii) of Table 3.2.

The international trade data for commodities were, as mentioned above, defined as SITC groups 0 to 4 in the *Annual Trade by Commodity Statistics* database of the OECD. In this case, both export and import flow data were employed. For each country, commodity trade was defined as the sum of commodity exports to and commodity imports from other countries included in the index. The countries included cover more than 80% of the Swedish commodity imports.

4.2 Detailed notes on trade-flow data

The bilateral trade data from 1993 onwards were taken from the SITC3 version the OECD's *Annual Trade by Commodity Statistics*. For 1991-1992, the SITC3 definition is not available on OECD's OLISnet. The SITC2 version was therefore used for these two years. An inspection of the data didn't indicate any breaks in the time series, due to the definition change in 1993.

The *Annual Trade by Commodity Statistics* database does not cover Brazil, Russia and India. It includes, however, these three countries in the breakdown by country of the exports and imports of the OECD countries. In this case, the principle of using export data as the foreign trade data source was therefore abandoned and exports from *e.g.* Brazil to Austria were measured as Austria's reported imports from Brazil. Data on bilateral trade between Brazil, Russia and India were taken from the *Comtrade* database of the UN. The data are conform to SITC3 and are fully comparable with the *Annual Trade by Commodity Statistics.*

For some countries, data on bilateral trade flows are not reported for some of the early years in the sample. For example, bilateral trade with the Slovak Republic is reported only beginning in 1997. Trade flows to and from this country for 1993-1996 were approximated using the Slovak Republic's export and import shares in other countries' foreign trade in 1997. The Czech and Slovak Republics are treated as closed economies in 1991-92, when they did not exist as separate countries.
Countries for which some data were not reported are listed below:

Country	**Period missing**	**Assessment based on**
Korea	1991-1993	1994
Hungary	1991	1992
Slovak Republic	1993-1996	1997
China	1991	1992
Poland	1991	1992

4.3 Detailed notes on data for the computation of domestic production for domestic market

A measure of domestic production of manufactures for the domestic market was constructed by deducting exports from gross production of manufactures, defined as groups 15-37 in the ISIC rev. 3 classification. The resulting measure was converted into US dollars to be comparable with the data on bilateral trade.

Data on gross production and exports were taken from the STAN database of the OECD. Unfortunately, the STAN database is not complete. The missing data points were filled with our own assessments, based on the data reported for other years. The following approximations were introduced in particular:

(i) China, Turkey, Russia, India and Brazil are not covered by STAN. For the first two of these countries, data comparable to those in *STAN* were provided directly by the OECD. For Russia, India, and Brazil data on gross production in the manufacturing sector were not available. An approximation of gross manufacturing production was obtained from data on value-added in the manufacturing sector by applying the transformation factor 10/3 employed by the IMF (cf. Bayoumi, Lee and Jayanthi, 2005).

(ii) Several data points were missing for a number of countries in the beginning or at the end of the period under study. STAN covers currently data up to and including 2003. Since the share of domestic production in a country's total demand for manufactures varies very little from year to year, the corresponding share for the closest reported year was used instead. For example, the STAN database provides data for Australia only up to 1999. For the years 2000-2003 we have then used the share of Australia's total demand for manufactures satisfied by domestic production in 1999. A full list of assessments made in this way is given below:

Country	**Period missing**	**Assessment based on**
Australia	1999-2003	1998
Canada	2002-2003	2001
New Zeeland	2002-2003	2001
Slovak Republic	2002-2003	2001
Greece	1991-1994	1995
Iceland	2003	2002
Poland	2002	2003
Switzerland	2002	2003
Ireland	2003	2002
All countries included	2004	2003 (or latest available)

(iii) Export data for Belgium and the Netherlands in the STAN database overstate in all probability the true numbers due to the inclusion of re-exports. In fact, in the case of Belgium exports exceed in some years gross domestic output of manufactures. To rectify this, the shares of domestic production for domestic market in the total demand for manufactures in Belgium and Netherlands were approximated by the average of the corresponding shares for other small European economies included in the index (Norway, Denmark, Finland, Austria, Switzerland, Greece, and Portugal).

