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The Economic Costs of the Coronavirus Shutdown for Germany: A Scenario Calculation

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Key Messages

- This paper presents an estimate of the costs of the shutdown measures in terms of lost value added and analyzes the consequences for the labor market
- Depending on the scenario, the economy will shrink by 4.3 to 20.6 percentage points. This corresponds to costs of EUR 152 to 729 billion Euros
- The aim must be to shorten the partial shutdown of the economy without compromising the fight against the epidemic, with strategies that combine a resumption of production with further containment of the epidemic

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The Economic Costs of the Coronavirus Shutdown for Germany: A Scenario Calculation*

Florian Dorn, Clemens Fuest, Marcell Göttert, Carla Krolage, Stefan Lautenbacher, Sebastian Link, Andreas Peichl, Magnus Reif, Stefan Sauer, Marc Stöckli, Klaus Wohlrabe, Timo Wollmershäuser

Abstract

This study uses scenario calculations to estimate the economic costs of the partial closure of the economy due to the coronavirus epidemic. With a shutdown duration of two months, the costs reach between EUR 255 billion and EUR 495 billion, depending on the scenario, and reduce the annual growth rate of GDP by between 7.2 and 11.2 percentage points; with a shutdown duration of three months they reach EUR 354 to 729 billion (10.0 to 20.6 percentage points growth loss). On the labor market, up to 1.8 million jobs subject to social security contributions (1.35 million full-time equivalents) could be cut and more than six million employees could be affected by short-time work. Public budgets will be burdened by up to EUR 200 billion, not including the extensive planned guarantees and loans. For political decisions it is particularly relevant to know how expensive it is to extend the shutdown. We see that *a single week* of extension will cause additional costs of EUR 25 to 57 billion and thus a decline in GDP growth of 0.7 to 1.6 percentage points. Given these costs, it is particularly urgent to develop strategies to make the resumption of economic activity compatible with containing the coronavirus epidemic.

* Completed March 22, 2020.

Introduction

In order to contain the spread of the coronavirus pandemic, authorities and companies in Germany have taken measures that have far-reaching consequences for the population and the economy. These include travel restrictions, the cancellation of events of all kinds, the closure of schools and universities, hotels, restaurants, and the closure of factories and service companies. Most recently, this "shutdown" has been further exacerbated by exit restrictions. [1]

The current "freezing" of large parts of the economy is not only the result of direct government bans or regulations. It is a mixture of government regulations, measures taken by companies to protect the health of their employees and the population as a whole and, last but not least, individual decisions.[2]

It is foreseeable that the shutdown will lead to a massive slump in economic development. This paper presents an estimate of the costs of the shutdown measures in terms of lost value added. We also analyze the consequences for the labor market. Such an estimate is necessarily subject to very high uncertainty. In this paper, we present a series of scenario calculations that use data on individual economic sectors from national accounts and from the ifo Institute's business surveys, but are also based on a number of *assumptions that are crucial for the results of the calculations.*

These are mainly assumptions about which sectors of the economy will reduce their activity and to what extent, and how quickly the return to normal economic activity will occur. Because of the high degree of uncertainty about the actual development of these variables, the scenarios considered provide information about approximate magnitudes of the economic consequences of the shutdown. The results should be interpreted in the light of this uncertainty.

[1] At the same time, politicians are currently taking extensive measures to stabilize the economy. On the need for economic policy action in the coronavirus crisis, see Fuest (2020).

[2] This is relevant, among other things, to the prospects of reversing the shutdown and getting the economy back on track. This cannot be achieved through decisions by government agencies alone. Businesses and the general population must be prepared to resume normal economic activity.

