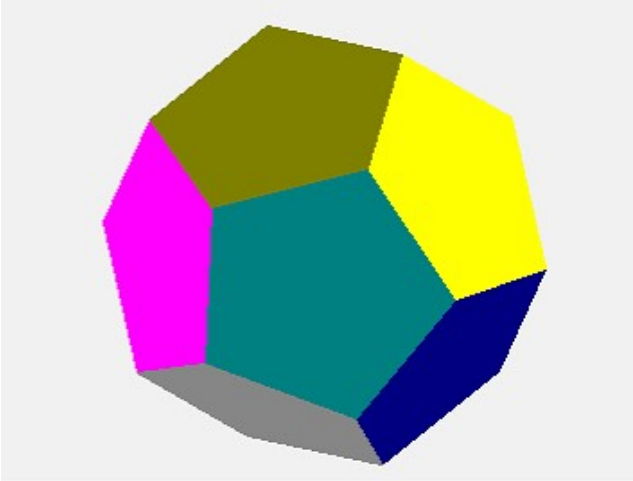
Elementary national economics

This is an article from my home page: www.olewitthansen.dk



Ole Witt-Hansen 1982 (2018)

Contents

1. The long-term effect of a recovery in exports..... 1
1. The consequences of a fall in the national export..... 2
3. Why do economic crises and economic booms replace each other with a period of 10-15 years in a liberal economy?..... 5

1. The long-term effect of a recovery in exports

We shall here look into the long term consequence of an increase in the national export revenues a certain year. Specifically we shall focus on the multiplier effect, a concept originally introduced by British economist J.M. Keynes.

It turns out that it has some favourable long term effects on the national economy as a whole, if it is administrated with sense.

The numbers belong to Danish national economy in the beginning of the 70'ties. And we therefore keep the currency in crowns. But it can of course be scaled to any national budget.
Denmark had at that time a population of about 4.5 million.

This article is an excerpt of an article from the university of Aarhus, first published in 1973, so the amounts, the tax rates are not contemporary, but that does not affect the conclusions.

So let us assume that the revenues for the export businesses one year increases with 500 million crowns.
The national income is denoted y, and the change in national income is Δy , and we assume a tax rate t for increment in revenues (marginal tax rate) is 30% , so that $t = 0.3$

For the increase in income after tax, that is, the available income, we shall assume that the consumers apply as stated below.

The fraction s, which goes to saving (the savings rate), is set to 10% (s =0.10).

The fraction m, which goes to buying import goods (the import rate) is set to 20% ($m = 0.20$)

The fraction d, which goes to buying goods from the home market, is set to 70% ($d = 0.70$)

The collected consume rate c is thus 90% ($c = d + m = 0.90$ or $d = c - m$)

By examining the course, which initiates by a year with an surplus in the export revenues, we divide it in periods of one year, since the adaptation to the new economic reality happens with a certain delay.
What happens in the first period is a national increase in income, which amounts to $\Delta y = 500$ million. This will however only result in a temporary saving, which in the next period will cause an increase in taxes and consummation. For this reason we do not include the temporary saving in the scheme below, which is only referenced to the next period. In the second period 30% are paid in taxes $0.30 \cdot 500 = 150$ million, which is calculated as: $\Delta y_1 \cdot t$.

From the remaining available income: $\Delta y_1(1-t)$, which is 350 million, is saved 35 million, which is calculated as: $\Delta y_1(1-t)s$.
The rest: $\Delta y_1(1-t)(1-s)$, which amounts to 315 million, is used to buy consumption goods, from which $\Delta y_1(1-t)(1-s)m$, equal to 70 million, is imported goods, while the remaining consumption $\Delta y_1(1-t)(1-s)(c-m)$ comes from the home market.

