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ANALYSIS:

HOW MUCH WILL THE SHUTDOWN OF THE DANISH ECONOMY DURING THE CORONA CRISIS COST?

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1 SUMMARY

This analysis is based on five scenarios for the length of the shutdown and an attempt to rate the industry's production losses. The scenarios depend on the selected and necessary measures that are employed against the corona epidemic. This anslysis shows:

- *In the middle scenario, there is a production loss of DKK 150 billion at a shutdown of 6 months, equivalent to 7.3% of gross value added in 2020. The Danish economy will go into a recession with a negative economic growth of 6% in 2020.*
- *In the extreme scenarios, the production loss ranges from just under DKK 80 billion to over DKK 500 billion (with a shutdown until summer and until a vaccine can be used in a year and a half). In scenarios 4 and 5, the Danish economy is in a recession until 2021.*
- *The shutdown triggers an outright supply shock, which cannot be controlled with short-term economic policy. However, it cannot be ruled out that, besides the supply shock, there may be a crisis on the demand side, since the global economic situation was fragile even before the epidemic. On the other hand, there are precedents for economies to catch up relatively quickly even with severe supply shocks, among others, as a result of natural disasters.*

The calculations are based on scenarios and simplifying assumptions that can illustrate the potential economic consequences. This is not a model-based forecast and the calculations are subject to considerable uncertainty,

This analysis attempts to identify production losses due to the so-called shutdown in connection with the COVID-19 pandemic.

Naturally, the economic situation is burdened with great uncertainty, which reflects the uncertainty regarding the length of the crisis, the extent of future shutdown measures, the situation abroad both regarding the COVID-19 crisis and the level of economic activity already before the crisis, and related economic effects of, for instance, bankruptcies, new political initiatives and uncertain expectations.

However, this analysis is limited to looking at the economic shock from the actual contagion-limiting shutdown of activities in Denmark, depending on how long it will last. Thus, it is not a forecast for the overall economy or an assessment of the global economic situation.

1 THE DURATION OF THE SHUTDOWN IS UNCERTAIN, BUT IT MAY LAST FOR A LONG TIME.

Since the beginning of March 2020, Danish Authorities have implementet a comprehensive shutdown of large parts of the Danish society and economy.

The shutdown has been carried out to limit the extent of infection and to protect the capacity of the healthcare system against pressures that may cause an increase in the mortality rate. In its strategic plan, the Danish Health Authority expected that 10% of the total population will have been infected during the first wave until summer. Unless it is possible afterwards to limit the spread of the disease permanently, 50%-60% are estimated to be infected before the immunity within the population is strong enough to naturally limit the disease. Such a permanent limitation of spread can be achieved either through vaccine or by means of a limiting strategy that seclude infected individuals very effectively from the wider world. Finally, it is possible that the combination of a seasonal decrease in the spread of infection during summer and the continued measures of limiting infection may eradicate the disease before another wave occurs duringautumn and winter. A vaccine is not expected to be available this year; according to Ferguson et al., (2020), it may take 18 months or more.

The stated primary purpose of the political efforts against the virus is to protect the healthcare system's capacity to treat critically ill patients. The fatality rate is expected to increase significantly if patients cannot be treated with e.g. ventilators. The method is by shutting down of activities such as kindergartens, (physical) education, retail shopping, entry bans for foreigners, stopping of air traffic, sending public servants home and the use of work from home to reduce the extent of social contacts in the population in order to limit the transmission of infection.

Thus, the crucial question is how extensive and lengthy the shutdown must be to avoid that the need for treatment exceeds the capacity of the healthcare system. Table 1 lists five very different scenarios for how long the shutdown can last. As shown, they involve shutdowns for a period of between 3 to 18 months.

