INCOME AND PRICE ELASTICITIES OF FOREIGN TRADE IN FINLAND AND AUSTRIA

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ABSTRACT: In countries where the growth in output has been swift, the income elasticity of export demand is generally high, but the income elasticity of imports is low. Firms in these countries have continuously been able to develop new product innovations and to stake out a monopoly position as a market leader in the markets for these new goods. The low income elasticity of imports in turn indicates that the import goods are primarily raw materials, intermediate products or mature final products with relatively low value added. The growth rate of these countries can surpass that of competitor countries without the foreign debt posing as a limiting factor. Japan has been a prime example of this. If the income elasticity of exports is high compared to that of imports, the country has been a strong performer. In the study the income and price elasticities of exports and imports are estimated for Finland and Austria. The results indicate that Austria's income elasticity of exports relative to its income elasticity of exports is much higher than in Finland. This would imply that growing at a faster rate than in the competitor countries will not spur a rise in the foreign debt as readily as in Finland. This has also been the case in recent decades.

KEY WORDS: elasticities of foreign trade, Finland-Austria

CONTENTS

1 INTRODUCTION

A key question from the standpoint of long-term economic growth is what determines the equilibrium between the current account and the real effective exchange rate. When analysing the equilibrium of the current account, one approach is to use the income and price elasticities of imports and exports. It is presumed that the imports of different countries are imperfect substitutes. Empirically observed low price elasticities mean that the goods produced in different countries are not close substitutes. A country's success and balanced growth depends upon the supply of new products on world markets. Changes in the real equilibrium exchange rates of currencies are caused either by income elasticities of exports and imports or differences in growth rates (Krugman, 1989).

It can be assumed that the income elasticities of import and export demand are systematically linked to a country's long-term growth rate. In fast-growing countries it can be hypothesized that there is high income elasticity with respect to export demand but low income elasticity of imports. In low growth countries the situation is vice versa. If the income elasticity of export demand in a particular country is high, this means that the companies in the country have continuously been able to meet the needs of the market growing faster than on average by developing new products and operating in a monopoly position as a market leader in markets for new innovative goods.

A low income elasticity for imports indicates that imported goods are primarily raw materials, intermediary products or mature, low value added products the production of which is shifting toward low-wage countries. In countries that are continuously able to develop new export products accepted in the markets as well as import low value added bulk products, the ratio of export to import prices, i.e. the terms of trade, will improve over the long run. In this kind of a country the growth rate can surpass that of competitor countries without spurring a deficit in the current account and/or a continuous weakening of the currency. This ultimately leads to faster growth than in other countries, a balanced or positive current account and a stable or appreciating currency.[1]

In the following we seek to shed some light on the above-mentioned hypotheses with the aid of regression equations on exports and imports of industrial products estimated for Finland and Austria.[2] The aim is to compare the countries' income elasticities of exports and imports. The theoretical starting point is a simple imperfect substitution model where export demand depends on foreign activity as well as relative export

[1] The situation in the Japanese economy generally reflects this kind of a development. It cannot, however, continue forever. For example, Japan has recently witnessed such a strong appreciation of its currency that it has been difficult to compensate by increasing productivity, i.e. by producing commercially useful product or process innovations. Japanese direct investments to other South-East and East Asian countries have been sizable. Japan has been plagued by almost zero growth for three years already, one of the factors behind which has been too strong a yen.

[2] This exercise has been part of a study conducted by VATT on the external environment of the economy, which has also been carried out within a country comparison framework.

prices. The demand for import goods is affected by domestic economic activity as well as relative import prices. Supply factors, i.e. decisions regarding the supply of export goods and import goods, have been omitted from the model. In the model the price elasticity of supply is thus implicitly assumed to be infinite and the price variable exogenous.

The estimated equations are dynamic difference models, where the independent variables are economic activity and lagged relative prices as well as the dependent variable's own lagged effect. The estimations were carried out for the years 1975-1990 using quarterly data. The purpose of the estimations has been primarily to determine long-run elasticities. The models estimated for Austria and Finland are similar. The equations account for the export and import demand of Austria considerably better than for Finland. One reason for this may stem from the instability of Finland's export and import volume during the estimation period. The estimated signs and magnitude of the long-term elasticities proved to be in line with the hypotheses. The income elasticity of Austrian exports is estimated to be appreciably greater in the model than that for Finland. The income elasticity for imports is, on the other hand, somewhat higher in Finland than in Austria. The elasticity of export and import demand with respect to prices is relatively higher in Austria than in Finland. In Finland the price elasticities were low and the sign of the price elasticity of import demand was contrary to that hypothesized.

