

## Export Market and Market Price Indices, trade statistics data

### Resumé:

This paper presents new export market and market price indices for the different export components in ADAM based on detailed SITC data from the OECD international trade by commodity statistics database. The export market price and volume indices are based on unit values and depend on the choice of index formula: Paasche, Laspeyres or Fisher chain index. The Paasche and Laspeyres chain price indices have downward and upward biases, respectively. There is a lot of volatility in the detailed unit values which makes it natural to prefer the Fisher index that is a geometric mean of the Paasche and Laspeyres index. Based on the Fisher index, we find a falling market share in fixed prices since 2000. There is also considerable evidence that the Danish market share is countercyclical to developments in the market, probably owing to the nature and composition of Danish exports. This helps to dampen fluctuation in Danish exports due to changes in the market. An expansion of the market base by including BRIC and Eastern European countries is also considered and the basic results do not change in any significant way. In a subsequent paper, we compare the new trade statistics data with the old data from ADAM and the OECD national accounts statistics.

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**Keywords:** Export market index, Market price, Unit value

*Modelgruppepapirer er interne arbejdsrapporter. De konklusioner, der drages i papirerne, er ikke endelige og kan være ændret inden opstillingen af nye modelversioner. Det henstilles derfor, at der kun citeres fra modelgruppepapirerne efter aftale med Danmarks Statistik.*

## 1. Introduction

Exports in ADAM are grouped into seven categories, and five of them have an estimated equation. The Armington (1969) model is used for modeling exports. The Armington model requires a measure of the export market index and competitors prices. To construct these series we need the price and quantity of imports of trading partners by ADAM export groups.

Up to 2002 trading partners' import prices and quantities were available from OECD *International Trade and Competitiveness Indicators* (ITCI) by detailed SITC components. Beginning 2003 these data cease to be reported, since then it has been a challenge constructing export market and market price indices for the different export groups in ADAM.

In this paper, we present new export market and market price indices for the different export components in ADAM based on detailed SITC-data, import statistics for OECD-members. The data is obtained from the OECD *International Trade by Commodity Statistics database* and contains both values and quantities on a detailed SITC level. We use unit values defined as value divided by quantity. Trade prices approximated by unit values are not devoid of shortcomings: bias can arise from compositional changes in product mix, it is difficult to distinguish price from quality change, unit value indices rely to a larger extent on outlier detection and deletion, given price stickiness such deletion run the risk of missing price catch-ups and understates inflation, see Silver (2007) for a detailed discussion. As this is the only source of information available we, nevertheless, use unit values. We believe that by using the most detailed unit values at 5-digit level we can minimize some of the shortcomings. Furthermore, our own construction of trade prices for partner countries using the same methodology facilitates cross-country comparison. And a market index and price created in this manner should reduce any bias due to observed discrepancies between country specific price and quantity figures that could have economic or methodological source, Gaulier et al. (2008).

In ADAM, the market index for Danish exports has been constructed using 20 OECD countries<sup>1</sup> that cover about 80 per cent of the total Danish exports. Here too we first consider the major trading partners and later expand the export market by including BRIC and Eastern European countries. In the following we briefly describe the data, outline the methodology in detail and present the results.

## 2. The Data

The OECD International Trade by Commodity Statistics database contains detailed data by SITC from 1961 to 2011 for imports and exports in quantity and value between OECD countries and 264 different partner countries. The data is reported by 5-digit SITC classification, it also contains totals at 1-digit

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<sup>1</sup>The 20 OECD partners are: Australia, Austria, Canada, Switzerland, Germany, Spain, Finland, France, Great Britain, Greece, Ireland, Iceland, Italy, Japan, Netherland, Norway, New Zealand, Portugal, Sweden and United States.

and subtotals at 2-digit and 3-digit. Trade values are reported in current USD and quantities are reported in different units of measurement: area in square meters, electrical energy in thousands of kilowatt-hours, length in meters, number of items, number of pairs, volume in liters, weight in kilograms, thousands of items, number of packages, dozens of items, volume in cubic meters, weight in carats, and curies. In this paper we have used SITC revision 3 with data for 1988-2011.

The data presents a number of challenges: quantities are reported in different units of measurement, missing quantities and values, different countries have different reporting threshold and not all countries have data for 1988-2011, and most importantly the problem of outliers. It is important to address these and any other potential problems before constructing price indices. Price indices based on unit values rely on outlier detection and deletion. Thus finding a sound methodology for filtering outliers is the first step in the data construction process. In the following we explain our method.

### 3. Method

First of all, since the focus here is on partners' import from the world, we have extracted out these data from the database. The next step in the data processing consists in removing totals, subtotals and zero trade flows. In this way we make sure price indices are built from the most disaggregated SITC level. Different reporting thresholds can introduce some heterogeneity among reporters due to a statistical bias. To deal with this, a reporting threshold of 10000 USD is imposed on trade value flows at 5-digit SITC. Whenever the threshold is not met, both value and quantity are dropped for the given observation. Observations with missing quantity and value are also dropped. The interest here is on the growth rate of unit values, hence the problem of different units of measurement can be ignored. Errors are likely to be correlated between reported values and quantities, working directly on unit values helps to reduce this bias.

Outliers are defined as unrealistic unit value developments, measured as  $p_t/p_{t-1}$ , for a given product over time. The important question is: how high/low a price variation should be declared an outlier? The simplest method is to fix a simple threshold, say a price growth above 100% is unrealistic, this can however be misleading as the magnitude of true price changes can be very high for some commodities. As a result it is chosen to define a criterion that controls product specific average price changes. We have tried a number of methodologies and chose the one that is used in most national statistical institutes in partner countries. Here we discuss only the final applied methodology.<sup>2</sup>

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<sup>2</sup> One of the alternative methodologies worth mentioning is that of CEPII's, French institute for research in international economics. CEPII publishes unit value indices for developing and developed countries, using UN comtrade database for commodities classified under the-harmonized system. The idea is to first compute median price change for each product and country over time and a median price change for each product across countries at each point in time. Once medians are calculated, price changes 5 times above or below the median are dropped.

### **Hidiroglou-Berthelot method**

We have used the Hidiroglou-Berthelot (H-B) method for outlier detection and treatment. This method is used, among others, at Statistics Sweden, U.S. Census Bureau, Statistics Canada and the external economy division at Statistics Denmark. The method is developed to detect outlying observations for a periodic business survey that are conducted on a regular basis from the same sampling unit. It is not possible to use the method directly for our trade data as described in Hidiroglou and Berthelot (1986). Accordingly the method has to be adapted to our purpose.