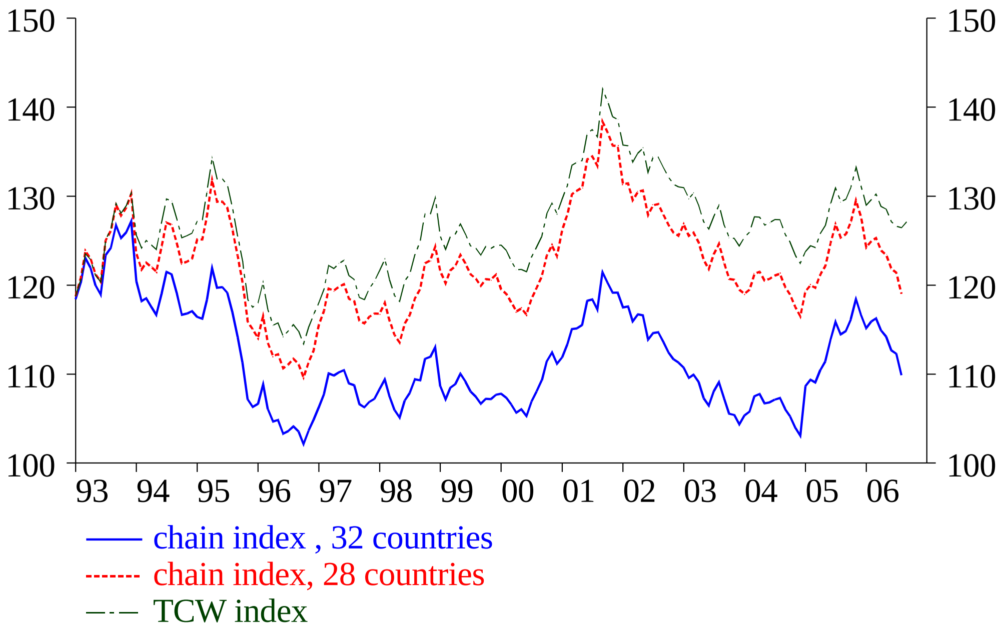
5. THE RESULTS

This chapter presents the numerical results of the computations, in particular the KIX index and its weights.

5.1 The exchange rate index

The effective exchange rate index KIX is depicted in Chart 5.1[18]. The monthly index was rebased to equal 100 on the 18-th November 1992 for comparability with the TCW index.[19] When the basket peg was abandoned in November 1992, there was a sudden depreciation of the krona (i.e. an increase in the index value) up to the level of approximately 120. The chart shows the subsequent gradual appreciation in the years up to 1996. The index varies from 1997 on around its (new) mean of 110.2 without any notable trend. The depreciation of the high-activity years 2000-01 and the subsequent depreciation are clearly visible.

Chart 5.1 TCW index and KIX for 32 and 28 countries, 18-th Nov 1992 = 100.



The chart includes also, for comparison, an analogous index computed for only 28 countries. Countries with high-inflation history, Brazil, India, Russia and Turkey were excluded in this version of the index. In Brazil and Russia, the annual increase in consumer prices reached three-digit numbers in the early 1990-ies. Their currencies depreciated in parallel. The effects of the hyper-inflation in Brazil and Russia are reflected in the

[18] KIX is denoted in the chart as referring to 32 countries since Belgium and Luxemburg are in the index added together.

[19] Since normalisation refers to a specific day, the monthly value of KIX for November 1992 is 104.287 rather than 100.

diverging paths of KIX computed for 32 countries and KIX computed for 28 countries in 1993-95. Although the sum of weights for Brazil, India, Russia and Turkey only amounts to less than 4 percent, their effect on the overall index is quite substantial. The inclusion of these four countries results in a significantly stronger krona, the index being almost 10 percent stronger (i.e. having a smaller value) than otherwise.

