The Economic Consequences of COVID-19 lock-down in the UK. An Input-Output Analysis Using Consensus Scenarios.

Matteo Richiardi*

Patryk Bronka*

Diego Collado*

* ISER, University of Essex

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Abstract

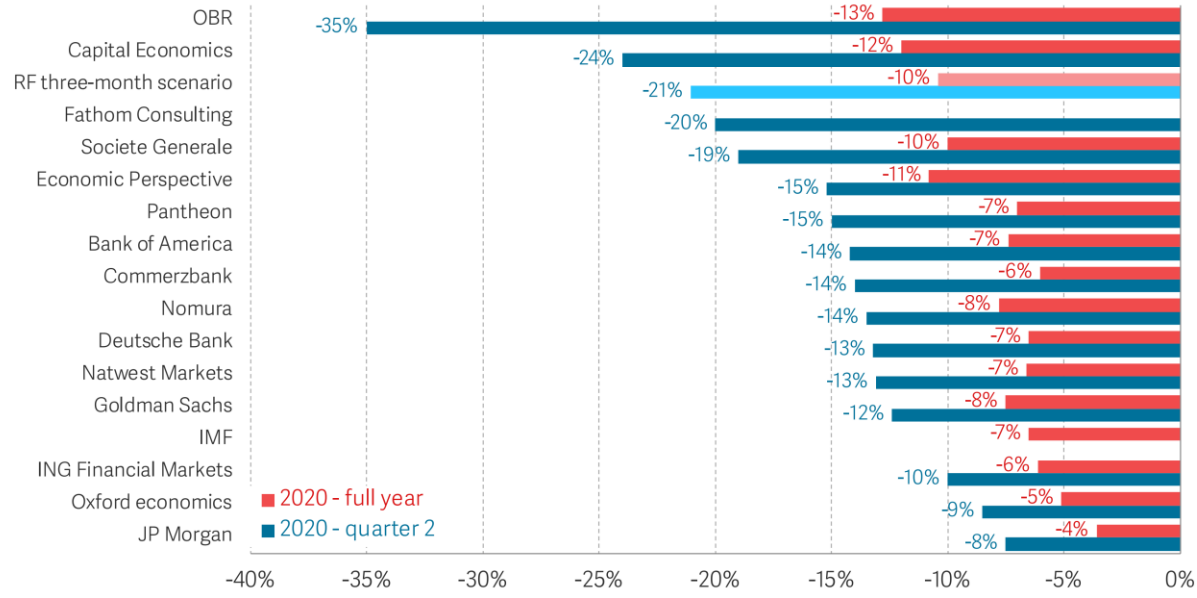
We develop a dynamic input-output model for the UK that allows considering both demand-side and supply-side constraints. We then parameterise it with the results of a consensus analysis of the effects of the Covid-19 lock-down on final demand and supply in key industries, based on an ad-hoc survey that was completed by over 250 UK-based economists. Median estimates show that almost one quarter of all jobs in the UK are at risk, with the Accommodation & Food industry contracting by over 80%, Transport & storage by over 40%, and Manufacturing by almost 30%.

1. Introduction

On Monday March 23, 2020, the UK Government followed a long list of countries and enforced drastic lock-down measures to limit and delay the spread of COVID-19. These included home confinement but for a limited list of exceptions, bans of public gatherings of more than two people, and closure of all retailers selling non-essential goods (essential shops include food retailers, pharmacies, hardware stores, corner shops, petrol stations, shops in hospital, post offices, banks, newsagents, laundrettes and pet shops). Schools were ordered to close a few days before, taking effect on that same Monday. The length of the lock-down period is, at the moment of writing, still uncertain, having been prolonged until at least the first week of May, but many commentators expect it to extend into June at least.

There are no doubts that the effects of this forced breaks imposed on the economy, for the UK as well for the other countries following similar trajectories will be massive. Expert forecasts for a three-month lock-down scenario range from a drop in the second quarter GDP of almost 10%, to a drop of 35% (Figure 1). The Office for Budget Responsibility's own forecasts are the more pessimistic (OBR, 2020).

Figure 1: Annual real GDP growth forecasts under a 3-month lock-down scenario



Source: Resolution Foundation (2020).

In this paper, we provide new estimates of the effects of the lock-down on different UK industries. Lacking timely data on sectoral activity and employment, we employ a dynamic input-output model based on the supply-use tables published by the Office for National Statistics and referring to 2016, parameterised with the results of a consensus analysis of the opinions of a large number of UK-based economists. We allow the lock-down measures to impact final demand by industry, and also model supply-side constraints originating from the government guidelines.

The innovation of the paper is to limit scenario assumptions to two key areas that are easier to visualise, and then propagate the effects of those assumptions throughout the economy by means of an input-output model. More precisely, we use the results of our consensus analysis to inform assumptions on the effects of the lock-down on (i) final demand, and (ii) sectoral supply, and then adjust production of intermediate goods and services accordingly. Final demand is affected because consumers face limitations to buy certain goods or services. For instance, beers can be ordered take-away from the local pub, and cars can be bought online without visiting a dealer, but fewer people are doing this. Supply is constrained due to the social distancing measures that producers have to put in place, or because productivity goes down due to working from home arrangements. In some sectors, distinguishing between reduction in demand and reduction in supply is difficult. This is particularly true for services requiring a personal contact: for instance, consumers can't buy a haircut in lock-down, while hairdressers cannot sell it. The distinction is more meaningful in manufacturing, wherever social distancing can be achieved in factories. Our approach is more sophisticated than some other early attempts to model the macro effects of the Covid-19 lockdown, but still disregards to a large extent substitution effects by households and producers. We motivate this simplifying assumption with the consideration that the shock was large, exogenous, unexpected, and likely of short duration (a few months), hence limiting the opportunities for reorganizing production and consumption plans.

