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A SECTORAL REVIEW"

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ABSTRACT: This review article seeks to examine in some detail certain major theoretical and empirical issues relating to price competitiveness. The article is one in a series of publications of ETLA paying special attention to sectoral variations in the price competitiveness.

Various theories of international price competitiveness abound, the most important of which is Purchasing Power Parity (PPP) theory. In its strongest form PPP would deny any difference in the purchasing power of currencies. We show that Finnish industry (1975-85) has experienced a cyclical trend in its competitiveness. The sectoral disaggregation in the study reveals two different patterns in competitiveness - first a Hicksian flex-price market (e.g. wood, paper products; Finland's traditional export sector) - and second a fix-price market (i.e. - the new manufacturing exports).

It would not be appropriate to draw too strong conclusions from this study, price competitive factors are but one of a series of elements in policy-making. We merely wish to bring one issue to light which has been much discussed although little examined in a systematic empirical framework.

KEY WORDS: theory of international trade: prices, price competitiveness, index numbers

"Finnish Price Competitiveness - A Sectoral Review"

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1. Preface/Acknowledgements:

This paper was written during my stay at the Research Institute of the Finnish Economy as an AIESEC-trainee.

Working in ETLA has been both stimulating and enjoyable because of the friendly and co-operative atmosphere at the Institute. I would like to thank everyone personally but space prevents me from doing so; however, particular thanks are due to three of my closest colleagues Markku Lammi, Esko Torsti and Antti Ripatti. Their camaraderie, and ADP skills! have enabled this paper to be published so soon. Thanks too, to Professor Yrjö Vartiä and Jukka Leskelä for their constructive comments on the early drafts of this paper.

In the event of any queries arising out of the paper, the author may be contacted through the Institute.

David I. Bendor

Helsinki, August 1986

"Nokia the largest private company in Finland, is restructuring its business from heavy industry towards high-technology.

"We go for quality products", said Jorma Ollila, vice-president for finance.

"It isn't possible for us to compete on price".

Euromoney, August 1986

2. Introduction/Summary

Imagine that there exists an industrial estate with only two firms, each with its own factory and its own output. Firm A produces clothes for leisurewear and firm B produces leather upholstery. How can you ascertain which firm is more competitive? Is it the firm with lower unit labour costs, or is some other measure more appropriate? No adequate answer really exists to this question; however, this example shows that the comparison on a micro level of two firms within the same ISIC 32 group (or for that matter 'industry' if we should loosen our terminology a little) presents significant difficulties.

As we broaden this comparison to an international level clearly the problems multiply rapidly. The point we wish to emphasize is that when we talk about price competitiveness we are in fact referring to relative price changes over time: between a home country and its foreign competitors. We have ignored all the other factors that may be important in determining a country's competitiveness; non-price factors for example (whether goods are delivered on time or if they are of the right quality etc.) may well be far more important than just relative price factors. Consequently conclusions that may be inferred from the data are limited, and the error of assuming that we know 'everything' should be avoided.

The aim of this study has been to compile indices of price competitiveness by industrial sectors, and to place these calculations into a theoretical framework, which will allow the reader to ascertain for himself or herself the position of Finland's price competitiveness.

The study falls into three sections: first the theoretical problems of price competitiveness are reviewed. Second, we put forward an analysis of the major index theoretical issues inevitably raised in the compilation of such data, and finally we present the data and examine its implications. The story we tell is not particularly new, although it does serve to confirm much of what people had only "suspected" earlier. The cyclical nature of Finnish price competitiveness comes across quite clearly, and one is led to pose the question - is there any solution to this vicious circle? If the answer lies anywhere it must lie in the long-term - cycles are not smoothed out in the short-term. Finland has been remarkably fortunate, her hard hitting devaluation policies have probably done more to boost the economy, than they have done to harm it. So, one could argue that if the problems have not changed - why should the policy solutions? I do not believe that old policies would not work, they probably would, but what I do believe is that new policies that seek to guide the economy forward into the future on a smooth and stable path, will have far better effects, than policies which have been implemented seeking to rectify the past. We present some policy conclusions in the post-script.

3.1. Theories Behind Price Competitiveness

(i) Purchasing Power Parity:

"The purchasing-power-parity theory asserts that the exchange rate is determined by the level of prices in the domestic country compared to that abroad, that changes in the exchange rate are determined by changes in these price levels, and that the percentage change in the exchange rate per month, quarter or year is determined by inflation at home relative to that abroad over these intervals. The theory is based on the intuitively appealing idea that money, whether domestic or foreign is valued - and therefore demanded - for the goods and services it can produce in the country to which the money pertains."

L.H. Officer (1984)

It is perhaps a little nihilistic to begin a study of price competitiveness with an examination of the theory of purchasing-power-parity (PPP) which provides a basis designed to deny the existence of improving or worsening price competitiveness. If PPP holds, in one form or other, price competitiveness will be defined as "neutral". In this section we provide an overview of PPP theory, discuss the concepts of exchange-rate equilibrium and cost-parity, and conclude with a critique which indicated why price competitiveness has both theoretical and empirical relevance.

PPP is certainly not a new theory, its origins may be traced back to the writing of Gerrard de Malynes in England (1601), and to the Salamanca School in Spain (16th Century). Cassel's article in the Economic Journal (1916) led to PPP's revival in modern economic literature. Although several different theories are placed under the PPP umbrella, essentially PPP is either seen in its absolute or

relative form. The absolute or strong theory of PPP relies on the "law of one price" (LOOP), i.e. in an integrated and competitive market. Therefore the PPP of a domestic country's currency will be ratio of the foreign price level to the domestic price level. Where the price level is defined as an average, often weighted, of absolute (money) prices. As the absolute theory is based upon general price levels, the assumption must be introduced that the ratio of the price of tradables relative to non-tradables is invariant to real changes in the economy. In this way one can account for the international transmission of inflation; only under a free float exchange rate system will a country regain its control over domestic monetary policy and its price level.

The relative or weak version of PPP describes price movements and not price levels, where price movements are measured by price indices. Calculation of such movements or price relatives requires the selection of a base period. Relative PPP may be defined in either of two ways: [i) as the ratio of the foreign to domestic price indices
[ii] as the product of this ratio and the base period exchange rate. The exchange rate here is defined as the price of the domestic currency in terms of foreign exchange, i.e. as the number of units of domestic currency per unit of foreign money. This need not, of course, refer to any specific 'equilibrium' value of the exchange rate, and is most readily taken to be the 'spot' rate of exchange. The base period will be the 'spot' exchange rate; ideally it would be the period in which the exchange rate equals the absolute PPP. Price indices (usually weighted) are averages of price relatives where the price relative is the ratio of a particular individual price (of a commodity for example) in the current period to the price of the same item in the base period. The first relative PPP will therefore be

without dimension - since it is a price index, the second relative PPP the product of the first and the base-period exchange rate - and will therefore have the same dimension as the exchange rate, i.e. the same dimension as absolute PPP.

We may illustrate the above as follows:

Let L_h^t = price level of domestic country in time t
 L_f^t = " " " foreign " " " " "
 P_h^t = " index " domestic " " " " "
 P_f^t = " " " foreign " " " " "
 R^t = actual/spot exchange rate in time t, number of units of foreign currency per unit of domestic currency

PPP^{abs} = absolute PPP in time t

PPP^{rel1} = relative PPP, first concept, in time t

PPP^{rel2} = relative PPP, second concept, in time t

Therefore:

$$(1) \quad PPP^{abs} = L_f^t / L_h^t$$

$$(2) \quad PPP^{rel1} = P_f^t / P_h^t$$

$$(3) \quad PPP^{rel2} = PPP^{rel1} * R^0$$

In conclusion, the logic or rationale which underlies the PPP definitions, above, is that the purchasing power of a currency, its command over domestic goods and services, and its changes over time, may be measured by the inverse of the country's price level. The PPP of the domestic currency vis-à-vis the foreign currency is the domestic/foreign relative PP- (i) relative price levels or absolute PPP

OR(ii) relative price indices, PPP first concept

OR(iii) the product of the foreign/domestic relative

price index and the base-period exchange rate, relative PPP second concept.

Propositions of PPP - may take three forms, according to which PPP definition one adopts. The first proposition relates the long-run equilibrium exchange rate to PPP; the second relates the short-run and long-run equilibrium exchange rates; the third relates the short-run equilibrium rate to PPP. Generally propositions 1 and 3 (either or both) are considered to constitute PPP theory.

Proposition 1: The long-run equilibrium exchange rate is primarily determined by PPP, and is a function of PPP where it will tend to equal PPP in the observation period.

Let RL^t = long-run equilibrium exchange rate in period t, number of units of foreign currency per unit of domestic currency,

$$RL^t = f_1 (PPP^{abs}, \dots)$$

$$RL^t/RL^0 = f_2 (PPP^{rel1}, \dots)$$

$$RL^t = f_3 (PPP^{rel2}, \dots)$$

where f_1, f_2, f_3 , are arbitrary increasing functions with respect to the explicit independent variable, ellipses (...) indicate space for further explanatory or error variables.

In effect the f_2 function is an exchange rate index observation period relative to the base period.

Proposition 2: Let $RS^t = g_1 (RL^t, \dots)$

$RS^t/RS^0 = g_2 (RL^t/RL^0, \dots)$ ie the short run exchange rate g_1 and g_2 are defined as f_1 etc. above and h_1 etc. below.

Proposition 3: The short-run equilibrium exchange rate in any current period, t , is principally determined by the PPP (again equalization will tend to occur)

$$RS^t = h_1 (PPP^{abs}, \dots)$$

$$RS^t/RS^0 = h_2 (PPP^{rel1}, \dots)$$

$$RS^t = h_3 (PPP^{rel2}, \dots)$$

This proposition may be derived from the first two propositions by substituting the different functions, where

$$h_1 = g_1 * f_1$$

$$h_2 = g_2 * f_2$$

$$h_3 = g_3 * f_3$$

To calculate absolute or relative PPP we may use:

Absolute

retail price level
wholesale price level
export price level
unit labour costs (level)
producer price level

Relative

retail price index/CPI
wholesale price index/WPI
export price index/EUV
unit labour costs (index)/ULC
producer price index/PP

CPI, WPI, EIV, ULC, PP are later used in the calculation of Finnish price competitiveness.

The equilibrium exchange rate

The above analysis has led us to make certain propositions which involve the concept of an equilibrium exchange rate, as opposed to the current or spot rate. Defining equilibria is a thorny task, however,

we shall attempt to highlight the major issues involved here. It is implicitly assumed that such an exchange rate is a long-term concept.

Keynes writing in Lloyds Bank Monthly Review (October 1935) first proposed a definition of the equilibrium exchange rate, which pre-empted much of what later writers were to put forward on the subject.

1. Keynes treated the equilibrium exchange rate in terms of a fixed or pegged level (later to be a feature of the equilibrium exchange rate literature)
2. This rate keeps the balance of payments near to equilibrium over a certain time period; the imbalance is measured by gold flows.
3. Keynes, like his successors, implied a flexible time period of payments imbalance.
4. The employment criterion is introduced; where the "normal" level of employment is not subject to "undue strain".
5. Only 'permanent' trade restrictions may be permitted under the definition.
6. The equilibrium rate will hold for no structural changes in the economy.

Joan Robinson writing in the wake of the General Theory seeks to extend Keynes' ideas into an open economy (see "The Foreign Exchanges" in Essays in the Theory of Employment, 1937).

"The notion of the equilibrium exchange rate is a chimera. The rate of exchange, the rate of interest, the level of effective demand and the level of money wages react upon each other like the balls in Marshall's bowl, and no one is determined unless all the rest are given."

The implication is therefore that no single equilibrium rate will correspond to given structural conditions. In conclusion when one refers to an equilibrium exchange rate, there are two possible definitions according to the time period chosen. In the short-run, the equilibrium exchange rate will be determined by market forces, ie. under a free float system. In the long-run, implicitly the focus of this study, the equilibrium exchange rate will

- a) yield balance of payments equilibrium, over a certain period of time,
- b) include some measure of the balance of payments, be it basis balance or official-settlements balance,
- c) incorporate a time period which comprises both cyclical and seasonal fluctuations in the balance of payments,
- d) not be influenced by macroeconomic policies designed to correct payments imbalance.

Cost Parity - The inadequacies of price parity have led to many proponents and opponents of price parity to turn their attention to cost parity; several arguments exist in its favour.

1. Costs of production are less subject to adjustment to exchange rate changes than are prices of traded goods,
2. Prices may be seen to comprise two 'cost' elements - cost and profits. Profits are often seen to be volatile, at least in the long-term, and therefore costs may be seen to better reflect long-term prices, for absolute parity.
3. If a country exports its goods at world prices, currency overvaluation may result in lost markets; hence cost levels/indices may reflect the over-valuation,

4. The structure of factor prices (in particular wage rates) within a country will change less over time than the structure of commodity prices,

5. Wage rates in the tradable sector of the economy are less susceptible to direct foreign influences than are commodity prices. This can of course be taken simply as a variant of LOOP.

How do we measure cost parity in practice? Ideally some measure of unit factor cost (UFC) would be used, in practice this is not always possible, and since labour is the most important factor of production best approximation may be given as unit labour costs (ULC). Further abstracting from the theory we may assume that wages equal UFC.

Therefore the number of B-currency per unit of A-currency is given by

$$\frac{W_B}{W_A} * \frac{PR_A}{PR_B}$$

where W_i = wage rate in country i

PR_i = productivity in country i.

The five points raised above are not to be seen so much as justification for using UFC, but rather why it may be a better alternative than prices. The principal reason for using ULC parity theory lies in the long-run maintenance of payments equilibrium, ie. a rise in the wage rate relative to that abroad, if not compensated for by an increase in productivity required exchange rate depreciation.

Friedman and Schwarz (1963) present a different perspective on price parity; they reject price parity because product price indices include the effect of changes in productivity. The monetary view they put forward suggests that PPP should refer to monetary changes alone and not incorporate changes in productivity which are real changes. Implicitly they reject UFC and ULC parity too. Friedman and Schwartz exclude such real factors from their indices by choosing factor prices weighted by employment (or as a second best, producer prices weighted by the volume of domestic production) as the relevant variable.

A Critique of PPP. The format of the critique is presented in four sections: index number problems; absolute, relative and cost parities reviewed; evidence of PPP failure; and the resulting implications for policy.

