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David Baqaee and Ben Moll on What if Germany is cut off from Russian oil and gas?

April 7, 2022

Webinar Transcript

Transcript:

Markus Brunnermeier: Welcome back everybody for another webinar organized for Princeton for everyone worldwide, we are happy to have David Baqaee and Ben Moll with us, hi David, hi Ben. David and Ben will present some work they did, together with many others from Germany titled "What if Germany is cut off from Russian oil and gas?" and studying essentially implications on the German economy. So we all talked about sanctions, we are all worried about the situation in Ukraine and let's think more deeply, how this will impact the German economy if there's a cutoff of Russian energy. I've listed here the names of the authors to give credit to all of them, and David and Ben are here for them. And what they point out correctly, is that coal, oil and natural gas are very different animals because coal and oil can be created on the world market, so what you do is just substitute with other suppliers and it also has a different implications for Russia. Russia can just sell to other customers, so if China and India are willing to buy the oil from Russia, then it's not too big, not too costly for them, and it's also not too costly for the West to impose the sanctions. The situation is very different for gas, because it's more local, it's more regional and depends on pipelines, so you have to find some different energy sources, so you can't just substitute with different suppliers and you need terminals, to get liquefied natural gas into the right place. So it's a more difficult situation so the situation depends very much on what source of energy it is. But essentially when you have a low cost of sanctions, there's also low effectiveness, because the other party can get around it. If there are high costs, then there might also be a higher effectiveness. Now the big question among the others is should we do it, or should we not do it, what are the implications, but there's also a dynamic dimension to it. Do you want to have some so-called blitz sanctions, so you just go "cold turkey" right away? Would be very harsh, that will be most effective as Russia cannot adjust, but it will also be most costly for the West, as the West cannot adjust. And essentially it's most effective because Russia cannot redirect all the supply to other countries and it might lead to a quick military withdrawal if one hits very quickly, very hard. That's one interpretation but it might also mean if it doesn't work, then it means, in the long run, the sanctions might be less sustainable, and the question is, do you want to build up some reserves to sustain sanctions in the long run? And you might be worried, you know if Trump is elected in 2024 and is less interested in NATO, wars typically can last decades on, that's essentially you know something to think about as well. So there's some trade offs here to consider, and it's not obvious, but of course it goes beyond economics, to make a judgment call on that. Now generally in economics, we can think of two studies. The first one is a macroeconomic approach where you really try to estimate the substitutability across sectors and how easily you can free yourself

from natural gas in particular and replace it with other energies and also replace the products which are very gas dependent with other products. An alternative approach is a much more detailed approach, where you look at the physics directly, you know, look at the gas pipelines, how it's transported from one spot to another spot, can you bring it there or not. It matters how the gas pressure is in the pipelines, if the pressure drops too much, it might not work anymore. So you'll have a much more physical detail approach and next week, we will do and doing these details with Elena Ribakova who is actually an expert on sanctions, has studied sanctions for many, many years and will go also into the financial sanctions, so we will have more than next week on this as well.

4:27

Markus Brunnermeier: Today, we will focus on the macro approach, but of course we have to keep in mind that there might be unintended consequences. I was told that the Ukrainian diesel for the Ukrainian military comes mostly from Poland, while Poland's oil to make diesel comes from Russia, so essentially if you cut off the Russian oil into Poland, it might be harder to supply the diesel for the Ukrainian military. So there are a lot of details which need to be figured out, but I think today's approach, we will do a lot on sustainability, so let me just bring everybody on board just highlighting a few simple points before we give the floor to Ben and to David. So here what I have, I have on the X axis how much gas you have to use to produce something, and you can substitute it for some other input. And I have drawn an isoquant which essentially says, if you want to produce the same amount, that's how much we can move things around, how much you can substitute. If you move along this white line, you cut back on the gas input, you have to increase the alternative substitutes by this amount. So that's essentially, given this production, which has been presented by this isoquant, you can see that the reduction in gas in order to compensate for this doesn't get the same output, you have to increase some other input by this amount. Now, if you have a different production technology, represented by this green isoquant, which is more curved, then if you cut back the gas input by the same amount, you have to input much more of the substitute than compared to the blue one, so the green one has lower substitutability compared to the blue one. And, of course, you can go very extreme and the very extreme version is when you have what we refer to as Leontief production functions, then you have actually a kink here. So it's like, if you want to cut back on gas, you can't do it at all, because you need an infinite amount of substitute, and this way you cannot really substitute it as a way at all. Now my first comment is that when we estimate this elasticity of substitution, so how much substitutability do we have, how curved are the isoquants, how much do we need to replace them, like what we had in this blue one, we might be in a situation where the situation is curved. Slightly curved around the point we are but at some point, it becomes very steep. So the estimate, the local estimate might not be a good guidance of what happens off the big shock or to put it differently, there are nonlinearities in the elasticity, so that's depicted here on this green line/isoquant. So it's very normal around the point where we are, but if you move further away, it becomes like a Leontief, very steep. And so, then it becomes very different, so it's very difficult to figure out when you make your local estimates, how they will hold for global large shocks. And that might lead to some non resilience in substitutability. Whereas more, there is some resilience, there is some substitutability there, but if it goes too far, it might not work anymore. So to go back to some earlier webinar, we had Jim Hamilton. One way to test for that is to use this method on the 1973 oil shock from OPEC. So just to give you some comparisons, the current world supply for oil, not for gas, just simply for oil coming from Russia is 13% and if we shut it down, all the certain percent have gone if they're not substituted away, you know, moved to China. If they move to China, then it's not. It's a wash, that doesn't change anything, so rather than going to the West, that goes to China, and in the end it's not costly for Russia. It doesn't benefit anybody, perhaps China getting cheaper oil. But essentially if you shut it off worldwide, this would be a deduction by 13%. The OPEC shock was an oil supply detection by 7% and

that's the slide I took from Jim Hamilton's presentation, where he shows in 1973 how the oil production went down, at the maximum drawdown was about 7%, so it will be interesting to see how things moved at that time, how the estimates would work at that time, because we know how the economy reacted if we just do a counterfactual at that time. And I would argue, now in 2022 we are much less oil dependent than they were in the early 70s, but we could also put the counterargument forward that we have only squeezed out in the last efficiency unit of oil or any gas and other things so to get an extra efficiency unit out, it will be much more complicated, in this sense.

9:25

Markus Brunnermeier: Now these elasticities are interesting, the question is how do they aggregate and you have a simple example just to show some complications which emerge so here is production. There's an upstream firm and there's another upstream firm and then there's a downstream firm taking as inputs the outputs from the two upstream firms and then producing an output. So in the simple example, what I did is I just assumed there are Leontief production functions upstream in both companies so that's x , and there's no substitutability in gas other input X and there's no substitutability between the input y and the gas in this other sector. So you can't substitute it all but you know the firm downstream can substitute between this firm and that firm's input, so the output of this firm is an input for this downstream for them and the output of this firm is an input for the downstream from as well, so here, I assume there substitutability at the downstream firm. Now if there's Leontief up there, and if it's 50/50, let's say for simplicity, but then actually serviceability doesn't help much, so you also get overall the aggregate elasticity of substitution is also Leontief so also there's no substitutability. On the other hand, if you know, there are 60/40 here and there's 50/50 over there, but then actually you can shift across the two inputs and this way you get substitutability in the aggregate, so it's very subtle how they have substitutability aggregates over time. The other thing I would like to emphasize is if you cannot move gas from this company and that location to that location, then it's actually more problematic as well. So one has to take this transportability of the gas into account as well. Finally, I would like to make a quick point about the production chains, so we already had a very short production chain, but we can have a longer production chain. Here is like a long production chain, and if you have an O-ring theory and if something goes wrong, the whole chain goes down, so if there's a shock at the top of the chain, then the whole thing might be going down that's, the question is when we compared to the Covid crisis, the shock was at the final sector, facing the consumer. In energy it's much more upstream, but it's not clear at all whether that's a drawback or an advantage, so, in a sense, it's a drawback because if you have an o-ring, no substitutability up there, and the concept to do much at all, it a little bit of a disruption kills the whole chain and makes the whole chain go away, it has much bigger amplification effects.