The consumption of goods from the home market causes, however, a corresponding increase in the national income, namely $\Delta y_2 = 245$ million which affects the following period and so on.
The consumption and creation of income can be seen in the table below.

period	Taxes	savings	import	consumption	Home market	National income increase
1,00						500,00
2,00	150,00	35,00	70,00	315,00	245,00	245,00
3,00	73,50	17,15	34,30	154,35	120,05	120,05
4,00	36,02	8,40	16,81	75,63	58,82	58,82
5,00	17,65	4,12	8,24	37,06	28,82	28,82
6,00	8,65	2,02	4,04	18,16	14,12	14,12
-						
Sum 1 -6	285,81	66,69	133,38	600,20	466,82	966,82
.						
Total	294,10	68,60	137,30	617,70	480,40	980,40

1. The consequences of a fall in the national export

If we on the other hand assume that the export decreases by 200 million in one year then the multiplier effect works the other way round, which is illustrated in the table below. The mathematic formulas are the same, apart from a minus sign.

Periode	Skat	opsparing	import	forbrug i alt	hj.markedvarer	indkomstigning Delta y
1						-200
2	-60,00	-14,00	-28,00	-126,00	-98,00	-98,00
3	-29,40	-6,86	-13,72	-61,74	-48,02	-48,02
4	-14,41	-3,36	-6,72	-30,25	-23,53	-23,53
5	-7,06	-1,65	-3,29	-14,82	-11,53	-11,53
6	-3,46	-0,81	-1,61	-7,26	-5,65	-5,65
-						
Sum 1 -6	-114,32	-26,67	-53,35	-240,08	-186,73	-386,73

In both cases, however, you may calculate the total increase/decrease in the national income after *n* periods.

$$\sum_{i=1}^{n} \Delta y_i = \Delta y_1 + \Delta y_2 + \Delta y_3 + ...\Delta y_n$$
$$= \Delta y_1 + \Delta y_1(1-t)(c-m) + \Delta y_1((1-t)(c-m))^2 + ... + \Delta y_1((1-t)(c-m))^{n-1}$$

This is, however, a geometric series, having the quotient $(1-t)(c-m)$ and with the first term Δy_1.
For a geometric series, we have the following formula for the sum of the terms.:

$$S_n = a_0 + a_0 q + + a_0 q^2 + ... + a_0 q^{n-1}$$

$$S_n = a_0 \frac{1-q^n}{1-q}$$

And, we find thus:

$$\sum_{i=1}^{n} \Delta y_i = \Delta y \frac{1-((1-t)(c-m))^n}{1-(1-t)(c-m)}$$

If $|q| < 1$, then a geometric series will converge when n approaches infinity, and the formula for the infinite sum is therefore.

$$S_\infty = a_0 \frac{1}{1-q},$$

$|q| < 1$ is precisely the case for the series above, and we therefore find:

$$\Delta y_\infty = \sum_{i=1}^{\infty} \Delta y_i = \frac{\Delta y}{1-(1-t)(c-m)} = 980.4\ mio$$

The factor: $$\frac{\Delta y}{1-(1-t)(c-m)}$$

is called the *multiplier*. It is that factor, one should multiply an income increase (or income decrease) in the national income to obtain the total long term income increase (or income decrease)

Using the prerequisites on which the calculations are founded, namely

A marginal tax rate of 30%. (t = 0.30):
A savings quota of 10% (s =0.10)
An import quota of 20% (m = 0.20)
A collected consumption quota of 90% (c = 0.90).

Using these data we find: $\frac{\Delta y}{1-(1-t)(c-m)} = 1.96$

Irrespectively of whether there has been a momentary recovery or decline in the national income, then it will (without financial interventions) cause the fiscal recovery (or decline) to be multiplied by a factor of about 2.

The model applied is of course vastly simplified, but if you look into the economic development in Denmark since the beginning of the 1950'ties, it is easy to recognize a positive spiral in times of economic upturn and a negative spiral in times of economic downturn. The predictions of the model is of coursed blurred by political and financial interventions.

If one includes the consequences of an upturn or downturn in employment, the multiplier will allegedly be enhanced, which in Denmark and other countries is well known from the economic booms and economic crises experienced since the second world war.

Although we have calculated the final improvement/decline in the national income, one might be interested in how many periods elapse, before 90% of the improvement/decline is reached.
To obtain this, we must solve the equation:

$$\frac{1-((1-t)(c-m))^n}{1-(1-t)(c-m)} = 0.90 \cdot 1.96$$

$$\frac{1-0.49^n}{1-0.49} = 1.71 \quad \Leftrightarrow \quad 0.49^n = 0.28 \quad \Leftrightarrow \quad n = 2.88 \approx 3$$

Which means that only after 4 periods (years) 90% of the improvement is accomplished.