The remaining of the paper is organised as follows. Section 2 describes our dynamic input-output model more in details. Section 3 introduces our consensus analysis. Section 4 discusses the results. Section 5 summarises and concludes.

2. The macro model

Attempts to predict the macro-effects of the lockdown are more numerous than those looking at distributional consequences. Most exercises rely on input-output (IO) models, of the Leontief (1936) or Gosh (1958) type. In the Leontief model, output depends on final demand, and a shock to demand for one sector reverberates its effects upwards in the production process through sectoral interdependencies. In the Gosh model, output depends on value added, and a shock to productivity in one sector reverberates its effects downwards in the production process through sectoral interdependencies.[1]

In both cases, standard applications assume that no substitution among inputs is possible in the production of any good or service (Christ, 1955): production is then scaled up or down to meet final demand or supply constraints using the same optimal production plan, with a fixed mix of inputs in nominal terms.

Applications of the Leontief model to disaster impact assessment have led to the so-called Inoperability IO model, which follows a very similar logic (Dietzenbacher and Miller, 2015). The Inoperability model assumes that, when an entire sector or sub-sector is shut down or drastically impacted, the demand for that sector is picked up by imports. As such, the assumption that there is only one process used for the production of each output is maintained.[2] An alternative to assuming perfect substitutability between domestic intermediate inputs and imports is to consider a Cobb-Douglas specification with constant returns to scale both for production functions (supply side) and utility functions (demand side), as in Acemoglu et al. (2016).[3] This assumption ensures that income and substitution effects exactly offset each other, and the optimal mixes of intermediate inputs and final demand depend only on technological and utility parameters respectively, and not on prices nor quantities. Acemoglu et al. show that, under those assumptions, demand shocks are only propagated upwards and supply shocks only propagated downwards.

Both approaches allow in principle for contemporaneous demand and supply shocks, but are not particularly well suited for analysing the disruptions caused by Covid-19. Starting from the Inoperability model, the assumption that imports can compensate for shortfalls of intermediate inputs looks unsatisfactory, given that imports are also affected, either by lock-down measures in the producing countries or by trade restrictions. The Cobb-Douglas assumption is also problematic in the Covid context, as it implies constant expenditure shares. This means, for instance, that if a company routinely uses low fare airlines to allow its managers to visit production facilities, and airlines cease to operate, it will hire a private plane to allow at least some managers to visit some plants, some of the time, so that the proportion of the budget that goes to travelling remains unchanged. This seems implausible in the current circumstances.

Most contributions trying to predict the effects of Covid-19 on the economy follow the standard IO literature without optimisation. They typically deal with the problem of reconciling demand and supply shocks by computing the effects of the two shocks separately, and then considering the biggest of the two. This is for instance the approach of del Rio-Chanona et al. (2020), who construct their own measure of supply shocks for the US based on detailed occupation-specific considerations, while taking the

[1] The dual nature of the demand-driven Leontief model and the supply-driven Gosh model and their mathematical equivalence between the Leontief and Gosh model has been proposed (Dietzenbacher, 1997) and, while debated (de Mesnard, 2009), is generally accepted in the literature (see also Manresa and Sancho, 2019).

[2] Again, the implicit assumption that prices do not change or that they are perfectly offset by changes in quantity is made.

[3] To be noted, Acemoglu et al. do not estimate production function and utility parameters, but rather use their theoretical framework to inform a reduced form econometric specification, estimated using past shocks (variation from the exogenous components of imports from China, changes in federal government spending, total factor productivity shocks and variation in foreign-industry patents).

Congressional Budget Office scenarios for the demand shocks.[4] Dorn et al. (2020) supposedly follow a similar approach in providing growth estimates for Germany, although they do not fully describe their methods.

Here we develop an IO model that jointly considers the effects of demand side and supply side shocks.

Let $y = [y_i]$ be the total output of each industry, $Z = [z_{i,j}]$ the matrix of intermediary inputs supplied by industry *i* to industry *j*, and $f = [f_i]$ the final demand for each industry. We have

$$y = Z + f, \quad (1)$$

where *y* is supply (production), and *Z* + *f* is demand (sales). Inventories (included in the final demand) guarantee that the accounting identity production = sales holds, from which we obtain the familiar expression

$$Z = Ay \quad (2)$$

where *A* is a matrix of technical coefficients, assumed to remain constant. In a standard IO approach, a change in the final demand Δf is transmitted upwards and leads to a change in total production equal to

$$\Delta y = (1 - A)^{-1}\Delta f, \quad (2)$$

while a change in production of Δy is transmitted downwards and leads to a change in final demand equal to

$$\Delta f = (1 - A)\Delta y. \quad (2')$$

There is however no way to allow contemporaneous demand and supply shocks to all industries. The fundamental problem is that if the equation demand = supply is to hold, one of the three terms *A, y* or *f* needs to be endogenously determined. We solve this problem by allowing *A* to change endogenously. Ideally, this could be rationalised under the assumption of constant elasticity of substitution (CES) production functions, to be separately estimated by sectors. CES production functions nest the three cases of Leontief (no substitutability), Cobb-Douglas (constant shares) and linear production functions (full substitutability). However, CES production functions are not simple to estimate on UK data, and estimates for many sectors do not converge (Richiardi and Valenzuela, 2020). We therefore proceed by making the extreme assumption of full substitutability. While this assumption might work for some inputs, that are dependable at least in the short term (think of air travels), it is clearly inadequate for others, which are essential in the production process (for instance, iron ore for metalwork). We defend it with two arguments: first, Covid-19 restrictions mostly involve the production and consumption of non-essential goods and services; second, our approach puts us on the safe side, by providing a lower bound of the estimated effect of the lock-down on the UK economy.