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00:19:07.080 --> 00:19:13.590

Markus Brunnermeier: On the other hand, if there is some stability at each stage of this chain, so you can also substitute at each.

68

00:19:14.430 --> 00:19:25.950

Markus Brunnermeier: stage of this chain as well, and then it plays out very difficult, so you can see it's very subtle how the sub stability aggregate over time and the David, of course, is an expert on this demand.

69

00:19:27.690 --> 00:19:34.560

Markus Brunnermeier: Now, finally, I would like to say something about financial frictions and how financial fictions add to the complications even further.

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00:19:34.950 --> 00:19:48.390

Markus Brunnermeier: So you might have some adjustment fictions and ideally company should actually scale back because it uses so much gas and company B should scale up because it uses some renewable energies and should actually scale up its production.

71

00:19:49.290 --> 00:19:56.970

Markus Brunnermeier: But because of financial fictions company be can't get financing so it's not so easy to get the finance, as they have to collab Palo Alto.

72

00:19:57.270 --> 00:20:08.220

Markus Brunnermeier: While company because of this high gas prices will actually go bankrupt, so I know ideal world without financial frictions company would just scale back and company B would scale up.

73

00:20:08.520 --> 00:20:20.700

Markus Brunnermeier: But what will have with financial fictions potentially scaffold a will go bankrupt scales back of course dramatically and company B cannot scale up because it has financial fiction, so an aggregated might be much was.

74

00:20:22.170 --> 00:20:29.490

Markus Brunnermeier: Now let me go to the poll questions Ben and David have put forward, and these are the questions they were asking you.

75

00:20:30.330 --> 00:20:36.240

Markus Brunnermeier: And the first question was following an input stop of crashing energy so everything.

76

00:20:36.750 --> 00:20:50.790

Markus Brunnermeier: coal, oil and gas everything together how much will the German GDP decline, but relative to not doing anything just leaving the economy running as it is now or was before any sanctions were imposed and the answers were.

77

00:20:53.490 --> 00:21:03.690

Markus Brunnermeier: So less than 1% is 7% let me go to the other extreme, more than 10% thought 10% people thought more than 10% the economy will tank.

78

00:21:04.440 --> 00:21:10.620

Markus Brunnermeier: We forgot to put the five to 7% and so i'm not saying anything but 123 percent was 36%.

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00:21:11.220 --> 00:21:20.430

Markus Brunnermeier: Three to 5% was 47% So you can see, most people think it's in the range between one and five or perhaps about five.

80

00:21:21.000 --> 00:21:29.610

Markus Brunnermeier: And 10% all it's about 10% in terms of GDP now if we do, alternatively, we impose some 40% tariff on the national energy.

81

00:21:30.180 --> 00:21:40.530

Markus Brunnermeier: And how the same question again just instead of total ban cold Turkey let's do a tariff like what color houseman proposed and we covered this earlier in the gym hammered.

82

00:21:41.490 --> 00:22:02.130

Markus Brunnermeier: A webinar, then the answers were the different and the answers going to the same numbers were 27% said, less than 1% so it's way more moderate 41% thought 123 percent 30% thought three to 5% and 11% thought five to 10%.

83

00:22:03.180 --> 00:22:03.570

Markus Brunnermeier: and

84

00:22:05.190 --> 00:22:23.880

Markus Brunnermeier: More than 10% essentially only one person asked on that, so it was very, very unlikely that who would tank the economy more than 10% Finally, the final question was about implications of doing a cold Turkey cut off of all energy supplies from Russia.

85

00:22:25.770 --> 00:22:43.440

Markus Brunnermeier: What are the implications on inflation less than 2% that's what 26% thought two to 4% that's 53% of big maturities or two to 4% extra percentage points on top of the inflation, we have, and more than 6% that's what 20% thought this way.

86

00:22:45.030 --> 00:23:00.600

Markus Brunnermeier: So I live with that and I pass on the floor to Ben and to David and there will present the results to us and we will have questions during the presentation thanks again to David and Ben and we're looking forward to the presentation.

87

00:23:02.490 --> 00:23:10.110

Ben Moll: Great Thank you so much Marcus for having us thanks everyone so much for coming really exciting to be here.

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00:23:10.890 --> 00:23:19.080

Ben Moll: So i'll do the first part and David will do the middle end up with a conclusion so we'll switch back and forth a bit so as Marcus already said, this is a.

89

00:23:19.500 --> 00:23:30.600

Ben Moll: joint work with a large team of sort of cutting across different sub fields and economics that's why so many people in the sense Okay, so you know what are the objectives of this paper.

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00:23:31.830 --> 00:23:39.780

Ben Moll: I mean Marcus has already said, a lot of this, but essentially our goal was just to assess the economic consequences for Germany have a cut off from.

91

00:23:40.380 --> 00:23:46.290

Ben Moll: Russian energy imports and there's sort of two reasons why you think that may be important The first one is.

92

00:23:47.220 --> 00:24:00.030

Ben Moll: Either Germany or the you may implement an embargo, you know from our side, or I guess the other reason why it's important is you know it's conceivable that Putin will sort of switch off the gas tap.

93

00:24:00.510 --> 00:24:11.880

Ben Moll: from his side and our goal here was sort of to provide a worst case assessment of some extreme assessment of a cold Turkey complete import stop.

94

00:24:12.330 --> 00:24:25.230

Ben Moll: And you know i'll come back to this is not because we think, for example, a full embargo is necessarily the best thing to do it sort of the idea was to maybe bound other scenarios for example you'd think that maybe with a tariff.

95

00:24:26.310 --> 00:24:37.680

Ben Moll: That would be bounded above by the sort of cold Turkey input stop and the other reason is that you know less extreme policies like attire have made and still trigger a full stop.

96

00:24:38.130 --> 00:24:46.740

Ben Moll: from the Russian side Okay, the basic you know philosophy here was we wanted to get a sense of the RAF magnitudes of economic losses.

97

00:24:48.120 --> 00:24:57.270

Ben Moll: from doing such from having such such an input stop relative to do nothing baseline and I guess here's some possibilities, this is sort of similar bits to the.

98

00:24:57.600 --> 00:25:05.370

Ben Moll: To the poll that we had so you may think, maybe there's small the small GDP decline says your point five to 1%.

99

00:25:06.060 --> 00:25:12.000

Ben Moll: relative to baseline Given this, you know growth in the baseline you could imagine, maybe not even a recession.

100

00:25:12.690 --> 00:25:18.630

Ben Moll: Maybe you think it's going to be like the covert recession that size of magnitude in Germany, it was a four and a half percentage point.

101

00:25:19.080 --> 00:25:27.510

Ben Moll: GDP decline, maybe you think it's like Spain or Portugal, during the euro crisis we I looked this up it's like five and 7% GDP loss.

102

00:25:27.960 --> 00:25:37.650

Ben Moll: And then the other scenario that could potentially be the case, could be something like mass unemployment and poverty which, for example in Germany, some politicians have used these words.

103

00:25:38.160 --> 00:25:47.280

Ben Moll: on TV to you know one about an import stop, which to me at least sounds something like the Great Depression and definitely a GDP loss of more than 10%.

104

00:25:47.550 --> 00:26:02.370

Ben Moll: Okay, so those are kind of Europe we just wanted to have a sense of where are we going to be in there okay here are the possibilities again our headline numbers in the paper are essentially GDP decline between half a percentage point in the most optimistic scenario.

105

00:26:03.390 --> 00:26:10.050

Ben Moll: And three percentage points okay so takeaways here that we want to make is essentially an import stop.

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00:26:10.500 --> 00:26:18.420

Ben Moll: will be likely somewhat less severe than a covert recession, which you know would be four and a half percentage points and then.