The H-B method uses a composite score function that includes a measure for *suspicion* that a data value is erroneous and the *impact* the suspicious record has on publication totals, see Jäder and Norberg (2006) and Bartha and García (2012). The method requires accurate and relevant medians and quartiles calculated for *homogenous groups*. Hence, the first challenge is to define homogeneous groups. Jäder and Norberg (2006) apply the H-B method for Swedish trade data that is classified according to the Combined Nomenclature at 8 digit level; the data is available by country, enterprise, year and month. The data have provided them various options to define homogeneous groups based on SITC classification, in/out flow of trade, enterprise, trade by country of origin and destination, and monthly figures based on several years of historical data. This is the type of data the H-B method requires.

We have, in contrast, annual data for each trading partners' import from the world. This limits our options for classifying traded items into homogeneous groups and calculation of relevant medians and quartiles. Consequently, adapting the H-B method to our data with sensible assumptions is necessary.

One option is to form a group consisting of similar commodities across partner countries and calculate median and quartiles accordingly. This can be erroneous as the size of import of a particular commodity is different among different countries; the Danish trading partners are different in size (as large as United States and as small as Iceland). In addition, there are instances where a particular commodity is reported in one country and not in another, or reported for some part of the sample period only. An alternative is to consider a particular commodity-country combination over time and calculate appropriate time median and quartiles. One of the limitations with this case is that the sample period (1988-2011) might not be sufficient. On the other hand it has the advantage of treating each product-country combination separately. We apply this approach in this paper. Originally, the composite H-B index is computed for level of unit values. The OECD database reports quantities in different units of measurement and in some cases quantities have level shifts within the sample period. Working with growth rates of unit values instead of level of unit values reduces error due to unit of measurement and level shifts. As a result, we formulate the H-B formula in growth rates. Furthermore growth rates are log transformed, this makes the distribution of ratios more symmetric. Given these considerations *suspicion* is defined as:

$$suspicion = \begin{cases} \frac{q1_t - \log\left(\frac{p_t}{p_{t-1}}\right)}{q3_t - q1_t} & \text{if } \log\left(\frac{p_t}{p_{t-1}}\right) < q1_t \\ \frac{\log\left(\frac{p_t}{p_{t-1}}\right) - q3_t}{q3_t - q1_t} & \text{if } \log\left(\frac{p_t}{p_{t-1}}\right) > q3_t \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

Where  $p_t$  is unit value, and  $q1_t$ ,  $q2_t$  and  $q3_t$  are first second and third quartiles for unit value growth rates over time,  $\log(p_t/p_{t-1})$ . The suspicion formula flags growth rates outside the lower and upper quartile based on their relative distance to the nearest quartile. A preliminary scrutiny of the data has indicated that the different SITC components differ in terms of the noise they contain. In general, the manufacturing components SITC5-9 contain more outliers than the other categories. In particular, the United Nation (1981) manual for compiling unit values recommends paying a special attention to the group machinery and transport equipment (SITC7) and miscellaneous manufacturing (SITC8). Accordingly we have chosen to use different suspicion thresholds for the different SITC components. An observation with a suspicion value above 1.5 for SITC 0, 1, 2, 3, 4, 5, 6 & 9 and 0.5 for SITC 7 & 8 is considered an outlier. In this way we maximize the data recovery rate. The lower the threshold the larger the amount of data we throw away as outlier. As a robustness check we exercise different suspicion thresholds for flagging outliers, see below.

Jäder and Norberg (2006) proposed a score function that consists of equation (3) and an equation for the potential impact the suspicious value could have on the publication total. To measure impact we need expected trade value given the quantity of imports. As this is not possible with the trade data we proceed with equation (4). Once a growth rate is declared an outlier, it is set to zero. In other words it is disregarded when aggregating growth rates at the detailed level to form a price at 1-digit SITC. A particular commodity is dropped for the whole sample period if more than half of the observations in the sample are declared outliers. The test preserves about 85-90% of the dataset. Finally, we should note that filtering is carried out in Danish Krone. Most of the Danish trading partners are also member states of the Euro-zone, and since the Danish Krone is set to follow the Euro we are indirectly referring to the Euro.

#### 4. Price Index

Once the data have been treated for outliers and other statistical issues, the first step is to create a price index for each trading partner's 1-digit SITC import. There are various ways of doing this. The general idea is to relate the growth rates of unit values at 1-digit SITC to a weighted sum of the growth rates of the detailed unit values within each 1-digit SITC. The most popular indices used by national statistical institutions are Laspeyres, Paasche, Fisher and Törnqvist indices, either fixed-base or chained.

In national accounts, member states of the European Union use chain Paasche price indices and the United States uses chain Fisher price indices in national accounts. Since most of the Danish trading partners are member states of the EU, it would be natural to use the chained Paasche index formula for unit values, given as:

$$P_t = \left( \frac{\sum_k p_{k,t} q_{k,t}}{\sum_k p_{k,t-1} q_{k,t}} \right) P_{t-1} = \left( \frac{1}{\sum_k w_{k,t} \frac{p_{k,t-1}}{p_{k,t}}} \right) P_{t-1} \quad (2)$$

Where  $k$  denotes a 5-digit SITC good,  $p_{k,t}$  is unit value of good  $k$  in period  $t$  and  $q_{k,t}$  is quantity of good  $k$  in period  $t$ ,  $w_{k,t} = \frac{p_{k,t} q_{k,t}}{\sum_k p_{k,t} q_{k,t}}$  is the weight of good  $k$  in period  $t$  and  $P_t$  is the Paasche unit value index for 1-digit SITC good.

However, the Paasche chain index is known to underestimate price evolutions by attributing a larger weight to products that have been increasingly consumed following a relative price drop. Alternatively, the Laspeyres index can be used, given as:

$$L_t = \left( \frac{\sum_k p_{k,t} q_{k,t-1}}{\sum_k p_{k,t-1} q_{k,t-1}} \right) L_{t-1} = \left( \sum_k w_{k,t-1} \frac{p_{k,t}}{p_{k,t-1}} \right) L_{t-1} \quad (3)$$

Where  $w_{k,t-1} = \frac{p_{k,t-1} q_{k,t-1}}{\sum_k p_{k,t-1} q_{k,t-1}}$  is the weight of good  $k$  in the previous year and  $L_t$  is the Laspeyres unit value index for 1-digit SITC good. The Laspeyres index, conversely, tends to overestimate real price evolutions as it uses the weight in the previous year, that is, when prices rise consumers shift to cheaper goods and thus reducing the quantities consumed of the expensive goods at the end of the period.

