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Economic aspects of COVID-19, numerical illustrations for Cyprus, and policy implications
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The world has been hit by a serious pandemic and the damage will be great. How large will the flow of lost output in Cyprus be? What will be the impact on public finances? Who should bear the cost of this disaster? Current economic agents through tax increases, or future taxpayers, and can further debt be justified and achieved? Can the effects of the impending recession be moderated with appropriate policies and what form should these take? To address these questions clearly, it is necessary to define the nature and duration of COVID-19 in light of the medical policies that have been adopted to deal with it. An initial reaction in several countries banked on attaining an early 'herd immunity'. This was abandoned when the speed and severity of contagion threatened to overwhelm medical systems and to lead to a massive number of infections and deaths. The policy levers now in most countries, including Cyprus, involve: extensive RNA-based testing, the strict isolation of infected or suspected cases, the home confinement of individuals who work in 'non-essential services' (resulting in the partial or complete shut-down of their sectors), the adoption of strict precautions for those who work in 'essential services', and the imposition of isolation and social distancing measures for all households and their members.

The current isolation phase entails a major reduction of economic activity in the non-essential sectors, causing major losses and possible bankruptcies for firms, as well as substantial reductions in or elimination of employment incomes. The impact of COVID-19 is explored in three related and interconnected scenarios. In scenario (i), it will be assumed that this phase will, in one form or another, last for four months or 1/3 of a year, followed by a phase in 2020H2 when the economy will exit the state of isolation and the normal rate of output will be re-established. This first scenario overlooks two further effects that are likely to be present during 2020H2 and would result in additional GDP losses due to (ii) a lingering COVID-19 and (iii) a drastic drop in tourist arrivals and revenues. The impact of the initial and two further shocks on GDP is evaluated at €3.7 bn or 16.82% of GDP. Such a reduction in GDP would generate a fall in government revenues by an equal percentage, raising the government's fiscal needs by €1.51 bn. To this must be added the fiscal requirements of measures to strengthen the economy that have been announced or planned; these requirements are difficult to predict but have been budgeted at a minimum of €1 bn if loans that are guaranteed by the government do not go in default. The combined fiscal needs will be in the region of €2.51 bn, or 11.41% of GDP, adding these percentage points to the debt/GDP ratio.

The issue of how these needs will be funded arises. The analysis suggests that the cost of isolation is essentially an investment in the preservation of health and the size and quality of future human capital. The monetary cost of this investment has been largely borne by those in the non-essential sector whose incomes

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have been drastically reduced by the adoption of this necessary policy. While employees in the essential sectors have probably not suffered income losses, all of them, but those in the health sector particularly, have had to work under extremely dangerous conditions and for very long hours, in many cases contracting the disease themselves. Since future generations will benefit from the preserved state of health that these sacrifices will result in, it is appropriate that they should also contribute to the health cost by servicing debts that will be passed on to them. However, as most countries will be borrowing, interest rates are likely to rise and render plans to raise all fiscal needs through debt infeasible. For this reason and because the income losses of some individuals in the non-essential sector are very substantial and substantially larger than those of others in that sector and elsewhere in the economy, a charge proportional to income on current taxpayers will be needed, as well as the resort to debt.

The three GDP losses due to COVID-19 are calculated as follows. (i) GDP without the disease during 2020 is assumed to equal €22, its value in 2019. In the first scenario studied, there are no tourism effects in 2020H2 and COVID-19 ends abruptly after four months in June; the regular production of January and February resumes in July for 2020H2 and, during these eight months, output will be produced at the monthly rate of €22/12=€1.83 bn. The Cobb-Douglas production function $Y=AK^bL^a=BL^a$ is used, where, Y is GDP, L and K are labour and capital services respectively, and the exponents b and a can be thought of as the shares of capital and labour respectively; these are typically assumed to equal 0.35 and 0.65. The elements of B are all assumed to be constant, and they need not be known. In 2020, with COVID-19 rampant during March–June, the policy of isolation implies that only $(3/5)L$ and all K will be available for use in production. Then income with COVID-19, will equal $Y|Covid=(2/3)Y+(1/3)\{B[(3/5)L]^{0.65}\}=(2/3)Y+(1/3)\{(3/5)^{0.65} BL^{0.65}\}= (2/3)Y+(1/3)\{0.72Y\}=14.67+5.28 =€19.95$ billion. Output during March–June 2019 would have been $1/3\{BL^{0.65}\}=€7.33$ but with COVID-19 it is $(1/3)\{B(3/5L)^{0.65}\}$, the difference being equal to the expression $1/3\{BL^{0.65}-B[(3/5)L]^{0.65}\}=1/3\{22-15.84\}=EUR\ 2.05$ bn or 9.3% of GDP. This is the first effect that can be established, an amount comparable to the entire GDP loss from 2011 to 2015 during the Cyprus crisis.

Two other scenarios are studied and they produce GDP reductions in addition to the one above: (ii) When COVID-19 carries into 2020H2, exacting a GDP loss equal to the amount $(1-\psi)=0.05$ of the GDP that might have been generated during 2020H2. In this case, $Y=(2/12)Y+5.28+\psi(6/12)Y=Eur\ 19.4$ bn, where $\psi=0.95$. (iii) When the contribution of tourism-to GDP generated during 2020H2 is lower by the amount $(1-\phi)=0.10$ of the GDP that might have been generated during the six months of 2020H2; i.e. the economy produces only $\phi(6/12)Y$. In this scenario, GDP or $Y=(2/12)Y+5.28+\phi(6/12)Y=Eur\ 18.85$ bn, where $\phi=0.90$. The loss in GDP is €1.1 bn.

The sum of these three likely effects is €3.7 bn=(2.05+0.55+1.1), or 16.82% of GDP=€22 bn. A 16.82% decline in GDP will reduce the 2019 €9bn government revenues by €1.51 bn. In addition to this fiscal need, the government plans programmes for two months to support employment which will cost at least €1 bn for that period. A further programme that guarantees 2/3 of a loan from a bank by a firm which maintains its employment has an unknown cost at this point and, of course, it is not clear what relief Cyprus will get from the EU through its newly agreed programmes. A further €1 bn fiscal requirement will be assumed, raising the total to €2.51 bn or 11.41% of GDP. This amount, if totally borrowed, will raise the debt/GDP ratio, which is about 100%, by 11.41 percentage points. This may be difficult to sustain if interest rates rise; some of the fiscal requirements should be raised through income taxes.

A number of other, related, points emerge in this study: (i) The epidemiological strategy of isolation is given a clear interpretation as an investment in the health, productivity, and level of future human capital. (ii) The cost of this investment has been borne by some, but not all, of the economic agents in the non-essential sector; as well, agents in the essential sector have not seen their income reduced substantially if at all. (iii) This justifies improving the government's fiscal position by imposing some temporary income-related charge on current taxpayers. (iv) But, in view of the substantial income sacrifices in the non-essential sector, the working condition dangers in the essential sector, and the benefit derived by future members of society from the preservation of human capital, a large portion of the fiscal needs should be raised through borrowing, particularly while low interest rates persist. (v) The argument that consumption should be stimulated for fear of a

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deeper recession is dominated by saving and investments in health and infrastructural projects that increase productive capacity sustainably. (vi) Finally, in a presumed short-lived emergency, it makes sense to avoid bankruptcies and maintain employment so that firms can be ready to resume operations in the near future. Clearly, this strategy is not warranted where firm closures are inevitable due to secular and irreversible drops in demand.

Further details on the methodology and procedures used in this study are available in an Economic Policy Working Paper to be released by the Economics Research Centre.