107

00:26:19.260 --> 00:26:23.490

Ben Moll: You know, we don't want to say you, we should be doing so, we should not be doing this.

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00:26:24.240 --> 00:26:33.540

Ben Moll: But we want to make the point that, in principle, we think, Germany is a rich country with a moderate debt to GDP ratio of something like 71%.

109

00:26:34.320 --> 00:26:45.480

Ben Moll: You know there's physical capacity, so you can potentially you know, do something there and provide insurance and socialize the cost, we did the same thing during Corbett.

110

00:26:46.440 --> 00:27:02.070

Ben Moll: Okay um here's something that's we're not going to cover in the paper that we wrote but i'll talk about a little bit at the end, which is the effects of an important stop on inflation Okay, just to you know manage expectations of it.

111

00:27:03.270 --> 00:27:09.180

Ben Moll: Okay, just to come back to this, I guess, to relate to the Pole, so I guess relative to the pole we're.

112

00:27:09.750 --> 00:27:23.010

Ben Moll: sort of a little bit lower than the average Pole respondent so I guess it's good that i'm presenting this we have some work to do to convince everyone that essentially you know we're sort of in the more in the lower part of that.

113

00:27:24.540 --> 00:27:37.620

Ben Moll: range of estimates that people gave and definitely to people who said more than 10 percentage points we want to argue it's very hard to make that case okay so here's just the graph to show you.

114

00:27:38.700 --> 00:27:46.890

Ben Moll: mark is already I think sort of had it German primary energy usage, this is table one in the paper, these are the main sort of.

115

00:27:47.610 --> 00:27:57.150

Ben Moll: Energy Sources up there in particular fossil fuels, oil, gas and coal and then these other energy sources, this isn't terrible hours and then essentially.

116

00:27:57.750 --> 00:28:07.380

Ben Moll: The, the main thing to look at is how much of that energy comes from Russia Okay, and you can see, especially for oil, gas and coal, these are large numbers.

117

00:28:07.830 --> 00:28:17.370

Ben Moll: In particular, for gas here you have a whopping 55% of all gas in Germany, come from Russia, so you know you can see why people are scared to certain extent.

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00:28:18.420 --> 00:28:24.150

Ben Moll: As Marcus has already said sort of our argument is that to a certain extent.

119

00:28:25.470 --> 00:28:31.470

Ben Moll: Gas is really the bottleneck to tricky one and oil and coal or maybe not so problematic.

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00:28:31.980 --> 00:28:42.270

Ben Moll: The argument is that oil and coal have a global market, and Germany has strategic reserves also oil and coal, you can you know put on a ship and move around much easier.

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00:28:42.510 --> 00:28:49.050

Ben Moll: Gas and contrast is really very much tied to the existing pipeline network and liquefied natural gas.

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00:28:49.980 --> 00:28:58.830

Ben Moll: supplies in the world as a whole or just kind of small and you cannot really substitute this too much as a result we're going to focus here really for the paper.

123

00:28:59.580 --> 00:29:09.150

Ben Moll: almost exclusively exclusively on gas again because in Germany at least that's sort of the big elephant in the room, as you know how What would you do about gas.

124

00:29:10.140 --> 00:29:24.090

Markus Brunnermeier: So Ben can ask you there's a question by moving our he would like to know whether your analysis also applies to other European countries like Australia and also to you, East European countries particular Central European countries as well.

125

00:29:24.180 --> 00:29:27.060

Markus Brunnermeier: and other special effects from a German economy to let's look so.

126

00:29:27.750 --> 00:29:38.130

Ben Moll: Great question and we have a slide on this at the very end, we in fact did some analysis exactly for the EU as a whole, we wrote a paper.

127

00:29:38.910 --> 00:29:53.850

Ben Moll: For the French Council of economic advisers with chameleon day and my town where we did some sort of exercise exactly for the US also let me, you know bank, the question and revisit later, but so your brief answer yes in principle.

128

00:29:54.390 --> 00:30:01.290

Ben Moll: Yes, some such analysis also applies to you as a whole, and these other countries okay.

129

00:30:02.460 --> 00:30:08.100

Ben Moll: So um so I said 55% of all gas comes from Russia.

130

00:30:08.430 --> 00:30:22.320

Ben Moll: And you know what's the size of the gas shark we want to think about so we want to say okay you do lose 55% of this gas, but you know some of this, you can substitute in some way or another Okay, and here we are relying on our.

131

00:30:23.100 --> 00:30:29.790

Ben Moll: Friends, the energy economist on the team and there's some very nice work by the people at Google on this.

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00:30:30.690 --> 00:30:46.200

Ben Moll: um it's important Marcus said already, a little bit to think about time horizons, so I should have maybe already even said this earlier so for for most of our exercises we're going to want to think of the relevant time horizon essentially roughly until the next winter.

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00:30:47.340 --> 00:30:56.430

Ben Moll: Why is that well that's because there's a lot of seasonality and gas demand certain particular gas demand is much, much higher in the winter, when you know households in particular.

134

00:30:56.760 --> 00:31:05.220

Ben Moll: And also farms use it to heat a lot, and so we already know basically that we're probably going to be fine over the summer.

135

00:31:05.730 --> 00:31:13.380

Ben Moll: So the question will be some you know how much extra gas will we be able to get roughly until next winter and also.

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00:31:14.130 --> 00:31:22.080

Ben Moll: You know, then going forward when we think about substitutability along the production chain, how much can you do there in terms of that type of substitution.

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00:31:22.590 --> 00:31:29.700

Ben Moll: until the next winter so we're talking a time horizons, you know, nine months, seven, eight months definitely less than a year.

138

00:31:30.600 --> 00:31:40.110

Ben Moll: And the idea is you know some of these 55% here, you can replace with import from other countries, in particular, say Norway or the Netherlands.

139

00:31:41.100 --> 00:31:59.640

Ben Moll: Some of these 55% are also used in electricity generation and from you know what i've been told you can essentially substitute that gas it's using electricity generation with other energy sources, so you can burn other things so in particular lignite say.

140

00:32:02.040 --> 00:32:13.890

Ben Moll: When our energy economist TEAM members counted up these numbers and relied on some estimates and literature, the number they came up with is essentially to you, while you lose 55% of the gas.

141

00:32:14.190 --> 00:32:26.670

Ben Moll: You can import a substitute 25% so that in the end, gas shock is essentially 30% okay so for all the following analysis essentially what we're going to work with is.

142

00:32:27.420 --> 00:32:45.480

Ben Moll: The following energy shock here, which is 30% decline and gas or equivalent Lee if you, you know calculate that up to the total terror what hours generated by gas or coal it's going to be sort of an eight or maybe 10% drop in in total energy or fossil fuels that yes.

143

00:32:45.570 --> 00:32:54.600

Markus Brunnermeier: But just to clarify you assume that the three power plants which will still active until the end of the year will be extended or in your analysis or not.

144

00:32:55.110 --> 00:33:04.230

Ben Moll: I honestly forget the answer to this, I think so, but i'm not hundred percent sure this is a question for.

145

00:33:04.500 --> 00:33:14.610

Markus Brunnermeier: And then the sanctions you if you look at the sanctions if they have to go over the next winter, then the numbers will be much larger so it's only if the sanctions last during the summer Is this correct in your analysis.

146

00:33:15.450 --> 00:33:20.610

Ben Moll: No, no, no, no, no, no, no, the scenario we're always going to do is.

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00:33:21.780 --> 00:33:24.180

Ben Moll: You put the sanctions now and you put them in place forever.

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00:33:24.510 --> 00:33:25.500

Markus Brunnermeier: forever okay.

149

00:33:25.590 --> 00:33:27.540

Ben Moll: And then, what forever and then.

150

00:33:28.020 --> 00:33:28.830

Markus Brunnermeier: Before long time.

151

00:33:28.920 --> 00:33:30.900

Ben Moll: yeah yeah and then it's a sort of.