([1] Index Number Problems: in constructing a measure of PPP using either price levels or indices one must first be convinced that the individual prices do reflect the prices at which transactions occur in a free market. If, for example, effective rationing and/or price controls in one or both countries exist, the PPP measure will be distorted and its value as a measure of the true relative buying power in the two countries would be lost. A related point we should keep in mind is that the value of the parity will in general depend on the kind of price level/index used, and with the different weighting systems used too. Different countries will, generally, use different weighting systems and therefore the resulting parities calculated will not be the "true" parities: which equalise all individual of paramount importance given different tastes, economic structures and accounting practices worldwide. We enlarge upon data problems below. In

calculating price competitiveness indices we have followed convention by using both Fisher and Törnqvist formulae which avoid many of the biases found in crude index numbers (see below). Asset market theory—asset market theorists explain exchange rate determination in terms of the interplay of financial markets—equalising the purchasing power of currencies domestically and abroad. When the purchasing power of money differs between two countries, more of the higher-valued money will be demanded in place of the lower valued money. The value of money will be its purchasing power in terms of commodities, and will therefore vary inversely with the domestic price level. Consequently "money arbitrage" of the relevant countries will yield the usual PPP result. PPP may be regarded as an equilibrating mechanism in asset markets too. In conclusion the theory implies that the exchange rate, like the prices of other assets, is in fact more sensitive to expectations concerning future events than national price levels. At times of changing expectations exchange rates are far more likely to be volatile than are national price levels, so departures from PPP will be the rule rather than the exception.

[2] Absolute, Relative and Cost Parities Reviewed

The critique of absolute parity divides into two sections:

- a) total rejection of the theory of absolute PPP, ie. that the freely floating exchange rate tends to the PPP
- b) the rejection that absolute PPP holds in the short-run, but that the equilibrium exchange rate may approach the PPP at that time. The degree of deviation of the short-run equilibrium exchange rate from

the PPP will be a function of the degree of international market imperfections – tariffs, other trade restrictions and transport costs. Further deviations from the PPP will arise if there are internal controls eg. prices and wages policy is in force. Non-current account items can also cause a breakdown in PPP major capital flows are one example. One of the most fundamental objections of PPP goes to the heart of the theory itself. PPP sees the direction of causation from price levels to the exchange rate, ie. the exchange rate is the determined variable. It may well be quite the opposite case in reality. Only if one seeks to interpret PPP in its weaker form, LOOP for example with general price levels, then questions of the direction are irrelevant.

The fundamental problem with relative price parity is its need for a base period. Ideally the base ought to be taken as the long-run equilibrium price, but unless the exchange rate was on a free float at that time, there is no guarantee that it was even in short-run equilibrium. Indeed if there was a free float then the exchange rate may have been subject to destabilizing short-run effects. Consequently if the base period was in disequilibrium the relative price parity will reflect/perpetuate it. Practical choice of a base period is enormously difficult, because it is very rare that one is fully aware that the period chosen is in fact a "normal" period. Even if one is fortunate enough to have chosen a "normal" base period it is not to say that economic conditions have not changed since then, such changes in the economy may be classified as either structural or non-structural in nature. Non-structural changes may take the form of changing transport costs or tariff barriers, alternatively conditions affecting international capital flows may be altered which will have

considerable effect. Structural changes take the form of relative price variations, often this may result from changing tastes technologies or factor supplies. The implication therefore is that one cannot realistically leave the base period unchanged for lengthy periods of time. Our analysis of price competitiveness uses 1980 as the base year, choosing this year has little merit other than economic convention. In fact 1980 was an unusual year for the balance of payments being a particularly poor balance.¹⁾

Objections to cost parity take either of two principal forms

- a) focussing on weaknesses of cost parity in relation to price parity
- b) in relation to UFC parity.

Cost parity, and the use of ULC data in particular, suffers from drawback that it may exclude other important cost factors.

Social insurance, taxes, prices of raw materials and capital costs present the empiricist with insurmountable problems. Cost may vary between firms in the same industry, let alone between different industries. Furthermore there is never sufficient data, and the dichotomy between traded and non-traded goods sectors is rarely feasible. In conclusion we have outlined some of the faults of PPP which have led us to discuss, in all but a preliminary fashion, some of the issues important in the theory of price competitiveness. PPP may well be invalid for the reasons highlighted above, and since this is so price competitiveness becomes an important issue in a country's

1) I have chosen to stress this point, although many feel it to be unimportant.

external trade situation. Yet we should be wary not to reject the theory altogether, since it still provides us with some notion of the "equilibrium exchange rate" which may well be important for countries which seek to regulate their exchange rates in line with their payments position. As Kindleberger (1973) writes: "it helps suggest what changes are necessary in the exchange rate or in price levels when inflation is proceeding at different rates in different countries". And as the section briefly illustrates the exchange rates of the major OECD countries rarely depart more than some 20 % from PPP.

[3] Empirical Evidence

"There is little doubt that the prices of primary commodities traded on major organized exchanges in different locations are fully arbitrated when literally all adjustments for contracts (maturity, delivery terms and location etc.) are made. But all available evidence suggests that PPP in the strong or weak version does not apply in the same fashion to manufactured goods. The lack of a close conformity with PPP is as much true for individual commodity prices as it is for aggregate price indices. Moreover, this absence of a very tight PPP relation appears particularly true during major monetary dislocations".

Dornbusch (1985)

Empirical tests for consistent evidence of LOOP (Kravis and Lipsey 1978, Isard 1977, Frenkel 1980) especially in the manufactured goods sector, have shown it to be lacking in applicability. Dornbusch presents data on correlations of inflation rates (US dollars) which support his agnostic view, though deviations do not exceed the 20 % figure mentioned above. Causes for such deviations most probably lie with the frequency of international macro shocks. Frenkel's work on the 1920s and 1970s shows that the reason for the failure of PPP to hold in both periods, is at least partly due to wider divergencies between wholesale and consumer price indices within countries in the 1970s. His analysis concludes that the differences in the two indices

reflects, to some extent, changes in relative prices between tradable and non-tradable goods. Since tradables have greater weight in wholesale prices than in consumer prices, the divergence in the two indices will increase as trade accounts for a larger share in GNP. We wonder whether this is independent of PPP.

[4] Policy implications, Conclusion

Since exchange rate movements often, or even predominantly, do not conform to tight PPP patterns we are encouraged to pose several important questions concerning macroeconomic measurement, linkages, and policy. Three problems emerge

(i) real income comparisons, (ii) interest rate issues, (iii) exchange rate policy.

(i) If we take the strong version of PPP (and LOOP) as our point of reference, then the purchasing power of the income in one country and currency can be compared with the purchasing power of the income of any other country by measuring incomes in a common currency. If one income is twenty times greater than the other, measured in the same currency at actual exchange rates, then its purchasing power over goods and services will be twenty times larger. However when, as it often happens, PPP fails to hold, then we will find systematic biases in the comparisons. This is often illustrated in the context of underdeveloped countries: the low relative price of non-tradables in poor countries (principally arising out productivity differentials) yields for poor countries true purchasing power of income significantly greater than one would have assumed given the exchange rate converted into income.

(ii) Deviations from PPP, trend or short-run, introduce equilibrium international interest rate differentials, if the deviations arise because of structural changes for example (differential productivity growth or changes in aggregate demand) these will have a systematic impact on relative non-traded goods prices and hence on real interest rate differentials. The higher the growth of productivity - the lower the real interest rate will be. A further dimension may be added here - risk averse speculators will be wary of such PPP deviations and consequently begin portfolio diversification.

(iii) Cassel recognized that even small deviations from PPP could lead to large changes in trade flows, and hence saw the need for as rapid re-establishment of parity. However, such reversion to PPP has not been as rapid as one might have at first expected, and consequently deviations from PPP have followed the pattern of PERSISTENT SWINGS IN A COUNTRY'S PRICE COMPETITIVENESS. Which in turn has important implications for a country's external balance. Simultaneous to these competitiveness effects will be changes in the domestic country's rate of inflation: where real depreciation increases inflation and real appreciation dampens it. Naturally such effects of PPP disparities will make the exchange rate changes an important macro policy variable. A fixed exchange rate policy for a country with a high domestic rate of inflation will be disastrous since the loss in external competitiveness will lead to large and ever increasing balance of payments deficits and unemployment. Not all countries can afford to let their currency float freely in a potentially unstable world market, so a crawling peg regime with periodic depreciations following PPP will ensure that over time the real exchange rate remains constant. Such a policy is clearly to be recommended in place

of 'shock' devaluations. Crawling peg is not without certain disadvantages- (1) market forces may be underestimated, and of ten real appreciation may be postponed (willingly or not), (2) there is a trade-off between stability of the real exchange rate and price stability.

Indeed certain countries may seek to exploit PPP disparities, or create them purposely in order to gain competitiveness and 'export' their unemployment. Dornbusch (1985) writes: "In the 1930s this was called a beggar-thy-neighbour' policy and in post war Europe it became 'export-led growth'."

In conclusion PPP does not have important ideas and concepts for our study of price competitiveness, and the issues raised above, we feel, have particular poignancy for Finland's external policy in the late 1980s and 1990s. Furthermore inclusion of PPP is valid because it remains significant in the literature as a measuring rod of the exchange rate. The other major use of PPP is as a forecasting variable for exchange rates.

(ii) Real Effective Exchange Rates

"Various "REAL" effective exchange rate indices, that is, nominal effective exchange rate indices deflated by indicators of relative prices, have been developed and used since the mid-1970s. On several occasions, such indices have been used as measures of the "real appreciation" of a given currency and "real" indices have often been regarded as appropriate indicators of equilibrium exchange rates or, more generally, of international competitiveness"

Edouard Maciejewski (1983).

The data we present in this study is called data of price competitiveness, what it is in reality may be something quite different; what in fact we are calculating are indices of real effective exchange rates. Any meaningful interpretation of such indices will depend on four factors.

1. The proper choice of the base year for the index (this is directly relevant to the points raised above on the relative PPP concept).
2. The proper choice of weights used in the index, ie. that there should be some relevance in the weights for price competitiveness.
3. The correct choice of price relatives.
4. The correct index formulae.

The indices we have calculated do not tell the whole story of Finland's external competitive position; but they do provide useful signals about the underlying price competitiveness situation and its relation to price and exchange rate developments. It should also be noted that these figures are not the only indicators of currency over/undervaluation. For many reasons (eg. the use of 'second-best' price statistics, the degree of approximation viz the number of countries included) these indices must be interpreted very cautiously. Three different indices are currently used in connection with currency movements, we review them below.

[1] Nominal effective exchange rate indices show changes in the nominal value of a specific basket of currencies over time. By definition it is no more than a Laspeyres exchange rate index; ie. the base period is fixed, and therefore fails to allow for (structural etc..) changes. This index is not directly a measure of international

competitiveness in the selected country's export sector, and it does not measure the "appropriate" level for the country's exchange rate. Here again we stress the importance of the weighting system used. "The proper choice of weights depends, therefore, on the particular policy objective selected as the focal point of the index. For different objectives, indices employing different weighting systems would be appropriate". - Rhomberg (1976).

[ii] Real effective exchange rate indices are nominal indices adjusted for ("deflated") corresponding indices of relative prices. Conceptually what we have therefore is a separation of the price effect and the exchange rate effect which yield the "real" exchange rate effect. The deflated index no longer embodies an exchange rate concept, since by definition the exchange rate is an inherently nominal measure ie. the relative price of two currencies. In effect it is not a true deflation that takes place, as we might perhaps be able to do with GDP (or similar economic series which have a clear cut price/quantity relation). Consequently the indices we have calculated are not direct indicators of over/undervaluation, but rather broad indicators of changes in price (or cost) competitiveness. Construction of such real indices summarises a PPP type of relationship between relative prices and exchange rates. The relationship holds only if one has perfect information in all markets, and in the absence of transport costs, trade barriers and price discrimination. In equilibrium the underlying spatial/arbitrage relationship assumes perfect commodity markets for traded goods with high substitutability of non-traded and internationally traded goods, as well as full-employment. If the above conditions are met the "world equilibrium price will be determined unambiguously". It is

automatically taken that there will be convergence to the PPP. In spite of this there is a real danger one will only end up measuring the magnitude of world trade distortions and not price competitiveness. This is particularly true in the case of homogeneous goods.

[iii] MERM indices show the medium-term net effects of changes in the exchange rate for the home country on its trade balance. Three factors are assumed to be of importance in determining the exchange rate effects (i) the degree of adjustment of domestic prices and costs to the exchange rate indices (ii) the price elasticities of foreign trade flows (iii) the aggregate demand management in operation.

Three Problems of the "Adjusted" Price Index:

1. The conceptual problem arising out of difficulties viz the choice of the proper indicator for price levels or changes in both the domestic country and its major competitors' prices.
2. The choice of a proper base period.
3. Difficulty in arriving at a properly weighted price index that would measure world equilibrium prices.

Theoretical links between equilibrium prices, exchange rates and balance of payments presented here are extensions of some of the concepts presented earlier on PPP. The reader's attention is drawn to the current definition of balance of payments equilibrium, which is the level of overall balance consistent with a country's desired level of external resources (ie. sustainable level). A second important

definition is that of the long-run equilibrium exchange rate consistent with full-employment of domestic resources and the overall balance of payments target. Which is as good as saying that the country's relative prices are in equilibrium.

In conclusion we have sketched above some of the principal issues concerning real effective exchange rate indices its relationship price competitiveness. Relative price indices adjusted for exchange rate movements and domestic relative prices should always be interpreted with care. Under no circumstances should the calculated values be treated as norms that would exactly measure the extent of the need for a change in the level of the exchange rate. Firstly because of the high degree of approximation used and the limited availability of statistics, and secondly because inter-country comparisons inevitably involve averaging techniques that may reduce large imbalances. It has therefore been necessary to calculate several different indices, using both different indices with different formulae so that incorrect signals which may arise because of the inaccuracies of the particular series are avoided.

(iii) Price Competitiveness

Although the question of external competitiveness has been with us for some time, the interest in the subject really took hold in the 1970s. The breakdown of Bretton Woods in the early 70s followed by the first oil shock which resulted in large differences in inflation rates between countries and significant balance of payments disequilibria; as well as the volatile international exchange rate scene

(cumulatively resulting in the "breakdown" of PPP); this has made the assessment of export competitiveness important for policy making. The Finnish economy which has been undergoing a development path which may be described as "structural evolution" involving an even more open economy, has inevitably brought about a review of the competitive position. In this chapter we shall review the major theoretical issues underlying price competitiveness, before turning to the empirical evidence in chapter [3.iii].

Enoch defines competitiveness unambiguously in the following way: "competitiveness may be defined as the advantage in price, speed of delivery, design, etc.. which enables a company or country to secure sales at the expense of its competitors", (BEQB 1978). A later Bank of England article (BEQB 1982) presented three different concepts of competitiveness, according to their classification Enoch's definition probably falls into the first category of the new concept.

1. Price competitiveness here covers both pure price and non-price factors. Therefore the market in question (primarily determined by the nature of the good itself) may be a homogeneous goods market where price factors will dominate, because anyone charging above the market rate will forfeit all sales. Only in a heterogeneous goods market will deviation from the 'market rate' be possible for reasons of product differentiation etc. It is in the later market that the broad concept of price competitiveness will have greatest significance.

2. Relative cost competitiveness is not a market-related idea, but is instead concerned with the need for prices to be above costs, so that in the long-run there will be some notion of 'normal profit' or

adequate capital return earned. The difference between prices and costs (suitably measured) will yield a measure of profit, which may be increased as a result of technological innovation or lower input prices. Here the entrepreneur has a choice: either to take the cost reduction as a profit increase or as a price reduction which could boost sales (and one might assume long-term profit); which effect will predominate depends on the market of the good in question.