Table 1. Shutdown scenarios

	Scenario 1.	Scenario 2.	Scenario 3.	Scenario 4.	Scenario 5.
Description	Shutdown during the first wave. The epidemic is assumed to lose its foothold and/or may be curbed by measures specifically targeted at infected individuals.	Shutdown during the first wave (3 months). In the second wave, the shutdown is gradually eased, the treatment capacity is increased to 2,000 places and the number of infected individuals is increased to 800,000.	Shutdown during the first wave (3 months). In the second wave, the shutdown is gradually eased, the treatment capacity is increased to 1,500 places and the number of infected individuals is increased to 600,000.	Stabilising the number of infected individuals to 100,000 until the disease loses its foothold. The shutdown is gradually phased out at the end of the period	Shutdown until a vaccine can be used ("British" scenario)
Duration	3-3½ months	5 months	6 months	16 months	18 months

Assumptions: As the Danish Health Authority (Sundhedsstyrelsen, 2020a, 2020b), I assume that 10% of the population will be infected during the first wave, lasting 3-3½ months. A possible interim period between the first and a second phase is disregared. I scenario 2-4, it is assumed that a total of 60% of the population will eventually have been effected, before the epidemic looses its foothold (herd immunity). It is assumed that an average spell of the illness lasts for two weeks, and that an infection is transmitted after one week. Critical ill patients are assumed to be treated at a ICU for an average of one week, and 0.5 % of the infected will be critically ill. The health care capacity is converted to a maximum number of infected, calculated as the number of places divided by the rate of critically ill times the ratio of ICU period to spell period. A capacity of 1,000 places thus allowes for 400,000 infected at the maximum at any given time. Finally, the length of the second wave is calculated from the difference between herd immunity and wave one infection numbers. This number is divided by the number of new immune, w.i.z. the total of infected times the ratio of infection period to illness spell.

In scenario 1, the disease will either lose its foothold by itself or could be kept in check with measures aimed at infected individuals and particularly vulnerable groups after the first wave. However, in scenarios 2-5, the disease is only assumed to lose a foothold after 60% of the population is infected, or (scenario 5) when a vaccine is found. In scenarios 2 and 3, the disease is assumed to lose a foothold already after 5-6 months, with the second wave significantly increasing both the number of infected individuals and the capacity of the healthcare system. However, in scenarios 4 and 5, the number of infected individuals is limited to 100,000 at a time until the virus loses its foothold. This corresponds roughly to the level during the first wave expected by the Danish Health Authority. Currently, significantly fewer people are thought to be infected.

2 THE SHUTDOWN IS A SUPPLY SHOCK

Shocks to economic activity may come from both supply and demand. The shutdown is a negative supply shock to the Danish economy and the shutdown in many other countries is a shock to the global economy. The decline in economic activity is due to the shutdown preventing a number of industries from manufacturing as usual. The supply shock is followed by a corresponding decline in incomes and, on a global level, will cause demand to fall just as much as supply falls. Seen from the individual firm , it will naturally look like a demand shock because customers fail to appear. However, that does not change the fact that it is the decline in the production capacity of the economy as a result of the shutdown that is the real reason for the fall in demand.

It is well known that the fall in income due to a supply shock cannot be avoided with economic policy tools that affect the demand side. On the other hand, political initiatives may affect the distribution of the income loss.

The corona crisis is a very different shock from the financial crisis, which, in addition to monetary policy impulses, was triggered by the freezing of the banking sector and the supply of liquidity in particular. However, the latter also had the traits of a supply shock, which could be limited by supplying liquidity from central banks and the national treasuries (in Denmark by guaranteeing banks with funding problems as well as extending payment deadlines for VAT and tax paid on regular income[1]).

The supply shock resulting from the corona crisis may have a number of consequences. First, the supply shock can spread to the demand side. The problem is not lessened by the fact that, even before the crisis, the business cycles looked fragile globally: Countries such as Japan, France, Italy, Hong Kong and South Africa had negative growth in the fourth quarter of 2019, while countries such as the UK, Germany, Canada and Sweden had stagnation or low growth. The euro area's growth was 0.5% p. a. in the fourth quarter. In addition, there were speculations that stock prices were overvalued; after the corona crisis started, there have been significantly greater corrections than this crisis could justify on its own (otherwise, the fall in prices signals expectations of a very strong supply shock, indeed).

