Causal Relationship Between Export and Economic Growth

The Poland and Sweden Case
Summary: Studies have found that export affects the economic growth for many countries today, benefits from trade often result in more income and jobs. Our thesis will analyze if this hypothesis between Export-GDP holds true, if export increase influence the economy increase or if the export coefficient increases by one unit, how much does the economy increase on average?

We used the statistical method of casual Multiple Regression form, which contents annual data of GDP, Export, Import and Investment, to compare the information between Poland and Sweden in the period of time between 1990-2006.

The results show us that the export of Poland has a negative effect on the economic growth comparing to Sweden, which has a positive export coefficient. Both these statements are statistically significant. One of the reasons for our different outcome, could be that the export for Poland absorbs to much resources, as the most of the transition economies of Europe, Poland didn’t have the needed knowledge and experience, so the export product was in long run more expensive than expected.

For Sweden, this positive export coefficient was expected, the country is already known for its export capacity and the technological knowledge it possess. This is the reason why we got different results, you have one country that has been under the pressure of international competition for a long time, that forced the country to become more efficient to survive, and on the other hand a country that has recently entered the liberal economic market.
Content

Summary 

1. Introduction
1.1 Purpose 
1.2 Method 

2. Theoretical considerations
2.1 The relationship between export and GDP 
2.2 The regression form of the relationship 
2.2.1 Production function 
2.3 The Econometric/Statistical method 

3. Poland 
3.1 Numerical and graphical explanation 
3.1.1 Regression Analyze 
3.2 SWEDEN 
3.2.1 Numerical and graphical explanation 
3.2.2 Regression Analyze 
3.3 F-test & T-ratio test 

4. Estimation and Results 

5. Conclusion 

6. References
1. Introduction

Previous studies have determined the importance of export for economic growth. Many countries are today very dependent on export, and some countries total export is over 50 percent of the GDP. One of the reasons why export has been such an important factor is that a growing foreign trade can generate jobs for the exporting country. For this, they have to trade with countries which demand their products, for example USA is a very important market. The nation has a huge negative trade balance and its economy is very dependent on the consumption.

The main reason why I made my choice to investigate this subject, was to understand if all countries do benefit from trade, according to the theory that export do influence the growth positively. The best way to analyze this hypothesis was to compare the two countries, one which already has a highly developed export market and the other one that is less developed. So the question is: could Poland benefit from export as much as Sweden does?

I chose Poland, for it’s geographical position. The country is located in the central Europe with a large population and borders to Germany. I wanted to investigate how was export developed, since the liberalisation from it’s previous economic policy and the entrance in E.U.

After the collapse of the plane economy in the 1980’s, many former socialist countries in Europe experienced major economic crises. But some countries had advantages that other countries did not, we know already that countries which are neighbours to developed countries, have higher GDP/capita. The conclusion is that an approach to Europe is beneficial for the economic growth and since that, several countries have taken steps to become members of the European Union. As a part of the conditions for E.U, nations signed the European Association Agreements which required the adoption of economic reforms and market liberalization policies which led to significant expansion in the export sector in many countries.

So the questions is how can we investigate this hypothesis?

Today there are many types of investigations in the area of Export- Growth. Some analyses specific information of individual countries where we can see if there has been a growth or recession related to one long period. But this kind of data is often insufficient, and it’s hard to evaluate the importance of export for the economic growth in general.
The type of investigation I shall analyse is through the framework of the production function in Regression form. When we analyze statistical data we try to find the connection between two or more factors, how for ex. the export affects, the economic growth. One of the most practicable methods are multiple regression analyses which we’ll use. The method is a combination of many variables, it gives a better prediction so we’ll be able to distinguish every effect from the independent variables to the dependent ones.

By analysing the causality between export and growth we will have a better understanding, and could therefore summer our investigation much more efficiently, then if we used the previous analysing form.

The article; *Exports and Economic Growth: the African Case* motivated me to select the statistical method: Multiple Regression form.

But, my opinion for the article is diversified, first the author is explaining the relationship between export and economic growth by comparing two groups. One is included by 28 African countries from Algeria in the north to Madagascar in south. The other group is the non-African LCD’s (less developed countries).

The data the author uses is over the 1960-1980 period, and his choice of the variables are Labour force, Capital input and Exports.