The inclusion of high-inflation countries could be questioned on the ground of their importance for the competitiveness of the Swedish trade. It is not clear to what extent local currency is used in those countries for pricing and transacting in the periods of two-digit inflation. If it is not used, it should not be included in the (real) exchange rate index. On the other hand, producers can hardly avoid dealing in local currency as long as it is needed to pay out wages.

Finally, Chart 5.1 shows also the Riksbank's effective exchange rate index for the krona, called the TCW index. The latter covers 20 countries, excluding – in comparison to KIX - China, South Korea, Poland, the Czech Republic, the Slovak Republic, Hungary, Mexico, Turkey, Iceland, Brazil, the Russian Federation and India. Generally, in recent years the krona appears to be stronger in effective terms when gauged by KIX as compared to the TCW. The largest part of the difference is due to the inclusion of the four countries mentioned above, in particular to the gradual depreciation of the Turkish lira during most of the 1990-ies. Other important factors are the depreciation of the Mexican peso and of the Chinese yuan in 1994. Depreciation of the Chinese yuan, the Russian rouble and of the Korean won contributed also to the increasing difference between the two indices after 2002.

It appears that country coverage is the most important source of differences between KIX and the TCW. Other differences (*e.g.* that KIX is a chain index while the TCW is a Laspeyres index) appear to have only minor effects.

5.2 The weights

KIX weights for 1991 and 2004 are displayed in Panel (ii) of Table 5.1. For comparison, Panel (i) exhibits the weights currently used by the Riksbank to calculate the TCW index (cf. the previous section). The latter index includes 20 countries and is based on data for 1989-91, referring to trade in manufactures. Thus, it does not allow for trade in commodities.

KIX weights exhibit considerable changes over the 14 years between 1991 and 2004. Generally, they reflect the process of globalization, with developed countries losing importance in international trade and the emerging European and Asian economies gaining it. Thus, the weight sum for the euro area in KIX shrank from 53 per cent in 1991 to 50 per cent in 2004. In particular, the importance of Germany has decreased significantly compared to 1991, as have the weights for Italy and Finland. Spain and Ireland are among the euro area countries that have seen an increase in their weights.

Outside the euro zone, the weights of the UK and Denmark have decreased markedly. The decrease of the weight for the UK took mainly place after 1998. The drop in the overall weight sum for the European countries was reduced by the increased importance of the new EU countries. Outside Europe, the weight for Japan exhibits the largest decline. Despite this, the weight sum for the Asian countries included in KIX has increased, mainly due to higher importance of China.

The TCW weights, which are based on data for 1989-91, exhibit a different pattern from the KIX weights for 1991. The main reason for that is the exclusion of emerging economies. The weights for Germany and the US are significantly larger in TCW, as is the weight sum for the euro zone. Besides the exclusion of the trade in commodities, the TCW weights also in many instances give a larger weight than KIX to export competition as compared to competition in the Swedish domestic market. This is due to the fact that the components of total competitiveness weights (*i.e.* export and import weights) for manufactures are weighed differently in TCW and in KIX (cf. Section 2.4).

6. SUMMARY

Effective exchange rate indices have been studied and computed since the collapse of the Bretton Woods system in 1971. An effective exchange rate index can be defined in different ways, depending on what it is supposed to measure. The IMF has laid ground for the definition of the index but many central banks and international organizations have adopted a slightly different approach.

Konjunkturinstitutet has compiled a new effective exchange rate index for the Swedish krona, KIX. KIX is a chain-linked index that includes the currencies of 33 countries. The weight attached to each country is based on the patterns of international trade in goods. Weights are updated annually, and allow for the competition on third-country markets. The index includes a number of emerging economies and gives in this way a wider and more adequate definition of the effective exchange rate of the krona than the traditional indices. Furthermore, it allows for the changes in the relative importance of Sweden's trading partners. The krona appears to be stronger according to the new index than according to the traditional ones, even when the problems of index comparison over longer time spans are acknowledged.