The structure of the report is as follows. Section 2 presents the theoretical model and section 3 the data used. Section 4 specifies the estimated equations and section 5 reports the results. Section 6 discusses the interpretation of the results.

2 MODEL AND METHODS

According to the imperfect substitution model (Houthakker and Magee (1969) and Krugman (1989)) the demand for the export products of each country depends upon the economic activity of the export country, the prices of the export good and the prices of products competing with exports. The import demand of each country in turn depends upon the economic activity of the country in question, the prices of import goods and the prices of goods competing with imports. These relationships at the aggregate level of the economy can be presented formally with the aid of equations (1) and (2):

(1) $X^i = g^i(Y^e, P^i_x, P^e)$,

(2) $M^i = f^i(Y^i, P^i_m, P^i)$,

where

X^i is the exports of country i

Y^e is the economic activity of the export country

P_x^i is the export price of country i

P^e is the price level of the export country

M^i is the imports of country i

Y^i is the economic activity of country i

P_m^i is the import price of country i

P^i is the price level of country i

In the equations all variables are expressed in terms of the currency of country i. By assuming that an equivalent change in income and prices does not affect the behaviour of consumers, the equations can be presented using real quantities and relative prices as follows:

$$(1') \; X^i = G^i\left(\frac{Y^e}{P^e}, \frac{P_x^i}{P^e}\right),$$

$$(2') \; M^i = F^i\left(\frac{Y^i}{P^i}, \frac{P_m^i}{P^i}\right).$$

In empirical studies the real export prices are generally depicted with relative export prices, i.e. the ratio of the export prices of the exporting country to those of the competitor countries. This is one measure of the price competitiveness of the country in question.[3] The analysis is based on the small open economy assumption, i.e. that each country can expand its exports and increase its imports without spurring a change in world market prices.

3 DATA

The data used in the estimations are quarterly OECD figures for the years 1975 - 1990. The volume and price indices for Finland's gross domestic product are those compiled by Statistics Finland. The variable depicting export prices is an index where Finnish export prices are divided by the weighted average of the 14 most important competitor countries' export prices (OECD countries). The relative import prices are depicted by the ratio of unit value index of imported industrial products (index in domestic currency) and the GDP deflator.[4]

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[3] A broader definition of competitiveness depends also on other factors, such as the goods' quality, marketing, service network and other factors of so-called real competitiveness. These kinds of phenomena are nevertheless difficult to measure and they are not taken into consideration in the study, as is cutomary in this kind of analysis.

[4] The variable depicting relative import prices must be regarded with caution. First, the unit value index is a rather deficient price indicator and, second, the GDP deflator depicts among other things price developments in the public sector and services. The ideal indicator would depict the prices of goods competing with import goods.

The variable measuring the foreign activity is the geometric average of the GDP volumes of Finland's 11 most important and Austria's 10 most important export countries. The GDP volumes are weighted according to each country's relative share within the groups of main export countries in 1980. The Soviet Union has been an important trading for Finland while Czechoslovakia, the former Yugoslavia, Poland and Hungary have been important for Austria during the period under investigation. Quarterly GDP figures were nevertheless not available for these countries for the entire period so they had to be omitted, even though the dependent variable is the total exports and imports of industrial products. Finland's three most important Western export countries, Sweden, United Kingdom and Germany, had a combined weight of almost 63 per cent while the share of Austria's main export countries, Germany, Italy and Switzerland, exceeded 74 per cent.

4 ESTIMATED EQUATIONS

By assuming that the foreign export demand and the domestic import demand are logrithmically linear, we can present equations (1) and (2) as follows:

$$(3)\ \ln X^i = d + e\ln(RY^e) + f\ln(RXP_i)$$

$$(4)\ \ln M^i = a + b\ln(RY^i) + c\ln(RMP_i),$$

where RY^e is the level of real activity in the export countries, RXP^i is the real export price of country i, RY^i is the level of real activity in country i and RMP^i is the real import price of country i.