152

00:33:31.920 --> 00:33:39.540

Ben Moll: The numbers i'm going to say, like our GDP loss say in the first year and then I guess in the second year, you would get another.

153

00:33:40.020 --> 00:33:50.820

Ben Moll: GDP loss right, but that in the second year you'd think that maybe the GDP loss will actually be less than in the first year, why because you know there's going to be more you know, adaptability and substitution as time progresses.

154

00:33:51.660 --> 00:33:55.980

Markus Brunnermeier: You said you're free until next window so so, but you go over the winter than or not.

155

00:33:57.120 --> 00:33:57.480

Markus Brunnermeier: you're not.

156

00:33:57.510 --> 00:34:03.330

Ben Moll: Sanctions are going to go over the winter yeah now, this is only sort of to say how much.

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00:34:04.350 --> 00:34:08.160

Ben Moll: Time do we, you know give ourselves here to.

158

00:34:08.490 --> 00:34:11.490

Markus Brunnermeier: You know, some take up for some of this 55% gas.

159

00:34:11.490 --> 00:34:12.000

Markus Brunnermeier: kalka.

160

00:34:12.570 --> 00:34:20.640

Ben Moll: The point here is that the seasonality works in our favor right if now we're in the middle of winter it'd be much harder.

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00:34:21.570 --> 00:34:29.490

Ben Moll: Why because gas demand would be high so that's kind of the point here, but yet the experiment is always put the sanctions in place now and keep them for a long time.

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00:34:30.060 --> 00:34:37.260

Ben Moll: it's not you know, putting them in place temporary okay thanks for clarifying okay so here's the plan for the remainder of the talk.

163

00:34:38.100 --> 00:34:41.700

Ben Moll: I wanted to give you some facts about German economy and its energy dependence.

164

00:34:42.180 --> 00:34:58.890

Ben Moll: And then sort of essentially starting from these facts we're going to map this sort of energy shock so minus 30% gas or eight or 10% total energy into some aggregate macroeconomic glasses so GDP or Gross National Income expenditure and there we're going to use the macro models.

165

00:34:59.940 --> 00:35:06.390

Ben Moll: there's going to be some different models we're going to use there's going to be a very simple model essentially just the production function.

166

00:35:07.020 --> 00:35:11.490

Ben Moll: This is going to serve to highlight the importance of substitutability marks already talked about this.

167

00:35:12.420 --> 00:35:19.380

Ben Moll: we're going to spend in this presentation quite a bit of time on something that we didn't spend too much time in the paper, but we think.

168

00:35:19.920 --> 00:35:27.780

Ben Moll: You know, we should maybe spend more time when we revise the paper which is David came up with this very nice sort of sufficient statistics formula.

169

00:35:28.050 --> 00:35:37.890

Ben Moll: For that you can use and Richard models, in particular with supply chains and international trade, maybe and that's based on this work with a manual farm.

170

00:35:38.700 --> 00:35:50.430

Ben Moll: And then we're going to show you some model simulations together with some back of the envelope calculations using these statistics, the sufficient statistics for these kind of models, where you have rich supply chains.

171

00:35:51.480 --> 00:35:56.250

Ben Moll: and international trades then there's going to be some more general stuff, for example.

172

00:35:56.970 --> 00:36:01.380

Ben Moll: You know just to discuss the discussion of mechanisms outside of the model and other studies.

173

00:36:01.740 --> 00:36:15.510

Ben Moll: And i'm going to come back to the question that was already asked you know what about other countries and then i'm going to discuss also a little bit this embargo versus tariff question okay so here's some facts about the German economy.

174

00:36:17.790 --> 00:36:27.180

Ben Moll: The first thing is are the first three bullet points here are just some numbers of you know how much of the total economic pie in Germany.

175

00:36:27.960 --> 00:36:43.170

Ben Moll: How much of these sort of payments, if you want go to these energy sources and the point is, you know the numbers aren't massive so you know total consumption of gas, oil and coal is something like 4% of Gross National news expenditure.

176

00:36:44.490 --> 00:36:46.950

Ben Moll: If you look at the importance of that that's less.

177

00:36:48.000 --> 00:37:04.080

Ben Moll: Why because, for example, some cool is produced domestically as well, and if you look just at gas where all of it is important and then it's essentially 1% of gross national expenditure goes to gas okay So these are not huge numbers.

178

00:37:04.440 --> 00:37:12.630

Markus Brunnermeier: Because numbers will not be fluctuating a lot, depending on the energy prices, now, did you use what numbers to the us from doing the cool.

179

00:37:13.050 --> 00:37:14.460

Ben Moll: For us, we that's.

180

00:37:14.520 --> 00:37:19.530

Ben Moll: that's a good question so we use the last number for a year for which there was data, which was.

181

00:37:21.000 --> 00:37:33.840

Ben Moll: I want to say 2020 or I think it was pretty cool but i'm not sure I should check this is a good point we can take some historical averages, maybe you know, rather than relying on one year thanks.

182

00:37:35.160 --> 00:37:38.400

Ben Moll: Okay, but you know it's not going to suddenly be 5% I think.

183

00:37:40.050 --> 00:37:54.900

Ben Moll: Okay here's some statistics on gas usage and across different sectors of the economy sort of households, industry so that's manufacturing and construction here services and electricity generation and so on.

184

00:37:55.440 --> 00:38:06.180

Ben Moll: And then i'm going to contrast this in a second with you know their economic importance in some sense, you can see, gases kind of equally distributed essentially across households.

185

00:38:07.140 --> 00:38:25.020

Ben Moll: industrial use and then everything else okay sort of one third one third one third, and a lot of it is in electricity generation okay it's interesting to contrast this just with how important you know dissenters are in employment and production.

186

00:38:26.160 --> 00:38:36.540

Ben Moll: And you get numbers like this here, and so one reason why I wanted to show this is, if you if you just look at sort of the total employment that's an industry in Germany.

187

00:38:37.500 --> 00:38:54.720

Ben Moll: You know that's 22% so that's obviously large, but you know it's not 50% and, in fact, even in Germany, which is sort of people have in mind is a very sort of industrial manufacturing intensive country way more people work in a service system so.

188

00:38:55.890 --> 00:39:02.100

Ben Moll: Similarly for gross value added, you know the number is a little bit higher but it's still sort of a quarter of the economy.

189

00:39:04.800 --> 00:39:11.640

Ben Moll: The numbers here, obviously in bullet points 123, as I said, are small and.

190

00:39:12.150 --> 00:39:18.900

Ben Moll: But you know you don't want to just conclude from that immediately that the aggregate GDP losses are going to be.

191

00:39:19.200 --> 00:39:29.220

Ben Moll: A small say and i'll come back to this point, why, because obviously energies are sort of a critical input in production, and so you there's lots of amplification mechanisms that could be important okay.

192

00:39:30.240 --> 00:39:36.060

Ben Moll: And why don't you show you one more table with data and then go on to the modeling.

193

00:39:37.500 --> 00:39:38.580

Ben Moll: And this is.

194

00:39:39.690 --> 00:39:55.170

Ben Moll: Some statistics of gas use and some other statistics across specific industries Okay, in particular, focus on the left hand side panel here for a moment and ignore what's on the right hand side here.

195

00:39:55.920 --> 00:40:04.710

Ben Moll: This is, you know the three sectors of the economy that we think would be hardest hit, in the case of an import shock.

196

00:40:06.480 --> 00:40:15.420

Ben Moll: These three sectors jointly makeup for 59% of all industrial gas use, which again was something like a third of total gas use.

197

00:40:17.430 --> 00:40:27.060

Ben Moll: The sectors are the chemicals industry that comes up a lot in the discussion it's the food processing industry and it's the metal industry okay.

198

00:40:27.720 --> 00:40:36.570

Ben Moll: And here's some other numbers here how many people work there, for example, and you can see, the total employment here is maybe something like.

199

00:40:37.560 --> 00:40:49.560

Ben Moll: You know, three three and a half percent of GDP of total employment and here's some other statistics you know gross value added and gross output in these industries.