*First* it’s difficult to evaluate the outcome of his results, you have over 28 African countries, and all countries are different from each other. Africa has, since its liberalization in the 50-60’s, been dominated by poverty, war and sickness. In my opinion, countries with these factors should not be investigated because it will give us the wrong interpretation. *Second* is his choice of the variable - Labour force. We know that normally it is a factor that doesn’t change much trough the years, its often stabile and doesn’t fluctuate as much as the other variables. So I prefer instead of this, another variable that could affect the Growth more: Import.

It is an more important factor for productivity. Countries which don’t have the knowledge or the technological advantages could import these inputs to become more efficient and therefore increase their GDP.

Because of these factors, my investigation is more efficient. There are two countries instead of several (ex. can only one country "weigh" more than others), and they are much more developed both in democratically and structural forms.

The outcome of my results will be more certain to analyze. The similarity between Poland and Sweden is stronger than among the African nations, both in cultural and industrial structure.
1.1 Purpose

In this paper we shall estimate the economic growth equation for Poland and Sweden and compare the estimated export impact and the relationship between export and growth.

1.2 Method

The ordinary least squares method, OLS shall be applied where we will estimate our equation with the help of the statistical program MINITAB. The data we’ll use, is from Database of *International Monetary Funds* and the models will be investigated with the help of study material.

2. Theoretical considerations

For many decades, the export growth was considered to be an important factor of economic growth, as it increases the production and employment. The benefits, that countries get from an increased export are following:

- The export development allows the country to concentrate investment in those sectors, this will result in specialization on the overall economy.

- The foreign exchange made available by export growth allows the importation of capital goods, which in turn increases the production potential of an economy.

- The volume of and the competition in exports markets cause’s economies of scale and acceleration of technique progress in production.

- In the given theoretical arguments mentioned above, we observed a strong correlation between export and production growth which is an empirical evidence in favour of the hypothesis.

- Worldwide competitive pressures are likely to reduce inefficiencies in export and result in the adoption of more efficient techniques in the overall trade sector.

- A larger export sector would make available more of the resources necessary to import in a more timely fashion both physical and human capital, including advanced technologies in production and management and for training higher labour quality.
Endogenous growth models show that import can be channel for long run economic growth because it provides domestic firms with access to needed intermediary factors and foreign technology. Growth in imports can serve as a medium for the transfer of growth knowledge from the developed countries.

2.1 The relationship between export and GDP

Here we analyze two of many theories of the relationship between export and growth.

**Export-led growth**

Michealy (1977), Feder (1982), Marin (1992), Thornton (1996) found that countries exporting a large share of their output seem to grow faster than others. The growth of exports has a stimulating influence across the economy as a whole in the form of technological spillovers and other externalities. Models by Grossman and Halpman (1991), Riviera-Batiz and Romer (1990) posit that expanded international trade increases the number of specialized inputs, increasing growth rates as economies become open to international trade.

(article: Exports, imports, and economic growth in Portugal; Ramos 2000)

**Feedback**

An interesting economic scenario suggest a two-way causal relationship between growth and trade. According to Bhagwati (1988) increased trade produces more income, and more income facilitates more trade, the results i similar to an productive life circle.

(article: Exports, imports, and economic growth in Portugal; Ramos 2000)

We must notice that the effect of trade on the technical efficiency is not included in our estimated model, and to be clear that Poland has not yet reached its full capacity, can we still relate these theories to our thesis? But the empirical question is: does Poland fully use the experience they get from trade to become more efficient?

We shall continue our discussion further in chapter four.
2.2 The regression form of the relationship

The causal link between exports and economic growth could be investigated by incorporating the variable Export into the aggregated production function. By including other variable as Imports and Investment our augmented production function is

\[ Y = Y \left( I, M, X \right) \]  \hspace{1cm} (10)

where \( Y \) is the aggregated output, \( I \) is the direct investment in the reporting country and \( X \) & \( M \) denotes for Export and Import. When it comes to the description of these variables we must first understand, which of these influence the GDP positively?

Export as we know, is produced goods and services, traded with a foreign country. Even though its not produced for the domestic population it does influence the economy positively, GDP increases. The revenues from the trade, could later be reinvested so the country could increase its productivity (Feedback, Export-Led Growth)

When it comes to Imports, the answer is difficult to describe. Even if Import is not produced by the home country, it can influence the productivity both negatively or positively. As we said before, some countries economy is dependent on the consumption (imports) and some are dependent on the exports. We know that domestic companies need to import components to produce their products, like car manufactures, so they could later export them. There could be a symbiosis relationship between exports and import. This shows that import can serve as a medium for the transfers of growth, enhancing foreign knowledge from developed export countries, the domestic country can turn its capital in order to stimulate its output growth.