In the same manner, one may obtain the total increase in import, as

$$\begin{aligned}\sum_{i=1}^{n} \Delta M_i &= \Delta y_1(1-t)m + \Delta y_2(1-t)m + \Delta y_3(1-t)m \\ &= \Delta y_1(1-t)m(1-t)(c-m) + \Delta y_1 m(1-t)((1-t)(c-m))^2 + ... + \Delta y_1 m(1-t)((1-t)(c-m))^{n-1} \\ &= \Delta y_1(1-t)m\frac{1-((1-t)(c-m))^n}{1-(1-t)(c-m)} = \Delta M\end{aligned}$$

And letting n go to infinity: $\Delta M = \Delta y_1(1-t)m\frac{1}{1-(1-t)(c-m)}$

Using the numbers from the example: $\Delta M = 500 \cdot 0.7 \cdot 0.2\frac{1}{1-0.7 \cdot 0.7} = 137.3\ mio.$

The same result could of course have been obtained as: $\Delta M = 980{,}4(1-t)m = 137{,}3\ mio$

The improvement in the trade balance of payment is obviously the initial increase in export minus the derived increase in export.

500 – 137.3 = 362.7 mio.

The total savings is then the sum of the private savings and the increase in tax revenues, (provided that they are not spend, which they usually are).

Increase in tax revenues: $980.4 \cdot 0.3 = 294.1\ mio.$
Increase in private savings: $980.4 \cdot 0.7 \cdot 0.1 = 68{,}6\ mio$
The total svings are therefore: 362.7 mio.

That the increase in savings equals the improvement in the trading balance is a direct consequence of the account we have drawn up.
The improvement of the balance of trading is a an improvement of the countries status towards abroad , that is, an investment that has come about only if it has been compensated of an equal not spend income, that is, a saving. Or expressed more formally:

$$\Delta y_1 - \Delta y_1(1-t)m\frac{1}{1-(1-t)(c-m)} = \Delta y_1(t+(1-t)s)\frac{1}{1-(1-t)(c-m)} \quad \Leftrightarrow$$

$$\Delta y_1 \frac{1-(1-t)(c-m)-(1-t)m}{1-(1-t)(c-m)} = \Delta y_1 \frac{(t+(1-t)s)}{1-(1-t)(c-m)} \quad \Leftrightarrow$$

$$1-(1-t)(c-m)-(1-t)m = t+(1-t)s \quad \Leftrightarrow$$

$$1-(1-t)c = t+(1-t)s \quad \Leftrightarrow$$

$$(1-t)+(1-t)c = (1-t)s \quad \Leftrightarrow$$

$$c = 1-s$$

The total quote of consumption is 1 minus the savings, which is true.

3. Why do economic crises and economic booms replace each other with a period of 10-15 years in a liberal economy?

This question has been the issue in thousands of books on national economy during the last century. I shall only very briefly refer to my own view based on the economic schools of Marx and Keynes.

The crucial point of Marx' theory is that the wealth of a nations does not come from passing money from one hand to another collecting fee and interest, but only from production, through the creation of added value (mehrwert).
The added value is the increase in value, when an item is being processed.
A independent craftsman, or farmer who owns his own tools collects the added value of his work for himself, while the owners of a factory, the capitalists, take a substantial part of the added value for themselves, because the workers in a factory do not own their machinery and tools for the production.

Both Marx and Keynes, (and more recently Joseph Stiglitz in his book: The price of inequality, and Thomas Piketty in his widespread book Capital) were aware that a huge gap between the rich and the poor can seriously threaten the stability of a society.

The logical outcome of these unfair social conditions, is that the workers should again have the full share of the added value created by their work, by taking over the factories from the capitalists, which can of course only happen by a social revolution.
We know in hindsight, what socialism, when sacrificing the democracy has led to, but we often forget the outraging social condition for the working class in the 19th century.

Marx analysis of the crisis in the capitalist society, were based on some very simple conjectures.