The equations are static and they depict the long-term dependence of exports and imports. In actuality exports and imports adjust to changes in economic activity and prices with a lag. In the estimated models the changes in exports and imports are regressed against changes in economic activity and prices, their lags and variables depicting long-term dependence. The models estimated with OLS can be presented as follows:

$$(5)\ \ \Delta\ln M_t = \alpha + \sum_{i=1}^{3}\beta_i\Delta\ln M_{t-i} + \sum_{j=0}^{3}\gamma_j\Delta\ln RY_{t-j} + \sum_{k=0}^{3}\delta\Delta RMP_{t-k} + \varepsilon\ln M_{t-4} + \zeta\ln RY_{t-4} + \eta\ln RMP_{t-4} + u_t$$

$$(6)\ \Delta\ln X_t = \theta + \sum_{i=1}^{3}\vartheta_i\Delta\ln X_{t-i} + \sum_{j=0}^{3}\iota\Delta\ln RY^e_{t-j} + \sum_{k=0}^{3}\kappa\Delta\ln RXP_{t-k} + \lambda\ln X_{t-4} + \mu\ln RY^e_{t-4} + \nu\ln RXP_{t-4} + v_t,$$

where the dynamic operator Δ is defined as follows: $\Delta X_t = X_t - X_{t-1}$

5 RESULTS

The estimation results for the import and export equations are presented in tables 1 and 2. The import equations turn out to be statistically more significant than the export equations measured in terms of both goodness of fit and regression coefficients. This could be an indication of the phenomenon that infinite elasticity of supply is more realistic with respect to imports than exports. The production capacity of the small economy in particular is naturally more limited than the combined capacity of its import countries.

The models estimated for Austria were better than those for Finland. The residual sum of squares for Finland is over five times higher than that for Austria. Finnish imports and exports have exhibited a clearly more irregular trend than the imports and exports of Austria. One reason for this may be the greater sensitivity of Finnish exports to several exogenous shocks, such as devaluations and widespread strikes, that have been omitted from the analysis. Among other things, the effects of the 1977 strike by transport workers and the general strike of 1986 appear as a dip in the import and export time series. Strike dummy variables would have probably improved Finland's estimation results.

The variables of the Austrian import equation turned out to be significant for all lags. The GDP variable in the Finnish import equation and its first two lags were significant while the price variable did not appear to have appreciable explanatory power. In the Finnish export equation the GDP and price variables had no explanatory power at all. The only significant coefficients were those for the dependent variable's own lags. In the Austrian export equation both the GDP and price variables and their lags had a statistically significant effect on exports.

The signs and magnitude of the long-term coefficients are, with the exception of the price elasticity of imported Finnish industrial products, in line with those presumed. In Austria the income elasticity of imports is considerably greater than the income elasticity of imports. In Finland the income elasticity coefficients of imports are approximately equal. Austria's income elasticity of exports is clearly greater than that for Finland in the model, which indicates that the share of products exhibiting rapid demand growth is greater than in Finland. The income elasticity of imports in Finland is greater than in Austria, which indicates that activity and imports have a closer connection in Finland than in Austria. In Finland, on the other hand, the sign of the price elasticity of imports is contrary to that hypothesized, and the absolute value of the price elasticity of exports is considerably less than one. The "incorrect" sign for the price elasticity of imports is attributable to the insignificance of the estimates of the regression coefficients used in calculations (estimated price elasticity of imports = $-(\ln RMP_{-4} \div \ln M_{-4})$).

6 INTERPRETATION OF RESULTS

The link between the rate of growth and income elasticity can be explained in two ways. On the one hand, income elasticity depicts growth possibilities. Countries where the income elasticities of exports and imports are approximately equal, as in Finland, are easily driven into balance of payments problems if their growth is faster than in competitor countries. Swift growth generally spawns capacity bottlenecks and the acceleration of inflation, weakening of price competition and increased foreign indebtedness. This forces the country to apply a "stop and go" economic policy where growth is held in check in order to bring borrowing and inflation under control. A solution to the dilemma stemming from the limiting of growth and repayment of debt has nevertheless been sought by lowering the nominal exchange rate. This has spurred an acceleration of inflation and thereby considerable fluctuations in the real exchange rates and economic instability. It has not been possible to return to the balanced growth path. The limiting of growth has not been able to stabilize movements in real exchange rates primarily because of swift fluctuations in inflation. The above-presented description fits Finland very well.