TABLES

Table 3.1 Swedish export and import shares for manufactures in 2004.

Percentage points. Countries included in KIX in bold.

Export and import shares are numbered in accordance with their size.

Export shares			Import shares		
1	**USA**	**11.13**	**1**	**Germany**	**21.70**
2	**Germany**	**10.10**	**2**	**United Kingdom**	**7.95**
3	**Norway**	**8.44**	**3**	**Netherlands**	**6.61**
4	**United Kingdom**	**7.47**	**4**	**France**	**6.43**
5	**Denmark**	**5.80**	**5**	**Denmark**	**6.28**
6	**Finland**	**5.52**	**6**	**Finland**	**5.99**
7	**Belgium**	**4.79**	**7**	**Norway**	**5.43**
8	**France**	**4.76**	**8**	**Belgium**	**4.67**
9	**The Netherlands**	**4.37**	**9**	**United States**	**4.13**
10	**Italy**	**3.83**	**10**	**Italy**	**3.71**
11	**Spain**	**2.84**	**11**	**China**	**2.86**
12	**China**	**2.31**	**12**	**Japan**	**2.73**
13	**Japan**	**1.85**	**13**	**Poland**	**2.72**
14	**Poland**	**1.69**	**14**	**Spain**	**1.56**
15	**Russian Federation**	**1.67**	**15**	**Ireland**	**1.53**
16	**Canada**	**1.25**	**16**	**Switzerland**	**1.45**
17	**Australia**	**1.23**	**17**	**Austria**	**1.24**
18	**Switzerland**	**1.21**	18	Hong Kong China	1.22
19	**Austria**	**1.07**	**19**	**South Korea**	**1.18**
20	**India**	**1.05**	**20**	**Hungary**	**1.01**
21	Iran	0.72	21	Estonia	0.87
22	**Turkey**	**0.83**	22	**Turkey**	**0.80**
23	**Mexico**	**0.72**	**23**	**Czech Republic**	**0.74**
24	**Brazil**	**0.66**	24	Chinese Taipei	0.70
25	Singapore	0.60	**25**	**Brazil**	**0.50**
26	Estonia	0.59	**26**	**Luxembourg**	**0.49**
27	**Greece**	**0.58**	**27**	**Russian Federation**	**0.48**
28	**Czech Republic**	**0.58**	**28**	**Portugal**	**0.41**
29	**South Korea**	**0.58**	29	Lithuania	0.41
30	South Africa	0.57	**30**	**India**	**0.38**
31	**Ireland**	**0.55**	**32**	**Canada**	**0.29**
35	**Hungary**	**0.51**	**33**	**Slovakia**	**0.23**
36	**Portugal**	**0.51**	**43**	**Greece**	**0.13**
46	**Iceland**	**0.25**	**48**	**Mexico**	**0.07**
49	**Slovak Republic**	**0.21**	**47**	**Australia**	**0.09**
54	**New Zeeland**	**0.16**	**62**	**New Zeeland**	**0.02**
76	**Luxembourg**	**0.06**	**65**	**Iceland**	**0.02**
Total KIX coverage		**88.55**	**Total KIX coverage**		**93.85**

Table 3.2 The structure of KIX weights: data for the year 2004.