3. Relative profitability incorporates what one might call an international form of price discrimination. This means that a firm may be able to sell its products in the domestic market and abroad at different prices. It is to be expected that prices in the domestic market will be higher because of the firm's greater monopoly position. The price of foreign sales in relation to domestic sales, corrected by some indicator of transport costs, would yield some information concerning the relative profitability of the two markets supplied and thus of the relative quantities supplied.

Having defined competitiveness in its various forms, we may turn our attention towards defining price competitiveness itself:

"Our main interest in a country's international price index is in its movements relative to those of other countries. Did the UK price index rise any more or less than that of [Finland] in a given period, and by how much more or less? The comparisons of price movements can be presented systematically simply by dividing the international price index for one country by the corresponding index for another country. We call the result an index of price competitiveness. In calculating it, we place the foreign country's index in the numerator and the (Finnish) index in the denominator. A rise in the index of [Finnish] price competitiveness, therefore, indicates that foreign prices of internationally traded goods have risen relative to [Finnish] prices and that [Finnish] price competitiveness has thus improved while that of the foreign country has declined".

Kravis and Lipsey (1971) adapted.

One point of refinement we add to the above definition, is the inclusion of an exchange rate in the calculation of the indices presented (see chapter 3.ii for further exposition of this point). Economic theory stresses the role of prices in determining both the direction and commodity composition of trade; empirical testing of such theory is undoubtedly difficult since the theory is based on pre-trade or pre-equilibrium comparisons, while the prices available for our measurement are post-trade prices which are narrowed in differential by international competition. Consequently it is difficult to create an empirical measure which will allow us to capture the causal relationship between relative prices and quantities, or for that matter the association between them too.

Methods of Aggregation, inevitably in a study of this nature, there will be problems with aggregation, in particular we refer to the difficulties (both theoretical and practical) concerning the choice of weights and price relatives.

[i] The problem of weights, as pointed out above, to be economically meaningful an index of price competitiveness must be calculated according to certain criteria, one such criterion is the need for the index to reflect in some way the type of competitive relationship that predominates in the export markets under consideration.

Footnote:

The market shares approach to price competitiveness. Changes in a country's market shares abroad are often taken to reflect changes in competitiveness or the 'ability to export'. Such changes will result from movements in relative prices or costs and in relative quantities. Both demand and supply factors will come into play: on the demand side export share may increase as a result of changing tastes abroad, or because of rapid foreign growth rates. Supply side changes will include fiscal and monetary policies which affect the level of economic activity and the level of prices. Productivity increases and government subsidies may be included here. The price competitiveness indices are mainly determined on the supply side.

This requirement implies that the selected weighting procedure reflects the different market structure as best it can. Maciejewski (1983) identifies three different weighting procedures:

Competition	Adequate weighting procedure
(a) Finnish exports are the main competitors in the foreign markets.	Trade export weights.
(b) Finnish exports are the minority competitors in the foreign markets.	Weights that reflect shares of other exporters in those markets.
(c) Finnish exports are on equal footing.	Weights taken to reflect both Finnish and foreign competitors in foreign markets.

Therefore weights chosen that represent the shares of the major foreign trading partners in the reporting country's total exports only provide a useful guide to competitiveness if domestic producers in the importing markets are the main competitors for the exports of the reporting country's producers. The importance of the reporting country as a market for the foreign-produced goods is assumed to be negligible. At the other extreme foreign exporters are assumed to be the main competitors for the reporting country's exports. Here weights derived on the basis of the respective market shares of each of the competitors of Finland in total world exports for the products under consideration would be appropriate. We have chosen not to follow Maciejewski's recommendations, for reasons specific to the Finnish case. Finland is a country which sells most of its exports in foreign currency contracts, rarely is the Finnish mark used for invoicing etc. Negotiation and re-negotiation of prices takes place in foreign currencies which are mainly determined by world market prices, and change little after devaluations. The implication is that there is in fact little pass-through effect into lower foreign currency prices but instead exporters profit margins increase. Add to this fact that

Finland takes a relatively small share of her export countries' markets and one is left with the conclusion that Finland is a world price taker. Therefore the use of an export-weight system has roughly the same effect as a double weighting system.¹⁾ For the aggregate price data (see below) we have used it has been assumed that every importing country may compete with Finland in that particular category of goods. This need not be so, Sweitzerland may not have a significant wood products export industry - yet we assume, in the weighting system that it does. Preliminary comparison of export and import weights show remarkable similarity in the trends of price competitiveness generated. In conclusion what we are attempting to do is to construct price indices of competitiveness by sectors, i.e. we are trying to find out how to gauge the relative performance of Finland against a certain number of competing countries. It is therefore necessary to define a weighting system which is appropriate to relative competitiveness. Bilateral trade weights have been used - where for each country *i*, the ratio of *i*'s imports with respect to Finland's total exports (in a particular sector) are used. It is simple, has economic justification but admittedly cannot properly allow for effects induces by third country markets. The OECD weighting method might be considered more desirable in this respect.

[ii] The choice of data

It is often considered, not unjustifiably perhaps, that the compilation of indices of price competitiveness is a process of "second best" strategies, since few if any of the data one would like to use are available:

1) It may be noted that the results we present for ULC Törnqvist indices are very similar to those of the OECD's (Economic Survey, Finland 1986). OECD use a complex double-weighting system.

"Proper measurement of price competitiveness would require indices of 'delivered' prices by market. Such indices would measure - in addition to changes in basic export prices - changes in transportation and distribution costs in tariffs. However, no such measure is currently available". - Junz and Rhomberg [1965].

One must therefore find proxies for the relevant price or cost indicators. Inevitably some of the information will be lost in terms of the adequacy of the economic meaning of price. It may be the case that different price indices will be relevant to different market structures. We will present a theoretical breakdown of the different measures used in the statistical calculations (below), however, certain fundamental points must be noted first, in the calculation of a price competitiveness index prices have some distinct advantages over costs:

1. the concept of price is generally more objective and therefore less likely to vary from one reporter to another,
2. cost data can be built up only for whole plants/companies/groups of commodities; consequently the comparison of costs at an international level will be distorted as different countries/sectors adopt different methods of calculation.

Important characteristics of different price variables

[1] Unit Labour Costs:

Unit labour costs (ULC) are most often taken to be indicators of price competitiveness. We would not disagree with that, but for certain reasons some more relevant to the Finnish economy, we feel that in the body of the data ULC seem to perform least well. ULC indices are usually defined as the ratio of all labour costs (including wages,

salaries, social security premiums and other employment taxes) to the volume of output produced by that labour. The implicit assumption here is that ULC forms the major component of the total costs per unit of output, even though other factors may significantly influence the overall cost of production. Furthermore it is assumed that the incidence of other costs (raw materials, capital, finance etc.) is sufficiently similar at the margin across the competing countries under consideration that changes in ULC could be seen to be the principal cause of varying costs between countries. The aggregate ULC data used in our calculations are taken from ETLA's own indices (Sihtola, 1978) and are explained in more detail in the next section. The question that concerns us here is that of erratic movements arising from leads- and lags relationships. This is most clearly seen in the different response of productivity and hourly wages to cyclical changes in demand. This means that the major disadvantage of using ULC is that they show marked cyclical variations, due to labour hoarding in the downswing for example. ULC may give quite incorrect signals about competitiveness as the economy enters a down phase, export markets may become more profitable to supply, and hence competitiveness may rise. Finland is a small open economy, the 'traditional' export sector (timber, paper, pulp etc.) is rather more subject to cyclical variations than most other export-sectors. Consequently there will be labour hoarding and the ULC index will tend to overstress the fall in competitiveness. The graphs below illustrate this point clearly.

[2] Export Unit Values:

Maciejewski (1983) strongly favours the use of export unit values (EUV) as the relative price data for the indices. EUV are calculated from actual data of values and quantities, and reflect the prices received for the goods traded. Indeed EUV data seems to perform well, but one must be aware of its deficiencies. EUV may not reflect changes in price competitiveness because (i) there may be different export taxes in the data originally used to compile the statistics, (ii) export prices are not necessarily raised or reduced significantly in relation to competitors' export prices, and even if cost developments would warrant such actions, domestic exporters and/or producers may prefer to cut their profit margins, (iii) since we have not been able to discover EUV on a sectoral level, aggregate data has had to be used instead, consequently the weights by which different commodities are combined differ from one country to another, owing to the composition of export trade, (iv) commodities produced domestically that are not exported are, by definition, omitted from export price indices. These may, however, have an important bearing on competitiveness. Should the price of a non-traded good fall, it may either be exported or even replace the imports that may have been necessary: since EUV is created out of goods actually exported it will not reflect the associated problem of those goods which cease to be exported, for example they may be over-priced, and will hence be excluded. Thus a country could 'price itself out of world markets', suffer from a falling market share, and at the same time appear to have stable, or even declining, export prices as reflected by the index. EUV indices tell half the story only, the competitiveness of its domestic products with imports is ignored.

[3] Wholesale Price Indices:

Wholesale price indices cover a broader range of products, than do EUV, and therefore contain an element of underlying price development for potentially exportable goods. WPI include a relatively large number of non-traded goods and some imported goods for domestic consumption. Such indices may more readily reflect changes in indirect taxes/subsidies actually levied on imports and not charged on exports; this is usually considered to be a poor proxy for the incentive to produce for the domestic market. WPI validity as a price relative in a competitiveness index relies upon wholesale prices approximating export prices if they are close to domestic producers' prices of exports at the factory level in terms of both coverage and commodity composition. Otherwise WPI will tend to over/understate underlying export price development of the reporting country. Kravis and Lipsey describe their results in the following way:

"The index from wholesale price data was usually biased upward relative to the index from international price data...the prices used in the official wholesale price indices tended to understate price increases about as often as they overstated them, but they almost always understated price decreases".

Preliminary results for out price competitiveness indices for Finland tend to support such findings (below). The drawbacks of using such data is that WPI suffer from poor international comparability (similar to EUV, above). Unlike EUV wholesale prices measure changes in prices rather than average values in primary markets, and WPI refer to current production while EUV are prices at the customs post and thereafter refer to past production.

[4] Consumer Price Indices:

Consumer price indices (CPI) are generally used as a proxy for the index of the home country's total unit costs relative to competitors'; or rather it attempts to measure relative producer costs. As CPI measures the domestic inflation rate, a rise in the index will show that the home country's producer costs have increased relative to those abroad, *ceteris paribus*. The implication is that above average rises in the home country's production costs tend to induce lower profit margins (of its producers relative to those of foreign producers) unless faster increases in costs are offset by domestic productivity gains. Reduced profit margins induce a relatively larger reduction in domestic supply which may then lead to a relatively larger reduction in domestic supply and eventually cause a falling international market share. Hence CPI is taken as a proxy for the movement in wages and other factors of production - i.e. they have some effects on both ULC and other unit costs. Time lags are ignored between the adjustment of production costs to consumer prices. Once again we must emphasize the inherent limitation of using such aggregate data - they reflect different countries economies, and therefore inter-country comparisons may be subject to error. Furthermore CPIs tend to include a relatively large proportion of non-traded and imported goods which are consumed in that country. One would prefer to compare unit costs directly in order to attain a more accurate competitiveness index.

Causes of International Price and Non-Price Differentials:

In this footnote we review some of the major issues concerning (price) competitiveness. These issues can be divided into two groups: international price restrictions and non-price factors.

1. International price frictions: let us assume that international market forces determine the equilibrium price for goods/services, and as a result prices of products from different national sources of supply were equalised; then how is it possible that differentials arise? Firstly transport costs (including freight, package and insurance) create differences in c.i.f. export prices. Secondly tariffs and other barriers would create differences between c.i.f. export prices and f.o.b. prices from domestic suppliers. Finland's recent accession to the status of full EFTA member may be seen as, in part, some recognition that free trade relations are important for successful export competitiveness; although it must be said that Finland's place in EFTA has been extremely long-standing, and its relations with the Common Market have generally been very good.

2. Non-price factors: can take many forms, in the literature they usually come under the headings of product differentiation, promotional activities, delivery/service, (access to/gaining of) finance. As Armington (1977) writes: "The important role played by non-price competitiveness is plain from the fact that, if it did not exist, each competitor in a given market would have to keep his price identical". We hope that there is no need to refer the reader to the epigram at the beginning of the study, but simply wish to re-iterate the very great importance of non-price factors in international trade. Kravis and Lipsey put the point well:

"With a few exceptions the generalizations we can make about these factors are non-quantitative and more impressionistic than the price indexes; they are not based, as the price indexes, on many thousands of numbers which were gathered and summarized in an objective way".

Non-price competitiveness also raised the issue of the price elasticity of exports and subsequently the role of devaluation as an effective balance of payments remedy. Junz and Thomberg (1965) studied the relation between prices and export performance of industrial countries (1953-63) and concluded:

".. the proportion of the observed variation in market shares which is explained by price factors is not very high. The results support the hypothesis that price changes show their full effect only in the course of several years". We may therefore conclude that, given the spectrum of opinions concerning Finland's price elasticity of exports, and the complex issues surrounding devaluation in this country (see below), the remedy for decreasing price competitiveness need not be an immediate decision to devalue the currency - this will be in part related to the non-price factors mentioned above. Indeed the evidence in the U.K. (Stout, 1977) points to the role of devaluation as a macro-policy instrument worsening non-price factors.

"The tentative conclusion we have reached is that there is, within engineering in general and machine tools in particular, a positive feedback from growing product inferiority, through devaluation, to increased product inferiority".

3.2. Index Theoretical Issues

An index which measures changes in the price competitiveness of a country, h , should relate its (export) prices, P_h , to the (export) prices of its competitor countries, P_i , in an appropriate way. How one chooses to aggregate these price relatives into a price competitiveness index is the focus of this chapter. The thrust of the following analysis is directed towards the application of descriptive index number theory (often otherwise referred to as "statistical index number theory") as opposed to economic index number theory which concerns itself more with details of causes and consequences of economic events and with their incorporation into an index, than with a so-called 'pure' index. To date economic theory of price competitiveness is still very much in its infancy, and as such is inadequate to offer sufficiently firm basis for the construction of an economic price competitiveness index.

The theory begins with the calculation of weighted averages, where weights may be taken from a base year 0, or from the observation year 1, for a country a_i ; hence w_i^0 and w_i^1 may be derived. Where the averages are either arithmetic, geometric or harmonic. The choice of the type of shares, import or export shares, on which the weights are based is discussed elsewhere. It has long been recognised in the literature on index numbers that there exists a permanent relationship between these different formulae, where the arithmetic mean is always greater than the geometric, which in turn is greater than the harmonic mean. This holds irrespective of the weights used, be they from the base year or the observation year.