The more noise the data contains the larger would be the upward and downward bias in the Laspeyres and Paasche indices respectively. These indices also suffer from a measurement error due to the fact that they use a single time period as weights to aggregate detailed unit values. In connection with this, the Fisher and Törnqvist indices are preferable as they use weights in two observation periods. The Fisher index ( $F$ ) and the Törnqvist index ( $T$ ) are given as:

$$F_t = (P_t \cdot L_t)^{1/2} \quad (4)$$

$$T_t = \prod_k \left( \frac{p_{k,t}}{p_{k,t-1}} \right)^{(w_{k,t-1} + w_{k,t})/2} \quad (5)$$

It has empirically been shown that the Laspeyres and Paasche indices are the upper and lower bounds of the real price evolutions, see Feenstra (1997) and Gaulier et al. (2008). Thus building the Fisher index as a geometric mean of the Laspeyres and Paasche indices is a good way to approach the correct but unobserved aggregate price. We should note that the Fisher and Törnqvist index produce almost identical results, thus we consider only the Fisher index.

After unit value indices at 1-digit SITC are constructed for partner countries using one of the index formulas (Eq. 2-4), quantity of partners imports at 1-digit SITC can be constructed by deflating the given value of imports with the unit value indices. The final step in the process is to calculate export market and market price indices. In ADAM the growth in the market for Danish

exports is measured as a weighted sum of the growth in trading partners' imports. That is,

$$\frac{fEe}{fEe_{-1}} = \left( \sum_j we_{j,-1} * \frac{fEe_j}{fEe_{j,-1}} \right) \quad (6)$$

Where  $j$  denotes trading partners,  $fEe$  is the market index at fixed prices (2005=1),  $we_j$  is country  $j$ 's share of total Danish exports and  $fEe_j$  is volume of imports of country  $j$  from the world. The weights,  $we_j$ , are calculated using data from Statistics Denmark's *StatBank*. Similarly, the growth in market price,  $pee$ , is measured as a weighed sum of the growth in trading partners' import prices, given as:

$$pee = \left( \frac{1}{\sum_j we_j \frac{pee_{j,-1}}{pee_j}} \right) pee_{-1} \quad (7)$$

Where  $pee$  is the market price and  $pee_j$  is country  $j$ 's import price in Danish Kroner.

Equation (6) and (7) are Laspeyres and Paasche indices respectively. They can be modified to the Fisher index. Note that the use of Laspeyres, Paasche or Fisher index is only important when aggregating detailed SITC unit values at the country level to 1-digit SITC unit values. It is not that important when aggregating the less volatile partners' 1-digit SITC unit values into market prices for Danish exports.

## 5. Results and discussion

### A) Market price and market index

The export market and market price indices based on the major 20 trading partners are presented first, the case with BRIC and Eastern European countries is considered later. Industrial exports comprise more than 40% of the total Danish exports. It is natural to start with industrial exports, and to save space the remaining export groups in ADAM are reported in appendix I.

Figure 1 below presents market price in Danish Krone (1a), market price in US dollar (1b), the change in market price in Danish Krone (3c), and the Krone-Dollar rate (1d). The Laspeyres index sets the upper bound and the Paasche index sets the lower bound, whereas the Fisher index lies in the middle as expected. Figure 1c demonstrates that compared to the Fisher index the growth rates in the Laspeyres index are 10% higher and the growth rates in the Paasche index are 10% lower. This bias margin gets higher the higher the amount of noise the data contains.

The Fisher index in US Dollar have been falling and rising over the two decades covered, whereas the Fisher index in Danish Krone have been more or less stable around two distinct levels. Most of the Danish trading partners use Euro and since Danish krone is pegged to the Euro this could be one of the reasons why the krone denominated price is relatively stable.

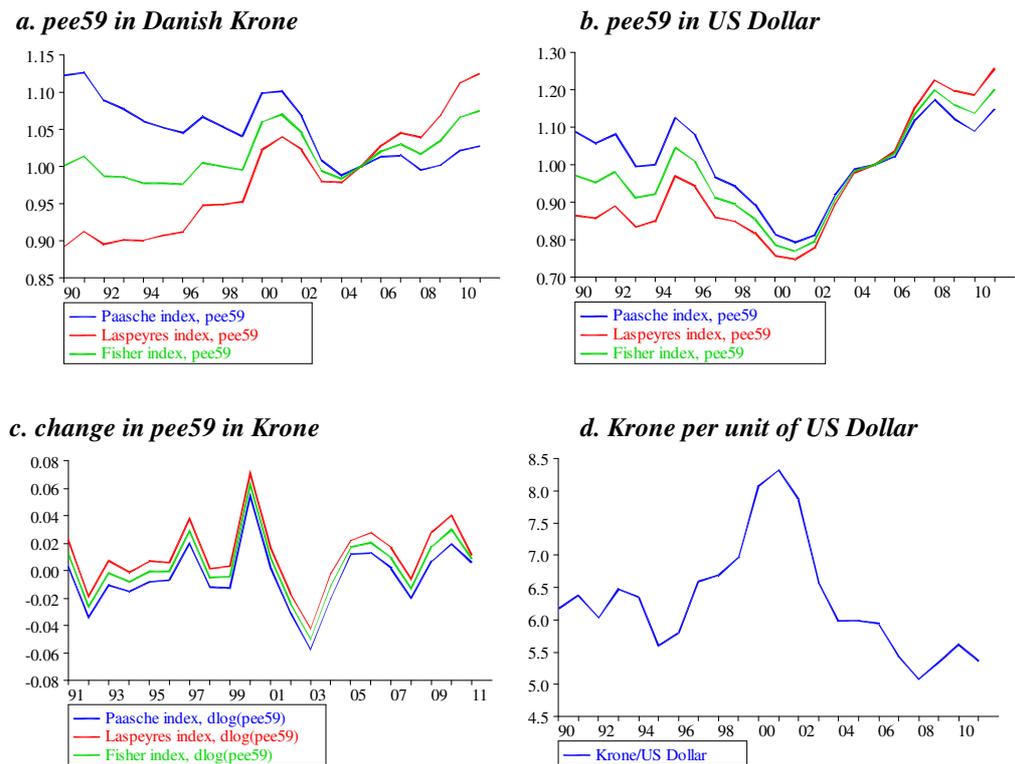
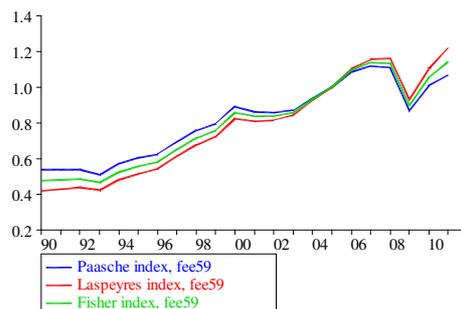
**Figure 1. Market price for manufactured exports, pee59 (2005=1)**