Calculation Approach and Scenarios Considered

Conceptually, our analysis is based on the supply framework of the national accounts statistics. We assume that production and thus value added in many economic sectors will be reduced, in some cases massively, in the course of the crisis, either because production will be closed down due to the risk of contagion or due to cancellations in the delivery of intermediate products, or because there is no more demand for the services of the economic sector. In all calculations we assume that economic activity will gradually increase again after the shutdown and return to its initial level.[1] Our calculations include data and assumptions about the importance of the individual economic sectors for the overall economic value added, about the extent to which the economic sectors are affected by the shutdown, the duration of the shutdown, and the speed of recovery of the economy in the context of the lifting or gradual easing of the shutdown. Because of the great uncertainty and the diversity of possible developments, we consider six different scenarios, which we explain in more detail below. Different shutdown periods are then considered for each of these scenarios.

Which Economic Sectors are Affected?

The starting point for our analysis is the national accounts, which are structured at the two-digit level according to the Classification of Economic Activities 2008 (WZ 2008) of the German Federal Statistical Office. This provides information on the gross value added in the individual economic sectors of the national economy. In each scenario, assumptions are made for each sector of the economy about the extent to which production and thus value added is reduced during the shutdown and how the exit from the shutdown will proceed. For some sectors of the economy, such as sports, entertainment and recreation, travel agencies, or restaurants and bars, we assume a complete shutdown of production. Other economic sectors, such as the pharmaceutical industry, utilities, the health sector, or agriculture and forestry, will continue to operate at full capacity. For other sectors of the economy, such as advertising and market research or architectural firms, we assume that activity will be scaled back by 50 percent. The assumptions about the level of activity in the individual sectors are based partly on the observation of past closures and partly on plausibility considerations.

[1] There could be both catch-up effects, for example in consumer durables, which temporarily raise the level of economic activity beyond the old growth path after the crisis, and permanent damage, for example from bankruptcies, which suggest that the level of activity before the crisis will not be reached again. In our scenario calculations we abstract from both effects.

Since the expected extent of the production decline in the economic sectors is very difficult to estimate, we consider three scenarios. One assumes low production losses, and a second assumes high production losses. We calculate the level of the losses on the basis of currently available information and press reports on the individual sectors. In a third scenario, we estimate the expected extent of the production losses based on the business expectations of the preliminary ifo Business Climate Index of March 2020.[1] We divide the individual economic sectors of manufacturing industry and service providers into quintiles regarding their business expectations. For the economic sectors with the greatest deterioration in their expectations, we assume that production will cease. For economic sectors with the least negative expectations of the future business situation, however, we assume only a comparatively slight decline in business activities of 20 percent.

Duration of the Shutdown

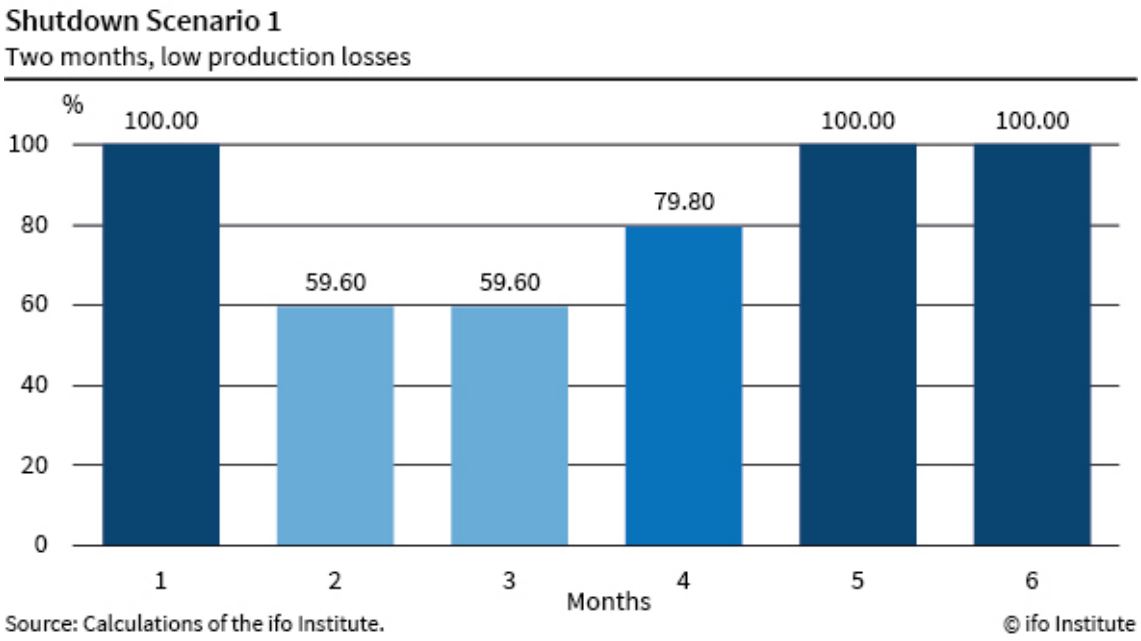
In the scenarios, assumptions must be made about the duration of both the shutdown and the subsequent economic recovery. In our scenario calculations, we distinguish conceptually between two phases. The first is known as a shutdown in a narrow sense. This is the period during which economic activity in many economic sectors is put on hold or reduced to a minimum. The second phase is the post-shutdown. In this phase economic activity is resumed, but it does not yet return to a normal level. One reason for this may be that it takes time to organize the return to normal economic activity. On the other hand, it can be assumed that the resolution of a shutdown is gradual, that economic sectors and economic activities – in particular if there is a high risk of infection – are resumed later than activities with lower risks.