Our modelling assumptions are best described in dynamic terms. We assume a linear production function in intermediate inputs *z*, imports *m* and labour *l*:

$$y_i^S = \sum_{j=1}^{J} z_{j,i} + m_i + l_i. \quad (3)$$

[4] The OECD (2020) works out its scenarios in an even simpler manner, by either looking at supply shocks (i.e. reductions in production) or demand shocks (i.e. reductions in sales), without working out their effects throughout the IO matrix.

Production is sold to other industries and final customers (including households, government, foreign markets and inventories):

$y_i^D = \sum_{j=1}^{J} z_{i,j} + f_i.$	(3)

Because of the disruptions caused by Covid-19, final demand is reduced to $\widehat{f_i} = \alpha_i f_i$.[5] We assume that in a first period production plans are potentially affected by disruptions in supply, but otherwise continue unchanged even in the face of reduced final demand. Disruptions in supply, due to either an inability of firms to buy all the intermediate inputs originally planned, or to a diminished productivity of labour, reduce production to $\hat{y}_i^S = \beta_i y_i^S$. In absence of supply-side constraints, a reduction in final demand leads to over-production, which goes to inventories.[6] On the other hand, in absence of demand effects, a reduction in supply leads to under-production. We make the assumption that intermediate customers are served first, so that under-production leads to a reduction in sales to final customers.

Now, the subsequent dynamics is very different depending on whether there is over- or under-production in any given industry. In the first case, production is reduced to bring it in line with sales, meaning that the demand of all intermediate inputs is proportionally and uniformly reduced. This triggers further effects, as it worsen supply constraints in industries that are net buyers from industry *i*, and worsen demand constraints in industries that are net sellers to industry *i*.

Note that the symmetry between demand and supply shocks is broken because production is not allowed to expand in presence of supply-side constraints. Note also that supply-side constraints interact with final demand constraints by making the adjustment faster: if supply is reduced at the same time when demand is reduced, the economy remains closer to an equilibrium, although at a lower level of activity.

Finally, our model maintains the original input mix as far as demand shocks are considered. It's only supply shocks that affect the composition of intermediary inputs.

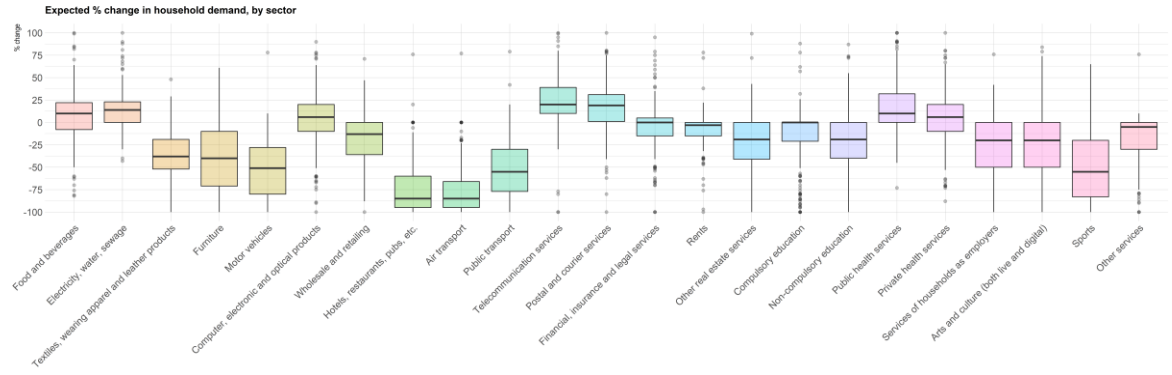
3. Scenario assumptions

Equipped with our dynamic IO model, we need scenario parameters for the supply and demand shocks. We get these from a consensus analysis of an ad-hoc survey of UK-based economists realised between April 24 and May 1, 2020. The questionnaire asked for the expected change, at the industry level, in (i) household demand (which we assumed representative of all final demand with the exclusion for the demand for exports), (ii) supply of intermediate goods and services, and (iii) exports, and was administered to 2,644 UK-based economists with complete personal profiles in RePEc. Filling in scenario assumptions on all the three dimensions cited above for the 64 industries used by the IO tables provided by the Office for National Statistics would have required asking for 192 different values. We have therefore opted for selecting key industries only: 23 industries most relevant for household demand, and 11 industries most relevant for exports and intermediate inputs. This brought down the number of industries that respondents were asked to focus on to 34, and the single values on which they were asked for an opinion to 45. We obtained 378 valid responses, for a response rate of 14.3%. Removing surveys in which no questions were answered and surveys in which respondents did not consent to the study, we are left with a sample of 257 responses with 81% of complete responses (208

[5] We assume that in a first period intermediate demand remains unchanged. Relaxing this assumption poses no problems (but also makes very little difference to our empirical results).
[6] So, technically, final demand remains unchanged, and only its composition is affected.

completed surveys and 49 partially completed surveys).[7] The distribution of the responses are depicted in Figures 2-4, while detailed descriptive statistics are reported in the Appendix, Tables A1-A3.