This may be shown in the following way

let subscripts 0,1 be the base year and observation year respectively;

let w_i^0, w_i^1 , be the share of country a_i , in Finnish exports

or imports, of certain (ISIC) industries;

let p_i^{01} be the price index of country a_i (eg. producer prices

or unit labour costs) in the observation year with 1980=100;

let p_h^{01} be the parallel Finnish price index;

let e_i^1 be the exchange rate of country a_i in the observation

and e_i^0 in the base year (1980).

The price relative will become:

$$(1) \quad \Pi_i^{01} = [p_i^{01} / p_h^{01} * e_i^1 / e_i^0]$$

indicating the relative change in the price of country a_i from the base year 0 to the observation year 1; in Finnish marks. For n countries:

$$\Pi^{01} = [\Pi_1^{01}, \dots, \Pi_n^{01}]; \text{ where } \Pi_n^{00} = (100, \dots, 100) \text{ ie. in 1980.}$$

Weighted arithmetic, geometric and harmonic means of positive numbers

$x_1 \dots x_n$ with positive weights $c_1 \dots c_n$ are defined and

denoted respectively by:

$$(2) \quad A(x,c) = \frac{\sum_{i=1}^n c_i x_i}{\sum_{i=1}^n c_i}$$

$$(3) \quad G(x,c) = \left[\prod_{i=1}^n x_i^{c_i} \right]^{\frac{1}{\sum_{i=1}^n c_i}} = \exp \left[\left(\frac{\sum_{i=1}^n c_i \log x_i}{\sum_{i=1}^n c_i} \right) \right]$$

$$(4) \quad H(x,c) = \frac{\sum_{i=1}^n c_i}{\sum_{i=1}^n (c_i / x_i)} = \left[\frac{\sum_{i=1}^n c_i x_i^{-1}}{\sum_{i=1}^n c_i} \right]^{-1}$$

Following properties of the moment mean (for a detailed proof see Vartia and Vartia 1984):

$$(5) \quad A(x,c) \geq G(x,c) \geq H(x,c)$$

with equality if $x_1 = x_2 = \dots x_n$; i.e. all x's are equal.

Base year weighted indices: arithmetic, geometric and harmonic means, may now be calculated by applying (5) to $x_i = p_i^{01}$; $c_i = w_i^0$

$$(6) \quad L = A[\Pi^{01}, w^0] = \sum w_i^0 \Pi_i^{01} \quad \text{"Laspeyres"}$$

$$(7a) \quad I = G[\Pi^{01}, w^0] = \exp [\sum w_i^0 \log \Pi_i^{01}] \quad \text{"Log-Paspeyres" or Geometric base year}$$

$$(7b) \quad \text{where Geometric base year} = \Pi [\pi_i^{01}]^{w_i^0}$$

$$(8) \quad LH = H[\pi^{01}, w^0] = [\sum w_i^0 (\pi_i^{01})]^{-1}$$

The inequality $L \geq I \geq Lh$ applies.

Observation year indices are therefore:

$$(9) \quad P1 = A [\Pi^{01}, w^1] = \sum w_i^1 \Pi_i^{01} \quad \text{"Palgrave"}$$

$$(10a) \quad p = G [\Pi^{01}, w^1] = \exp [\sum w_i^1 \log \Pi_i^{01}] \quad \text{"Log-Paasche" or Geometric -observation year}$$

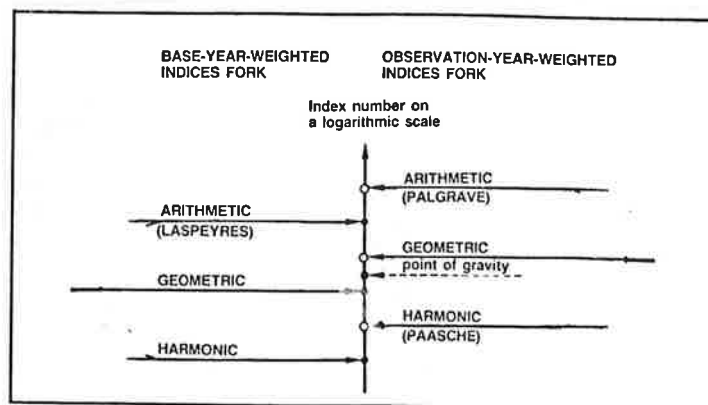
$$(10b) \quad \text{where Geometric observation year} = \Pi [\pi_i^{01}]^{w_i^1}$$

$$(11) \quad P = H [\Pi^0, w^1] = [\sum w_i (\Pi_i^0)^{-1}]^{-1} \quad \text{"Paasche"}$$

The inequality $P_I \geq p \geq P$ applies.

Hence, whichever indices one calculates, by using either base year or observation year weights, the two relative differences, between the arithmetic, geometric, and harmonic indices (in this order) depend on the variance of price log-changes and are approximately equal. This holds for both base and observation year weighted indices, usually the relative differences between the individual indices are approximately the same in base and observation year indices, see figure 1. The figure is an asymptotically accurate description of small price/quantity changes which are our primary concern.

Figure 1.



Source: KOP Economic Review 1985:2. Suni and Vartia. (Adapted)

The relative position of the two forks is arbitrary, it is perfectly possible for the observation year fork to be situated beneath the base year fork. Whichever case prevails the common point of gravity may be obtained by connecting those tines of the forks which are anti-symmetrical. All the crude indices we have defined so far violate Fisher's (1922 p. 64) time reversal test which states that: "the forward and backward index number multiplied together should give unity".

If, for example, we apply Laspeyres' method forward and backward then, respectively:

$$(12) \quad L_0^1 = w_i^0 [P_i^1 / P_i^0] \quad \text{and}$$

$$(13) \quad L_0^1 = w_i^1 [P_i^0 / P_i^1] \quad \text{which should be}$$

reciprocals of one another.

(Note: for clarity the exchange rate element has been excluded from the present analysis.)

However, as the reciprocal of the Laspeyres' backward formula $1/L_1^0$ and the original formula differ (i.e. L_0^1), the former is called the time antithesis of the latter. As Fisher (1922) wrote "The time antithesis of any index number between one time and another is found by applying the very same formula the other way round and then turning it upside down".

To satisfy the time reversal test we must take the geometric average of any index number and its antithesis and produce a rectified index number.

Since $1/L_1^0 = P_0^1$, the "rectified" Laspeyres formula $L_0^1 * 1/L_1^0$ becomes Fishers' ideal index:

$$(14) \quad F = \sqrt{L^*P} = \sqrt{(\sum w_i^0 [P_i^1 / P_i^0]) ([w_i^1 [P_i^1 / P_i^0]^{-1})^{-1}}$$

We can perform a similar exercise on the family of Geometric indices, by crossing 1_0^1 with its time antithesis $1/1_1^0 = P_0^1$, leaving us with the Törnqvist formula:

$$(15) \quad T = \sqrt{1^*p} = \exp [(\sum \frac{1}{2} [w_i^0 + w_i^1] \log [P_i^1 / P_i^0])]$$

Consequently we have derived these two superlative indices which are not only popular for most analyses that drop the asymmetric Laspeyres and Paasche, but are also, quite evidently, the best indices of price competitiveness put forward in this study. To emphasize again, the importance in using and calculating the Fisher and Törnqvist indices lies in their unbiasedness; Paasche and Laspeyres indices are comparatively very crude, their positions may be reversed (i.e. from one fork lying above/below the other) and their method of calculation leaves the way open for bias resulting from changing market conditions. Fisher and Törnqvist are not dependent such factors. The inaccuracies/bias of Paasche and Laspeyres indices in the price competitive data compiled herein lead us to warn the reader to be very wary of these indices. The Geometric indices are here less crude than Laspeyres and Paasche, but still inferior to the superlative indices. The biases of L, l, p, P are, however, usually only moderate and may be either positive or negative, whereas P1 and Lh are usually biased upwards or downwards respectively. This holds for our data, and as a consequence they have not been calculated in the body of our data.

Figures 2 and 3, overleaf, illustrate some of the points we have raised in this chapter. Both are taken from data for paper (1975-85), 34, producer prices, which can be seen in the appendix.

In figure 2 the relative positions of the different families of indices have been illustrated the solid line represents the ideal indices usually one plotted on top of the other. Two points are to be stressed. firstly we see that the Geometric indices are for the most part lying closer to the ideal indices than are either Paasche or Laspeyres. And secondly the relative position of the two forks is seen to change in 1982 with a reversal taking place $P > L$, $p > l$.

Figure 3 illustrates the index number problem, ie. the explanation or illustration of the derivation of the superlative indices. Where L and L_h , P and P_l are to be "mirror" images of one another through the Geometric indices. Furthermore it can be shown that the two Geometric indices overlap if one series is "reversed" as it were.

Conclusion

We have taken this opportunity to briefly outline some of the major issues in descriptive index number theory which are fundamental to the correct interpretation of the indices of price competitiveness we present. We may vary both the weighting system and the method of aggregation, yet the final index taken as either the Fisher or Törnqvist will be almost identical. In preference therefore it is these superlative indices that must be calculated and examined most closely.