	AS	AU	BL	CA	SC	GE	DA	FI	FR	UK	IR	IC	IT	JA	NL
(i) Swedish export shares:															
	1.39	1.21	5.47	1.41	1.37	11.4	6.55	6.23	5.38	8.43	0.62	0.28	4.32	2.08	4.94
(ii) Balance-of-resources matrix:															
Australia (AS)	74.2	0.03	0.08	0.21	0.06	0.04	0.09	0.17	0.03	0.31	0.12	0.02	0.06	0.18	0.13
Austria (AU)	0.24	38.6	0.48	0.20	2.52	2.16	0.98	0.50	0.40	0.55	1.21	0.50	0.74	0.04	0.47
Belgium+Luxemb. (BL)	0.54	2.28	48.5	0.39	1.67	3.89	3.03	1.53	4.26	3.02	3.23	1.47	1.68	0.12	6.64
Canada (CA)	0.38	0.16	0.35	51.0	0.24	0.09	0.16	0.21	0.14	0.63	0.48	0.68	0.07	0.08	0.3
Switzerland (SC)	0.40	2.59	0.6	0.35	47,0	1.61	1.11	0.55	0.95	0.75	1.18	0.45	1.03	0.18	0.88
Germany (GE)	2.20	31.1	13.2	1.28	17.5	64.9	16.9	8.40	8.46	9.16	8.02	9.19	6.40	0.59	11.8
Denmark (DA)	0.20	0.4	0.26	0.09	0.37	0.62	42.6	1.28	0.23	0.51	1.54	6.69	0.16	0.03	0.59
Finland (FI)	0.19	0.35	0.36	0.09	0.30	0.37	1.60	66.7	0.17	0.47	0.32	0.88	0.17	0.02	0.71
France (FR)	1.11	2.91	6.78	0.56	5.39	3.79	3.78	1.92	67.0	4.11	4.28	1.81	3.37	0.21	3.17
Un. Kingdom (UK)	1.64	1.4	4.37	1.14	2.95	2.44	4.85	2.12	2.66	58.5	29.9	6.28	1.56	0.26	3.82
Ireland (IR)	0.33	0.32	4.04	0.07	1.92	0.52	0.79	0.30	0.55	1.77	18.0	0.34	0.49	0.11	1.12
Iceland (IC)	0,00	0,00	0,00	0,00	0.02	0.03	0.04	0,00	0,00	0.01	0.01	48.4	0.00	0.00	0.06
Italy (IT)	1.15	5.18	2.17	0.58	7.32	2.95	3.26	1.64	3.84	2.79	2.51	2.20	75.7	0.19	1.9
Japan (JA)	4.66	0.92	1.95	1.72	1.23	1.34	1.17	1.68	0.82	1.94	3.15	2.10	0.72	92.8	3.51
Netherlands (NL)	0.38	2.48	5.41	0.19	1.96	3,00	4.30	2.27	1.96	2.85	3.74	5.12	1.44	0.08	48.5
Norway (NO)	0.05	0.14	0.16	0.03	0.11	0.23	1.79	0.70	0.10	0.33	0.69	2.32	0.07	0.02	0.39
New Zeeland (NZ)	1.18	0,00	0,00	0.02	0.01	0.01	0.04	0,00	0,00	0.03	0.02	0.01	0.01	0.05	0.02
USA (US)	5.41	1.4	4.27	38.0	5.09	2.09	2.81	1.65	1.99	4.35	12.6	6.21	1.02	1.65	5.8
China (CH)	3.35	0.57	1.66	1.75	0.84	1.63	2.75	2.40	0.94	1.87	3.37	1.06	0.95	2.48	4.62