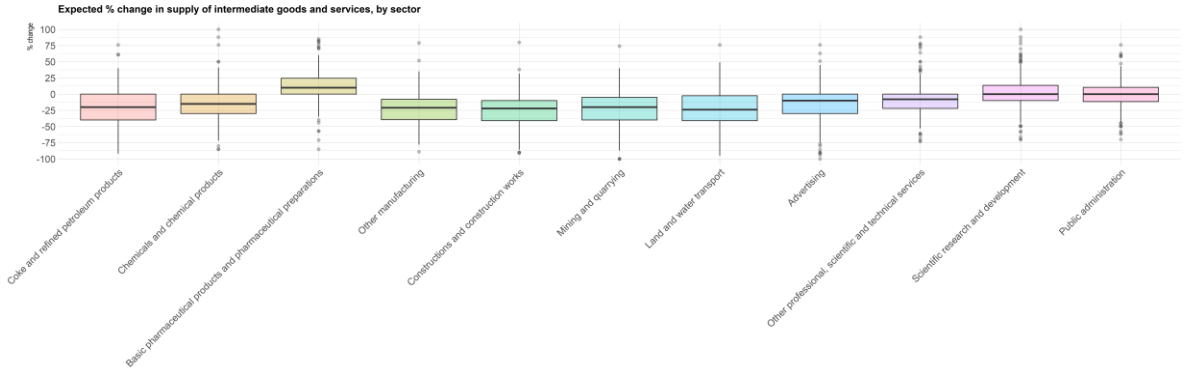
Figure 2: Box-plot for the expected change in household demand, by sector



Responses to the question: Please provide your estimates of the effects on final household demand for goods and services of the Covid-19 related lock-down measures implemented by the UK Government on March 23: these are due to constraints preventing consumers from physically visiting sellers.

Note: Statistics based on 257 valid responses to this question.

Figure 3: Box-plot for the expected change in supply of intermediate goods and services, by sector

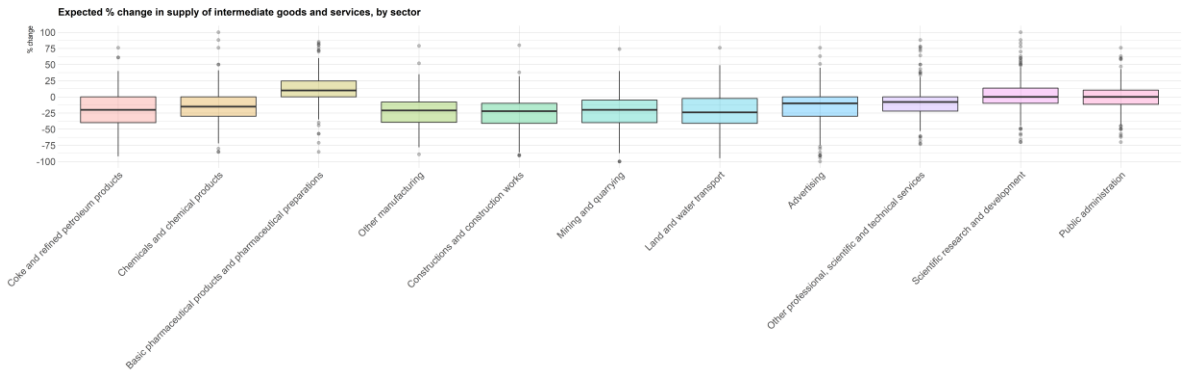


Responses to the question: Please provide your estimates of the effects on the supply of intermediate goods and services to businesses of the Covid-19 related lock-down measures implemented by the UK Government on March 23: these are due to social distancing and smart working measures reducing the output of intermediate goods and services, which producers sell to other producers.

Note: Statistics based on 223 valid responses to this question.

[7] More information on the study is available at www.euromod.ac.uk/covid/consensus.

Figure 4: Box-plot for the expected change in export of intermediate and final goods and services, by sector



Responses to the question: Please provide your estimates of the effects on the supply of intermediate and final goods and services of the Covid-19 related lock-down measures implemented by the UK Government on March 23: these are due to due to reduction in the demand from importers, or to difficulties to get the goods and services through the border.

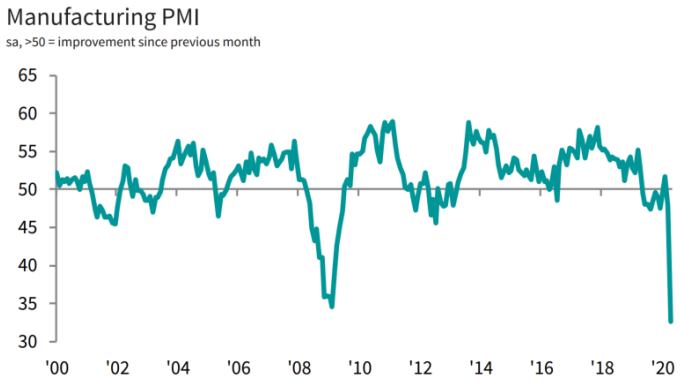
Note: Statistics based on 208 valid responses to this question.