Figure 2

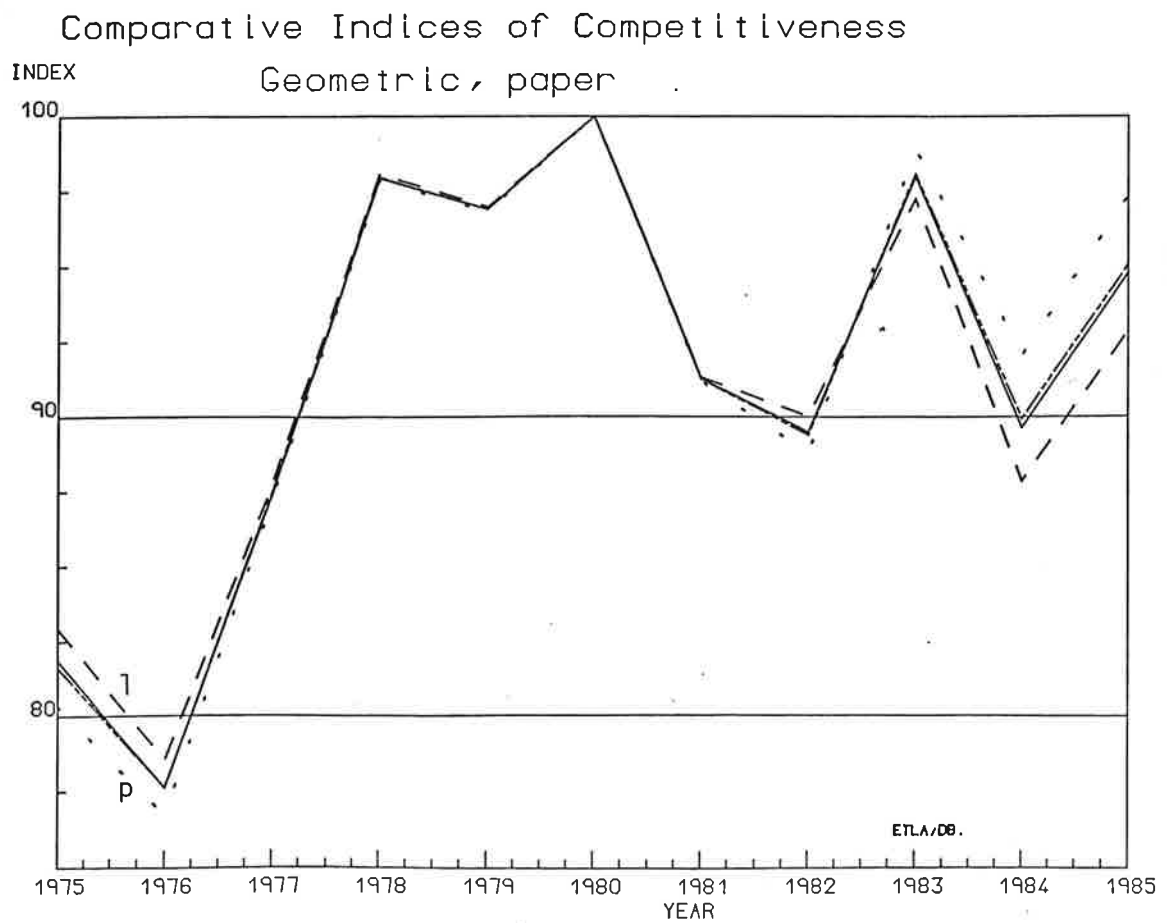
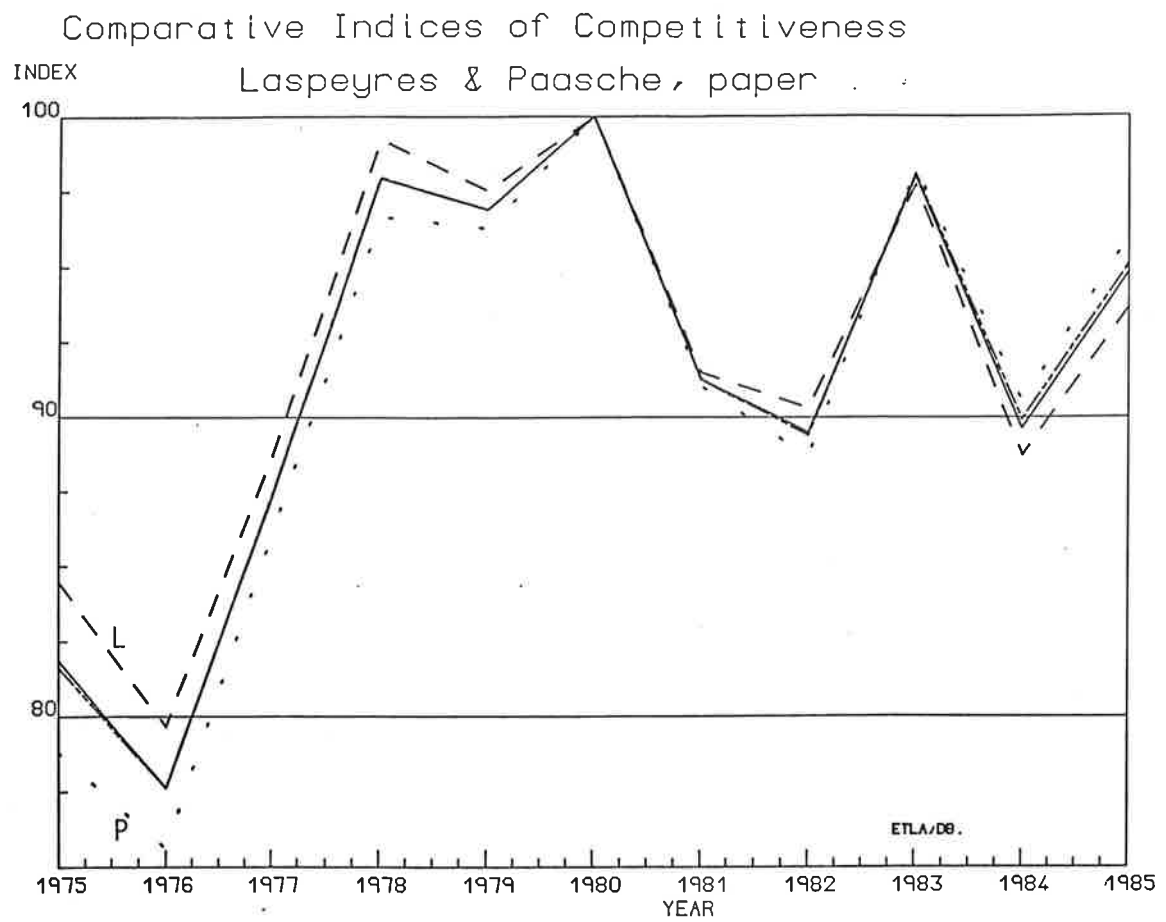
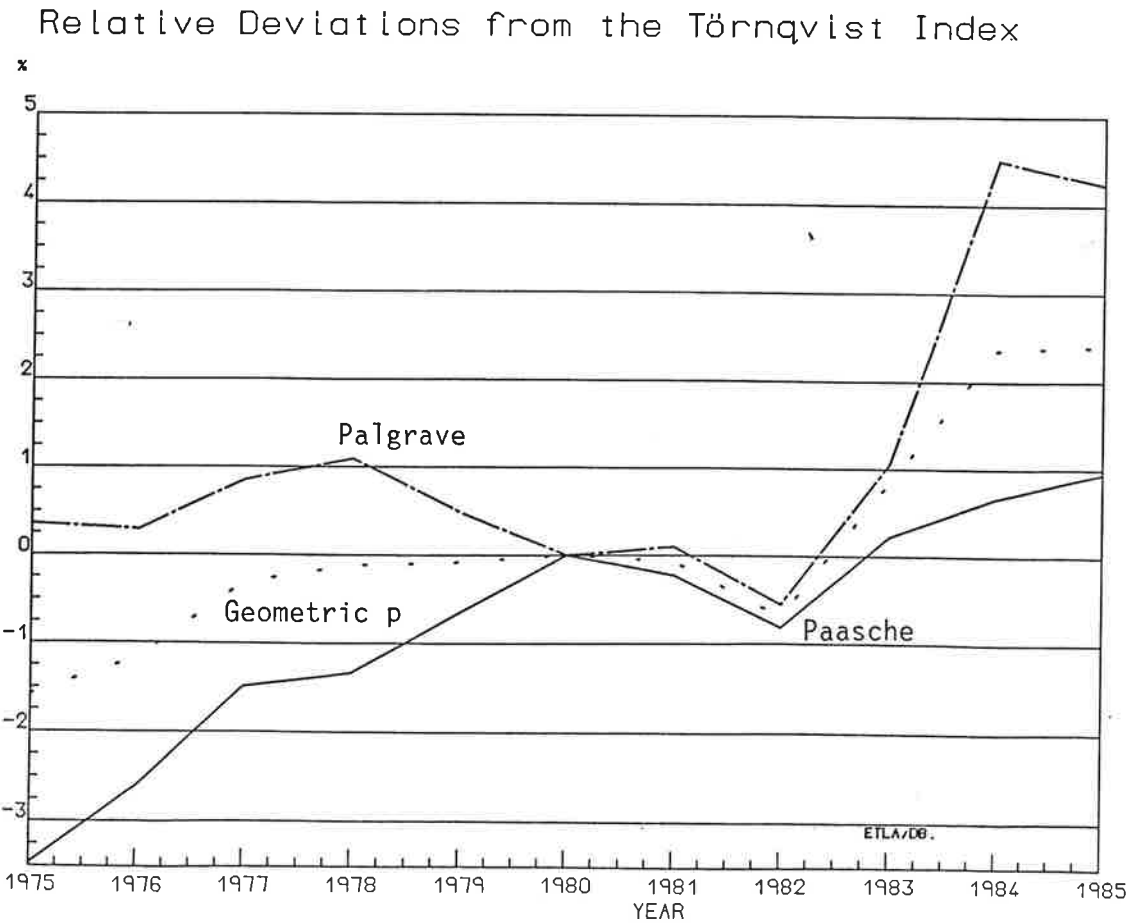
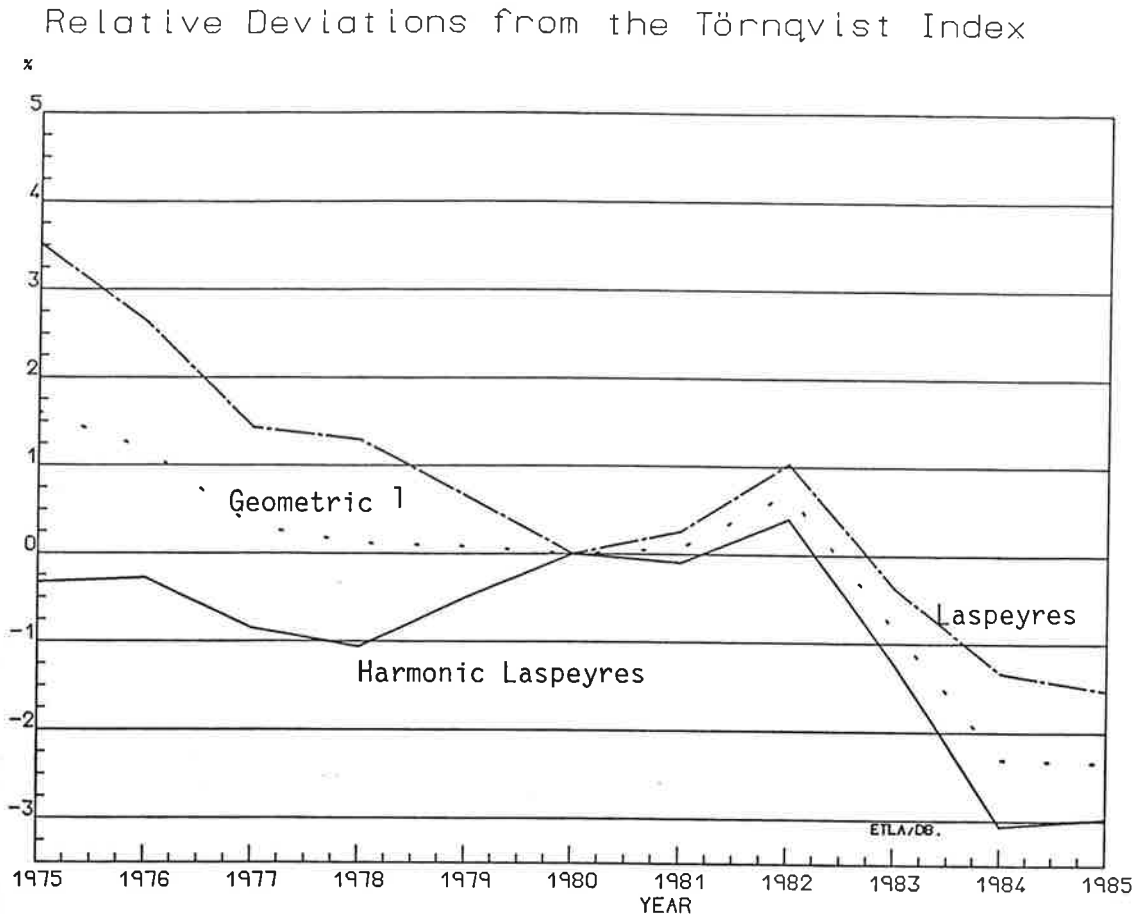


Figure 3



3.3. Finland's Price Competitiveness by Sectors

1. The Data:

(i) The Weights: that have been used have been export and import weights derived from Board of Finnish Customs trade statistics. The figures for the relevant countries are taken and the weights calculated according to their share in that sample. The sum of the weights for a sector will always equal one. The Board of Customs uses the CCCN classification for the division of export statistics by country of destination (the reverse for imports) into branches.

(ii) The Prices: prices of Wholesale Price Indices (WPI), Export Unit Values (EUV), and Consumer Price Indices (CPI) may be readily derived from the IMF-databank or International Financial Statistics (various yearbooks offer the most readily available condensed sources). The practice of the IMF is to use data provided by individual national banks. Therefore there will inevitably be differences in the methodologies used in the compilation of such statistics, although international guidelines issued by the IMF which have been widely adopted by national banks, have made international comparisons easier. IMF data is at an AGGREGATE level only, therefore no sectoral price data has been made available here. The role of the weights (which are taken from the export shares in the different sectors) play the most important role of 'disaggregating' the measures of price competitiveness.

Unit Labour Cost (ULC) data is also AGGREGATE data, and to some extent reflects the drawbacks of the IFS-data. This data has been calculated in ETLA and is not reproduced elsewhere. Principal sources of ETLA's

ULC come from the Swedish Employer's Confederation Wages and total labour costs for workers, International Survey. The Yearbook of Labour Statistics, (ILO), Social Statistics (EEC), and the OECD's National Accounts and Main Economic Indicators. Since the data only covers hourly wages in manufacturing industry we have a good measure for our industrial indices. Further details of ETLA's ULC data may be obtained from: K. Sihtola's An international comparison of unit labour costs (1978). The only prices which have been available measuring price changes at a sectoral level have been Producer Prices (P.P.). The source of the P.P. data is the OECD's Indicators of Industrial Activity, published quarterly. Annual figures have been used. The OECD follow the ISIC (International Standard Industrial Classification) method, "where prices shown are generally producer prices. Wholesale price indices are, however, shown for the following countries: Austria, France, Italy, Japan and Switzerland. Price indices for the Netherlands cover deliveries for the home market", OECD 1986, II, Indicators of Industrial Activity. The major disadvantage with these figures as compared with the four aggregates (above) is that they do not have any consistent number of countries reporting the relevant data. The number of countries included will consequently vary from sector to sector. The smallest sample includes six countries (Chemicals, ISIC 35), and the largest has fourteen (Basic Metals, ISIC 37). It should also be noted that Finland does not submit data for ISIC 38 (Metal Products), we have chosen to use the 3-digit category 381 as proxy.

(iii) The exchange rate: Bank of Finland Bulletins provided data of the Finn Mark against foreign currencies. From 1978 onwards average selling rates are available, before that time the August rate data

was used. Currencies taken are expressed in the form: one unit of foreign currency equals x units of Finn Marks.

A summary of the method of calculation is shown in Table 1.

2. The Performance of Different Price Data:

As we outlined earlier it is not possible to create an ideal competitiveness index, simply because the data is unavailable on a comparable international level. Consequently we have taken five different sets of price data in order to attain as broad an indication as possible of the development of Finland's price competitiveness. Figure 4 illustrates the movements of the different indices, for one sector Industry, ISIC 3. In spite of the differences in concept and coverage the trend seems to hold for all of the indices. This is an encouraging phenomenon given the fact that EUV, CPI, ULC, WPI are all aggregates, weighted only by sectoral market shares, while P.P. is based on both sectoral price and weight movements. We do not believe that at one index presented here is significantly superior to any of the others, and that the imperative should be to calculate as many different indices as possible for the broadest possible view; however, closer examination of the data reveals that P.P. in fact reflect sectoral differences far better, given the disaggregated nature of the price data.

Table 1

SUMMARY: CALCULATION OF PRICE COMPETITIVENESS INDICES

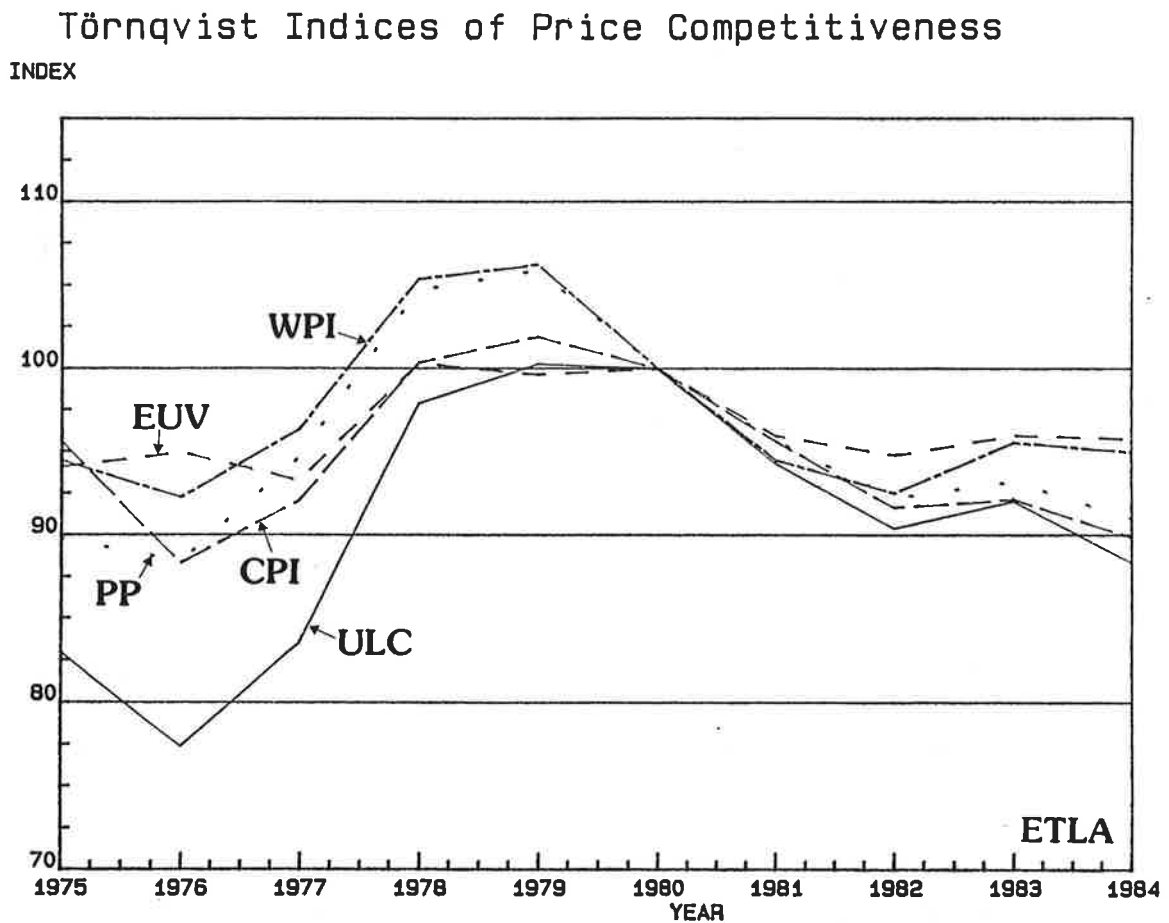
PRICE DATA		WEIGHTS				BASE YEAR	INDICES
EUV	Aggregate Only	IFS	Export; some import	By sectors	Bd of Customs	1980	L,P; Fisher/l,p; Törnqvist
WPI	As above	IFS	As above	As above	As above	1980	As above
CPI	As above	IFS	As above	As above	As above	1980	As above
ULC	As above	ETLA	As above	As above	As above	1980	As above
P.P.	By sectors	OECD	As above	As above	As above	1980	As above

Countries Included:

EUV, WPI, CPI, ULC: Aggregate data and weights have been taken from the following countries—USA, UK, W.Germany, Sweden, Denmark, Norway, France, Belgium, Netherlands, Switzerland.