When it comes to investment, the capital input can be an important factor for economic growth only if it’s invested in those sectors that could generate a positive growth. Many countries in Eastern Europe are attractive markets for Investors, but if the Economic structure is not similar to what we are familiar to, the outcome could be unexpected.

2.2.1 Production Function

Our augmented production function turns later into that estimated regression form we shall investigate, in the form of

\[ Y = \beta_0 + \beta_1 X + \beta_2 M + \beta_1 \text{Inv} + u \]

Where \( Y \) stands for the aggregated output, \( \beta \) is the regression coefficients to be estimated and \( u \) is the disturbance error term.
Our investigation is to estimate the value of these coefficients, too see how strong it affects Y. It’s expected that the coefficients will be different from each other, but our mainly focus is on $\beta_1$ our export coefficient, how much does the economy on average changes if we change $X$ by one input. The questions will be, is the value of $\beta_1$ for Poland higher or smaller comparing to Sweden.

The aggregated output is $Y = C + I + G + (X-M)$, show us that some of our variables have different impact on the output, like Investment and Export have a positive impact comparing to Import. If we estimate the coefficients through this equation, than $\beta_1, \beta_3$ is positive and $\beta_2$ is negative. But we must not fully rely on these kind of information, the economy of countries differ from each other and we could have a different coefficients outcome.

My Hypothesis is that, because of these statements; the $\beta_1$ for Poland is smaller than for Sweden, but its $\beta_2$ is larger. These statement are based on that Poland has not reached the same beneficial level from export as Sweden does today, but its economy is more dependent on the consumption so its import coefficient must be positive.

2.3 The Econometric/Statistical method

-Buy using the data from International Monetary Fund and in to the statistical data program Minitab and SPSS, I got the values of the coefficients for our regression formula

$$Y = \beta_0 + \beta_1X + \beta_2M + \beta_1Inv + u$$

(7)

After this interpretation, we had do some hypothetical testing to conclude that if our coefficients are significant, if there is a relationship between them and the aggregated output. (our test result will be reviled in ch. 3.1.1 and 3.2.2 and analyzed in ch 4)
-Our next method is a test called the F-test & T-test

**F-test**
This test reveals if we shall exclude or include the extra variables we put, in the equation models.

The F-test formula

\[
F = \left[ \frac{(R^2_{\text{unrestricted}} - R^2_{\text{restricted}})}{m} \right] / \left[ \frac{(1 - R^2_{\text{unrestricted}})}{(n - k - 1)} \right] \tag{8}
\]

*The Hypothesis is tested on a 5 % significance level.*

\[
F = \text{observed F-value}
\]

\[
R^2_{\text{unrestricted}} = R^2_{\text{restricted}} - m
\]

\[
m = \text{number of restriction} = \text{difference in number of estimated parameters}
\]

\[
n = \text{number of observations}
\]

\[
k = \text{number of parameters in the unrestricted model (excluding the intercept)}
\]

If the observed value of F is smaller than the statistical value of F, we cannot reject the null hypothesis, therefore we should exclude these variable from the regression model.

**T-test**
With the help of T-test we can determine if the export coefficient is significantly different from the previous export coefficient in the regression model.

The t-test formula

\[
t = \frac{\beta_m - \beta_{m-1}}{s_e} \tag{9}
\]

*The Hypothesis is tested on a 5 % significance level.*

This quota is an measurement of how large the deviation ( \( \beta_m - \beta_{m-1} \) ) is regarding to the residual diffusion, \( s_e \). As larger (numerical) as this quota gets, more we can sure be that this deviation has not been caused by an chance.

If the observed t-value is larger (numerical) than the statistical t-value well be sure that the deviation we observed is not a coincidence.
3. POLAND

Poland economy was based on rich natural resources for both agricultural and industry. It’s industry was entirely based on the countries coal, which at that time was the fourth biggest coal producer of the world. Poland economy was dominated of heavy industry, large enterprises and a large centralized bureaucracy controlling every aspect of production.

When it comes to the trade Poland was isolated from the international economy because of the nationalization of foreign trade. By the middle of the 1970s, large trade deficits had been incurred with the Western countries. The negative balance of payments increased from US$100 million in 1970 to US$3 billion in 1975. Unable to expand exports to the West at the necessary pace, Polish planners began centralized restriction of imports. This policy in turn had an adverse effect on domestic production, including the production of exportable.