We then created a mapping between the 192 parameters required, and the 45 obtained (Appendix, Table A4). On the basis of this mapping, we identified 3 scenarios: a baseline with median values of the responses, a low-impact scenario with the p25 values, and a high-impact scenario with the p75 values.

4. Results

Feeding the IO model based on the most recent IO tables provided by the Office for National Statistics (2016) with these parameters leads to reduction in economic activity of 22.6% of GDP, in the Baseline scenario, 9.2% in the Low-impact scenario, and a staggering 40.9% in the High-impact scenario. This is to be interpreted as the new equilibrium where the economy fully adapted to the lock-down conditions. Our hypothesis is that the economy has adjusted quite rapidly to the lock-down, so that an equilibrium analysis can be considered a good first approximation. This is supported by most of the forecasts described in Figure 1 and by some partial, preliminary evidence. For instance, the Purchasing Managers' Index (PMI) for UK manufacturing – summarizing whether market conditions, as viewed by purchasing managers, are expanding, staying the same, or contracting – released on May 1, 2020, plunged to its lowest level since the survey began in 1992 (Figure 5).

Figure 5: Purchasing Managers' Index (PMI), UK manufacturing.



Source: HIS Markit / CIPS.

The combination of demand and supply side constraints, as discussed in Section 2, also helps to produce a rapid adjustment.

Note that by assuming equilibrium, the effects can be referred to periods of arbitrary duration: we estimate GDP to shrink by almost one quarter as long as lock-down persists. Hence, if the lock-down lasts for three months, GDP in that quarter would fall by 22.6%. Assuming the economy will quickly bounce back to the old equilibrium once the lock-down is released, that would amount to a reduction in yearly GDP of 22.6 / 4= 6.7%, in the Baseline scenario.

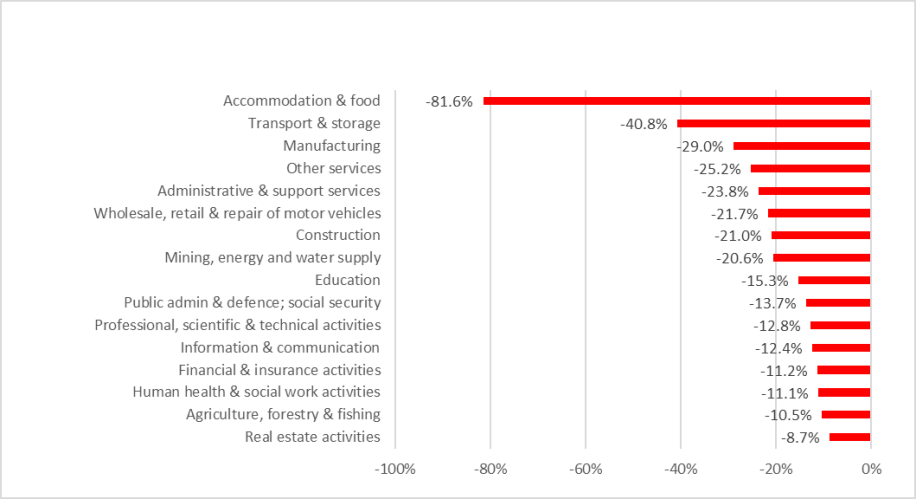
The effects of such a dramatic contraction in production on employment however depend crucially on how firms respond – their specific HR policies at a time of a national emergency. The presence of quite generous government schemes, in this respect, undoubtedly takes some pressure to cushion employment responses away from companies. The latest available data from the British Chambers of Commerce (BCC), released on April 22, 2020, point to more than 70% of surveyed firms having furloughed staff, with 30% saying they have furloughed between 75% and 100% per cent of their workforce. For simplicity, we assume a decrease in employment proportional to the decrease in production. That leads to a loss of 7.3 million jobs (-22.3%) in the baseline scenario, going down to just above 3 million jobs (-9.4%) in the low-impact scenario, and shooting up to almost 13.5 million jobs (-41.0%) in the high-impact scenario.[8]

Figure 6 reports the results by macro-sectors. Sector I - Accommodation & food services is the most badly hit, with an estimated reduction in lock-down of more than 80%, followed by H - Transport & storage with -40% and C - Manufacturing (almost -30%). The least affected sectors are L - Real estate activities, A - Agriculture, forestry & fishing, Q - Human health & social work and K - Finance and insurance, all around -10%.[9]

[8] The difference about the overall employment and production effects is due to different labour intensities of different industries. We use the latest employment data by industry as provided by the Office for National Statistics in its JOBS05 series - Workforce jobs by region and industry (seasonally adjusted), released on 17 March 2020.

[9] Results for the low-impact and high-impact scenarios are reported in the Appendix, Figures A1-A2.

Figure 6: Employment effects by macro-sectors, baseline scenario.



The detailed employment effects predicted by our IO model by industry are reported in Table 1. Note that the estimated effects differ sometimes significantly from the input values obtained from the scenario analysis. For instance, final household demand for industry 39 - Telecommunication services was projected to go up 20% in the consensus analysis, but overall output and employment is estimated to go down 9% from our IO model. This is because of inter-industry linkages in the supply and demand of intermediate inputs.

[insert Table 1 here]

Interestingly, if we shut down supply constraints we obtain a modified Baseline scenario where the contraction in employment is reduced to 5.5 million jobs, or 16.9% of the total. Supply side constraints therefore amount to one quarter only of the total macroeconomic effect.