P.P. vary; countries are included in the appendices. C=Canada; US=USA; J=Japan; Dk=Denmark; Ger=W.Germany; UK=UK; Sw=Sweden; No=Norway; Be=Belgium; Nl=Netherlands; Fr=France; I=Italy; Ch=Switzerland; Au=Austria; Sp=Spain.

Figure 4



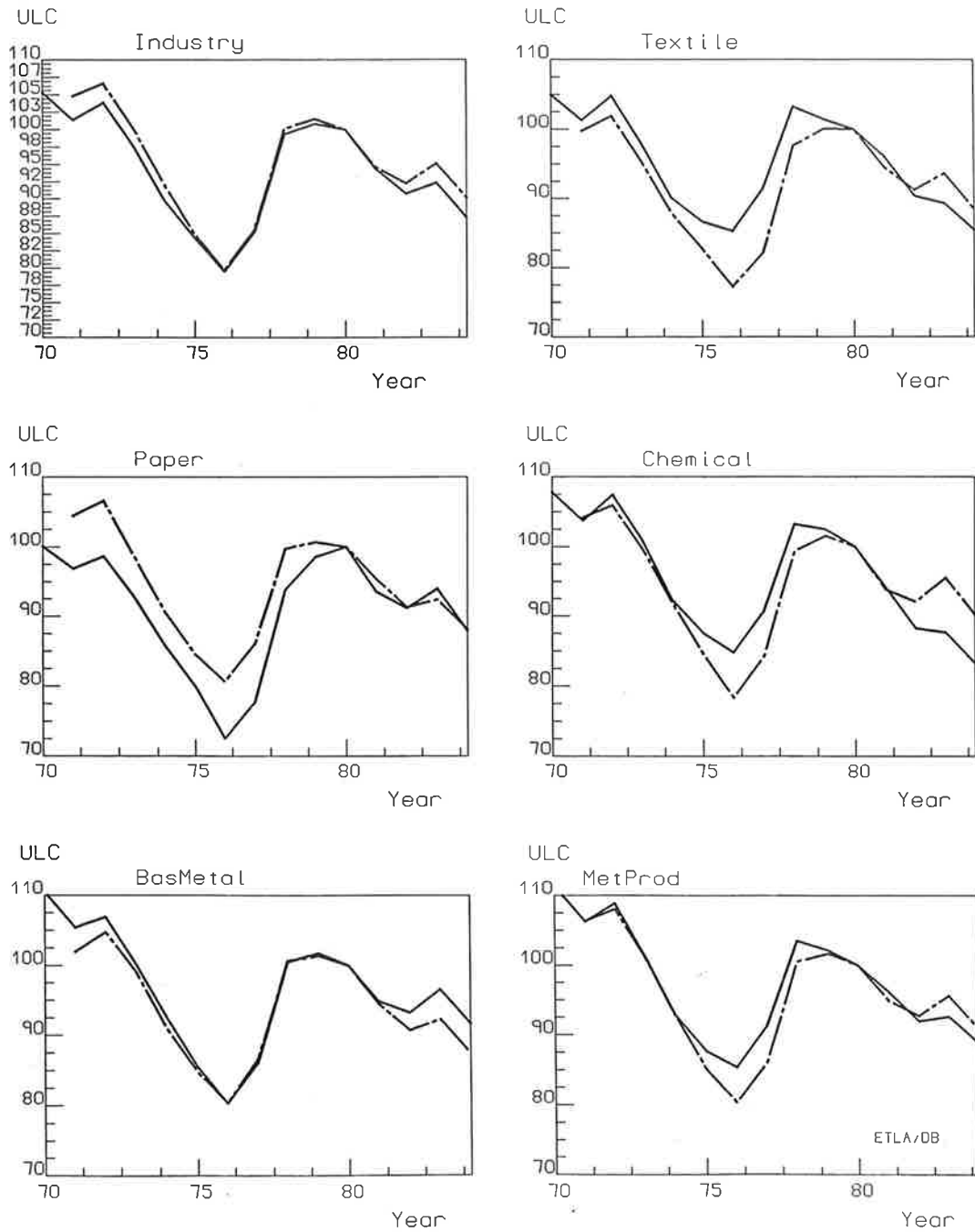
3. The Performance of Different Weights:

Figure 5 shows the comparative performance of export and import weights in different sectors (1970-85), Laspeyres data is used. The striking similarity between the two series is partly explained by the fact that we have not, of course, changed the price data, so the weights can only vary the indices. It is difficult to draw many solid conclusions from this, however, certain features are worth highlighting. Although the threat of import-penetration seems more likely in certain sectors, where competitiveness has been seen to move more dramatically, particularly in textiles, chemicals, and metal products, the overall industry indicators move remarkably similarly. If anything it appears that in the 'non-traditional' sectors domestic competitiveness seems to decline more sharply as the Finn Mark becomes progressively stronger, emphasizing the open nature of the Finnish economy and the economic validity for using export weights in preference to import weights.

4. Why Has Price Competitiveness Changed?

Why price competitiveness should change is not easily explained, the most obvious starting point is to examine which variable within the price competitiveness equation has more 'influence'. Assuming that the weights of various countries do not change over the period (not empirically invalid by any means) we can break down the effects into two categories, either price or exchange rate factors. In Figure 6 the graphs show 3 different ISIC sectors (3, 34, 37) competitiveness in the upper case, and price/exchange rate movements of the two most important export countries (i.e. those two countries with the largest weight share) in the lower case. Again it is difficult to point to any

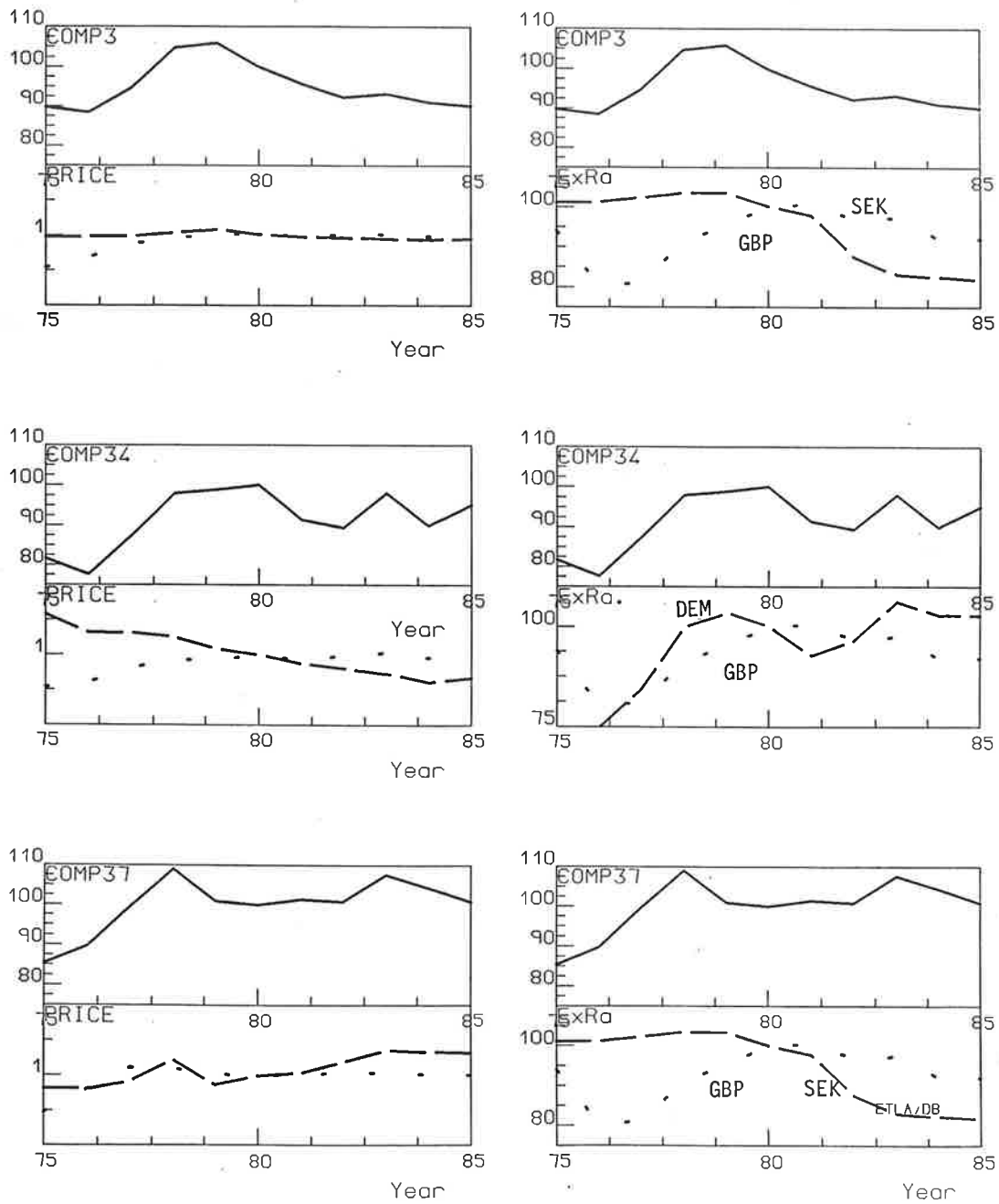
Figure 5



_____ Export weights
 -.-.-.-.- Import weights

ETLA/DB

Figure 6



outstanding conclusions, but in the light of our theoretical discussion earlier certain interesting observations can be made. PPP theory in its strong version (often referred to as LOOP, the law of one price) states that the exchange rate will equalize all costs, in a common currency, across all countries. Empirically this does not seem to be so, however, weaker versions of PPP point to price equalization taking place to differing degrees in different markets. In a Hicksian flex-price sector, commonly taken to be homogeneous goods markets, there is little scope for price deviation, and the exchange rate will play the overriding role. In the Figure ISIC 34, paper, represents such a market, and it would seem that indeed the exchange rate movements do tend to play a more prominent role. The fluctuation of the exchange rate and price competitiveness of paper seem to move in a broadly similar manner. In the alternative fix-price sector, heterogeneity of goods, will allow for price differentiation; and as ISIC 37 shows there appears to be greater resemblance between price movements and competitiveness that with the exchange rate. The analysis does not seem to provide conclusive results, and the price and exchange rate movements in the broader Industry sector (ISIC 3) do not point to any clear trends. Intuitively we feel that in the case of Finland the exchange rate is more of a symptom than a cause of declining competitiveness. Rising unit costs often sparked by devaluation appear a more convincing cause. Figures 7, 8, 9 represent a graphical summary of our major findings.¹⁾

1) OECD producer price data is used.