As far as the duration of the recovery is concerned, we consider two types of shutdown scenarios. In the simplest case, we assume that in the month following the end of the shutdown, in the post-shutdown phase, 50 percent of the production losses incurred during the shutdown are made up and in the following month the normal level of economic activity is restored as if the crisis had not occurred. This process is illustrated

[1] The business expectations of the ifo Business Survey of March 2020 do not yet take into account the dynamics of coronavirus infections at the current margin and the latest political measures such as exit restrictions. The scenario based on expectations regarding the future business situation is therefore a rather optimistic one at the present time.

in Figure 1. The shutdown takes effect in month 2[1] and lasts two months in this example. We also consider shorter and longer shutdown periods, but in this scenario we always assume that the post-shutdown phase (here consisting only of month 4) is very short and that the economy returns to normal activity within one month. For the extent of the shutdown, we use the scenario of low production losses in Figure 1 as an example.

Figure 1



Since such a rapid recovery would be very challenging and seems realistic only if the shutdown period is not too long, we consider a longer recovery phase in a second group of scenarios. For the post-shutdown phase, we assume that all sectors of the economy need a certain amount of time to expand their economic activity again. We assume that the longer the shutdown persists, the longer this phase will last. It follows that the costs of the shutdown increase disproportionately with its duration. The reason being if production is interrupted for a longer period of time, there will be greater damage due to bankruptcies, outward migration of workers, and the loss of business relations. This extends the time needed to return to normal levels of economic activity. In addition, we assume that some sectors of the economy will remain restricted even after the end of the shutdown, for example because their activities are particularly susceptible to infection.

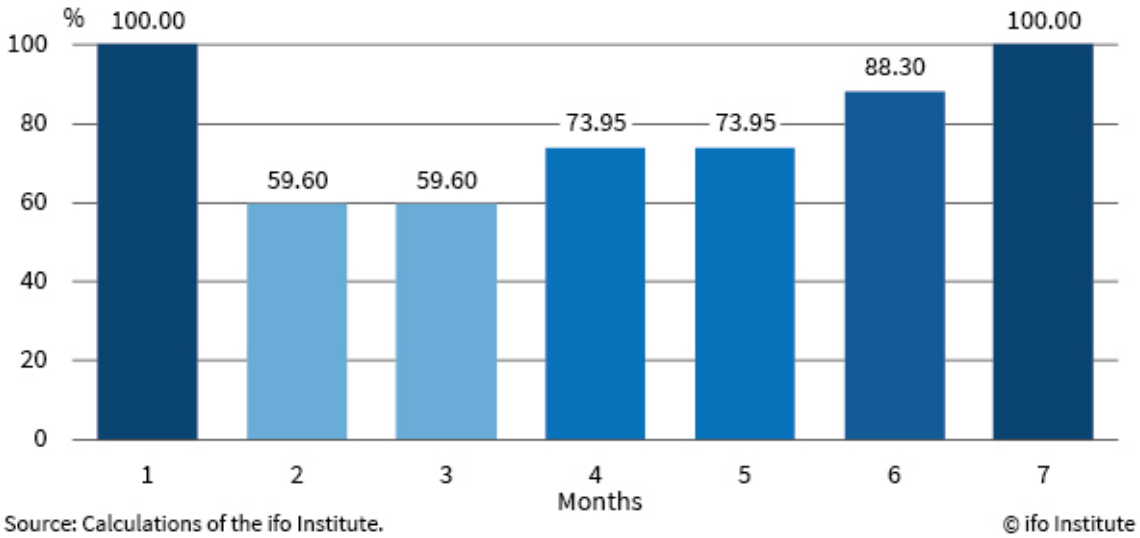
[1] It would be conceivable to assume a gradual introduction of the shutdown. We refrain from doing so in order to keep the number of scenarios manageable. This tends to underestimate the cost of the shutdown.