5. Summary and conclusions

In this paper we produced new estimates of the employment effects of the Covid-19 lock-down, based on a novel dynamic input-output model for the UK, parameterised with inputs from an ad-hoc survey involving over 250 UK-based economists. Based on median values of the responses, we estimated that almost one quarter of all UK jobs are at risk, for the duration of the lock-down, with losses of up to 80% of jobs in some sectors, notably Accommodation and Food services. The next phase of our research is to compute the effects of such a drastic reduction in economic activity on household disposable income, using a detailed tax-benefit model for the UK.

Table 1: Estimated employment effects in the Baseline, High-impact and Low-impact scenarios.

			Change in Employment (%)		
			Baseline	High-impact	Low-impact
	Industry		median	p25	p75
1	A	Products of agriculture, hunting and related services	-9	-24	-2
2	A	Products of forestry, logging and related services	-43	-65	-19
3	A	Fish and other fishing products; aquaculture products; support services to fishing	-13	-26	-2
4	BDE	Mining and quarrying	-37	-57	-19
5	C	Food products, beverages and tobacco products	-17	-30	-5
6	C	Textiles, wearing apparel and leather products	-34	-50	-17
7	C	Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials	-28	-46	-8
8	C	Paper and paper products	-23	-44	-2
9	C	Printing and recording services	-41	-58	-25
10	C	Coke and refined petroleum products	-27	-45	-11
11	C	Chemicals and chemical products	-22	-37	-4
12	C	Basic pharmaceutical products and pharmaceutical preparations	-12	-30	-2
13	C	Rubber and plastics products	-32	-51	-14
14	C	Other non-metallic mineral products	-26	-47	-3
15	C	Basic metals	-41	-61	-20
16	C	Fabricated metal products, except machinery and equipment	-33	-52	-15
17	C	Computer, electronic and optical products	-15	-35	-1
18	C	Electrical equipment	-27	-45	-8
19	C	Machinery and equipment n.e.c.	-41	-56	-28
20	C	Motor vehicles, trailers and semi-trailers	-53	-79	-31
21	C	Other transport equipment	-30	-48	-12
22	C	Furniture; other manufactured goods	-40	-65	-16
23	C	Repair and installation services of machinery and equipment	-17	-37	0
24	BDE	Electricity, gas, steam and air-conditioning	-18	-39	0
25	BDE	Natural water; water treatment and supply services	-16	-34	-1
26	BDE	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services	-16	-35	-2
27	F	Constructions and construction works	-21	-42	0
28	G	Wholesale and retail trade and repair services of motor vehicles and motorcycles	-44	-72	-23
29	G	Wholesale trade services, except of motor vehicles and motorcycles	-13	-34	-1
30	G	Retail trade services, except of motor vehicles and motorcycles	-22	-43	-9
31	H	Land transport services and transport services via pipelines	-34	-59	-12
32	H	Water transport services	-49	-64	-30
33	H	Air transport services	-89	-96	-74
34	H	Warehousing and support services for transportation	-39	-60	-23
35	H	Postal and courier services	-10	-22	-4
36	I	Accommodation and food services	-82	-94	-51
37	J	Publishing services	-15	-41	0
38	J	Motion picture, video and television programme production services, sound recording and music publishing; programming and broadcasting services	-26	-40	-21
39	J	Telecommunications services	-9	-27	-1
40	J	Computer programming, consultancy and related services; information services	-8	-25	-1
41	K	Financial services, except insurance and pension funding	-11	-26	-8
42	K	Insurance, reinsurance and pension funding services, except compulsory social security	-12	-26	-9
43	K	Services auxiliary to financial services and insurance services	-9	-22	-4
44	L	Real estate services excluding imputed rents	-10	-27	0
45	L	Imputed rents of owner-occupied dwellings	-8	-25	0
46	M	Legal and accounting services; services of head offices; management consulting services	-13	-28	-6
47	M	Architectural and engineering services; technical testing and analysis services	-24	-40	-18
48	M	Scientific research and development services	-3	-18	0
49	M	Advertising and market research services	-14	-30	-6
50	M	Other professional, scientific and technical services; veterinary services	-10	-27	-2
51	N	Rental and leasing services	-12	-31	0
52	N	Employment services	-12	-31	-3
53	N	Travel agency, tour operator and other reservation services and related services	-92	-92	-92
54	N	Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services	-12	-29	-3
55	O	Public administration and defence services; compulsory social security services	-14	-32	-2
56	P	Education services	-15	-35	-7
57	Q	Human health services	-11	-29	-2
58	Q	Social work services	-11	-32	-3
59	RST	Creative, arts and entertainment services; library, archive, museum and other cultural services; gambling and betting services	-23	-54	-2
60	RST	Sporting services and amusement and recreation services	-63	-86	-34
61	RST	Services furnished by membership organisations	-10	-33	-4
62	RST	Repair services of computers and personal and household goods	-20	-42	-16
63	RST	Other personal services	-11	-34	-6
64	RST	Services of households as employers; undifferentiated goods and services produced by households for own use	-20	-50	0
		Total	**-22.3**	**-41.0**	**-9.2**

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Appendix: Additional tables and figures

Table A1: Descriptive statistics for Question 1 of the questionnaire: Impact of lock-down on household final demand.