In a situation of floating exchange rates, the effective real devaluation that can bring a lasting solution to the debt problem will prevent a price wage spiral, so that the outcome is the same. The countries cannot achieve an effective real devaluation via which they would be able to grow faster than competitor countries unless the income elasticity of exports is considerably higher than the income elasticity of imports.

A second basic explanation is that divergent growth rates affect trade flows so that differences in income elasticities arise. In other words, the differences in demand are explained in part by supply-side factors. Over the long run the differences in growth rates in various countries are explained primarily by differences in total factor productivity. Total factor productivity in turn is determined on the basis of various factors of real competitiveness. The channels which link current account problems arising from unfavourable income elasticities to total factor productivity are very complicated and are related to growth and development issues.

Income elasticity questions must be investigated especially from the perspective of the supply side. The terms of trade approach (Bhagwati, 1969) is one important explanation. If a country has not specialized in foreign trade, i.e. the country produces goods competing with imports as well as export products, the growth in production will not have a clear impact on the terms of trade. The key question is the effect of growing demand on imports. If the country's own goods are substitutes for imports, or imports consist of raw materials and intermediate goods as occurs in sufficiently import-biased growth, the terms of trade of the country will improve.

Swiftly growing countries expand their share of the world market, not by lowering the relative price of their goods, but rather by continuously developing new products and

expanding their product range geared toward growing demand and the needs of growing economies. The mix of export and import goods changes over time.

In countries with a high growth rate there is also a high income elasticity of export demand but a low income elasticity of import demand (Krugman, 1989). Rapid growth does not spur a need to lower the real exchange rate, which is generally not a lasting solution. The trade between industrialized countries does not necessarily reflect country-specific comparative advantages. On the contrary, countries specialize in order to exploit economies of scale at different levels. The enterprises of a country can expand their product range and increase their share of world trade without a need to lower the real exchange rate.

Countries are thus not doomed to having a goods structure based on the principles of comparative advantage, but rather by active development of product innovations they can gradually shift to production of goods with higher income elacticities. The precondition is that the country places strong emphasis on education, research, product development and learning by doing, i.e. by creating a sound know-how base via governmental action. Since product innovations require continuous renewal of physical production facilities, the incentive system related to investments must foster creation of capacity geared toward manufacturing of new products. The intermittent price competitiveness achieved by devaluation policy does not constitute such an incentive.

The ratio of income elasticities of exports and imports in Austria was 1.5 and in Finland 1.0 (tables 3 and 4). It seems that especially Finnish export products are marked by slower growth in demand than those of Austria. Roughly speaking, it appears that Finland is a country that exports more bulk products and imports high-tech goods. This finding makes it easier to understand the course of events in Finland in recent years. The swifter growth in output than in Finland's competitor countries has led to rising foreign indebtedness more easily than in Austria. Since Finland has closed the productivity gap compared to the leading Western European countries, the economy can grow over the long run only at approximately the rate of growth prevailing in the competitor countries owing to the constraint set by foreign debt.[5] Finland has historically been a country plagued by swift inflation, a depreciating currency and growing foreign indebtedness. The country has been forced into devaluations by the consequent disequilibria. The devaluations have nevertheless not fostered a sustained competitive advantage, but rather they have always triggered the beginning of a new cycle of inflation. This policy has also spawned unemployment costs and welfare losses, which have been especially high in the 1990s.

The development of Finland and Austria is depicted in figures 1 and 2. During 1970-1995 GDP growth was 2.5 per cent in Finland, 2.7 percent in Austria and 2.4 per cent in OECD Europe. The growth rates in Finland, Austria and OECD Europe were approximately equal. Growth in Austria has been considerably steadier than in Finland

[5] The projections of the Finnish President's employment task force (1994), where the target rate of annual GDP growth during 1995-2000 is 5 per cent, i.e. almost twice that of European competitors, appear to be overly optimistic.