Reforms in the 1970s and 1980s gradually gave individual enterprises more direct control over their foreign trade activities. Although price supports helped Poland’s balance of trade within the system, they also encouraged inefficient and low-quality production that discouraged trade with the rest of the world. The central state failed to yield economic growth, the industrial production declined so they were inspired to reform the policy in the 70’s and 80’s, but no real change occurred until 1989 when the program of privatization was included of all parts of Polish Economy.

After 1985 the foreign trade situation further complicated Poland's economic crisis. The relative importance of Comecon (Council for Mutual Economic Assistance) trade declined yearly, necessitating expanded trade with the West, particularly the Europe. The sudden collapse of Comecon in 1990 increased the changes in the geographic direction of trade. The share of Poland’s trade occupied by the Comecon group declined to 22.3 percent in 1990 and 14.4 percent in 1991. On the export side, its share declined to 21.4 and 9.8 in the respective years.
3.1 Numerical and graphical explanation, 1990-2006

After the first turbulent years of economic recession, Poland has been one of the strongest growing transition economies of Europe. The liberal policy, an increasing domestic consumption and FDI inflow has put Poland beside the Baltic countries to one of the fastest growing countries in Europe.

The graph shows us the similarity between the export and import curve. After 1995 we see that total import is larger than total export, the negative trade balance could be caused by the growing domestic demand of foreign products, it could for example substitute the old production machines both in the industrial and agricultural market. The largest Export markets are Germany 24.9%, France 6.2%, Italy 6%, UK 5.7%, Czech Republic 5.6%, Russia 5.3% (cia.gov 2008). The main exports products are machinery and transport equipment 37.8%, intermediate
manufactured goods 23.7%, miscellaneous manufactured goods 17.1%, food and live animals 7.6% (cia.gov 2003)

The export and import as % of GDP has increased from 23,95% and 21,98% in 1994 to 41,01% and 43,92% in 2007. (imf.org) The import share of GDP were in the beginning smaller than the export share of GDP, but later grew more, one reason could be an increasing need for energy resources for the growing Polish economy, 2/3 of the natural gas is imported today (cia.gov)

Because of the geographical location, the entrance in E.U and the economic stability the Investment had a steady increase from 1990 to 2000. The main investment were first concentrated in the financial and industrial regions, but since the growing of domestic consumption more detail services have been established. The reason the FDI fell in the year 2000 could be the financial crisis in Russia.

<table>
<thead>
<tr>
<th>Figure</th>
<th>Observations</th>
<th>Mean</th>
<th>Max Value</th>
<th>Min Value</th>
<th>StdDev</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>17</td>
<td>377.7</td>
<td>568.96</td>
<td>214.85</td>
<td>109.9</td>
</tr>
<tr>
<td>Export</td>
<td>17</td>
<td>54.02</td>
<td>138.06</td>
<td>17.78</td>
<td>35.01</td>
</tr>
<tr>
<td>Import</td>
<td>17</td>
<td>58.46</td>
<td>144.33</td>
<td>15.1</td>
<td>36.71</td>
</tr>
<tr>
<td>Figure 3</td>
<td>17</td>
<td>6.12</td>
<td>19.83</td>
<td>0.09</td>
<td>5.08</td>
</tr>
</tbody>
</table>

Table 1: Calculated Values of Mean (Average), Maximum, Minimum and Standard deviation
3.1.1 Regression Analyze

Ordinary least squares (OLS) are applied to our estimated regression equation, for Poland and Sweden. I have analyzed the annual data from the period 1990-2006. In the regression analyze, with the help from the statistical program Minitab we choose to put one variable at the time to see how the regression equation changes.

Model 1.

The regression equation is

GDP P = 205 + 2,96 EXP  (1)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>204,94</td>
<td>16,43</td>
<td>12,47</td>
<td>0,000</td>
</tr>
<tr>
<td>EXP</td>
<td>2,9614</td>
<td>0,2687</td>
<td>11,02</td>
<td>0,000</td>
</tr>
</tbody>
</table>

S = 37,6308  R-Sq = 89,0%  R-Sq(adj) = 88,3%

This equation gives the information of each variables including the constant.

The coefficients for Constant is 204,94 which means if the other variables are equal to 0, GDP would be equal on average at 204,94.

The coefficient for Export is 2,96, which means if the export increases by one unit, GDP would increase on average by 2.96 units.

SE Coef stands for standard deviation, the a measure on the coefficients random fail.