This is what we call the post-shutdown normal level. For a certain period of time, these sectors are at least partially excluded from the economic recovery that characterizes other economic sectors.

The cost of the duration of the shutdown is therefore reflected overall in a longer post-shutdown phase. It lasts all the longer the longer the shutdown persisted. In the calculations we implement this in the following way. After a shutdown phase lasting *n* months, the economy needs a further *n* months of catching up, during which time it makes up half of the losses between shutdown and post-shutdown normal level. Only then is the post-shutdown normal level reached. Figure 2 illustrates this type of scenario with a longer recovery phase in the case of a two-month shutdown. Here, too, the shutdown begins in month two and is relaxed in month four, but the post-shutdown normal level is not reached until month six. In month seven, the situation returns to normal. Here, too, we use the scenario of low production losses in the shutdown as an example in the figure.

Figure 2

Shutdown Scenario 2
Two months, low production losses



Source: Calculations of the ifo Institute.

Overview of the Scenarios Considered

By combining the different cases for the depth of the shutdown and the duration of the recovery, a total of six scenarios are obtained, which are summarized in Table 1.

Table 1

Scenario	Macroeconomic decline in value added on shutdown	Duration of the post-shutdown phase
1.	Low	1 month
2	High	1 month
3	ifo Business Survey based	1 month
4	Low	At least 2 months, extended in case of longer shutdown
5	High	At least 2 months, extended in case of longer shutdown
6	ifo Business Survey based	At least 2 months, extended in case of longer shutdown

For each of the six scenarios, we consider the consequences for one, two and three months of shutdown, so that our analysis contains a total of 18 scenarios. We also examine the impact of (further) extensions of the shutdown on costs. In calculating the costs, we consider as the counterfactual scenario (case without coronavirus crisis) a gross domestic product for 2020 according to the ifo economic forecast of December 2019 (see Wollmershäuser et al. 2019).

Results of the Scenario Calculations

Our calculations bring us to the conclusion that the shutdown phases will lead to considerable production losses and thus to a large decline in gross domestic product in 2020. If the shutdown lasts for more than one month, the production losses quickly reach dimensions that are well beyond the slump in growth known from previous recessions, at least in the history of the Federal Republic of Germany.

Table two shows the results of the cost calculations for the case of a shutdown of only one month. Scenario three assumes the lowest production declines and the fastest

recovery. The costs of the shutdown amount to EUR 152 billion per year, and the gross domestic product collapses by 4.3 percent. At present, however, everything points to the fact that the economic downturn could last much longer. It cannot be ruled out that the impact on production will be bigger. In scenario five, the production losses during the shutdown are bigger and the recovery period (post-shutdown phase) lasts two months. This already raises the costs to 7.5 percent of GDP.