200

00:40:51.450 --> 00:40:54.120

Ben Moll: We thought it was interesting to contrast.

201

00:40:55.500 --> 00:41:07.170

Ben Moll: The economic activity and employment in these industries which we again think would be hard to sit in an import shock with the three industries that were harvested.

202

00:41:08.370 --> 00:41:10.620

Ben Moll: During the COVID 19 pandemic okay.

203

00:41:12.360 --> 00:41:32.190

Ben Moll: These are air transportation and, in particular hospitality and entertainment and the point we want to make here is that if you look in terms of gross value added wages and employees, roughly in total magnitude the sectors are kind of the same okay.

204

00:41:34.020 --> 00:41:37.410

Ben Moll: Employees in fact you know you can count up the numbers here.

205

00:41:38.700 --> 00:41:53.760

Ben Moll: are actually quite a lot smaller in these three sectors than, for example in hospitality is just baked in terms of number of employees, but if you look at gross value added and things like how much capital, there is a Derek kind of comparable okay.

206

00:41:55.590 --> 00:42:01.800

Ben Moll: there's a big difference engender it's kind of interesting way more men working in these sectors here, then.

207

00:42:03.570 --> 00:42:04.410

Ben Moll: In these sectors.

208

00:42:05.430 --> 00:42:16.920

Ben Moll: there's two things that are obviously very important between the current crisis and or potential crisis and in the case of an import stop and the 2020 crisis, the first thing is.

209

00:42:17.400 --> 00:42:21.720

Ben Moll: In the 2020 crisis we shut down the sectors completely essentially okay.

210

00:42:22.350 --> 00:42:32.070

Ben Moll: Whereas now we're not talking about that right we're instead talking about losing 30% of the gas supplies here, which then maybe in an extreme case would shut down 30% of.

211

00:42:32.340 --> 00:42:37.110

Ben Moll: The production in these sectors you think okay so we're not talking about completely shutting down the sectors.

212

00:42:37.530 --> 00:42:46.680

Ben Moll: And on the other hand, what's very different is, these are very sort of OPS sort of downstream sectors that are very close to final consumption, whereas these here are.

213

00:42:47.250 --> 00:42:55.110

Ben Moll: Very upstream sectors so you'd think that if, even if the shark is kind of small disk and sort of propagates through to production network through the supply chain.

214

00:42:55.650 --> 00:43:03.450

Markus Brunnermeier: So banking i'll just compared with another crisis which, like the subprime crisis there was always argued, you know the subprime losses, but tiny.

215

00:43:03.900 --> 00:43:08.100

Markus Brunnermeier: yeah the thinking was so centrally track the whole world economy down tool so.

216

00:43:09.480 --> 00:43:09.810

Markus Brunnermeier: It.

217

00:43:09.900 --> 00:43:11.580

Markus Brunnermeier: could be way more dramatic.

218

00:43:11.670 --> 00:43:26.730

Ben Moll: hey, no, no, I mean that's exactly the point I was making here and i'll make a number of slides again but yeah just you know just to put things into perspective, a little bit you know I do think this there's something about this comparison that's useful.

219

00:43:27.870 --> 00:43:31.350

Ben Moll: Okay, and another word that comes up a lot is.

220

00:43:33.090 --> 00:43:36.180

Ben Moll: distribution of effects of potential import stop.

221

00:43:37.830 --> 00:43:46.500

Ben Moll: You know, in the idea is that poor households, maybe have a much larger expenditure share on energy and then, if.

222

00:43:47.700 --> 00:43:57.420

Ben Moll: Either the you know gas get gets cut or the prices go up in particular these poor households would be much harder at it there's a very.

223

00:43:58.170 --> 00:44:06.930

Ben Moll: Nice survey data set in Germany that actually has these very detailed questions about household consumption of these different.

224

00:44:07.680 --> 00:44:18.690

Ben Moll: Energy expenditures and you don't find a very strong pattern across the income distribution there's a little bit of a gradient here, you can see right.

225

00:44:19.590 --> 00:44:30.090

Ben Moll: But overall, you know this gradient here or this how to expand it to share barriers across the income distribution is relatively flat okay there's some other things that are interesting.

226

00:44:30.870 --> 00:44:40.860

Ben Moll: You know it differs a lot more with household size, rather than you know just income of the households at the top obviously correlated.

227

00:44:42.300 --> 00:44:48.630

Ben Moll: If you include car fuels which are not in this graph here, then the graph looks a little different.

228

00:44:48.990 --> 00:44:56.820

Ben Moll: In particular it's actually sort of an inverse U shape so hump shaped with income why just because the poorest households don't tend to have cars.

229

00:44:57.600 --> 00:45:09.660

Ben Moll: As much essentially Okay, so we were not going to talk about distribution of effects, a lot more Maybe you can come back to it in a discussion essentially we're going to say that.

230

00:45:10.500 --> 00:45:21.450

Ben Moll: You know these are maybe something to worry about but it's not completely obvious if you look at the data that these are going to be massive and you can probably compensate with.

231

00:45:22.080 --> 00:45:30.120

Ben Moll: With fiscal transfers if you're worried about them okay alright, so let me come to the macro modeling part of things OK.

232

00:45:30.480 --> 00:45:39.150

Ben Moll: So, again what's the spirit here the spirit, as always, I guess, in quantitative macros we're going to you know start from the facts, the type of facts that I've just shown you.

233

00:45:40.410 --> 00:45:52.410

Ben Moll: And then we're going to try to map this sort of energy shocked that I talked about this 30% drop or our if you think about in gas or, if you think about total energy maybe 10% drop into.

234

00:45:53.310 --> 00:46:05.760

Ben Moll: You know, GDP growth national national income losses using these macro models and the philosophy again right is going to be to try to think hard about specific mechanisms.

235

00:46:07.170 --> 00:46:15.660

Ben Moll: leg sadie's production chains or aggregate demand amplification and what have you and then try to put an empirical discipline on these as much as possible.

236

00:46:15.960 --> 00:46:22.350

Ben Moll: And then sort of tried to see what comes out of it, of course, you know as MAC Marco said.

237

00:46:23.190 --> 00:46:30.960

Ben Moll: there's always a lot of uncertainty about exactly what is the right parameter values are, in particular, a lot of these other cities.

238

00:46:31.290 --> 00:46:36.300

Ben Moll: You have sort of very local estimates and then, if you for a very large shock like this.

239

00:46:36.960 --> 00:46:47.160

Ben Moll: You know there's there's some uncertainty, how much you can sort of use these this emphasis is to extrapolate for these very large sharks, but you know, at the end of the day, it's still.

240

00:46:47.850 --> 00:47:00.600

Ben Moll: The best game in town, I would say, and so so that's what we're going to do here okay remember again just to remind you that you know gases something like 1% of GDP and gas rock is 30%.

241

00:47:03.870 --> 00:47:12.750

Ben Moll: So I said the gas expenditure share small, but of course the issue right is that essentially substitutability, maybe Lord may be a bottleneck and production.

242

00:47:14.760 --> 00:47:28.230

Ben Moll: Just to you know have some sort of a benchmark or comparison, I want to put on the table to calculations, that I think are sort of the two extreme calculations, you could do.

243

00:47:28.530 --> 00:47:39.840

Ben Moll: And they're also going to be, I want to argue nonsensical calculations okay that you don't want to do because they're sort of just fly in the face of what we know about empirical evidence okay So the first thing you can do.

244

00:47:41.370 --> 00:47:55.170

Ben Moll: Which again you don't want to do is, you could say oh look by gases 1% of GDP and the clients by 30% so we're going to get a GDP loss of 1% i'm 30% which would be 0.3% okay.

245

00:47:56.790 --> 00:48:10.710

Ben Moll: that's a crazy thing to do, why exactly because you know it would to completely ignore any of these sort of ordering or bottleneck or production chain effects in any amplification okay there's a very nice.