Second, the crisis can create adjustment problems if companies become insolvent and have to find new owners, and the losses must be distributed to creditors. The government has introduced a number of subsidies that compensate for some of the solvency losses. It may mitigate any adjustment problems, but it is important to emphasise that the losses will simply be redistributed to some others and that may also have negative effects on the overall economy. This also applies if the government debt increases.

However, it is also well known that economies often recover very quickly even after major supply shocks such as natural disasters that cause material destruction of the capital stock. Therefore, the size of the supply shock is of independent interest because it is more certain than the derived

[1] The parliament has also extended payment deadlines for VAT and tax paid on regular income during the corona crisis, but it is hardly as relevant as during the financial crisis, because this time there is no liquidity crisis.

consequences. In addition, the supply shock itself cannot be mitigated by short-term economic policy, or, in Denmark's case, by the effect of monetary policy in the euro area and the very large automatic stabilisers. Even in a situation where there is a need for short-term economic policy, it will not necessarily require discretionary measures because we conduct through the fixed exchange rate policy the same monetary policy as the euro area (unless the krone comes under pressure) and because public spending and tax revenue are among the most sensitive to business cycle fluctuations in the EU.

Et rent udbudschok bør ikke ventes at få varige konsekvenser, medmindre det sætter sig i strukturelle forhold som beskæftigelse eller offentlige finanser. I Danmark er de offentlige finanser holdbare, mens konsekvenserne kan blive alvorlige i lande med i forvejen svage offentlige finanser, herunder i eurolande som Italien. En genopblussen af statsgældskrisen i euroområdet kan ikke udelukkes.

A pure supply shock should not be expected to have permanent consequences, unless it affects structural levels of e.g. employment and government debt. In Denmark, public finances are sustainable (technically defined), but the consequences could be serious in countries with initially weak public finances, including euro countries such as Italy. A reemergence of the government debt crisis in the euro area should not be rules out.

3 ONE MONTH'S SHUTDOWN COSTS ALMOST 1½ % IN ANNUAL ECONOMIC GROWTH.

The following is a calculation of what the aforementioned scenarios will entail on the supply shock to the Danish economy. The calculation is based on a number of simplifying assumptions. It is important to stress that this is not a model prediction or an actual forecast.

The shutdown impacts different industries in widely varying ways. A number of service industries such as hairdressing and bar keeping will be practically impossible to conduct. On the other hand, manufacturing industries as well as agriculture and forestry have largely been exempted from the shutdown. Some activities, including in the education sector, are being carried out online and through work from home.

A rough score has been made for how individual industry's gross value added will be affected by the shutdown (see appendix). The baseline is the industrial distribution of gross value added in 2019. The intention is not that the individual industry score is accurate, but to ascertain a picture of the average overall impact. Despite widespread sending home of employees, public service is assumed to be at normal capacity because this part of public spending is calculated input-based in the national accounts and because those sent home receive pay.

Under these assumptions, production capacity measured by gross value added is estimated to decrease by 17.2% during shutdown compared to normal production. Converted to a monthly basis, this means that immediate effect of one *month's* shutdown is a reduction in the *annual* economic growth by 1.4 percentage point.

It is also assumed that this immediate impact is proportional to the number of months of shutdown in the five scenarios. This applies regardless of the fact that in the long shutdown scenarios there is room for some easing of the shutdown (e.g. reopening of kindergardens and border passage), as growing immunity reduces infection levels. Also, technological adjustmenst could emerge, allowing some activities, which have been hampered by the shutdown initialy, to take place within the limits of the shutdown. E.g. working from home could become even more commonplace. Both relaxing the shutdown and the emergence of new technological solutions would reduce the adverse economic effect over time. On the other hand, a prolonged shutdown will cause bottlenecks in both sales and staffing, and even in sales for those industries not directly affected by the shutdown. For example, the industry may be affected by an increasing number of people calling in sick due to infection and quarantine, as well as absence from work for the purpose of childcare. It may also have growing problems in the sales of its manufacture, although it delivers to a limited extent the industries that are shutdown at home and abroad. All things considered, the two effects are assumed to offset each other, so the effect on growth is directly proportional to the length of the shutdown.