T stands for T-ratio of the coefficient and P for p-value.

S is the residual diffusion

R-sq stands for correlation coefficient, measure the relationship between the dependent and the independent variable. R-sq=100 % means there is a perfect correlation between them.

R-sq(adj) : adjustment of the R-sq

Model 2.

The regression equation is

GDP P = 191 - 3,84 EXP + 6,53 IMP  (2)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>191,10</td>
<td>10,02</td>
<td>19,07</td>
<td>0,000</td>
</tr>
<tr>
<td>EXP</td>
<td>-3,836</td>
<td>1,269</td>
<td>-3,02</td>
<td>0,009</td>
</tr>
<tr>
<td>IMP</td>
<td>6,533</td>
<td>1,210</td>
<td>5,40</td>
<td>0,000</td>
</tr>
</tbody>
</table>

S = 22,1845  R-Sq = 96,4%  R-Sq(adj) = 95,9%

The coefficients for Constant is 191,10 which means if the other variables are equal to 0, GDP would be equal on average at 191,10

The coefficient for Export is -3,836, which means if the Export increases by one unit, GDP would decrease on average by 3,836 units.

The coefficient for Import is 6,533, which means if the Import increases by one unit, GDP would increase on average by 6,533 units.

Model 3.
The regression equation is
\[ \text{GDP P} = 181.163 - 4.905 \times \text{EXP} + 8.404 \times \text{IMP} - 6.704 \times \text{INV} \quad (3) \]

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>181.163</td>
<td>9.314</td>
<td>19.45</td>
<td>0.000</td>
</tr>
<tr>
<td>EXP</td>
<td>-4.905</td>
<td>1.151</td>
<td>-4.26</td>
<td>0.001</td>
</tr>
<tr>
<td>IMP</td>
<td>8.404</td>
<td>1.256</td>
<td>6.69</td>
<td>0.000</td>
</tr>
<tr>
<td>INV</td>
<td>-6.704</td>
<td>2.612</td>
<td>-2.57</td>
<td>0.023</td>
</tr>
</tbody>
</table>

\[ S = 18.7560 \quad \text{R-Sq} = 97.6\% \quad \text{R-Sq(adj)} = 97.1\% \]

The coefficient for Constant is 181.163 which means if the other variables are equal to 0, GDP would be equal on average at 191.10.

The coefficient for Export is -4.905, which means if the Export increases by one unit, GDP would decrease on average by 4.905 units.

The coefficient for Import is 8.404, which means if the Import increases by one unit, GDP would increase on average by 6.533 units.

The coefficient for Investment is -6.704, which means if the Investment increases by one unit, GDP would decrease on average by 6.704 units.

We see the similarity between how the different curves are moving in a homogenous in the graphical explanation (except investment).

### 3.2 SWEDEN
Between 1945-1975, Sweden had an average growth rate on 3.5% which later decreased to 1.5% from 1975-1990. One of the reasons was the technological gap between USA and the rest of the world. Sweden could rapidly increase its productivity by importing techniques from U.S. This generated a highly increased production in the industries factories which also had a higher productivity than the agricultural. The other reason is the benefit Sweden had when other countries still were in the rebuilding process after WW2. In the 60’s the international trade increased with settle of customs rules, (the beginning of WTO and EU) and in this process could Sweden become one of the wealthiest countries in the world in 1970’s. From 1970-1990 Sweden had a steady export growth rate.

3.2.1 Numerical and graphical explanation, 1990-2006

![Time Series Plot of GDP in Sweden](image)

Sweden had a financial crisis in the beginning of the 90’s, but the economic growth has since then raised strongly. E.U entrance in the middle of 90’s pushed Sweden further out from recession.
Swedish Economy: Analysis of Export, Import, and Investment Trends

Swedish Economy: Analysis of Export, Import, and Investment Trends

**Time Series Plot of Export and Import of Sweden**

![Graph showing the export and import trends of Sweden from 1990 to 2006.](chart1)

**Figur 6** annual data level, series of Export and Import, 1990-2006 source: imf database

Swedish Economy: Analysis of Export, Import, and Investment Trends

**Sweden has always been known to have a strong positive trade balance, and graph show us the trade difference has been constant since 1990. Export is an important factor of the Swedish Economy.**

The export and import as % of GDP has increased from 33.95% and 30.02% in 1994 to 51.71% and 44.44% in 2007. (imf.org)

**Time Series Plot of Investment in Sweden**

![Graph showing the investment trends in Sweden from 1990 to 2006.](chart2)

**Figur 7** annual data level, series of Investment, 1990-2006 source: imf database

Swedish Economy: Analysis of Export, Import, and Investment Trends

**Sweden had on average of 10 billions of Investment among the years except the peak and the fall in 1999, could be caused by the IT-bubble crash.**
3.2.2 Regression Analysis

Model 4.