Figure 2 shows the export market index for manufactured exports. The Laspeyres index produces a relatively steeper market index in volume. As we shall see in figure 4 below this will have consequences for the market share in volume. Both the export market volume and market price indices indicate the Fisher index is the ideal index to use.

**Figure 2. Market index in volume for manufactured exports, fee59 (2005=1)**

## B) Sensitivity of results to the filtering threshold

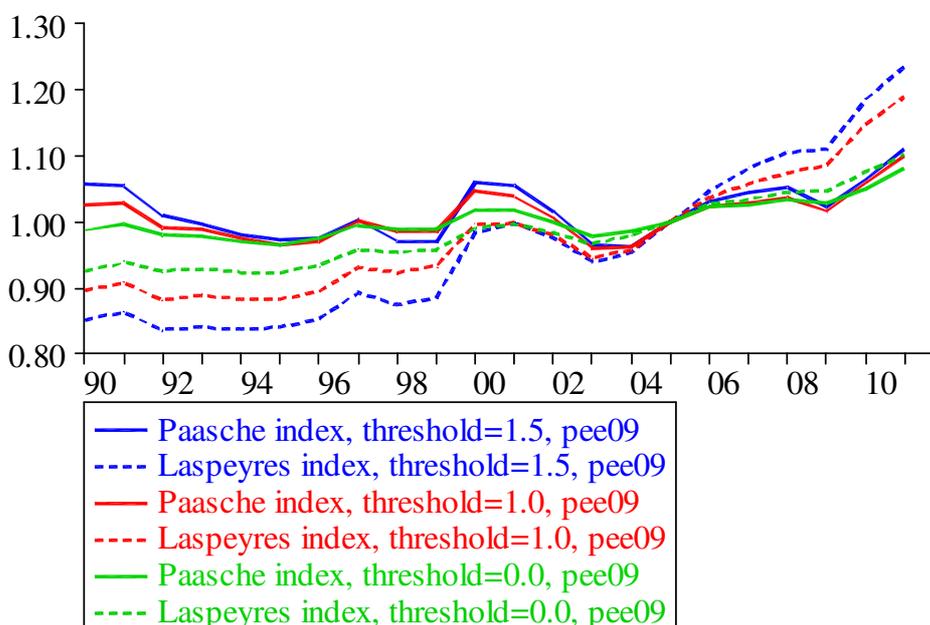
We have chosen a suspicion threshold of 0.5 for SITC 7 & 8 and 1.5 for the other SITC components, this is *ad hoc* and not that sensitive for the market expression based on the Fisher index. The smaller the suspicion threshold the higher the amount of data we throw away as outlier. This runs the risk of deleting true price growths as outliers. On the other hand a higher threshold value produces erratic price movements. The upward and downward biases in

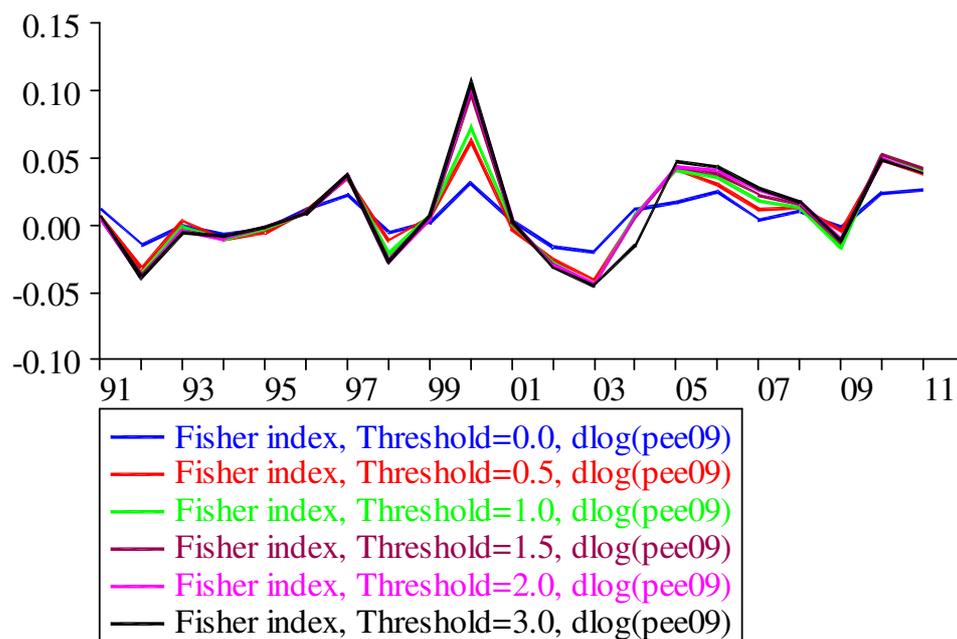
Laspeyres and Paasche indices increase as the filtering threshold increases. In particular the group SITC 7 & 8 require a special attention. These groups do not give us that much freedom to exercise different threshold values. As a result when increasing the threshold for the other SITC groups, 0, 1, 2, 3, 4, 5, 6, & 9 above 0.5 the threshold for SITC 7 & 8 is fixed at 0.5.