However, it will be possible to catch up with a portion of the production backlog after the shutdown, especially for shorter durations of shutdown. This effect is also well known, albeit the magnitude will depend on many conditions. Specifically, it is assumed that production can be increased by 5% above the normal level for one quarter after the shutdown has ended (roughly in line with excess capacity at the outset of the crisis).

Table 2 shows the main results of the calculation for the five scenarios

Table 2. Growth loss upon shutdown

	Scenario 1.	Scenario 2.	Scenario 3.	Scenario 4.	Scenario 5.
Duration	3-3½ months	5 months	6 months	16 months	18 months
Growth loss DKK billion (Jan 2020-factor prices)					
2020	78	122	152	297	297+
2021	0	0	0	153	214+
Both years	78	122	152	450	511+
Growth loss %					
2020	3.8	5.9	7.3	14.4	14.4+
2021	0.0	0.0	0.0	7.3	10.2+

Source: Statistics Denmark, Danish Ministry of Finance and own calculations.

The supply shock in scenario 1, where the shutdown is limited until summer, can thus be calculated at DKK 78 billion in factor prices or a fall in growth in 2020 by 3.8 percentage points. The

Danish Ministry of Finance's forecast from December projected a growth of 1.3% by 2020. In this scenario, this growth will instead fall by 2.5%. (1.3% minus 3.8%).

In scenario 4, where the shutdown lasts well into 2021, the total growth loss in 2020 and 2021 will be over DKK 500 billion. The declining growth rate is respectively 14.4% and 10.2% in those two years. Given the expectation of growth of 1.3% in both years, we will experience negative economic growth of 13.1% and 8.9% in those two years. It will be a very huge recession. In scenario 5, the shutdown continues until a vaccine is developed. This does not allow for the same gradual relaxing of the shutdown as in the case of developing herd immunity. The losses associated with scenario 5 should be regarded as very conservative estimates, and both scenario 4 and 5 are much more uncertain than 1-3.

Compared to the extreme scenarios, scenario 3 with six months of shutdown shows a total production loss of just over DKK 150 billion (in factor prices) in 2020. This corresponds to a decrease of 7.3%, so that the recession will be 6.0%. By comparison, gross value added fell by 4.4% during the 2009 financial crisis.

It is extreemely difficult to estimate the effect of the supply shock on employment and unemployment. The immediate drop of 17% gross value added is associated by a drop in the use of labour by 20%, measured both by heads and working hours. That would translate to 500,000 employees. Unemployment and registered employment would not, however, fall by nearly the same, since falling activity does not normally lead to a comparable amount of redundancies. Furthermore, special subsidies to firms during the crisis will play a limiting role

During the financial crisis, employment fell from 2008 to 2009 by 92,600 persons, or 3.1%, while gross value added fell by 4.4%. That translated into a fall of 20,000 person per percentage point drop in gross value added. Assuming a comparable fall associated with the shutdown, employment will fall by approx. 125,000 persons in scenario 3. This effect must be seen as more uncertain, however, and furthermore there is traditionally a lag between aggregate production and employment. This was the case during the financial crisis too.

4 CONCLUSION

The calculations performed in this analysis suggests that the shutdown related to the corona crisis will result in a supply shock to the Danish economy, which depending on the duration of the shutdown will lead to a larger recession than during the first year of the financial crisis. In the medium scenario, economic activity will fall by 6% in 2020.

It is important to note that this is a first estimation of the possible orders of magnitude of the economic consequences. The method should be refined and developed in light of new experience from the development of the epidemic. Notwithstanding, the amounts are so large that is paramount that the government develops and publishes estimates for the economic consequences of both already decided and possible new policies.

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