South Korea (KO)	1.27	0.50	0.37	0.75	0.29	0.59	0.92	1.65	0.26	0.71	1.08	0.56	0.38	0.66	0.78
Portugal (PT)	0.05	0.14	0.35	0.04	0.17	0.32	0.37	0.14	0.45	0.4	0.31	0.13	0.14	0.00	0.27
Spain (SP)	0.33	1.01	1.29	0.12	0.89	1.23	1.24	0.56	2.9	1.78	1.60	0.89	1.41	0.04	1.07
Greece (GR)	0.02	0.08	0.05	0.01	0.05	0.10	0.17	0.11	0.05	0.12	0.08	0.04	0.10	0.00	0.08
Czech Republic (CZ)	0.03	2.34	0.45	0.02	0.45	1.61	0.53	0.25	0.3	0.39	0.40	0.38	0.30	0.01	0.74
Slovak Rep. (SL)	0.02	1.05	0.16	0.01	0.12	0.55	0.30	0.19	0.1	0.10	0.10	0.07	0.18	0.00	0.21
Mexico (ME)	0.10	0.01	0.10	0.63	0.04	0.11	0.04	0.02	0.03	0.08	0.26	0.00	0.02	0.03	0.13
Hungary (HU)	0.03	2.43	0.31	0.01	0.28	1.18	0.52	1.08	0.29	0.39	0.36	0.31	0.29	0.01	0.47
Poland (PL)	0.07	0.66	0.58	0.05	0.26	1.33	1.87	0.35	0.4	0.45	0.27	0.81	0.46	0.01	0.7
Turkey (TU)	0.07	0.35	0.26	0.07	0.20	0.56	0.86	0.23	0.33	0.68	0.66	0.22	0.43	0.00	0.47
Russian Fed. (RU)	0.02	0.17	0.49	0.07	0.40	0.26	0.52	1.16	0.12	0.32	0.09	0.37	0.28	0.09	0.24
Brazil (BR)	0.11	0.13	0.22	0.28	0.09	0.15	0.07	0.08	0.08	0.17	0.21	0.21	0.16	0.04	0.16
India (IN)	0.29	0.21	0.65	0.24	0.22	0.23	0.51	0.13	0.18	0.48	0.28	0.34	0.24	0.06	0.26
(iii) Total export weights															
	1.17	1.19	4.74	1.40	1.39	14.7	3.55	4.73	6.25	7.33	0.91	0.15	5.43	3.71	4.46
(iv) Import weights															
	0.09	1.37	.5.22	0.33	1.69	24.3	7.41	6.70	7.04	8.93	1.68	0.02	4.21	2.48	6.29
(v) Total competitiveness weights for manufactures (=0.56*(iii) + 0.44*(iv))															
	0.69	1.27	4.96	0.92	1.52	18.9	5.26	5.60	6.60	8.04	1.25	0.09	4.89	3.17	5.27
(vi) Commodity weights															
	1.97	1.45	5.30	6.82	0.82	7.88	1.34	0.85	6.71	6.17	0.93	0.13	4.23	4.50	6.79
(vii) Final KIX weights (0.85*(v) + 0.15*(vi)															
	0.88	**1.30**	**5.01**	**1.83**	**1.41**	**17.2**	**4.66**	**4.87**	**6.62**	**7.75**	**1.20**	**0.10**	**4.79**	**3.37**	**5.50**