In figure 3 below we show the effect of changing the filtering threshold on the market price for total goods. Figure 3a demonstrates the sensitivity of the upward and downward biases to the choice of threshold values. The solid lines are Paasche indices and the dotted lines are Laspeyres indices. As we reduce the threshold we throw away more and more data as outliers and the margin between the Paasche and Laspeyres indices gets smaller. This, however, comes with a cost of filtering away true price changes as outliers. In this situation the Fisher index that is a geometric mean of the Laspeyres and Paasche index, maybe the ideal index to use, because the Fisher index is more robust to the choice of filtering threshold. Figure 3b shows for a threshold value of 1.5 and above the growth rates in market price remains more or less qualitatively unchanged. Ultimately we want a threshold value that maximizes the data recovery rate and at the same time controls for unrealistic price movements. After a careful scrutiny of the market price together with country specific unit value changes a threshold value of 1.5 is chosen.

**Figure 3. Market price for total goods with different filtering thresholds (2005=1)**

*a. Laspeyres and Paasche indices*



*b. Fisher index***C) Market share and relative price**

The export equation in ADAM relates market share to relative prices. A closer look into the development in market share and relative prices especially after 2002 is of a particular importance. Now that data is available it would be natural to consider the following question: have the Danish market share and relative prices been falling or rising?

On one hand, the growing OECD trade with BRIC countries, East European countries, and several other Asian and Latin American countries should crowd out Danish exports in the OECD market. On the other hand, the nature and composition of Danish exports are different from competitors' export, so that it is not clear to what extent Danish exporters will lose market shares to the newly emerging exporters. Yet again Danish exports are not destined to only OECD countries, trade with BRIC and East European countries have been gaining momentum.

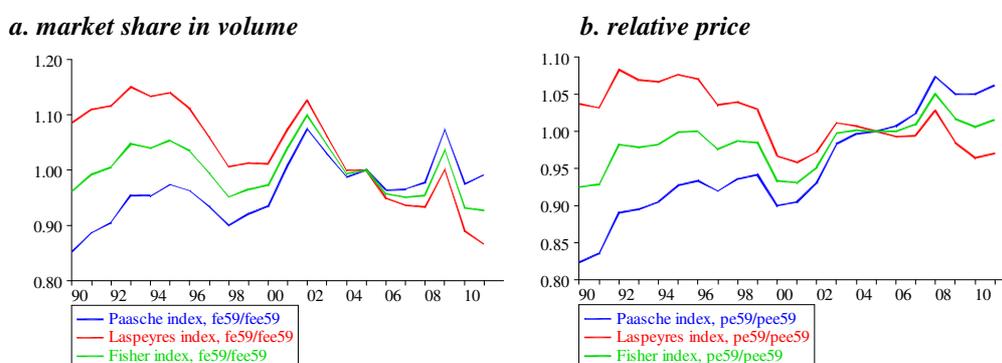
In addition to this, figure 2 above has indicated that the growth rates in the market index depend on the index formulas we apply. The Laspeyres market index is steeper than the Paasche market index, this will have a direct consequence on market share. As a result, the answer to the question posed above is not straightforward.

Figure 4 shows the market share and relative price for industrial exports based on the different index formulas. Due to upward and downward biases in Laspeyres and Paasche indices, we should focus on the Fisher index. We should note that the Danish national account prices are Paasche price indices and quantity figures are Laspeyres indices. To be consistent, we should also construct Danish prices based on the different index formulas. This is not, however, necessary. As we can see from appendix II the Danish export prices

are not sensitive to the choice of index formula. This is because the national account export prices at the detailed level contain little or no outliers. Hence we do not have to re-calculate the given Danish prices in different index formulas and we can continue our discussion as if the national account Danish prices are Fisher indices.

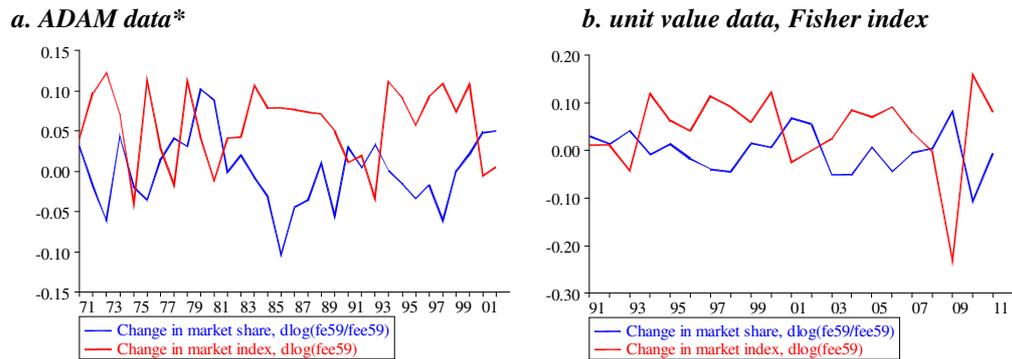
The market share based on the Fisher index shows that the Danish market share has been falling moderately since the beginning of 2000 and price competitiveness has been worsening with the exception of 2009. The year 2009 was characterized by a worldwide fall in both exports and imports. It is because Danish exports did not fall as much as partner imports that Denmark experienced a rise in market share in that particular year. We attribute this to the less cyclical nature of Danish exports that move less than one-to-one to changes in the market, at least in the short run.

**Figure 4. Market share and relative price, industrial exports (2005=1)**



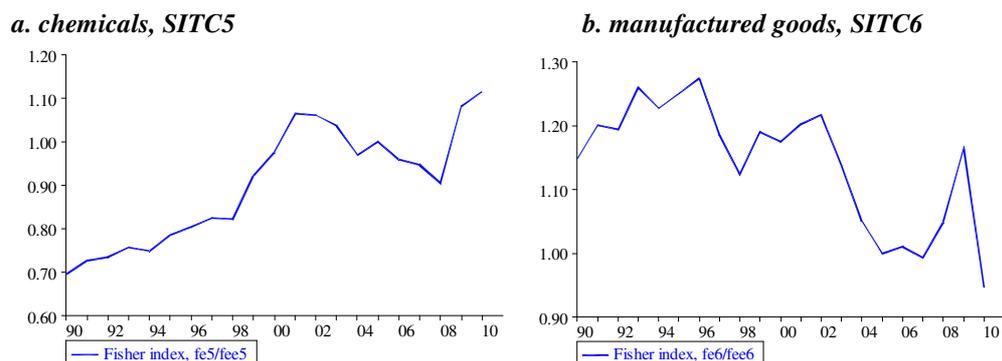
The countercyclical nature of Danish market share is reflected in ADAM's export relation. The short-term demand elasticity has long been estimated to be less than one. A simple plot of the change in market share together with the change in market index based on Fisher index clarifies this point, see figure 5. The Danish market share is clearly negatively correlated with the change in the market index. Danish manufactured exports often win market shares during periods of international recession, and lose market shares during upswings.<sup>3</sup> We attribute the countercyclical nature of the market share to the composition of Danish manufactured exports. A large share of Danish manufactured exports is made up of goods that are less cyclical, for example pharmaceuticals and energy technology.