Figure 1. GDP Volume Index in 1970 - 1995, index (1970) = 100

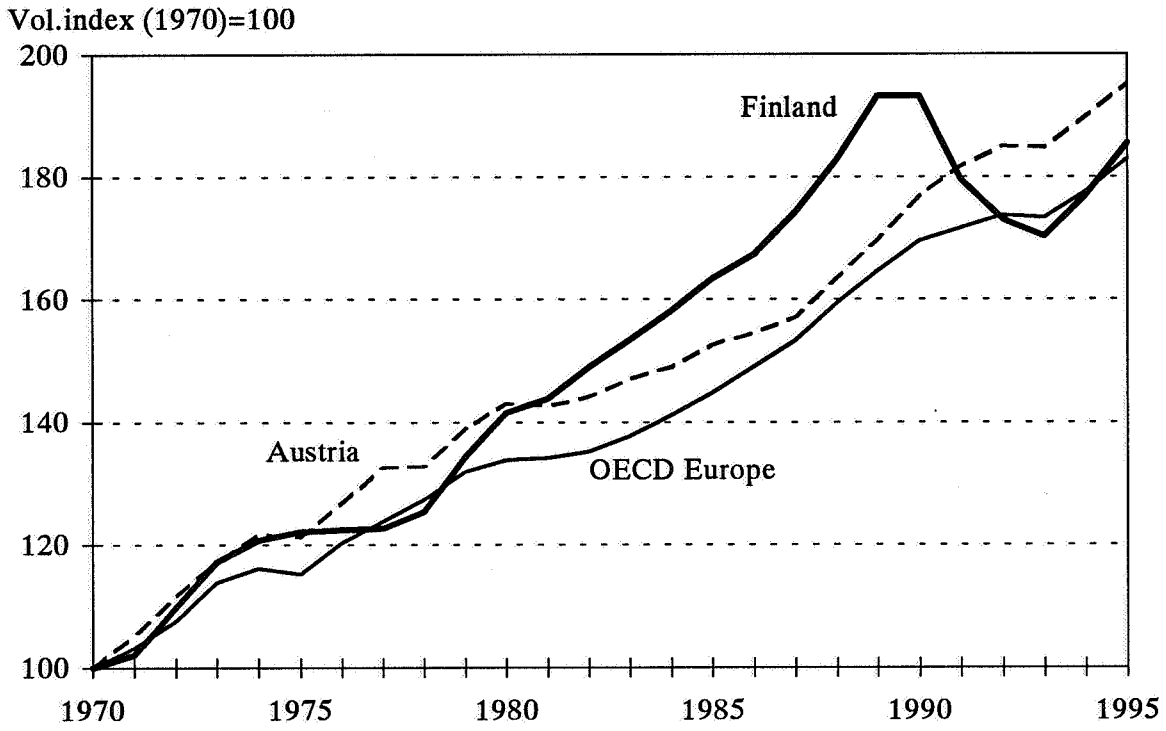
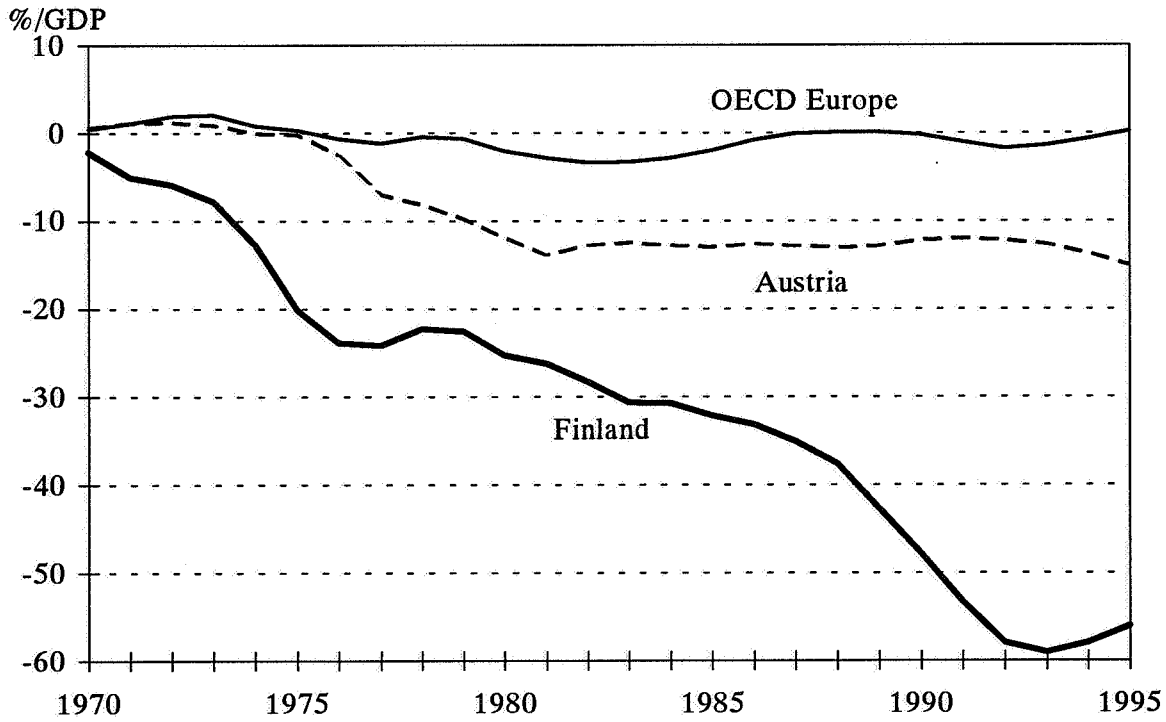