The regression equation is
$$GDP = 83.0 + 1.24 \times EXP$$ \hspace{1cm} \text{(4)}

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>83.00</td>
<td>12.89</td>
<td>6.44</td>
<td>0.000</td>
</tr>
<tr>
<td>EXP</td>
<td>1.2429</td>
<td>0.1125</td>
<td>11.04</td>
<td>0.000</td>
</tr>
</tbody>
</table>

$$S = 17.4744 \hspace{1cm} R-Sq = 89.0\% \hspace{1cm} R-Sq(adj) = 88.3\%$$

The coefficient for Constant is 83 which means if the other variables are equal to 0, GDP would be equal on average at 83.

The coefficient for Export is 1.2429, which means if the Export increases by one unit, GDP would increase on average by 1.2429 units.

Model 5.

The regression equation is
$$GDP = 83.8 + 1.09 \times EXP + 0.170 \times IMP$$ \hspace{1cm} \text{(5)}

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>83.84</td>
<td>13.31</td>
<td>6.30</td>
<td>0.000</td>
</tr>
<tr>
<td>EXP</td>
<td>1.0934</td>
<td>0.3063</td>
<td>3.57</td>
<td>0.003</td>
</tr>
<tr>
<td>IMP</td>
<td>0.1702</td>
<td>0.3230</td>
<td>0.53</td>
<td>0.606</td>
</tr>
</tbody>
</table>

$$S = 17.9110 \hspace{1cm} R-Sq = 89.3\% \hspace{1cm} R-Sq(adj) = 87.7\%$$

The coefficient for Constant is 83.84 which means if the other variables are equal to 0, GDP would be equal on average at 83.84.

The coefficient for Export is 1.0934, which means if the Export increases by one unit, GDP would increase on average by 1.0934 units.

The coefficient for Import is 0.1702, which means if the Import increases by one unit, GDP would increase on average by 0.1702 units.
Model 6.

The regression equation is
\[
\text{GDP S} = 83,2 + 1,11 \text{ EXP} + 0,139 \text{ IMP} + 0,142 \text{ INV}
\]  
(6)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coef</th>
<th>SE Coef</th>
<th>T</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>83,18</td>
<td>13,82</td>
<td>6,02</td>
<td>0,000</td>
</tr>
<tr>
<td>EXP</td>
<td>1,1080</td>
<td>0,3180</td>
<td>3,48</td>
<td>0,004</td>
</tr>
<tr>
<td>IMP</td>
<td>0,1395</td>
<td>0,3419</td>
<td>0,41</td>
<td>0,690</td>
</tr>
<tr>
<td>INV</td>
<td>0,1422</td>
<td>0,3565</td>
<td>0,40</td>
<td>0,697</td>
</tr>
</tbody>
</table>

\[
S = 18,4745 \quad R\text{-Sq} = 89,4\% \quad R\text{-Sq(adj)} = 86,9\%
\]

The coefficient for Constant is 83,18 which means if the other variables are equal to 0, GDP would be equal on average at 83,18.

The coefficient for Export is 1,1080, which means if the Export increases by one unit, GDP would increase on average by 1,1080 units.

The coefficient for Import is 0,1395, which means if the Import increases by one unit, GDP would increase on average by 0,1395 units.

The coefficient for Investment is 0,1422, which means if the Investment increases by one unit, GDP would increase on average by 0,1422 units.

This graph is more homogenous that the Poland case, specially the GDP, Import and Export curves.
3.3 F-test & T-ratio test

Results from F test

<table>
<thead>
<tr>
<th>unrestricted and restricted model</th>
<th>F observed</th>
<th>F statistical</th>
<th>5% significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) GDP = 206 + 2.96 EXP</td>
<td></td>
<td>28.78</td>
<td>We reject the null hypothesis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.60</td>
<td></td>
</tr>
<tr>
<td>(2) GDP = 191 - 3.84 EXP + 6.53 IMP</td>
<td></td>
<td>6.50</td>
<td>We reject the null hypothesis</td>
</tr>
<tr>
<td>(3) GDP = 181 - 4.91 EXP + 8.40 IMP - 6.70 INV</td>
<td></td>
<td>6.39</td>
<td>We cannot reject the null hypothesis</td>
</tr>
<tr>
<td>(4) GDP = 83.0 + 1.24 EXP</td>
<td></td>
<td>0.132</td>
<td>We cannot reject the null hypothesis</td>
</tr>
<tr>
<td>(5) GDP = 83.8 + 1.09 EXP + 0.170 IMP</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. In the first column, because the observed F-value is larger than statistical F-value, we reject the null hypothesis, therefore we can include the import variable in model 2.