<sup>3</sup> See Monetary review, 2010 1<sup>st</sup> quarter, Danish National Bank.

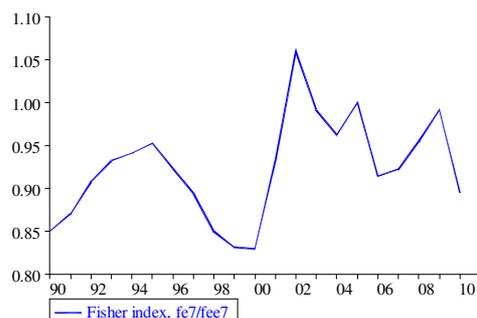
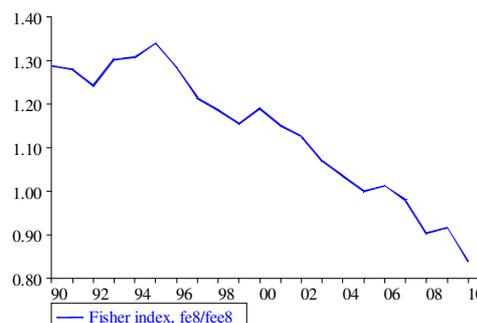
**Figure 5. Change in market share and market index**

\*This is the old ADAM data previously used.

The composition of Danish manufactured exports<sup>4</sup> has been changing significantly in the last 20 years. The market share for SITC5 (chemicals and related products) has been steadily growing. The SITC5 products are less sensitive to business cycles, a good example is pharmaceutical products. In 1990 the composition of industrial exports was 15% SITC5, 19% SITC6, 39% SITC7 and 28% SITC8; these values are today 26%, 14%, 37% and 23%, respectively. There has been a growing shift from goods that are more sensitive to business cycles (SITC6 and SITC8) to goods that are less sensitive (SITC5). The share of SITC7 has been relatively stable. This will have a profound effect on the market share for industrial products as a whole. The change in composition is also reflected in the market share for each industrial export sub-components. Figure 6 below shows the market shares for SITC6 and SITC8 have been on average falling while the market share for SITC5 have been on average rising and the market share for SITC7 have been moving up and down over the sample periods covered.

**Figure 6. Market share in volume for industrial export sub-components, Fisher index (2005=1)**

<sup>4</sup> Manufactured exports comprise: chemical and related products, SITC5, manufactured goods classified chiefly by material e.g. textile & leather, SITC6, machinery and transport equipment, SITC7, miscellaneous products e.g. furniture, SITC8, and commodities not classified elsewhere, SITC9. Here SITC7 is excluding ships and air crafts, and SITC9 is included in SITC8.

*c. machinery and transport, SITC7\***d. miscellaneous, SITC8*

\*fe7 is excluding ships and aircrafts and fee7 is including ships and aircrafts.

A look into the market shares of the industrial export sub-components makes it easier to understand the market share for the whole industrial export. The insight can be further strengthened by examining the Danish market share in individual partner countries. Obviously, considering all trading partners is a tedious exercise, consequently, the top 5 trading partners (ranked by the share of partners import from the total Danish exports) are considered. These countries are Germany, Sweden, Great Britain, Norway and United States. To examine whether Denmark is being crowded out from the OECD market by emerging economies a measure of competitors' market share in the five countries mentioned above is required. To this end we use the market share of BRIC countries in the OECD market, where we compare the 5 OECD country's import from BRIC against import from Denmark, note that value of imports in US dollar is used. The figures are reported in appendix III.

In general, OECD's import share from Denmark has been more or less stable for SITC5 and SITC7. The share of SITC8 has been falling. In contrast, OECD's import of SITC8 from BRIC has been steadily rising and marginally rising for the other SITC components. SITC8 is a good example where Danish exporters are being crowded out by BRIC exporters, in other words there is a loss of competitiveness in this group. This is not the case in the other SITC groups especially SITC5, where Danish exports are clearly distinct from competitors' export and despite economic down and up-turns, Denmark has been able to keep a stable share of the OECD SITC 5-market. A growing shift in Danish industrial exports toward goods that are less sensitive to business cycles may ensure a stable market share in the future.