Table 2

Loss of Value Added Due to the Coronavirus Crisis: 1-Month Shutdown

Scenario	Duration of shutdown/post-shutdown (in months)	Largest loss of value added in one month (shutdown) in %	Loss of value added per year (EUR billion)	Decline in the annual growth rate of GDP (in percentage points)
1	1 / 1	40.4	180	5.1
2	1 / 1	48.7	216	6.1
3	1 / 1	34.8	152	4.3
4	1 / 2	40.-4	226	6.4
5	1 / 2	48.7	265	7.5
6	1 / 2	34.8	202	5.7

Source: Calculations of the ifo Institute

Tables three and four give an overview of the costs if the shutdown phase lasts two and three months respectively. The costs are correspondingly higher.

Table 3

Loss of Value Added Due to the Coronavirus Crisis: 2-Month Shutdown

Scenario	Duration of shutdown/post-shutdown (in months)	Largest loss of value added in one month (shutdown) in %	Loss of value added per year (EUR billion)	Decline in the annual growth rate of GDP (in percentage points)
1	2 / 1	40.4	297	8.4
2	2 / 1	48.7	357	10.1
3	2 / 1	34.8	255	7.2
4	2 / 3	40.4	421	11.9
5	2 / 3	48.7	495	14
6	2 / 3	34.8	368	10.4

Source: Calculations of the ifo Institute

Table 4

Loss of Value Added Due to the Coronavirus Crisis: 3-Month Shutdown

Scenario	Duration of shutdown/post-shutdown (in months)	Largest loss of value added in one month (shutdown) in %	Loss of value added per year (EUR billion)	Decline in the annual growth rate of GDP (in percentage points)
1	3 / 1	40.4	418	11.8
2	3 / 1	48.7	502	14.2
3	3 / 1	34.8	354	10
4	3 / 4	40.4	619	17.5
5	3 / 4	48.7	729	20.6
6	3 / 4	34.8	538	15.2

Source: Calculations of the ifo Institute

The main result is that the costs of the shutdown can reach astronomical heights even with a duration of three months and reduce the growth of the gross domestic product this year by between 10 and just over 20 percentage points.

Table five provides information on the additional costs incurred if the shutdown is extended beyond one month. Thus, an extension of only one week increases the costs by EUR 25–57 billion. This shows how important it is to look intensively at ways of combining a shorter shutdown period with effective control of the epidemic.

Table 5

Additional Costs of an Extension of the Shutdown Phase, Based on a Short Shutdown (1 Month)

Scenario	Extend the shutdown by...					
	1 week (0.25 months)		1 month		6 weeks (1.5 months)	
	EUR bn	percentage points of GDP	EUR bn	percentage points of GDP	EUR bn	percentage points of GDP
1	28	0.8	117	3.3	177	5
2	35	1	142	4	216	6.1
3	25	0.7	103	2.9	152	4.3
4	50	1.4	195	5.5	294	8.3
5	57	1.6	230	6.5	347	9.8
6	42	1.2	166	4.7	255	7.2

Source: Calculations of the ifo Institute

When interpreting the results of our calculations, it is important to bear in mind that they are based on a wide range of assumptions regarding economic variables about whose development there is little or no reliable information is available. In addition, it should be noted that various types of shutdown costs have been excluded from our calculations. These include the lost hours of instruction in schools and universities, i.e., from an economic perspective, the lack of investment in human capital. These costs also include the social, psychological, and medical burdens associated with aspects of the shutdown, such as restrictions on going out.

Estimate of the Impact on the National Budget

Estimating the consequences of the shutdown for the national budget is subject to even greater uncertainty than estimating the consequences for value added. Lower consumption and reduced investment will lead to a decline in indirect taxes. This will be exacerbated by the possibility in several countries of having VAT prepayments refunded.

Furthermore, the sharp drop in corporate profits will lead to a significant reduction in the income taxes payable on them. The possibility of deferring tax prepayments will entail additional costs for public budgets in the current year. The decline in employment is also reflected in lower income tax payments and social security contributions paid. At the same time, the higher unemployment figures and the greatly expanded short-time work are also associated with increased public spending. From a stabilization perspective, this decline in taxes and increase in spending is desirable (Dolls, et al., 2012).