Figure 2. Current Account Surplus/Deficit as a Percentage of GDP in 1970 - 1995, cumulative sum



(figure 1). In Finland the external balance has nevertheless been substantially weaker than in Austria (figure 2). When looking at the cumulative sum for the current account surplus/deficit (as a percentage of GDP), it can be observed that from 1970 to 1995 the cumulative deficit has been about 56 per cent in Finland but only 15 per cent in Austria.

Under conditions of regulated capital markets a devaluation has provided an impetus to growth for a certain period of time. In the situation of free capital movements this kind of policy leads to a higher level of long-term interest rates than in competitor countries, eventually spurring a slowdown in the rate of growth. The demand for stable monetary conditions and low inflation have thus become increasingly important from the standpoint of growth.

7 CONCLUSIONS FOR MANAGEMENT OF FINNISH AFFAIRS

On the basis of this model analysis it is not possible to make far-reaching conclusions about the economic policy stance or its possibilities. Some views on the limits of Finnish growth policy can nevertheless be presented.[6]

A crucial condition for the improvement of employment is that economic growth must remain high throughout the latter half of the 1990s. Even 5 per cent growth will not by itself lower the number of unemployed below 200 thousand. When international growth in Europe is estimated at 2.5.-2.75 per cent during the next five years, it will be especially difficult for Finland to achieve 5 per cent GDP growth annually with the current production structure. The large amount of underutilized inputs, especially labour resources, will on the other hand enable GDP growth to be faster than in the competitor countries. Despite this it would still be a good achievement if growth would average even 3.5 per cent over the medium term.

Two conclusions can be drawn about the above-mentioned limits. First growth policy should be aimed primarily toward bolstering real competitiveness. A key role in this endeavour is upgrading the quality of human capital and know-how with the aid of research, product development, wage and labour relation incentives. The prerequisites for real capital should also be safeguarded, even though from the standpoint of tax legislation and other corresponding incentives the conditions for growth are already sufficient, at least by international comparison. Stable monetary conditions are also an absolute necessity for growth. The second conclusion that can be drawn about the limitations to growth is that various kinds of structural measures will gain in significance with respect to the lowering of unemployment.

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[6] Compared to the model calculations presented above, the severe recession in the early 1990s in Finland may have changed the traditional behavioural relations. From November 1991 to March 1993 when the Markka depreciated strongly there was not any acceleration of inflation. The uncontrolled devaluation spawned a slump in the domestic markets and growth in unemployment, which killed inflation. The substantial appreciation of the floating markka since March 1993 has dampened inflation.

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Table 1. Import Equations for Industrial Products[7]