246

00:48:11.370 --> 00:48:17.880

Ben Moll: Article or interview, I think, by Larry summers where he talks about the financial crisis, this comes back to marcus's point just now.

247

00:48:18.840 --> 00:48:30.360

Ben Moll: And he likens the financial crisis to what of electricity, where to go off Okay, and then he says okay electricity is only 3% or 4% of GDP.

248

00:48:30.900 --> 00:48:42.720

Ben Moll: let's say electricity falls by 80% then he says, there would be some crazy economists would would say you'd only lose 3% of GDP, thank you, says, all the Chicago and Minnesota.

249

00:48:43.500 --> 00:48:51.180

Ben Moll: People would do this essentially and and he says that's a crazy thing to do and I obviously we obviously agree with that okay.

250

00:48:52.590 --> 00:48:56.430

Ben Moll: So you think that it has to be larger than this on the flip side.

251

00:48:57.630 --> 00:49:03.480

Ben Moll: The other crazy scenario to do would be no substitutability whatsoever okay.

252

00:49:04.200 --> 00:49:18.990

Ben Moll: So gas is a complete bottleneck, even though it's just one percentage point of GDP in that case, what you would get right is that GDP faults essentially one for one with gas So if you have a 30% gas drop, you would have a 30% GDP drop.

253

00:49:21.030 --> 00:49:30.510

Ben Moll: I want to say that's also a crazy view of the world, essentially OK, and now let's let's actually you know connect us with a little bit of economic theory.

254

00:49:32.010 --> 00:49:40.560

Ben Moll: where you can sort of see this point nicely, I think, and this is also going to be our sort of simplest model here, which is simply just the CS production function okay.

255

00:49:41.610 --> 00:49:53.010

Ben Moll: So you have some output, why that's produced using in particular gas and other stuff say here's some aggregate of capital and Labor but doesn't really matter some other factors for production.

256

00:49:54.390 --> 00:50:03.300

Ben Moll: And the key parameters here will be two parameters, so one will be the lcc of substitution between.

257

00:50:05.010 --> 00:50:15.300

Ben Moll: gas and other factors of production and the second one so that's the Sigma here, and the second one, will be the share of gas in production, which is the okay now.

258

00:50:15.780 --> 00:50:32.550

Ben Moll: it's relatively easy to see that the two, I want to say crazy cases that I talked about here, above are exactly the two extremes of progress production, essentially, in which case this calculation would be correct okay.

259

00:50:34.080 --> 00:50:57.810

Ben Moll: And the on Jeff so no substitutability whatsoever, in which case this calculation here would be correct, so you know just to be clear, in principle, it is possible to have that 30% gas drop leads to 30% drop in GDP, and if you really think that all substitute abilities.

260

00:50:58.680 --> 00:51:03.750

Markus Brunnermeier: So Ben you I guess you will open up this aggregate production function, later on, or because.

261

00:51:03.930 --> 00:51:04.260

Ben Moll: Yes.

262

00:51:04.350 --> 00:51:13.650

Markus Brunnermeier: The other thing is, I want to say, if you have a 30% drop of GDP, that would be political unrest, on top of it, so I will be less than more than 30% I guess yes.

263

00:51:14.580 --> 00:51:16.770

Ben Moll: yeah and will yeah we'll do something much.

264

00:51:18.090 --> 00:51:21.540

Ben Moll: You know, richer than then this here in a second okay.

265

00:51:23.280 --> 00:51:29.160

Ben Moll: But I think it's still useful to give you to bounce some magnitudes essentially okay and.

266

00:51:30.240 --> 00:51:38.760

Ben Moll: Just some general thoughts, but mark is already kind of did a lot of this so i'll go fast on analysis use of substitution and substitution more general.

267

00:51:40.020 --> 00:51:52.230

Ben Moll: So one thing I think mark is already, he said, most of these things and first time dependent, so you know that, in the short run analysis or less than a long run, again i've already said what we want to think about here is.

268

00:51:53.370 --> 00:51:54.360

Ben Moll: horizon.

269

00:51:56.400 --> 00:52:02.610

Ben Moll: time horizon for substitution that's roughly until the next winter why because we think sort of that's.

270

00:52:03.540 --> 00:52:10.950

Ben Moll: Because the seasonality and gas demand that's how much time we have So what are we going to do is we're essentially going to go to the empirical literature.

271

00:52:11.430 --> 00:52:15.840

Ben Moll: Where they estimate these kind of cities, they typically.

272

00:52:16.350 --> 00:52:27.270

Ben Moll: distinguish between short run, which is like less than a year long run, which is more than a year, or much longer than a year we're going to take always the shorter analysis these then we're always go going to go to the very.

273

00:52:27.870 --> 00:52:34.020

Ben Moll: bottom of the range of the empirical estimates and then we're going to kind of divide them by two okay to get basically the.

274

00:52:34.290 --> 00:52:40.980

Ben Moll: The the sort of shorter analysis is that we think are relevant and we're going to have very loyal cities but not zero okay.

275

00:52:41.640 --> 00:52:56.340

Ben Moll: Another thing that mark is already said is micro versus macro so cities so macro in particular takes into account not just substitution within a production process but also across production processes.

276

00:52:57.840 --> 00:53:03.840

Ben Moll: or firms so there's maybe sort of an extensive margin so Marcus had this nice example with the truly aren't you have.

277

00:53:05.790 --> 00:53:11.280

Ben Moll: Technologies where you may still be able to substitute and yet supply chains.

278

00:53:12.360 --> 00:53:14.550

Ben Moll: Market, I think, had literally exactly these points.

279

00:53:16.080 --> 00:53:25.920

Ben Moll: So long supply chains create bottlenecks that's the ordering point but on the other hand, the longer chain, the more substitution possibility, so these things kind of go both ways.

280

00:53:27.090 --> 00:53:36.210

Ben Moll: The final thing that's going to be important, on not in the CS example, but in the Richard models and the second is potentially substitution via imports.

281

00:53:37.260 --> 00:53:51.810

Ben Moll: So the idea is going to be okay so gas is going to you know decline lot and, therefore, maybe it's going to become a lot more expensive as well it's not going to be economically profitable to produce some intermediate goods anymore.

282

00:53:52.830 --> 00:53:58.860

Ben Moll: But you could potentially replace these with imports okay so here's an example that comes up a lot in Germany.

283

00:53:59.550 --> 00:54:11.460

Ben Moll: So there's a production chain, which is something like this, so gas is used to produce ammonia ammonia is used to produce fertilizer and then the idea is if the gas declines, we don't have a fertilizer anymore.

284

00:54:12.360 --> 00:54:15.360

Ben Moll: But you know what we would say, is to certain extent.

285

00:54:15.900 --> 00:54:30.930

Ben Moll: You can import the fertilizer instead and then still preserve some of the downstream production of course it's been bad for the German fertilizer producers and and the jobs that are in the sector, however, it doesn't mean that the entire system that comes after that collapse.

286

00:54:31.980 --> 00:54:37.500

Markus Brunnermeier: But those who analysis take into account of the fertilizer world price worldwide, but much more expensive.

287

00:54:37.920 --> 00:54:39.720

Ben Moll: Yes, we do take that into account.

288

00:54:40.890 --> 00:54:50.190

Ben Moll: yeah we are yeah i'll come back to that in a SEC or David will in fact and we wrote a low supplement here on substitution that makes some of these points, and also has some.

289

00:54:50.730 --> 00:55:01.950

Ben Moll: historical examples of how economies respond to large shocks there's some interesting stories in there, for example, about airplane production in World War Two where in the US.

290

00:55:03.330 --> 00:55:14.160

Ben Moll: You know, President Roosevelt said we need 50,000 plans right now everyone, The Economist the industry people everyone said it was going to be impossible, two years later, they produce the hundred thousand airplanes.

291

00:55:16.260 --> 00:55:16.680

Ben Moll: and

292

00:55:18.060 --> 00:55:29.820

Ben Moll: Here are just in the simple model, so the CES production function output losses for different lcc of substitution okay here, I did a 10% energy drop.