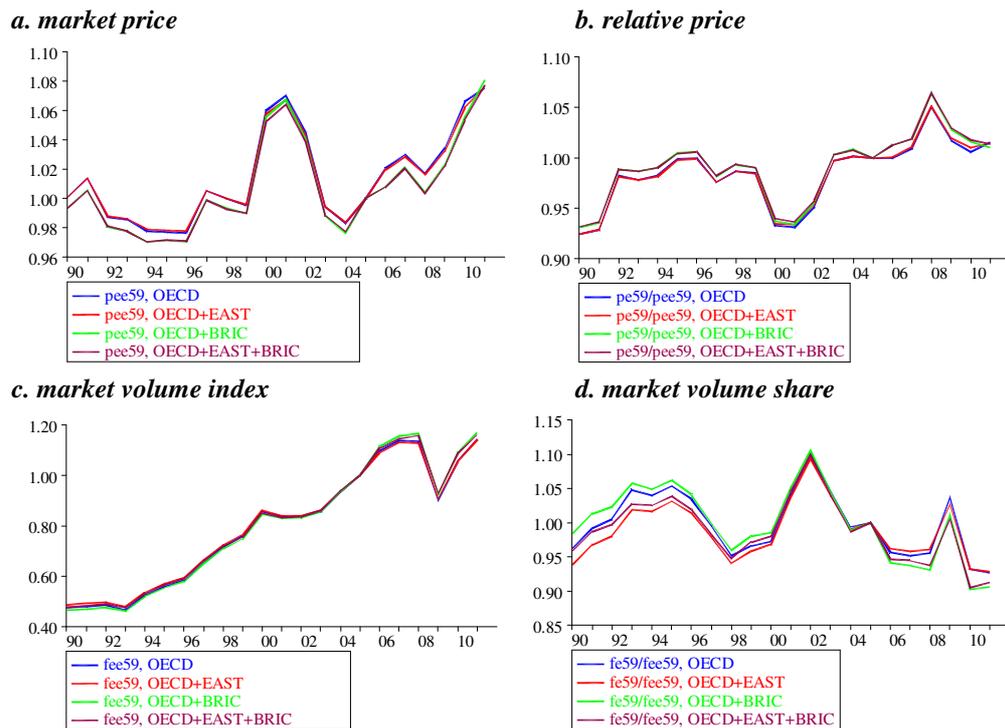
#### **D) Expanding the market base**

So far we have considered only 20 OECD countries, but trade with BRIC countries, Eastern European countries and other Asian and Latin American countries have been growing significantly in recent years. The newcomers expand the market for Danish exports and at the same time they increase the competition for the OECD market. In the following the market base is expanded to include BRIC countries: Brazil, Russia, India and China; OECD countries: South Korea, and Turkey; East European countries that are also OECD member states: Hungary, Czech Republic and Poland. By 2010 about 11% of the total Danish exports have been destined to these countries. Historically the share of these countries has been low, 3% in 1990 and 6% in

2000. In particular, trade with the BRIC countries China and Russia and with Poland in Eastern Europe is significant. We should note that the OECD database does not cover import data for BRIC, we have approximated the imports of BRIC by the total OECD export to BRIC.

Figure 7 presents export market and market price indices based on the smaller and larger market base, we report only Fisher indices since this is our preferred index. The differences are not significant. Export market and market price indices are weighted aggregates over different products and different countries. In order to see a significant change there has to be a change in the price/volume of imports of the major trading partners, say Germany that alone accounts for about 16% of Danish exports. Trade with BRIC and East European countries have become important only recently and should not influence market volume and price indices in a significant manner. The imports of BRIC countries have not fallen as much as OECD import during the recent financial crisis, this is why the market share with the larger market base has a more negative trend in recent periods.

**Figure 7. Fisher market index and market price for manufactured exports, different market base (2005=1)**



## 6. Summary

This paper has presented data for export market and market price indices. Price indices are constructed based on unit values using data from OECD International Trade by Commodity Statistics database. We have shown that the export market and market price indices are sensitive to the choice of index formula. The Laspeyres index in general gives the highest growth rate in the market index and consequently the highest fall in the Danish market share due

to upward biases. Conversely, the Paasche index suffers from a downward bias. The Fisher index on the other hand is a geometric mean of the Laspeyres and Paasche indices and it is our preferred choice.

Based on the Fisher index, a moderate fall in the Danish market share is observed since the early 2000s. There is considerable evidence that the Danish market share is countercyclical to developments in the market. Expanding the market by including BRIC and Eastern European countries does not alter the basic result based on the major OECD trading partners in a significant way. In a subsequent paper, we pursue a comparison of the unit value data with the official OECD National Accounts Statistics and old ADAM data.

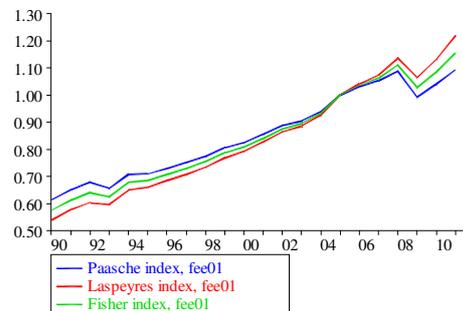
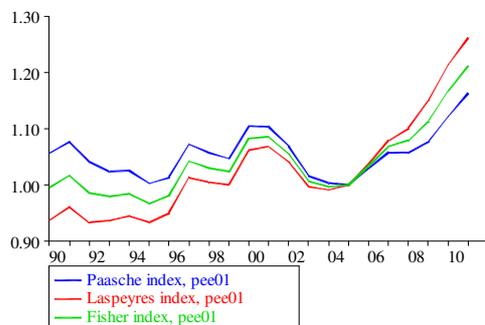
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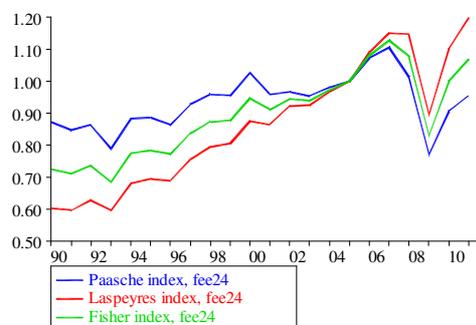
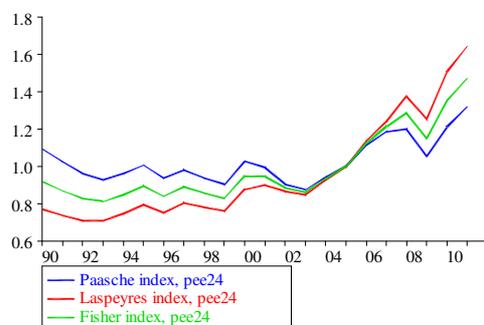
## Appendices

### Appendix I. Market price and export market indices

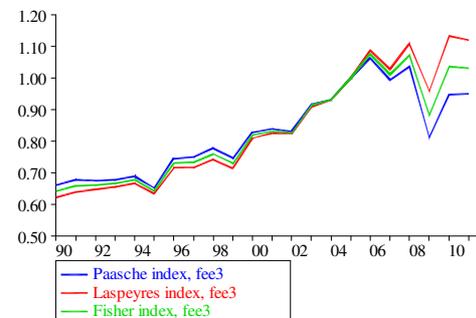
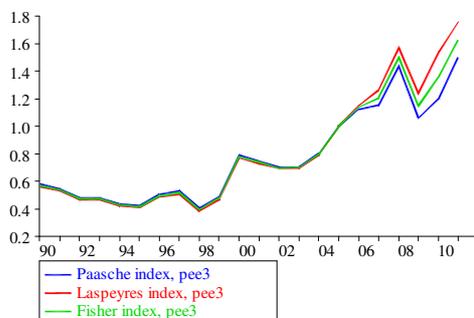
#### a. agricultural exports (2005=1)