2. In the second column, the observed F-value is larger than statistical F-value, we reject the null hypothesis, we can include the Investment variable in model 3.

3. In the third column, the observed F-value is smaller than statistical F-value, we cannot reject the null hypothesis, we should than exclude the import variable in model 5.

4. In the fourth column, the observed F-value is smaller than statistical F-value, we cannot reject the null hypothesis, we should than exclude the Investment variable from model 6.

The results show us that the aggregated output is depended on import and investment for model 2,3, except for equation 5,6 where Y is not dependent on Investment,Import.
Results from T-test

<table>
<thead>
<tr>
<th>Beta coefficient for export</th>
<th>T observed</th>
<th>T statistical</th>
<th>5% significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) EXP = 2.96</td>
<td>-3.02</td>
<td>2.14</td>
<td>The export coefficient is significant from 2.9614</td>
</tr>
<tr>
<td>(2) EXP = -3.836</td>
<td>-4.23</td>
<td>2.16</td>
<td>The export coefficient is significant from -3.836</td>
</tr>
<tr>
<td>(3) EXP = -4.905</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4) EXP = 1.24</td>
<td>3.57</td>
<td>2.14</td>
<td>The export coefficient is significant from 1.2429</td>
</tr>
<tr>
<td>(5) EXP = 1.09</td>
<td>3.48</td>
<td>2.16</td>
<td>The export coefficient is significant from 1.0934</td>
</tr>
<tr>
<td>(6) EXP = 1.11</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. In the first column, the observed t-value is larger than statistical t-value, therefore the export coefficient significant from 2.9614.

6. In the second column, the observed t-value is larger than statistical t-value, the export coefficient significant from -3.836.

7. In the third column, the observed t-value is larger than statistical t-value, the export coefficient significant from 1.2429.

8. In the fourth column, the observed t-value is larger than statistical t-value, the export coefficient significant from 1.0934.

All the export coefficients are significantly from its previous export coefficients in the regression model. The observed t-value is larger than the statistical value in every test. The results show us that the deviation between the coefficients has not been caused by an chance.
4. Estimation and Results

If we assume the error term u is independently and distributed identically, OLS (ordinary least squares) is applied for Poland and Sweden. We analyzed the period 1990-2006, where the numbers are average annual data.

Results from the models indicated that for every time we have an additional variable, the regression equation changes and give us different information.

<table>
<thead>
<tr>
<th><strong>Equation</strong></th>
<th><strong>Constant</strong></th>
<th><strong>X</strong></th>
<th><strong>M</strong></th>
<th><strong>Inv</strong></th>
<th><strong>R-sq</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Poland</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model (1)</td>
<td>205</td>
<td>2,96++</td>
<td>(11,02)</td>
<td></td>
<td>89,0 %</td>
</tr>
<tr>
<td>Model (2)</td>
<td>191</td>
<td>-3,84++</td>
<td>6,53++</td>
<td>(-3,02) (5,40)</td>
<td>96,4 %</td>
</tr>
<tr>
<td>Model (3)</td>
<td>181</td>
<td>-4,91++</td>
<td>8,40++</td>
<td>-6,70+</td>
<td>(-4,26) (6,69) (-2,57)</td>
</tr>
<tr>
<td><strong>Sweden</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model (4)</td>
<td>83,0</td>
<td>1,24++</td>
<td>(11,04)</td>
<td></td>
<td>89,0 %</td>
</tr>
<tr>
<td>Model (5)</td>
<td>83,8</td>
<td>1,09++</td>
<td>0,170</td>
<td>(3,57) (0,53)</td>
<td>89,3 %</td>
</tr>
<tr>
<td>Model (6)</td>
<td>83,2</td>
<td>1,11++</td>
<td>0,139</td>
<td>0,142</td>
<td>(3,48) (0,41) (0,40)</td>
</tr>
</tbody>
</table>

+ Significant at the 0,05 level
++ Significant at the 0,01 level
( the parenthesis is included the t – ratio )

Table 3. Pooled regression results 1990-2006; Export, Import and Investment growth, Poland versus Sweden ( t-ratio in parentheses)

Results from table 3, indicate that the appearing results were not what we had expected. The theoretical facts assured me that I had to know how the outcome would be, but my expectations were wrong. The question of this thesis was if Poland could experience the same beneficial level from export as Sweden does?