Our scenarios show that the burden on the national budget could amount to between EUR 50 billion and EUR 200 billion, depending on the course of the shutdown. In the case of a one-month shutdown, which corresponds to scenarios one to three, the costs amount to around EUR 50 billion. In the case of a three-month shutdown followed by a one-month post-shutdown phase, the costs would be significantly higher. For example, the costs for scenario four would be around EUR 175 billion. The costs for scenarios five and six would be EUR 200 billion and EUR 150 billion respectively. These figures do not yet take into account the costs of loans and guarantees, where there will be defaults, and possible burdens on European rescue parachutes. The times of high financing surpluses in public coffers are over and will not return, at least not in the near future.

Assessment of the Effects on Employment and Short-Time Work

In the following, the effects on employment and the number of persons in short-time work are to be estimated for each scenario.[1] First, the volume of work affected by the shutdown is approximated for each economic sector on the basis of the respective employment.[2]

The volume of work affected by the shutdown is compensated for via various channels. Part of it will be absorbed by reducing employment, i.e., by not hiring, expiring fixed-term contracts, and dismissals; another part will be absorbed by various measures to reduce the average working hours of the remaining employees. These include, for example, short-time work and the reduction of credit balances on flextime accounts. Finally, it can be assumed that part of the affected work volume will be compensated for by lower productivity per hour. This means that a part of the affected work volume is nevertheless performed.

[1] The calculations are based on the number of jobs expected to be lost in each scenario and the scale of the crisis. A large part of the job losses are likely to be rebuilt after the crisis.

[2] Here we assume a proportional relationship, i.e., if a loss of production of *x*% is assumed in an industry, *x*% of the volume of work performed by employees in this area is considered to be affected.

The distribution of labor market adjustment across the channels described is difficult to approximate due to the lack of historical experience. The assumptions made are summarized in Table 6. In all scenarios, it is assumed that only a small proportion will be compensated by job cuts and that companies will try to keep their employees as far as possible, as was the case in the economic crisis of 2008/09, for example. Furthermore, we assume that, especially at the beginning of the shutdown, the reduction of holiday and flextime credits will play an important role. Insofar as employees are sent on short-time work, it can be assumed that the average degree of short-time work is almost total, i.e., only a few hours are still worked. Finally, the proportion of mini-jobs (exclusively or as a sideline, marginal part-time work) that are cut back is likely to be disproportionately high.

Table 6: Assumptions for Estimating Labor Market Effects

Scenarios		Employment subject to social security contributions			Mini jobs
Duration of shutdown	Duration of post-shutdown	Compensation through job cuts (VG/DL)[1]	Compensation through short-time work2	Ø Degree of short-time work3	Compensation through job cuts (VG/DL)[4]
1 month	Short	1.0% / 1.5%	15%	75%	30%/30%
1 month	Long	1.5% / 2.3%	20%	75%	35%/35%
2 months	Short	3.0% / 4.5%	25%	80%	50%/50%
2 months	Long	4.0% / 6.0%	30%	80%	55%/55%
3 months	Short	5.0%/ 7.5%	35%	90%	70%/70%
3 months	Long	8.0% / 12.0%	40%	90%	70%/70%

Notes: [1]Assumption on the share of the work volume of employees subject to social insurance contributions affected by shutdown, which is compensated by job cuts; differentiated according to manufacturing industry (VG) and service sector (DL). [2]The share of the affected work volume of employees liable to social insurance contributions remaining after job cuts, which is compensated by short-time work. [3]Degree of short-time work (if production losses exceed this level, the loss of production is set instead). [4]Part of the affected work volume of the marginal part-time employees, which is compensated by job cuts.
Source: Calculations of the ifo Institute

The individual parameters will strongly depend on the duration of the shutdown and the duration of the post-shutdown phase: the strength of the job cuts should increase with the

duration, as should the use of short-time work. In contrast, the importance of the reduction of vacation and flextime credits should decline over time.