293

00:55:31.110 --> 00:55:43.920

Ben Moll: Which is, if you think about oil, gas and coal combined that sort of the right magnitude, so you start with energy equals hundred percent so one here and so use a normalized production here to one.

294

00:55:45.870 --> 00:55:52.710

Ben Moll: If you're in the Leon tf case where the hostess of substitution here zero so the blue line here.

295

00:55:53.820 --> 00:56:03.930

Ben Moll: Then, as i've said, you know if you have a 10% energy drop you're going to have output dropping by 10 percentage points Okay, so you go 9% energy means 90% output.

296

00:56:05.760 --> 00:56:08.250

Ben Moll: If you go cup Douglas instead.

297

00:56:09.300 --> 00:56:14.430

Ben Moll: You get this much smaller number, which is essentially just the energy share times the shock.

298

00:56:15.720 --> 00:56:25.920

Ben Moll: And then the question is sort of Where are you in between okay what's interesting, I think, and I didn't appreciate enough before you know, making these calculations, is that.

299

00:56:26.940 --> 00:56:34.050

Ben Moll: Because this gas share is small Okay, even with very low elysees of substitutions.

300

00:56:35.070 --> 00:56:45.540

Ben Moll: The output losses are potentially actually quite far from the artist, so this is, for example, the red line here is an analysis of substitution of point of force have quite a low number.

301

00:56:46.740 --> 00:57:02.370

Ben Moll: And you can see that the output last year is still less than two percentage points, essentially, whereas with fully aren't if it would be 10 percentage points okay we'll come back to this, so it really matters to you know what you think about the LSD cities, how small.

302

00:57:04.440 --> 00:57:07.680

Ben Moll: And now I think David is going to take over.

303

00:57:09.780 --> 00:57:13.710

David Baqaee: Great thanks a lot mark isn't then um so.

304

00:57:15.120 --> 00:57:21.930

David Baqaee: I think the way that we want to think about these economies, though, is that they're much more complicated than the simple.

305

00:57:23.040 --> 00:57:31.410

David Baqaee: single CS nest with suggesting, so this is what Marcus was getting at real life economies are very complicated machines there's.

306

00:57:32.130 --> 00:57:39.210

David Baqaee: Domestic supply chains that run across sectors and there is international supply chains that link D sectors to other producers in the rest of the world.

307

00:57:39.660 --> 00:57:45.480

David Baqaee: So this picture that I have here is sort of an illustration of what a modern industrialized economy looks like.

308

00:57:46.200 --> 00:57:53.670

David Baqaee: Each little in this picture represents an industry, so you can take one of these dots is, for example, the chemicals industry.

309

00:57:53.910 --> 00:58:02.430

David Baqaee: it's connected to other industries and the domestic economy because it's both buying inputs from the other industries and selling inputs to the other industries.

310

00:58:02.760 --> 00:58:11.970

David Baqaee: And it's connected to the rest of the world through important final outputs where we think of exports as being part of the final outputs that these producers are producing.

311

00:58:12.750 --> 00:58:16.950

David Baqaee: So, as this cop, both in marcus's discussion and intense discussion.

312

00:58:17.640 --> 00:58:27.060

David Baqaee: When you look at these complicated structures it's not immediately obvious which way it's going to go relative to the simple model, on the one hand, the fact that you've got.

313

00:58:27.480 --> 00:58:42.900

David Baqaee: Vertical chains pushes in the direction of maximizing the damages when there's a shock, but on the other hand, to the extent that you have horizontal connections that opens up the door for substitutability, where you can escape the shock further downstream.

314

00:58:44.610 --> 00:58:50.160

David Baqaee: Now we want to ultimately be able to think about economies that are complicated like this.

315

00:58:51.210 --> 00:58:53.370

David Baqaee: So Ben if you could go to the next slide.

316

00:58:55.530 --> 00:59:04.830

David Baqaee: And my starting point, whenever i'm trying to think about these complicated economies is just to start off by thinking about maybe some sufficient statistics intuitions.

317

00:59:05.040 --> 00:59:15.450

David Baqaee: that are going to apply across the board to a vast class of models, just so I know what are the things that I need to be thinking about in order to understand the answer to the question that we're interested in.

318

00:59:15.930 --> 00:59:25.170

David Baqaee: So in this context we're interested in two key aggregate statistics, one is going to be a measure of German real consumption of resources so that.

319

00:59:25.770 --> 00:59:36.450

David Baqaee: is going to be real GDP Gross National indicators and the other statistic that we're going to be interested in is real production by German producers, which is real GDP.

320

00:59:37.470 --> 00:59:44.520

David Baqaee: Now these two things oftentimes get conflated in sort of that non academic non technical discussion, but they're not actually the same thing.

321

00:59:45.030 --> 00:59:54.090

David Baqaee: The way to think about it is that GDP includes things like the production of exports, so when Germany makes a car and ships it overseas that's going to be inside GDP.

322

00:59:54.600 --> 01:00:05.010

David Baqaee: And on the other hand, je ne includes consumption of imports, so when German consumers buy something from foreigners that's going to be inside Jenny but it won't be inside GDP.

323

01:00:05.220 --> 01:00:11.820

David Baqaee: So these objects, because of the way that they're exposed to international trade in different ways don't have to behave the same way.

324

01:00:12.960 --> 01:00:27.990

David Baqaee: Now our starting point for thinking about this, what happens in a complicated economy like the one I showed you before is we're going to assume, to start with, that the economy has productive efficiency, so the German production network is efficient.

325

01:00:28.980 --> 01:00:31.230

David Baqaee: And then, if you can go to the next slide and.

326

01:00:32.970 --> 01:00:46.200

David Baqaee: Then, using that efficiency, we can actually come up with some very general formulas for how German real consumption and real production are going to be affected by a shock, like the one we're talking about where you cut off imports from Russia.

327

01:00:46.980 --> 01:00:58.680

David Baqaee: So what i'm showing you here is the beginnings of a approximation to the changing real consumption by Germany, in response to basically any kind of shock you put in.

328

01:00:59.250 --> 01:01:07.230

David Baqaee: into your model so on the left hand side we've got the change log change or if you'd like a percentage change in German wheel consumption.

329

01:01:07.500 --> 01:01:17.580

David Baqaee: On the right hand side i'm going to show you the different pieces of how real consumption is going to be affected by shocks, so the first time we've got here is just what Ben was talking about, which says.

330

01:01:18.480 --> 01:01:27.240

David Baqaee: If you reduce import so the amount of imports J is indexing the nature of that important, so this could be, for example, Russian gas or it could be.

331

01:01:28.260 --> 01:01:32.520

David Baqaee: Something else that you're getting from Russia, you take the shock to.

332

01:01:33.240 --> 01:01:40.530

David Baqaee: The quantity of the import so in our example, this is going to be like a 30% reduction in your ability to source natural gas.

333

01:01:40.800 --> 01:01:57.510

David Baqaee: And you multiply it by the amount that Germany collectively is spending on gas as a share of total consumption or total national consumption national expenditures so that's sort of the first order term that Ben was talking about, and then we can go a couple more slides.

334

01:01:59.160 --> 01:02:14.550

David Baqaee: So the next two terms you're on the top line The first one is the change in German exports and it's weighted by the expenditure sharing θ just the German imports would be and the final term is the changing employment.

335

01:02:15.780 --> 01:02:26.760

David Baqaee: weighted by the wage bill of the workers who are becoming unemployed, so this is a first order approximation that works as long as the initial.

336

01:02:27.510 --> 01:02:37.920

David Baqaee: Production network was efficient, and so one way, you can think about it is, if you think there's strong Keynesian effects or aggregate demand externalities or financial frictions that are going to result in reductions and employment.

337

01:02:38.160 --> 01:02:49.620

David Baqaee: That last term is what's going to capture that effectual first order you have to think about how many workers are losing their jobs and then, what was the wage bill going to those workers in the initial equilibrium before the show.