Table 3.2 continued.

NO	NZ	US	CH	KO	PT	SP	GR	CZ	SL	ME	HU	PL	TU	RU	BR	IN	
(i) Swedish export shares:																	
9.53	0.18	12.6	2.60	0.65	0.57	3.21	0.66	0.66	0.23	0.81	0.58	1.91	0.94	1.89	0.75	1.18	
(ii) Balance-of-resources matrix:																	
0.08	12.3	0.08	0.20	0.44	0.02	0.05	0.03	0.01	0.01	0.03	0.01	0.01	0.06	0.02	0.05	0.81	AS
0.48	0.23	0.12	0.10	0.07	0.42	0.43	0.57	2.91	4.87	0.06	5.10	1.09	0.45	0.54	0.06	0.10	AU
1.42	0.49	0.38	0.20	0.14	1.89	1.89	2.01	1.68	2.01	0.22	1.78	1.80	1.43	0.57	0.26	1.64	BL
0.30	0.73	3.81	0.19	0.12	0.12	0.09	0.15	0.06	0.07	0.36	0.05	0.08	0.07	0.09	0.13	0.14	CA
0.51	0.32	0.24	0.18	0.17	0.65	0.8	1.08	0.88	0.75	0.24	0.94	0.62	0.75	0.31	0.23	0.25	SC
7.96	1.98	1.54	1.87	1.23	8.15	7.40	7.88	20.0	22.3	1.73	20.4	12.9	6.81	5.85	1.28	1.21	GE
4.39	0.31	0.06	0.06	0.06	0.58	0.29	0.40	0.26	0.28	0.03	0.36	0.51	0.12	0.18	0.04	0.08	DA
2.28	0.25	0.06	0.17	0.05	0.30	0.25	0.35	0.23	0.27	0.04	0.72	0.55	0.25	1.69	0.09	0.10	FI
1.86	1.39	0.50	0.45	0.38	4.68	6.18	3.93	2.63	2.47	0.52	3.17	2.96	2.48	1.17	0.49	0.48	FR
4.17	1.73	0.86	0.27	0.37	2.12	2.34	2.44	1.69	1.33	0.31	2.25	1.44	1.60	0.82	0.32	1.19	UK
0.70	0.17	0.41	0.05	0.11	0.35	0.45	0.41	0.23	0.15	0.15	0.23	0.17	0.18	0.05	0.04	0.04	IR
0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	IC
1.72	0.99	0.49	0.39	0.36	3.96	3.83	7.89	2.96	4.10	0.64	4.28	3.47	3.19	2.01	0.48	0.47	IT
1.51	5.53	2.53	5.26	6.82	0.99	0.86	1.54	1.22	0.36	1.52	1.99	0.50	0.94	1.06	0.51	0.93	JA
2.95	0.38	0.21	0.16	0.27	1.89	1.55	1.90	2.46	1.38	0.17	2.78	1.82	1.30	1.00	0.15	0.25	NL
61.2	0.04	0.04	0.04	0.07	0.17	0.12	0.14	0.07	0.11	0.01	0.05	0.19	0.08	0.04	0.04	0.04	NO
0.01	64.0	0.02	0.02	0.04	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.01	0.03	NZ
1.87	4.72	81.5	1.85	3.52	0.82	0.90	2.18	0.76	0.41	28.4	1.52	0.46	1.02	0.71	2.96	1.65	US
1.33	2.53	2.44	84.2	3.83	0.59	0.92	1.55	1.29	0.52	1.37	3.60	1.00	1.30	2.89	0.71	1.64	CH
0.43	1.10	0.83	3.41	81.3	0.31	0.48	2.06	0.31	1.19	0.87	1.10	0.48	1.16	0.72	0.40	1.09	KO
0.14	0.03	0.04	0.01	0.01	55.6	1.28	0.15	0.08	0.12	0.03	0.14	0.09	0.10	0.02	0.02	0.01	PT
0.88	0.16	0.11	0.09	0.05	14.1	67.9	2.21	0.89	1.22	0.73	1.18	0.90	1.47	0.28	0.27	0.14	SP
0.08	0.01	0.01	0.00	0.00	0.08	0.07	58.1	0.03	0.04	0.00	0.06	0.05	0.13	0.09	0.01	0.00	GR
0.31	0.03	0.03	0.02	0.01	0.20	0.25	0.28	52.7	14.9	0.03	2.23	1.81	0.26	0.30	0.02	0.06	CZ
0.10	0.01	0.03	0.01	0.00	0.06	0.09	0.11	2.50	34.1	0.01	1.22	0.72	0.09	0.11	0.00	0.01	SL
0.03	0.03	2.74	0.05	0.03	0.02	0.05	0.01	0.03	0.01	60.9	0.08	0.01	0.02	0.01	0.19	0.02	ME
0.24	0.03	0.03	0.03	0.01	0.34	0.26	0.27	1.13	2.78	0.04	41.2	0.82	0.24	0.24	0.02	0.01	HU
1.59	0.03	0.03	0.04	0.01	0.47	0.28	0.22	2.08	2.76	0.02	2.20	64.5	0.41	0.80	0.02	0.02	PL
0.25	0.06	0.09	0.02	0.01	0.40	0.41	1.16	0.19	0.30	0.04	0.45	0.38	72.3	0.50	0.01	0.03	TU
0.91	0.03	0.14	0.34	0.26	0.10	0.14	0.47	0.49	0.82	0.11	0.71	0.41	1.16	77.7	0.07	0.40	RU
0.06	0.09	0.35	0.13	0.13	0.41	0.15	0.21	0.09	0.10	1.11	0.08	0.16	0.15	0.04	91.0	0.08	BR
0.19	0.32	0.30	0.19	0.14	0.20	0.24	0.28	0.16	0.25	0.24	0.16	0.15	0.50	0.14	0.08	87.1	IN
(iii) Total export weights																	
6.12	0.15	13.2	4.10	1.30	0.56	3.23	0.45	0.88	0.29	0.90	0.69	1.91	1.04	1.86	0.84	1.31	
(iv) Import weights																	
4.18	0.02	4.03	2.31	0.98	0.52	1.99	0.17	1.03	0.32	0.08	1.60	2.98	0.68	0.49	0.52	0.39	
(v) Total competitiveness weights for manufactures																	
5.26	0.09	9.17	3.31	1.16	0.54	2.68	0.33	0.94	0.30	0.54	1.09	2.39	0.88	1.25	0.70	0.90	
(vi) Commodity weights																	
3.18	0.62	13.4	4.57	2.07	0.74	3.55	0.62	0.76	0.44	2.91	0.57	1.20	0.94	5.42	2.17	0.97	
(vii) Final KIX weights																	
4.94	**0.17**	**9.82**	**3.50**	**1.30**	**0.57**	**2.81**	**0.37**	**0.92**	**0.32**	**0.90**	**1.01**	**2.20**	**0.89**	**1.89**	**0.93**	**0.92**	