Figure 7

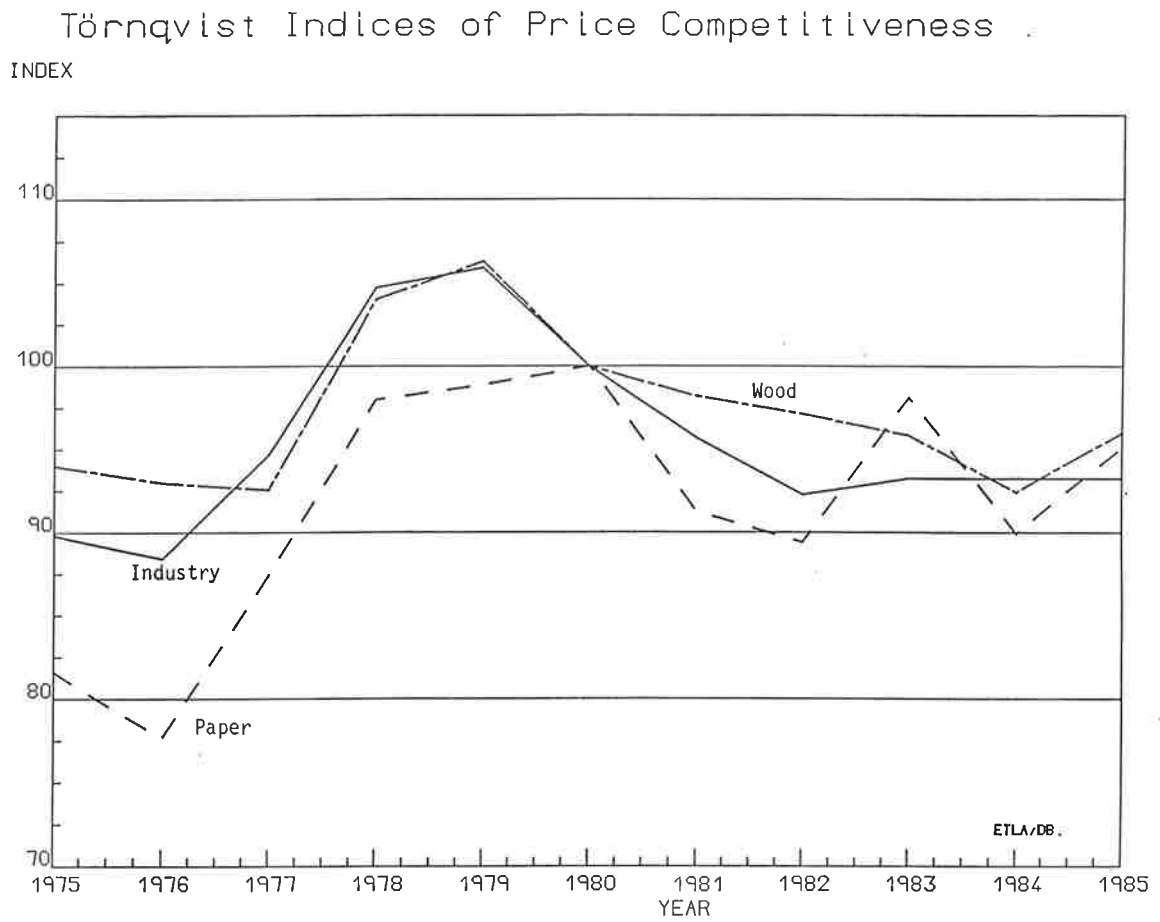


Figure 8

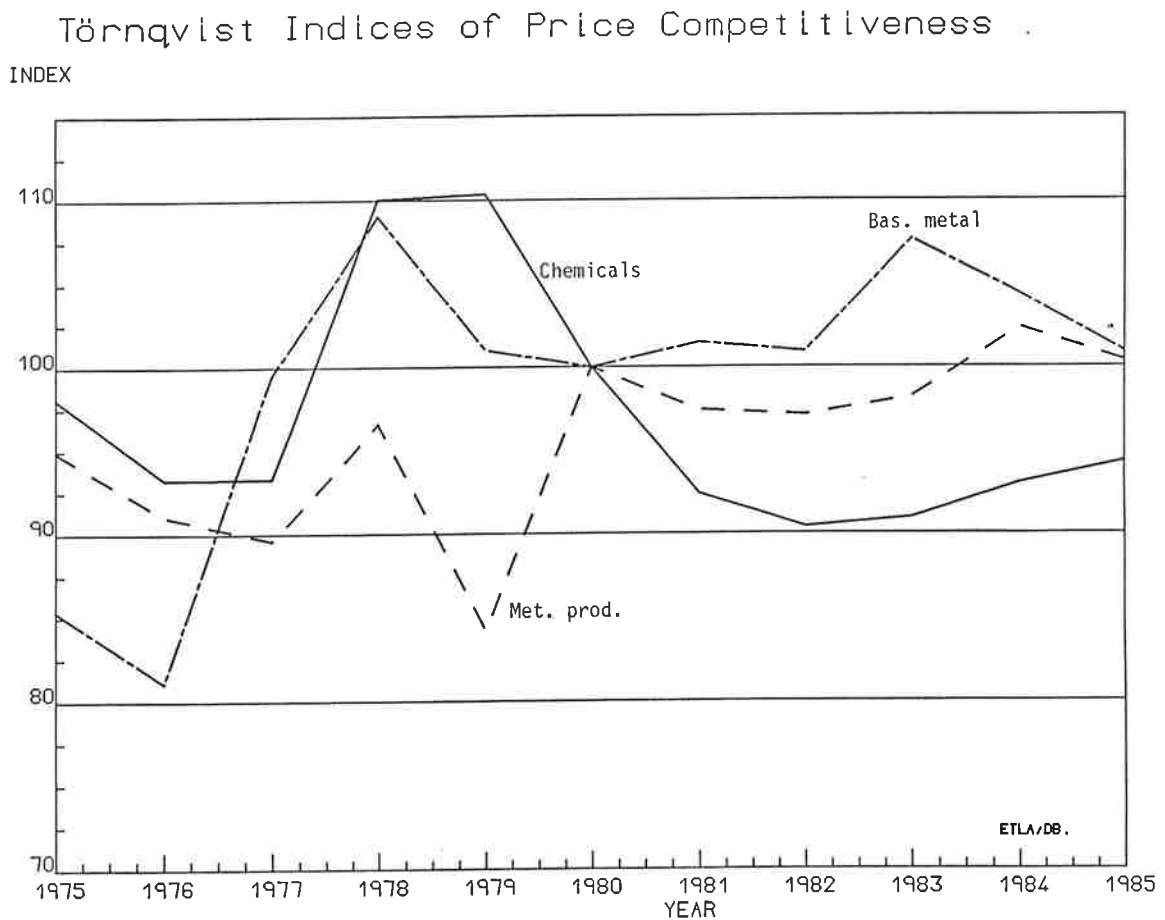
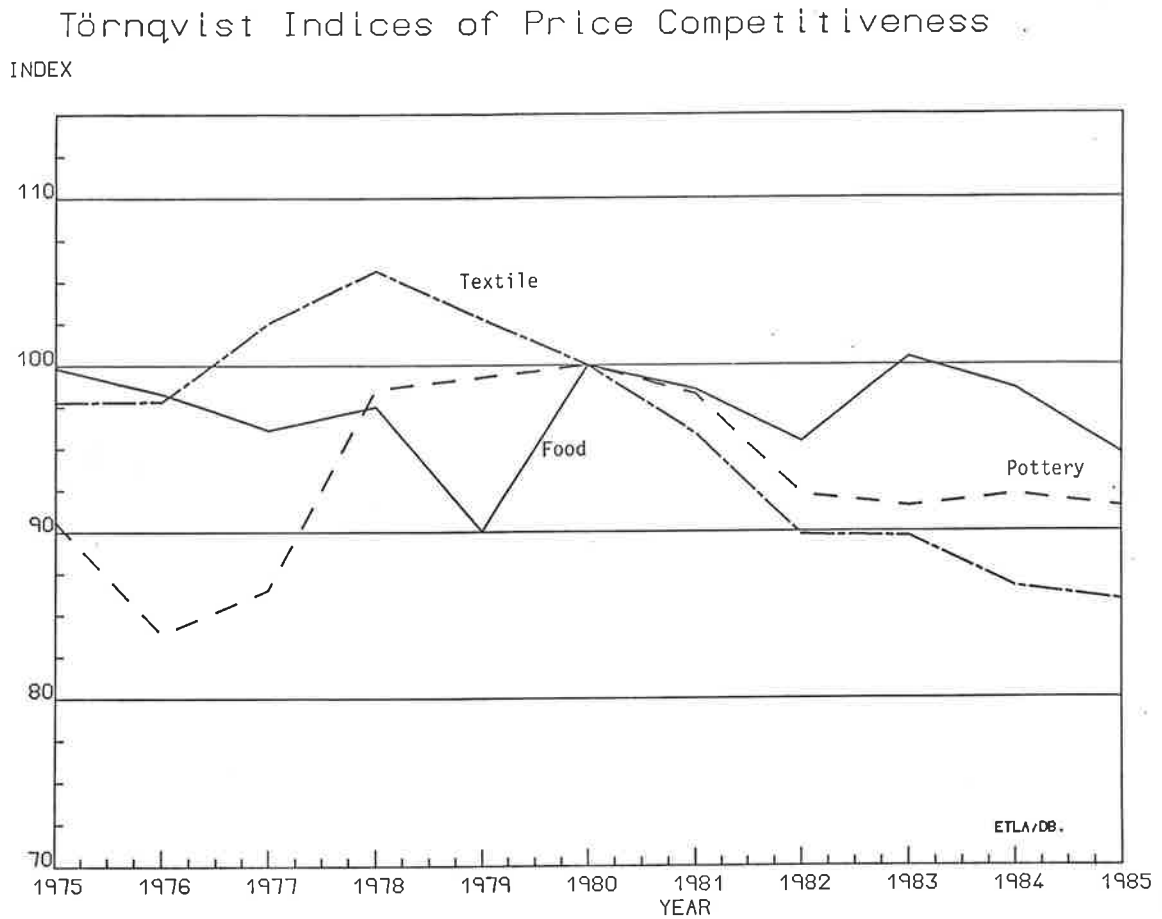


Figure 9



Bertil Näslund's work (1983) on exchange rate variations and the behaviour of firms relates to such a hypothesis. Näslund presents results obtained from interviews and questionnaires sent out to Swedish firms, which indicate that significant proportions, 41 %-43 %, of firms do NOT reduce price (as measured in foreign currency) after devaluation, with the remainder of firms changing price in line with total or part of the net devaluation. This response can be translated into a Finnish context, where firms have very similar decision-making/production processes. The division between firms who do change their export prices after devaluation as opposed to those who do not may also reflect the different pricing decisions between those firms concerned with cost factors and those firms who, because of market conditions, are price takers. Within the decision-making process of

the firm there is the question of the aims and objectives of the firm, i.e. is a firm profit or sales (volume) maximising? If the main aim is to increase volume then one would expect prices to be reduced more often. Of the firms who declared that their main objective was volume, 80 % reduced prices, as opposed to 50 % of firms with other objectives. The most recent OECD Economic Survey on Finland (June 1986) makes some strong statements about the state of the Finnish economy and specifically refers to price competitiveness on several occasions:

"Through 1985, the continued worsening of external competitiveness and export performance resulted in a further edging up of unemployment and this has become the focus in the policy debate. ... Although wage growth had moderated somewhat in Finland, the moderation has not been sufficient in relation to what has happened in the main competitor countries so that cost competitiveness has been deteriorating. More generally, incentives to strive for lower inflation and hence better price competitiveness have been weakened by the increasing importance of the sheltered sector in wage negotiations and the maintenance of price regulation in certain key areas. However, the deterioration in competitiveness has been offset to some extent by the cost reducing effect of the energy tax package and by corporate tax reform, and measures have been announced recently to reduce official price and limit restrictive business practices".

The framework of the OECD's analysis is correct if you accept their approach towards competitiveness which would appear to be heavily biased towards price/cost competitiveness alone. What is quite true, and emerges from their analysis quite clearly, is that competitiveness must be examined in an economy-wide context. Competitiveness, more than anything else, is a reflection of the state of health of the whole economy, whether or not one sees the problems of an economy as short- or long-term is another matter. The OECD interprets worsening competitiveness as a by-product of the economic-policy mix followed in Finland: "The policy approach adopted, while successful in its own

right, has some negative side effects which have probably been inevitable. Symptomatic of these are the reduced share of investment in GDP, high levels of real interest rates, gradual erosion of cost competitiveness and the increase in public debt, all of which are inter-related. The major source of difficulty, though not yet serious, is persistently high wage cost pressure which, through its negative effect on international competitiveness, has made it necessary to maintain higher interest rates than abroad in order to keep the stable nominal exchange rate and has contributed to the weakened investment trends".

If this analysis is correct then what are the remedies, if they are needed at all, the next section examines these issues.

4. Postscript

"Today the price competitiveness of Finnish industry is, in terms of relative unit labour costs, below its long-term average and will this year further deteriorate. Next year it is likely to stop worsening. The deterioration will be partly compensated for by energy taxation and business taxation reforms and the reduction of employers' social welfare costs". Suhdanne economic prospects, Autumn 1986, ETLA.

The moves towards reforming certain 'rigidities' in the Finnish labour market would go some way to answering a major criticism of the economy presented by the OECD. The tendency for wages to rise disproportionately quickly has been an important factor in deteriorating the price competitiveness of exports. Several incomes policies have been instituted in the past, although the rate of inflation in Finland has consistently been higher than the OECD average during the time period of this study. If inflation is not to rise any faster then deflationary policies will have to be ruled out for the time being. Current exchange rate policy and the interest rate manipulation which it entails could result in longer-term damage to the economy.. In the short-term a country can suffer from a poor price competitive performance, if the long-term the consequences are potentially disastrous. It could be argued that the ten-year cycles in competitiveness, brought about by the interaction of rising unit costs (ULC in particular) and an appreciating Mark, have been BENEFICIAL to the Finnish economy by promoting structural change and development. The strong devaluating shocks have done much to further the growth of the 'non-traditional' sector, especially because of the

enhanced ability to export. The Finnish economy has benefitted a great deal from its 'special' status with the Eastern bloc, profiting from a mutually beneficial trade of industrial goods for oil. While the oil price remains low this trade relation will diminish in importance and Finland will have to divert quite considerable export potential to the West which inevitably entails tougher competition. The cost of supporting the Finn Mark against both speculation and international pressures will cost the Finnish economy dear. It seems that the shock devaluation policy of the past is no longer feasible given fears of accelerating inflation (and speculation) so an alternative must be found. First of all wage costs must be kept under control, this will ease pressure on price competitiveness and inflation simultaneously. Secondly, the wide cyclical fluctuation of price competitiveness and constant re-emergence of the ten-year cycles could be replaced with a more satisfactory system of what we shall call a "snake for price competitiveness". The "snake" or wide bands system would ensure that the price competitiveness of exports did not peak and trough at such high or low levels. Price competitiveness could be maintained within a certain range by following step one and by ensuring that the Finn Mark did not become wildly over/under-valued. In view of current speculation against the currency, which is a new phenomenon, it would be inappropriate to recommend fixed policy rules, but the Bank of Finland would have the option to depreciate 'softly' without incurring damagingly large currency flows. By doing this pressure to raise the interest rate would diminish and fears of under-investment could be allayed. As investment continues non-price competitive factors would improve, as efficiency and product design progress.

In conclusion we hope that we have been able to present a long-overdue review of the theory surrounding price competitiveness as well as original data on the sectoral movement of price competitiveness in the Finnish economy over the period 1975-85. Although the work has been divided into broad sections it is intended that it be taken as a whole. We hope that parts of the paper have been provocative and interesting, so that discussion will be stimulated from a position of information and knowledge, rather than journalistic hypothesis. As ever there remains plenty of scope for more work on the subject, and it is hoped that this study will provide some of the impetus and incentive to do it.

Summary of Major Theoretical Issues

We have presented in sections 3(i) and 3(ii) all the major issues concerning price competitiveness and its correct interpretation. We now present a brief summary of some of the most important points.

1. Price competitiveness may be defined in three principal ways as: (i) price competitiveness, (ii) relative cost competitiveness, (iii) relative profitability. This study focusses on the concept of price competitiveness which may be considered to embrace purely price factors which have compiled in the indices of price competitiveness, and non-price competitiveness which we urge the reader to bear in mind may be as, if not more, important than price factors.

2. We have examined the concept of Purchasing Power Parity, which if held true would negate the importance of price competitiveness. Evidence shows that PPP has performed with mixed success in economic history. PPP also provides the basis for the deviations of ABSOLUTE and RELATIVE deviations of price competitiveness. Since data on price LEVELS is unavailable at an international level, price INDICES have been used instead; therefore price competitiveness indices only provide us with a comparison in relation to the base year of the movement of costs and prices in different countries. We are in fact calculating REAL EFFECTIVE EXCHANGE RATES, where movements in the series can either be seen as the real appreciation or depreciation of the currency.

3. Four criteria exist for the construction of a price competitiveness index:

- (a) Proper choice of the base year. [Ref: relative PPP/ equilibrium exchange rates.]
- (b) Proper choice of weights. [Ref: market share theory]
- (c) Correct choice of price relatives.
- (d) Correct index formulae. [Ref: section 3(ii)]

Most of the above criteria have been satisfied in our study.

Competitiveness by sectors, 1980=100

ISIC:	1 Ag&for	2 Mining	3 Industry	31 Food	32 Textile	33 Wood
1975			90.133	100.652	97.485	94.800
1976			88.967	98.015	97.187	93.320
1977			94.763	96.056	102.051	92.559
1978			104.763	98.036	105.694	106.722
1979			106.097	90.234	102.798	106.533
1980			100.000	100.000	100.000	100.000
1981			95.651	98.442	95.954	98.061
	89.696	95.527				
1982			92.098	95.359	89.696	96.610
1983			92.501	97.765	89.420	95.527
1984			88.738	96.972	86.393	91.135
1985			88.424	93.732	85.580	95.355

ISIC:	34 Paper	35 Chemical	36 Pottery	37 BMetal	38 MetProd
1975	82.930	98.474	88.947	85.623	94.526
1976	78.542	93.492	82.423	74.235	91.472
1977	87.617	93.220	85.499	99.505	89.400
1978	98.088	110.166	98.067	109.260	96.013
1979	96.990	110.431	99.373	101.294	97.519
1980	100.000	100.000	100.000	100.000	100.000
1981	91.318	92.505	98.257	100.762	96.971
1982	90.002	90.625	91.840	100.495	96.856
1983	97.262	90.855	90.467	106.781	98.121
1984	87.851	93.087	90.455	102.670	99.049
1985	92.859	94.408	89.570	99.751	98.704

Notes

-
- (1) Unit Labour Costs, OECD. US, J, Dk, Ger, I, Nl, No, Sw, UK. 70%
- (2) Unit Labour Costs, OECD. US, J, Dk, Ger, Nl, No, Sw. 45%
- (3) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, Uk, Be. 53%
- (31) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK. 41%
- (32) Producer Prices, OECD. US, J (excl. 323, 324), Dk, Ger, No, Sw, I, UK. 67%
- (33) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, I, UK. 53%
- (34) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK. 43%
- (35) Producer Prices, OECD. J, Dk, Fr, No, Sw, UK. 47%
- (36) Producer Prices, OECD. C, US, J, Dk, I, Nl, No, Sw, Ch, UK. 48%
- (37) Producer Prices, OECD. C, US, J, Dk, G, No, Sw, I, Fr, Au, Ch, Sp, Nl, UK. 84%
- (38) Producer Prices, OECD. US, J, Dk, G, Nl, I, Sw, Ch, UK. (381 prices used as 43% -proxy)

These are geometric, base-weighted, indices.