Based on these assumptions, all scenarios have strong effects on employment (see 7).[1] A shutdown of one month results in a loss of 160,000 to 340,000 jobs subject to social insurance contributions and 180,000 to 390,000 mini-jobs, depending on the scenario. If the shutdown lasts two months, according to this calculation, a loss of 470,000 to 910,000 employment relationships subject to social insurance contributions and 300,000 to 610,000 mini-jobs is to be expected in the affected sectors; if the shutdown lasts three months, the losses increase to 780,000 to 1.8 million employment relationships subject to social insurance contributions and 420,000 to 780,000 mini-jobs.

Table 7: Effects on Employment

	Employment reduction after duration of shutdown in thousands					
	Employment subject to social security contributions			Marginal employment		
Scenario	1 month	2 months	3 months	1 month	2 months	3 months
1	190	570	950	290	490	680
2	230	680	1.130	330	550	780
3	160	470	780	180	300	420
4	280	760	1.510	340	540	680
5	340	910	1.810	390	610	780
6	230	620	1.250	210	330	420

Source: Calculations of the ifo Institute

In all scenarios, the total number of short-time workers rises to a level that in some cases significantly exceeds the record levels of 1.5 million short-time workers during the financial crisis of 2008–2009 (see Table 8). In the case of a one-month shutdown, according to this calculation 2.1 million to 3.9 million are to be expected. If the shutdown lasts for two or three months, the number should increase to 3.4 to 5.5 million or 4.2 to 6.6 million, respectively.

[1] In all scenarios, the total reduction in employment is likely to be further increased by the business activities of the self-employed not considered here.

Table 8: Effects on Short-Time Work

	Short-time work by duration of shutdown in millions		
Scenario	1 month	2 months	3 months
1	2.7	4.3	5.3
2	2.9	4.6	6.0
3	2.1	3.4	4.2
4	36	5.1	5.8
5	3.9	5.5	6.6
6	2.8	4.0	4.6

Source: Calculations of the ifo Institute

Conclusions

On the one hand, the available estimates of the costs of shutdown in the form of lost value added show that the coronavirus epidemic will cause costs that will probably exceed everything known from economic crises or natural disasters in Germany, at least in recent decades.

Even with a shutdown period of two months, the costs reach between EUR 255 billion and EUR 495 billion, depending on the scenario, and reduce the annual growth rate of GDP by between 7.2 and 11.2 percentage points; with three months, they already reach EUR 354 to 729 billion (10.0 to 20.6 percentage points growth loss).

The crisis is also causing massive distortions in the labor market, which are overshadowing the conditions at the height of the financial crisis. In the scenarios we are looking at, up to 1.8 million jobs subject to social security contributions (1.35 million full-time equivalents) could be cut and more than 6 million employees could be affected by short-time work. Without taking into account the extensive planned guarantees and loans and possible European rescue packages, public budgets would be burdened by up to EUR 200 billion. From the point of view of macroeconomic stabilization, the underlying loss of tax revenues and additional expenditure, especially for transfers, are both desirable and necessary.

Of particular relevance for political decisions is the question of what costs are incurred if the shutdown is extended. Here it can be seen that *a single week* extension causes

additional costs of EUR 25 to 57 billion and thus a decline in GDP growth of 0.7 to 1.6 percentage points. An extension from one to two months increases the costs of the shutdown by up to EUR 230 billion (6.5 percentage points growth).

From the astronomical amount of the costs of the shutdown, it follows that it is urgently recommended to use practically every conceivable amount in the area of health policy measures that shorten the duration of the shutdown without impairing the necessary fight against the epidemic. It is also clear how urgent it is to introduce new, possibly innovative forms of production organization that make it possible to combine a resumption of production with further containment of the epidemic.

Debates that[1] see an insoluble conflict of objectives between economic recovery and the fight against the epidemic lead to a dead end. There is an urgent need to look for ways to combine the gradual lifting or easing of the shutdown with effective health protection. Current developments in other countries, especially in Asia, offer starting points. These include, as epidemiologists repeatedly emphasize, extensive testing, special protection of vulnerable sections of the population, widespread use of breathing masks, disinfection measures in public spaces, and much more.

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[1] An example of this approach is given in a recent contribution by Eichenbaum et al (2020).

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