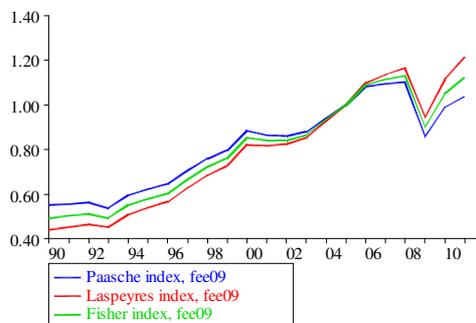
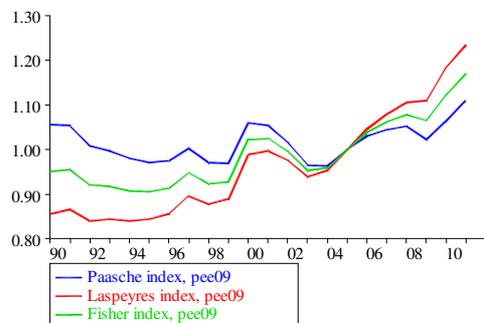
#### b. material exports (2005=1)



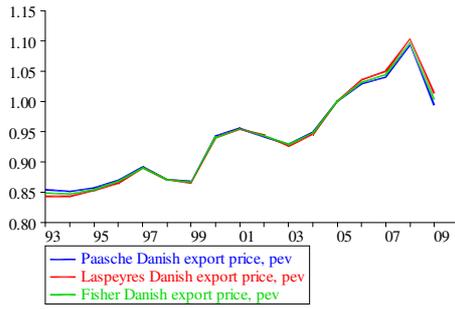
#### c. energy exports (2005=1)



#### d. total goods (2005=1)



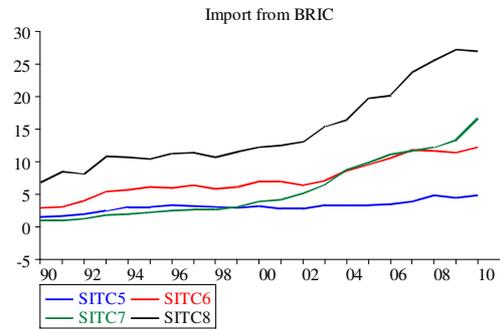
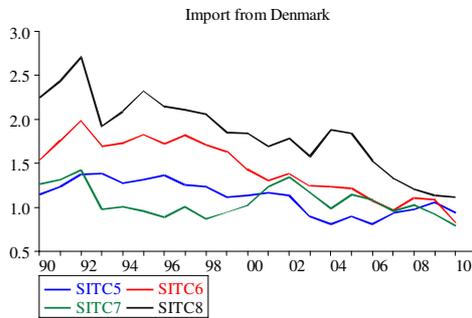
**Appendix II. Danish export prices for total good, different indices (2005=1)\***



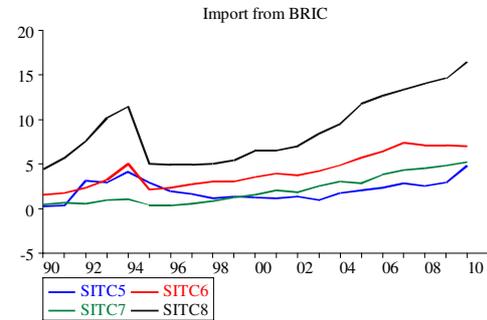
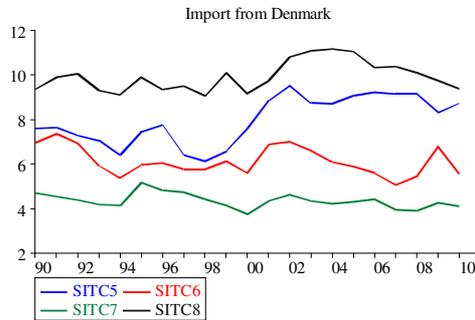
\*Calculation by Michael Osterwald-Lenum, Model-group.

**Appendix III. Imports of OECD countries from Denmark and BRIC in current price, as a percentage of the total imports from the world.**

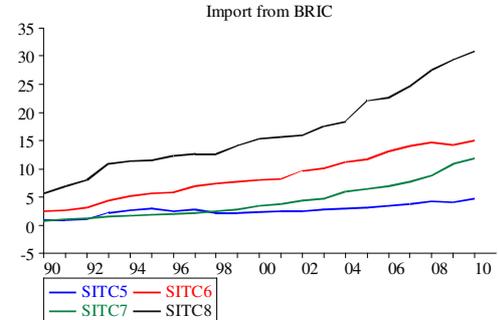
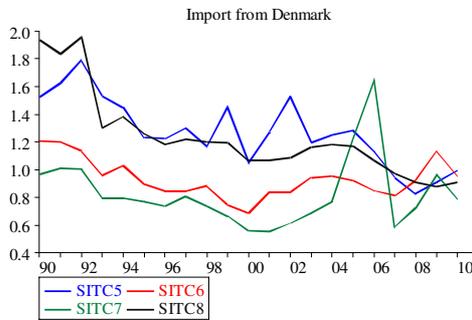
**Germany**



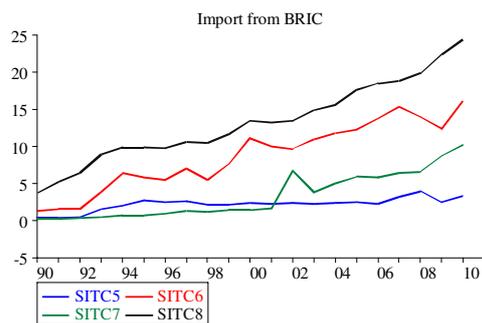
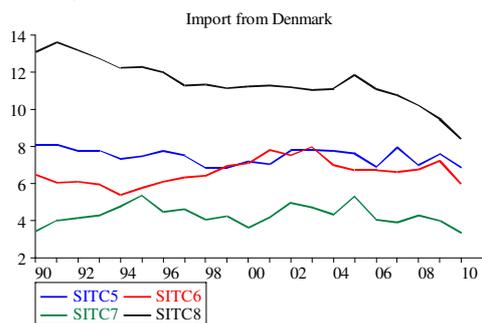
**Sweden**



**Great Britain**



**Norway**



**United States**