Competitiveness by sectors, 1980=100

ISIC:	1 Ag&for	2 Mining	3 Industry	31 Food	32 Textile	33 Wood
==DATA						
1975			90.967	101.071	97.903	95.181
1976			90.018	98.468	97.943	94.353
1977			95.068	96.344	102.630	93.187
1978			105.236	98.257	106.066	107.365
1979			106.309	90.350	102.907	106.796
1980			100.000	100.000	100.000	100.000
1981			95.877	98.653	96.041	98.150
1982			92.530	95.628	89.788	96.772
1983			93.342	98.431	89.604	95.766
1984			89.647	97.840	86.649	91.328
1985			89.399	94.388	85.831	95.625
END						

ISIC:	34 Paper	35 Chemical	36 Pottery	37 BMetal	38 MetProd
==DATA2					
1975	84.487	98.723	89.739	84.855	95.268
1976	79.665	93.974	83.559	74.447	92.226
1977	88.600	93.454	86.411	98.910	89.848
1978	99.239	110.282	98.663	108.557	96.248
1979	97.545	110.481	99.595	100.293	97.595
1980	100.000	100.000	100.000	100.000	100.000
1981	91.486	92.533	98.377	101.010	97.225
1982	90.307	90.657	92.096	100.819	97.367
1983	97.723	90.928	91.043	107.488	98.996
1984	88.726	93.110	91.075	103.580	100.140
1985	93.634	94.436	90.197	100.569	99.753
END					

Notes

- (1) Unit Labour Costs, OECD. US, J, Dk, Ger, I, Nl, No, Sw, UK. 70%
- (2) Unit Labour Costs, OECD. US, J, Dk, Ger, Nl, No, Sw. 45%
- (3) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, Uk, Be. 53%
- (31) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK. 41%
- (32) Producer Prices, OECD. US, J(excl. 323, 324), Dk, Ger, No, Sw, I, UK. 67%
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- (37) Producer Prices, OECD. C, US, J, Dk, G, No, Sw, I, Fr, Au, Ch, Sp, Nl, UK. 84%
- (38) Producer Prices, OECD. US, J, Dk, G, Nl, I, Sw, Ch, UK. (381 prices used as 43% -proxy)

These are Laspeyres, base-weighted, indices.

Competitiveness by sectors, 1980=100

ISIC:	1 Ag&for	2 Mining	3 Industry	31 Food	32 Textile	33 Wood
==DATA						
1975			89.491	99.043	98.047	93.198
1976			87.921	98.557	98.477	92.594
1977			94.578	96.199	103.067	92.549
1978			104.692	96.961	105.657	101.389
1979			105.721	89.792	102.756	106.073
1980			100.000	100.000	100.000	100.000
1981			95.673	98.656	95.823	98.266
1982			92.391	95.473	89.890	97.587
1983			93.973	103.227	89.957	96.152
1984			93.342	100.179	86.895	93.678
1985			91.926	95.648	86.116	96.610
END						

ISIC:	34 Paper	35 Chemical	36 Pottery	37 BMetal	38 MetProd
==DATA2					
1975	80.329	97.731	92.289	85.098	95.329
1976	76.714	93.069	85.335	88.613	90.633
1977	87.081	93.424	87.468	99.500	89.793
1978	97.855	109.937	99.041	108.760	97.140
1979	96.833	110.260	99.172	100.707	72.725
1980	100.000	100.000	100.000	100.000	100.000
1981	91.189	92.283	98.247	102.134	97.844
1982	88.766	90.108	92.587	101.292	97.329
1983	98.918	90.964	92.529	108.467	98.205
1984	92.047	92.933	93.959	106.101	105.724
1985	97.371	94.254	93.376	102.008	102.020
END					

Notes

- (1) Unit Labour Costs, OECD. US, J, Dk, Ger, I, Nl, No, Sw, UK.
- (2) Unit Labour Costs, OECD. US, J, Dk, Ger, Nl, No, Sw.
- (3) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, Uk, Be.
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- (33) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, I, UK.
- (34) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK.
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- (36) Producer Prices, OECD. C, US, J, Dk, I, Nl, No, Sw, Ch, UK.
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Competitiveness by sectors, 1980=100

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1975			90.133	100.652	97.485	94.800
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1984			88.738	96.972	86.393	91.135
1985			88.424	93.732	85.580	95.355
END						
ISIC:	34	35	36	37	38	
	Paper	Chemical	Pottery	BMetal	MetProd	
==DATA2						
1975	82.930	98.474	88.947	85.623	94.526	
1976	78.542	93.492	82.423	74.235	91.472	
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1985	92.859	94.408	89.570	99.751	98.704	
END						

Notes

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- (3) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, Uk, Be. 53%
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- (33) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, I, UK. 53%
- (34) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK. 43%
- (35) Producer Prices, OECD. J, Dk, Fr, No, Sw, UK. 47%
- (36) Producer Prices, OECD. C, US, J, Dk, I, Nl, No, Sw, Ch, UK. 48%
- (37) Producer Prices, OECD. C, US, J, Dk, G, No, Sw, I, Fr, Au, Ch, Sp, Nl, UK. 84%
- (38) Producer Prices, OECD. US, J, Dk, G, Nl, I, Sw, Ch, UK. (381 prices used as 43% -proxy)

These are geometric, base-weighted, indices.

Competitiveness by sectors, 1980=100

ISIC:	1	2	3	31	32	33
	Ag&for	Mining	Industry	Food	Textile	Wood
==DATA						
1975			88.511	98.702	97.672	92.782
1976			86.654	98.080	97.859	91.493
1977			93.869	95.905	102.542	91.805
1978			104.156	96.622	105.346	106.640
1979			105.502	89.642	102.654	105.815
1980			100.000	100.000	100.000	100.000
1981			95.967	98.428	95.744	98.177
1982			91.945	95.196	89.795	96.878
1983			93.072	102.571	89.738	95.945
1984			91.943	99.124	86.539	91.368
1985			90.563	94.818	85.734	96.255
END						
ISIC:	34	35	36	37	38	
	Paper	Chemical	Pottery	BMetal	MetProd	
==DATA2						
1975	78.790	97.389	91.769	84.612	94.419	
1976	75.604	92.499	84.291	88.069	89.561	
1977	86.052	93.190	86.605	99.212	89.238	
1978	96.668	109.778	98.513	108.450	96.831	
1979	96.281	110.202	98.940	100.617	103.440	
1980	100.000	100.000	100.000	100.000	100.000	
1981	91.047	92.243	98.123	101.823	97.547	
1982	88.655	90.057	92.331	100.953	96.878	
1983	98.302	90.896	91.913	107.658	97.463	
1984	90.526	92.898	92.909	104.836	103.838	
1985	95.990	94.222	92.286	101.028	100.708	
END						

Notes

- (1) Unit Labour Costs, OECD. US, J, Dk, Ger, I, Nl, No, Sw, UK.
(2) Unit Labour Costs, OECD. US, J, Dk, Ger, Nl, No, Sw.
(3) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, Uk, Be.
(31) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK.
(32) Producer Prices, OECD. US, J (excl. 323, 324), Dk, Ger, No, Sw, I, UK.
(33) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, I, UK.
(34) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK.
(35) Producer Prices, OECD. J, Dk, Fr, No, Sw, UK.
(36) Producer Prices, OECD. C, US, J, Dk, I, Nl, No, Sw, Ch, UK.
(37) Producer Prices, OECD. C, US, J, Dk, G, No, Sw, I, Fr, Au, Ch, Sp, Nl, UK.
(38) Producer Prices, OECD. US, J, Dk, G, Nl, I, Sw, Ch, UK. (381 prices used as -proxy)

These are Paasche, observation year, indices.

Competitiveness by sectors, 1980=100

ISIC:	1 Agr&for	2 Mining	3 Industry	4 Other	31 Food	32 Textile	33 Wood
1970	109.393	110.415	106.324	111.262	125.111	107.488	100.901
1971	104.918	105.126	102.178	106.672	116.930	103.419	97.807
1972	107.146	107.749	104.578	111.864	117.111	107.036	100.510
1973	102.097	100.731	97.881	102.482	105.923	99.029	95.753
1974	93.618	91.330	89.836	92.482	97.319	90.470	88.117
1975	85.909	86.601	84.104	90.424	89.250	86.452	82.549
1976	80.973	81.819	78.926	92.825	85.995	85.016	75.210
1977	86.131	86.684	84.174	98.122	91.182	90.185	80.599
1978	102.984	99.826	98.600	106.780	103.687	102.155	96.518
1979	103.225	101.109	100.672	102.362	102.878	101.261	100.381
1980	100.000	100.000	100.000	100.000	100.000	100.000	100.000
1981	94.381	94.591	93.966	96.871	97.545	95.370	92.027
1982	93.737	90.709	90.019	86.110	95.275	88.082	88.776
1983	98.582	91.751	91.426	80.431	98.540	86.101	91.074

ISIC:	34 Paper	35 Chemical	36 Pottery	37 BasMetal	38 MetProd	39 Other
1970	100.429	108.318	105.462	111.857	113.808	118.280
1971	97.170	104.154	101.927	106.550	108.262	111.758
1972	98.866	107.863	105.235	107.861	110.744	112.954
1973	92.811	101.158	99.999	100.688	102.375	104.458
1974	85.611	92.432	91.409	92.674	93.424	95.659
1975	79.650	87.590	85.044	85.262	87.711	87.859
1976	71.829	84.778	80.770	79.799	85.258	84.456
1977	76.780	90.484	86.702	85.032	90.497	89.658
1978	93.156	103.027	101.057	99.899	102.844	103.260
1979	98.362	102.468	101.933	101.649	102.106	102.777
1980	100.000	100.000	100.000	100.000	100.000	100.000
1981	93.249	93.953	93.269	94.488	95.734	96.172
1982	90.668	87.838	88.724	92.546	90.785	94.016
1983	93.468	87.035	89.604	95.857	91.037	96.988

Notes

1. Unit Labour Costs (cf SVP-files/Sihtola) are taken as a proxy variable for prices.
2. Countries included in the above indices are- US, Dk, Ger, Sw, No, Fr, Ch, Be, Nl, UK.

These are Laspeyres, base-weighted, indices.

Törnqvist indices of price competitiveness:

1980=100

ISIC:	3 Industry	31 Food	32 Textile	33 Wood
1975	89.811	99.844	97.766	93.996
1976	88.442	98.286	97.830	92.956
1977	94.670	96.127	102.558	92.554
1978	104.727	97.497	105.675	104.021
1979	105.909	90.013	102.777	106.303
1980	100.000	100.000	100.000	100.000
1981	95.662	98.549	95.888	98.163
1982	92.244	95.416	89.793	97.097
1983	93.234	100.459	89.688	95.839
1984	91.011	98.562	86.644	92.398
1985	90.158	94.685	85.848	95.980

ISIC:	34 Paper	35 Chemical	36 Pottery	37 BMetal	38 MetProd
1975	81.619	98.102	90.603	85.360	94.927
1976	77.623	93.280	83.866	89.621	91.052
1977	87.349	93.322	86.478	99.503	89.596
1978	97.971	110.051	98.553	109.010	96.575
1979	96.911	110.345	99.272	101.000	84.214
1980	100.000	100.000	100.000	100.000	100.000
1981	91.253	92.394	98.252	101.446	97.407
1982	89.382	90.366	92.213	100.893	97.092
1983	98.087	90.909	91.492	107.621	98.163
1984	89.925	93.010	92.190	104.371	102.332
1985	95.088	94.331	91.453	100.873	100.348

Notes

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- (3) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, Uk, Be.
(31) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK.
(32) Producer Prices, OECD. US, J (excl. 323, 324), Dk, Ger, No, Sw, I, UK.
(33) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, I, UK.
(34) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK.
(35) Producer Prices, OECD. J, Dk, Fr, No, Sw, UK.
(36) Producer Prices, OECD. C, US, J, Dk, I, Nl, No, Sw, Ch, UK.
(37) Producer Prices, OECD. C, US, J, Dk, G, No, Sw, I, Fr, Au, Ch, Sp, Nl, UK.
(38) Producer Prices, OECD. US, J, Dk, G, Nl, I, Sw, Ch, UK. (381 prices used as -proxy)

Fisher indices of price competitiveness:

1980=100

ISIC:	3 Industry	31 Food	32 Textile	33 Wood		
1975	89.731	99.879	97.787	93.974		
1976	88.320	98.274	97.901	92.912		
1977	94.467	96.124	102.586	92.493		
1978	104.695	97.436	105.705	107.002		
1979	105.905	89.995	102.780	106.304		
1980	100.000	100.000	100.000	100.000		
1981	95.922	98.540	95.892	98.163		
1982	92.237	95.412	89.792	96.825		
1983	93.207	100.480	89.671	95.855		
1984	90.788	98.480	86.594	91.348		
1985	89.979	94.603	85.782	95.939		

ISIC:	34 Paper	35 Chemical	36 Pottery	37 BMetal	38 MetProd
1975	81.589	98.054	90.748	85.353	94.843
1976	77.608	93.234	83.924	89.598	90.884
1977	87.317	93.322	86.508	99.518	89.542
1978	97.945	110.030	98.588	109.018	96.539
1979	96.911	110.341	99.267	101.010	100.475
1980	100.000	100.000	100.000	100.000	100.000
1981	91.266	92.388	98.250	101.416	97.386
1982	89.477	90.356	92.213	100.886	97.122
1983	98.012	90.912	91.477	107.573	98.227
1984	89.621	93.004	91.987	104.206	101.972
1985	94.805	94.329	91.236	100.798	100.229

Notes

- (3) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK, Be. 53%
- (31) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK. 41%
- (32) Producer Prices, OECD. US, J(excl. 323, 324), Dk, Ger, No, Sw, I, UK. 67%
- (33) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, I, UK. 53%
- (34) Producer Prices, OECD. C, US, J, Dk, Ger, No, Sw, Ch, UK. 43%
- (35) Producer Prices, OECD. J, Dk, Fr, No, Sw, UK. 47%
- (36) Producer Prices, OECD. C, US, J, Dk, I, Nl, No, Sw, Ch, UK. 48%
- (37) Producer Prices, OECD. C, US, J, Dk, G, No, Sw, I, Fr, Au, Ch, Sp, Nl, UK. 84%
- (38) Producer Prices, OECD. US, J, Dk, G, Nl, I, Sw, Ch, UK. (381 prices used as 43% -proxy)

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