Variable	Finland regression coefficient	t-value	Austria regression coefficient	t-value
constant	-1.1978	-0.823	0.71025	0.440
$\Delta \ln M_{-1}$	-1.0680	-7.646	-0.71080	-4.828
$\Delta \ln M_{-2}$	-0.44576	-2.464	-0.53086	-3.261
$\Delta \ln M_{-3}$	-0.13501	-0.877	-0.40754	-2.382
$\Delta \ln RY$	3.0535	5.641	3.2381	6.973
$\Delta \ln RY_{-1}$	3.6187	5.059	2.2870	3.581
$\Delta \ln RY_{-2}$	2.3412	3.133	2.2552	3.375
$\Delta \ln RY_{-3}$	1.2983	1.910	0.71921	1.025
$\Delta \ln RMP$	-0.089234	-0.581	-0.79982	-3.820
$\Delta \ln RMP_{-1}$	-0.32108	-1.502	-0.56057	-2.216
$\Delta \ln RMP_{-2}$	-0.50725	-2.128	-0.57913	-2.349
$\Delta \ln RMP_{-3}$	-0.082634	-0.337	-0.33810	-1.386
$\ln M_{-4}$	-0.16838	-1.204	-0.38950	-2.927
$\ln RY_{-4}$	0.31700	1.607	0.61119	1.665
$\ln RMP_{-4}$	0.10093	0.457	-0.38189	-2.435
R^2	0.772		0.699	
RSS	0.10101		0.04005	
AR(1)	0.19842		0.10978	
AR(2)	0.92708		0.1942	
AR(3)	5.5272		0.30201	
AR(4)	5.6584		0.31371	
Chow(30,30)	1.3504		0.85911	
Chow(36,24)	2.1248		0.95356	
Breusch-Pagan	35.785		0.24698	

[7] R^2 is the measure of the model's goodness of fit, DW is the Durbin-Watson test, which tests for the first degree autocorrelation of the residuals, AR(i), i=1,...,4, are LM-tests, which test the autocorrelation of the residuals to the ith degree. The critical values of the tests for the $Chi^2(1)$-$Chi^2(4)$ degrees of freedom are 3.84, 5.99, 7.81 and 9.49 respectively. The Chow-test tests the stability of the parameter estimates. The critical values of the Chow-test at the 5% level and degrees of freedom F(30,15) and F(24,21) are 1.325 and 1.33 respectively. The Breusch-Pagan test depicts the heteroskedasticity of the residuals. The critical value of the Breusch-Pagan test at the 5% level and degrees of freedom $Chi^2(28)$ is 41.3.

Table 2. Export Equations for Industrial Products[8]

Variable	Finland regression coefficient	t-value	Austria regression coefficient	t-value
constant	-0.031640	-0.048	-0.24201	-0.316
$\Delta \ln X_{-1}$	-0.81430	-5.395	-0.75118	-5.052
$\Delta \ln X_{-2}$	-0.53933	-2.826	-0.82069	-4.309
$\Delta \ln X_{-3}$	-0.23789	-1.391	-0.59714	-3.015
$\Delta \ln RY^{e}$	1.6651	1.551	2.3807	4.946
$\Delta \ln RY^{e}_{-1}$	0.41475	0.382	2.2483	3.974
$\Delta \ln RY^{e}_{-2}$	1.1124	0.947	2.7261	4.444
$\Delta \ln RY^{e}_{-3}$	0.82442	0.726	1.3911	2.082
$\Delta \ln RXP$	-0.11428	-0.593	-0.79500	-5.356
$\Delta \ln RXP_{-1}$	-0.21993	-0.956	-0.44955	-2.339
$\Delta \ln RXP_{-2}$	-0.099818	-0.429	-0.88433	-4.604
$\Delta \ln RXP_{-3}$	-0.12396	-0.537	-0.55939	-2.571
$\ln X_{-4}$	-0.20464	-2.036	-0.66739	-3.661
$\ln RY^{e}_{-4}$	0.36649	1.215	1.6007	3.551
$\ln RXP_{-4}$	-0.15634	-0.776	-0.89955	-3.776
R^2	0.503		0.675	
RSS	0.11324		0.02094	
AR(1)	0.75068		1.7288	
AR(2)	9.4151		1.7475	
AR(3)	10.058		1.8078	
AR(4)	10.228		1.8815	
Chow(30,30)	1.3504		0.85911	
Chow(36,24)	2.1248		0.95356	
Breusch-Pagan	0.84446		18.107	

[8] The residuals for the export equations of Finnish industrial products are autocorrelated for tests AR(2)-AR(4). Increasing the lag of the independent variables reduced the autocorrelation. It was deemed undesirable to increase the number of lags due to the short period under investigation and in order to ensure the comparability of the regression models for Finland and Austria.

Table 3. Imports of Industrial Products: Long-Term Regression Coefficients

	Finland	Austria
$lnRY^i$	1.88	1.57
lnRMP	0.60	-0.98

Table 4. Exports of Industrial Products: Long-Term Regression Coefficients

	Finland	Austria
$lnRY^e$	1.79	2.40
lnRXP	-0.76	-1.35

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