If the demand for some goods is increased, (which e.g. could be based by new methods of production, or new industrial inventions), then the production of these goods will be increased, to satisfy the demand. This again will cause a demand for labour, and possibly causing higher wages to cope with the demand.

This again means an increase in the consumers abilities to consume goods, which again will cause an increased demand.

That this cannot go on in infinity is rather obvious, but no one has ever been able to predict when it culminates and the downturn begins. This has been the case both regarding the great depression in 1929 and the economic downturn in 2008.

Marx gave the explanation that the upturn continues until the market i saturated, that is, when the consumers have the goods they need, and start saving instead of consuming. (However Marx did not know the pattern of consuming, which has developed in the western world since the 1960'ties).

A more tangible reason is that in times of upturn people begin to take loans often with security in their real estates, the prices of which follow the upturn, but real estate does not really create added value, as is the case with production, and the prices of real estate follow the demand, rather than the realistic value. This creates paper money, which is not founded in production or construction of real estate.
In periods having a high rate of economic growth the stock market booms, The stock market grows because it grows, and everyone wants to join the merry go round. As long as the share prices grow, everyone profits.
However, the stock market may reach a level, which is beyond of what the stock market companies can yield. And at one point the overrated stock market will crash.

Unfortunately the crash is far more rapid and devastating than the upturn, as we know from the crises in 1929 and 2008.
Rather than Marx formulated it, the market is saturated, one should perhaps say thet the market becomes exhausted, and the consumers resort to savings rather than consuming.
If the savings via the banks are not canalizes into investment in the creation of new enterprises, then the savings may be poisonous for a liberal economy. Since saving in a bank do not create added value, that is, production, which is the foundation of wealth.

And it usually doesn't, because when the market stagnates, the entrepreneurs are unwilling to expand the production, or establishing new enterprises.

The economic downturn becomes a bad spiral for the economy and wealth of a nation.

The prospect of a downturn, followed by closures, bankruptcy of enterprises and the increase in unemployment do neither encourage the consumers to spend more to reach a helping hand the threaten companies, on the contrary they tend to increase their savings to face an unsecure social and economic future.
But this will only enhance the economic downturn, which may eventually lead to a recession, if the politicians do not intervene

The following decrease in internal revenues, as a consequence of the enormous loss of productive capital, compel the countries either to make drastic cuts in the social spenditures or to launch national bonds, to compensate for the deficit on the national budget.

These bonds can then be bought from the savings of the population, since national bonds are considered as a safe investment.

But the point is that borrowing money (paying interest), from the population to service the same population, does not create new jobs, new companies, since it does not create added value.

A huge government debt, which will only grow, if the revenues from taxes is not increased, is well known in almost all of the western countries and Japan.

Surprisingly Japan leads by a national dept of more than 240% of the BNP. This size of national dept can never be repaid within a decade of years, instead it tends to grow.

If the dept of Japan was foreign dept, it would be a serious threat to wealth of Japan, that is, if Japan failed to manage the repayment of dept, which ultimately could cause a national bankruptcy, or at least loss of national economic sovereignty.

“Fortunately” for Japan, in contrast to most western countries, the treasuries (national bonds) are owned by the Japanese population themselves. But nevertheless the Japanese government uses about 40% of the national income for interest and repayment of treasuries.

For this reason the Japanese economy, (which only 25 years ago was the second largest economy only surpassed by the US) has stagnated for more than 20 years.

A similar development has occurred especially in the south European countries, but also markedly in the US.
These countries have all a national (for the US most foreign) dept, which can never be repaid for years to come, especially for the US, which almost every year lift the ceiling for the national dept.

That the republican presidents, at the same time haven given tax reductions (to the very rich), only worsens the national economy is rather obvious.

We started out with Marx assertion, that wealth does not come from passing money from one hand to another, a crucial point we have tried to illustrate above.

If the national tax income would be spend on creating infra structure, (As FDJ did), or canalizing the money into production, many countries would be much better off than they are now.

The moral is, (if this word may be used cocerning economics at all) that savings are poisonous for increased prosperity. Unfortunately it is about 40 years too late to have realized that.

Reference: Irene Kristensen: Elementær matematisk økonomi. Århus Universitet 1974 -1975