We note that each coefficient are significant at the 0,05 level in model 1,2 & 3, and they change for every time we add an extra variable. In model 1 our Export coefficient is first +2,96, and then it decreases to -4,91 in model 3 so the export effect on the economy is negative. The results are not what I expected, my hypothesis was that Poland export coefficient would be smaller than Sweden’s, but I never anticipated a negative coefficient. The coefficient is significant at the 0,01 level and when we analyze the results from the T-test, the export coefficient is significant. We also notice the import variable is positive, my hypothesis was correct, the variable has an positive impact on the economy as I anticipated.
Our theory resume that export growth is considered to be an important factor of economic growth. The entrance in E.U opened the possibilities for Poland to compete with other more developed export orientated countries in Europe. This gives a great opportunity to attract successful firms, with their technological knowledge and experience from competitive markets, they could contribute to the polish export and economy.

My perception of the outcome is that Poland in comparison to Sweden, has not yet developed its economic structure to the same level as western Europe since the introduction of the market economy. Today the east part of Poland is less developed than the rest of the country and many educated labour force have moved abroad. To compensate this loss, Poland have imported labours from Ukraine and Belarus which could be less productive than the domestic labour force and this could in the long run affect the economic growth.

The reason for the negative result we got for the export coefficient is that, the export market absorbs too much resources. If firms produce goods that are not attractive to the European markets, they have to work more efficient to increase their quality or reduce the price level, if they want to survive. If none of those factors are improved, then the best option is to end the production. This is probably familiar to many domestic firms, they can not be as efficient as in Sweden when it comes to using the growth factors; Labour, Investment and Human Capital. This inefficiency could also be the reason why our Investment coefficient is negative. Foreign firms could establish in Poland but the knowledge that Polish labour posses is not efficient for the production.

The results indicate that we must reject the theories of Export-led growth and Feedback in our investigation. Because the export doesn’t affect the growth positively, we can not relate these theories to our study. The chance to develop the export sector after the entrance in E.U. has not been effective, the technological improvement has grown slowly and the emigration to other countries has increased.

My conclusion is that; if export doesn’t favour the economy, they should try to improve its export or turn its focus on something else.

The table 1, from the article Exports and Economic Growth: the African Case showed that the export coefficient was positive. The reason for it could be that some few countries affect the outcome of the regression more than others, we see also that the correlation coefficients are low (R-sq: 0.303). Even thought the results I get from the F-test is significant, I don’t see a similarity between our equations. The reason is as I told before, the analyze between few countries is more effective.
5. Conclusion

This paper has showed that, all countries do not benefit from export and the main question is how we can turn the opposite for Poland. Even if the variables for Poland were significant at 1% level, it’s hard to think why should export have a negative impact on the growth and the import a positive on the economy.

Why countries like Poland (probably many other post communist states) have a negative export impact could be that, it requires a lot of resources. Poland has today not yet improved its internationally competitive capacity, for effective export it has to understand the meaning of competition. International firms have to be secure that Polish firms which export goods and services provide stable service for many years ahead. Export today requires too much labour, capital etc. Poland should instead focus only on goods that have a chance in the international market.

When it comes to import, the countries economy are dependent on the domestic consumption, there are goods that need to be imported to Poland for production like agricultural machines. This may be the reason for its positive impact on the Growth. Why Sweden has different outcomes, could be that it has adapted itself to the international trade. It understood the impact of export and invested in Human capital which later contributed in those produced goods and services they could export.

So what should Poland do? Try to effective its export so it could be beneficial for the economy? It’s hard to take some conclusions about it. Countries are different from one another. It takes time and resources trying to change the whole economic system.

6. References

Articles


Datorstödda metoder (Spring 2009)," Lab compendium Econometrics", Högskolan i Skövde, Sweden
Litterateur


Lars Calmfors & Mats Persson (1999), *Tillväxt och ekonomisk Politik*, Lund studentlitteratur, Lund

Statistical database

IMF, International Monetary Fund, 2009

UN, United nations, 2009

Statistical Programs

Minitab solutions & SPSS 17

Web