	variable	median	mean	sd	min	max	pct_25	pct_75
F1	Food and beverages	10	8.05	28.2	-82	100	-8	22
F2	Electricity, water, sewage	14	15.5	20.4	-43	100	0	23
F3	Textiles, wearing apparel and leather products	-38	-37.38	24.8	-100	48	-52	-19
F4	Furniture	-40	-39.72	34.4	-100	61	-71	-10
F5	Motor vehicles	-51	-50.86	31.6	-100	78	-80	-28
F6	Computer, electronic and optical products	6	3.71	29.7	-100	90	-10	20
F7	Wholesale and retailing	-13	-18.89	28.3	-100	71	-36	0
F8	Hotels, restaurants, pubs, etc.	-85	-73.68	29.1	-100	76	-95	-60
F9	Air transport	-85	-75.4	28.2	-100	77	-95	-66
F10	Public transport	-55	-53.11	30.5	-100	79	-77	-30
F11	Telecommunication services	20	23.35	27.3	-100	100	10	39
F12	Postal and courier services	19	17.57	26	-100	100	1	31
F13	Financial, insurance and legal services	0	-4.3	25.5	-100	95	-15	5
F14	Rents	-3	-8.37	17.8	-100	78	-15	0
F15	Other real estate services	-19	-24.84	30.3	-100	99	-41	0
F16	Compulsory education	0	-15.84	31.2	-100	88	-21	0
F17	Non-compulsory education	-19	-21.17	32.2	-100	87	-40	0
F18	Public health services	10	15.53	31.9	-73	100	0	32
F19	Private health services	6	4.2	30.3	-88	100	-10	20
F20	Services of households as employers	-20	-25.86	33	-100	76	-50	0
F21	Arts and culture (both live and digital)	-20	-22.16	37.5	-100	84	-50	0
F22	Sports	-55	-50.53	37.9	-100	65	-83	-20
F23	Other services	-5	-17.85	25.3	-100	76	-30	0

Table A2: Descriptive statistics for Question 2 of the questionnaire: Impact of lock-down on export demand.

	variable	median	mean	sd	min	max	pct_25	pct_75
X1	Coke and refined petroleum products	-20	-23.46	28.4	-92	76	-40	0
X2	Chemicals and chemical products	-15	-14.04	26.7	-85	100	-30	0
X3	Basic pharmaceutical products and pharmaceutical preparations	10	11.65	25.7	-85	85	0	24.5
X4	Other manufacturing	-21	-23.87	23.4	-89	79	-39.5	-8
X5	Constructions and construction works	-22	-27.15	25.3	-91	80	-41	-10
X6	Mining and quarrying	-20	-25.17	26.7	-100	74	-40	-5
X7	Land and water transport	-24	-26.36	28.9	-95	76	-41	-2.5
X8	Advertising	-10	-14.76	27.2	-100	76	-30	0
X9	Other professional, scientific and technical services	-8	-6.98	25.2	-73	88	-22	0
X10	Scientific research and development	0	3.38	25.6	-70	100	-10	13.5
X11	Public administration	0	-1.04	23.1	-70	76	-11.5	10.5

Table A3: Descriptive statistics for Question 3 of the questionnaire: Impact of lock-down on supply of intermediate inputs.

	variable	median	mean	sd	min	max	pct_25	pct_75
Z1	Coke and refined petroleum products	-24	-27.072	25.1	-100	76	-40	-10
Z2	Chemicals and chemical products	-18	-17.808	24.6	-93	89	-33	0
Z3	Basic pharmaceutical products and pharmaceutical preparations	0	0.899	30.2	-99	85	-13.2	18
Z4	Other manufacturing	-20	-24.351	25.4	-100	80	-41	0
Z5	Constructions and construction works	-20	-25.192	26.8	-100	81	-41.2	0
Z6	Mining and quarrying	-20	-24.178	26.2	-100	98	-41.2	0
Z7	Land and water transport	-18	-24.87	30	-100	78	-44	0
Z8	Advertising	-10	-15.942	26.2	-100	81	-30.2	0
Z9	Other professional, scientific and technical services	-6.5	-9.37	26	-92	91	-24.2	0
Z10	Scientific research and development	0	-0.577	25	-99	86	-13.2	11
Z11	Public administration	0	-5.303	22.2	-100	79	-10	0

Table A4: Mapping from results of the consensus analysis to parameters used for the macro model.