Table 5.1 KIX and TCW weights

Percentage points

	(i) TCW	(ii) KIX, 32 countries	
	1989-1991	**1991**	**2004**
Germany	22.28	19.22	17.24
France	7.15	6.75	6.62
The Netherlands	4.24	5.25	5.50
Italy	6.05	5.67	4.79
Finland	6.69	5.67	4.87
Belgium-Luxemburg	3.55	4.28	5.01
Spain	2.48	2.35	2.81
Ireland	0.77	0.88	1.20
Austria	1.71	1.51	1.30
Portugal	0.93	1.17	0.57
Greece	0.27	0.42	0.37
Euro Area	**56.12**	**53.16**	**50.28**
UK	11.56	9.31	7.75
Denmark	5.60	6.02	4.66
EU-15	**73.28**	**68.49**	**62.69**
Poland	-	0.58	2.20
Czech Republic	-	0	0.92
Hungary	-	0.24	1.01
Slovakia	-	0	0.32
EU	**-**	**69.31**	**67.14**
Norway	5.58	5.71	4.94
Switzerland	2.74	2.21	1.41
Turkey	-	0.39	0.89
Iceland	-	0.11	0.10
Russian Federation	-	0.03	1.89
Europe	**81.60**	**77.77**	**76.38**
USA	11.63	10.84	9.82
Canada	1.16	1.73	1.83
Mexico	-	0.67	0.90
Brazil	-	0.65	0.93
Americas	**12.79**	**13.90**	**13.47**
Japan	5.20	5.25	3.37
China	-	0.57	3.50
Korea	-	0.99	1.30
India	-	0.42	0.92
Asia	**5.20**	**7.22**	**9.09**
Australia	0.27	0.93	0.88
New Zeeland	0.14	0.18	0.17
Pacific	**0.41**	**1.11**	**1.06**
Total	**100.00**	**100.00**	**100.00**

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