	Industry		Direct Multiplier of Lockdown on Final Consumption (Exports ecluded)	Direct Multiplier of Lockdown on Exports	Direct Multiplier of Lockdown on Supply of Intermediate Inputs
1	A	Products of agriculture, hunting and related services	F1	F1	F1
2	A	Products of forestry, logging and related services	Z4	X4	Z4
3	A	Fish and other fishing products; aquaculture products; support services to fishing	F1	F1	F1
4	BDE	Mining and quarrying	Z6	X6	Z6
5	C	Food products, beverages and tobacco products	F1	F1	F1
6	C	Textiles, wearing apparel and leather products	F3	X4	Z4
7	C	Wood and of products of wood and cork, except furniture; articles of straw and plaiting materials	Z4	X4	Z4
8	C	Paper and paper products	Z4	X4	Z4
9	C	Printing and recording services	Z4	X4	Z4
10	C	Coke and refined petroleum products	Z1	X1	Z1
11	C	Chemicals and chemical products	Z2	X2	Z2
12	C	Basic pharmaceutical products and pharmaceutical preparations	Z3	X3	Z3
13	C	Rubber and plastics products	Z4	X4	Z4
14	C	Other non-metallic mineral products	Z4	X4	Z4
15	C	Basic metals	Z4	X4	Z4
16	C	Fabricated metal products, except machinery and equipment	Z4	X4	Z4
17	C	Computer, electronic and optical products	F6	F6	Z4
18	C	Electrical equipment	Z4	X4	Z4
19	C	Machinery and equipment n.e.c.	Z4	X4	Z4
20	C	Motor vehicles, trailers and semi-trailers	F5	F5	Z4
21	C	Other transport equipment	Z4	Z4	Z4
22	C	Furniture; other manufactured goods	F4	F4	Z4
23	C	Repair and installation services of machinery and equipment	Z4	X4	Z4
24	BDE	Electricity, gas, steam and air-conditioning	F2	X6	Z6
25	BDE	Natural water; water treatment and supply services	F2	X6	Z6
26	BDE	Sewerage; waste collection, treatment and disposal activities; materials recovery; remediation activities and other waste management services	F2	Z4	Z4
27	F	Constructions and construction works	Z5	X5	Z5
28	G	Wholesale and retail trade and repair services of motor vehicles and motorcycles	F5	F7	F7
29	G	Wholesale trade services, except of motor vehicles and motorcycles	F7	F7	F7
30	G	Retail trade services, except of motor vehicles and motorcycles	F7	F7	F7
31	H	Land transport services and transport services via pipelines	F10	X7	Z7
32	H	Water transport services	F9	X7	Z7
33	H	Air transport services	F9	F9	F9
34	H	Warehousing and support services for transportation	Z7	X7	Z7
35	H	Postal and courier services	F12	F12	F12
36	I	Accommodation and food services	F8	F8	F8
37	J	Publishing services	F21	X9	Z9
38	J	Motion picture, video and television programme production services, sound recording and music publishing; programming and broadcasting services	Z9	X9	Z9
39	J	Telecommunications services	F11	F11	F11
40	J	Computer programming, consultancy and related services; information services	Z9	X9	Z9
41	K	Financial services, except insurance and pension funding	F13	F13	F13
42	K	Insurance, reinsurance and pension funding services, except compulsory social	F13	F13	F13
43	K	Services auxiliary to financial services and insurance services	F13	F13	F13
44	L	Real estate services excluding imputed rents	(F14+F15/2)	(F14+F15/2)	(F14+F15/2)
45	L	Imputed rents of owner-occupied dwellings			
46	M	Legal and accounting services; services of head offices; management consulting	F13	F13	F13
47	M	Architectural and engineering services; technical testing and analysis services	F23	X9	Z9
48	M	Scientific research and development services	Z10	X10	Z10
49	M	Advertising and market research services	Z8	X8	Z8
50	M	Other professional, scientific and technical services; veterinary services	Z9	X9	Z9
51	N	Rental and leasing services	Z9	X9	Z9
52	N	Employment services	Z9	X9	Z9
53	N	Travel agency, tour operator and other reservation services and related services			
54	N	Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services	Z9	X9	Z9
55	O	Public administration and defence services; compulsory social security services	Z11	X11	Z11
56	P	Education services	(F16+F17)/2	(F16+F17)/2	(F16+F17)/2
57	Q	Human health services	(F18+F19)/2	(F18+F19)/2	(F18+F19)/2
58	Q	Social work services	F23	F23	F23
59	RST	Creative, arts and entertainment services; library, archive, museum and other cultural services; gambling and betting services	F21	F21	F21
60	RST	Sporting services and amusement and recreation services	F22	F22	F22
61	RST	Services furnished by membership organisations	F23	F23	F23
62	RST	Repair services of computers and personal and household goods	F23	F23	F23
63	RST	Other personal services	F23	F23	F23
64	RST	Services of households as employers; undifferentiated goods and services produced by households for own use	F20	F20	F20

Note: Values referred to as per Tables A1-A3.

Figure A1: Employment effects by macro-sectors, High-impact scenario.

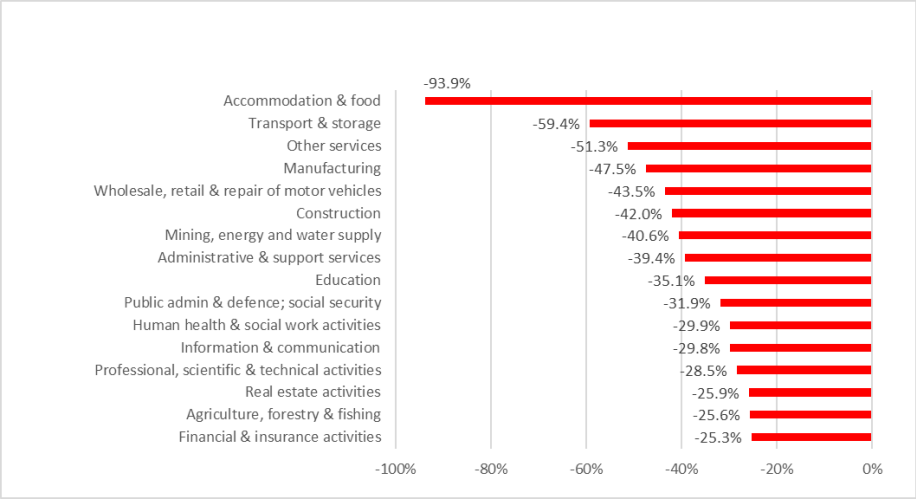

Figure A2: Employment effects by macro-sectors, Low-impact scenario.