338

01:02:50.100 --> 01:03:03.060

David Baqaee: Now, if you can get one more perfect, so the term that we've got now on the second line he are the nonlinear effects of these trucks, and these are really the things that Ben was talking about, and these are the things that.

339

01:03:03.630 --> 01:03:08.700

David Baqaee: complementarities on substitute abilities are going to play an important role in disciplining.

340

01:03:10.050 --> 01:03:15.990

David Baqaee: So what the terms in the square brackets are is they're basically, taking into account the fact that when.

341

01:03:17.040 --> 01:03:27.090

David Baqaee: The supply of natural gas goes down in Germany, you would expect expenditures on natural gas in Germany to go up as a share of total expenditures.

342

01:03:27.510 --> 01:03:36.870

David Baqaee: And the fact that the expenditures are rising, is going to mean that the reduction in the quantity of natural gas that you have access to becomes more important and becomes more costly.

343

01:03:37.440 --> 01:03:50.430

David Baqaee: So these deltas that you see, for example, the first delta on the imports term is telling you, you have to think about what is the change in expenditures on imports, in response to the shock.

344

01:03:50.670 --> 01:03:59.520

David Baqaee: And if you can come up with some either historical estimates of what you think that those changes are or you have a structural model with detailed.

345

01:04:00.570 --> 01:04:03.690

David Baqaee: assumptions about how production works, you can put a number on that.

346

01:04:03.960 --> 01:04:15.630

David Baqaee: But as a starting point, I think it's very useful to just understand that whatever number you're going to come up with at the end of the day, it has the mapping to a sensible changing the expenditure share on imports for Germany.

347

01:04:16.530 --> 01:04:26.130

David Baqaee: Now the Leon JFK just using this equation, you can already think about what's going on in the COP Douglas case and into the on τ case in this simple example that Ben was showing.

348

01:04:27.210 --> 01:04:35.790

David Baqaee: In the contact list case that changing those expenditure shares is zero and so everything in the square brackets is zero you don't have to think about that at all.

349

01:04:36.360 --> 01:04:47.820

David Baqaee: In the $\nu \tau$ case what actually happens in response to a small shock, the energy is that the expenditure share on energy, the model would predict should jump to one.

350

01:04:48.270 --> 01:04:54.150

David Baqaee: Because the marginal value of you need energy to produce stuff it's like everything else is worthless now.

351

01:04:54.420 --> 01:05:04.290

David Baqaee: And so the only thing that you're going to want to spend money on is energy, and so the model that beyond τ model has these very extreme predictions about how expenditure shares.

352

01:05:04.530 --> 01:05:09.540

David Baqaee: should move on how relative prices should do and I think that's why we think that's not realistic, is because.

353

01:05:09.840 --> 01:05:16.770

David Baqaee: If you look at different historical episodes where there has been energy crises, either in the 70s, or in Japan, where there was mishima.

354

01:05:17.070 --> 01:05:28.830

David Baqaee: You don't see such extreme changes in relative expenditure shares and so your beliefs, about the relative expenditure share are going to discipline and how big you think the effects are going to go on more.

355

01:05:29.970 --> 01:05:38.910

David Baqaee: And there was an equivalent sort of type of results were real GDP but i'm going to focus, where we focused on real consumption, because that's somewhat relevant welfare measure.

356

01:05:39.450 --> 01:05:55.650

David Baqaee: In our notes next slide please great So what are the key uncertainties, what are the key quantities that we need to be able to put numbers on in order to get a final answer i'm just going to go through the ones that we think are really important that you need to take a stance on.

357

01:05:57.690 --> 01:05:57.960

David Baqaee: sure.

358

01:05:59.310 --> 01:06:13.440

Markus Brunnermeier: So you have you know different input sectors different experts sectors and so forth, if I make it finer and finer the approximation change, I suppose I put them together or I make them finance finance.

359

01:06:13.770 --> 01:06:16.920

Markus Brunnermeier: So those of inputs and thousands of expert or millions of it.

360

01:06:17.370 --> 01:06:17.760

David Baqaee: that's right.

361

01:06:17.820 --> 01:06:19.290

Markus Brunnermeier: You told us what summation will.

362

01:06:19.290 --> 01:06:20.100

Markus Brunnermeier: Change no.

363

01:06:20.160 --> 01:06:26.040

David Baqaee: Well, so he will always be this formula it's just that once you start aggregating across different so this.

364

01:06:26.250 --> 01:06:37.200

David Baqaee: The way you should think about this is you've brought your economy, down to the level where each of these jays you can click off as a perfect substitutes with the other days, so if you haven't.

365

01:06:38.160 --> 01:06:49.050

David Baqaee: If you haven't done if you haven't gone down to that level where things become homogeneous, then the first order approximation still works that's the first line, but the second line is no longer true because.

366

01:06:49.440 --> 01:06:54.000

Markus Brunnermeier: The numbers, then you look down at what deep how deep do you go down.

367

01:06:54.030 --> 01:06:55.710

David Baqaee: We have thousands of don't we break.

368

01:06:55.710 --> 01:07:02.370

David Baqaee: Things into bilateral so in the structural model that we have we break things into sector.

369

01:07:03.630 --> 01:07:11.820

David Baqaee: Sector pair by destination orange so German chemicals industry buying Russian gas that would.

370

01:07:12.300 --> 01:07:15.750

Markus Brunnermeier: assume is entry that perfect substitutes within the chemical industry.

371

01:07:17.490 --> 01:07:26.640

David Baqaee: or not, no, we don't assume perfect substitutes within the chemical industry we assume perfect substitutes within that industry country pair.

372

01:07:27.030 --> 01:07:36.690

David Baqaee: So, for example, if you're buying so Germany is collectively producing a thing called sub whatever is the chemical industry output or plastics, or whatever.

373

01:07:36.870 --> 01:07:38.640

David Baqaee: that's a homogeneous output for us.

374

01:07:39.300 --> 01:07:42.450

David Baqaee: And then, when Germany is sourcing let's say.

375

01:07:44.460 --> 01:07:54.300

David Baqaee: petroleum from different places we think of each of those as being imperfect substitute for the alternative sources, where you source that energy that makes sense, but.

376

01:07:54.330 --> 01:08:04.410

Ben Moll: Can I jump in as well, but mark is the nice thing about David sufficient statistics formula is that exactly if you want it to go viner you can do it using the formula right.

377

01:08:04.620 --> 01:08:09.990

Markus Brunnermeier: No, I see a little formula, but I just want to know in your calculations, how do I find it a go.

378

01:08:10.500 --> 01:08:12.240

Markus Brunnermeier: No, because if you don't go so deep.

379

01:08:12.300 --> 01:08:15.480

Markus Brunnermeier: Then you assume more perfect substitutes portability and you.

380

01:08:15.720 --> 01:08:23.670

Ben Moll: Know yeah we there we did it at the industry level, and we have 30 sectors in Germany and one of these, to say the chemicals industry as a whole.

381

01:08:25.860 --> 01:08:34.740

Markus Brunnermeier: But if I cannot move gas, because from one chemical induced blonde to another one, because of the pressure is not there, you would not capture that essence.

382

01:08:36.930 --> 01:08:37.200

David Baqaee: Right.

383

01:08:38.400 --> 01:08:52.380

David Baqaee: yeah so so we do have so, as I said, for us, the homogeneous good is country country sector, specific and that's really a data limitation it's just we're not able to drill any further that's the most desegregated data that we're able.

384

01:08:52.560 --> 01:08:58.110

Markus Brunnermeier: To trust your formula, you would without data say Oh, I put another cautious to a minute.

385

01:08:59.250 --> 01:09:01.350

Markus Brunnermeier: Just within the sector that's awesome.

386

01:09:01.680 --> 01:09:11.070

David Baqaee: yeah so so what I just want to say is I haven't mapped this to the data yet right the formula is the formula, then the question is okay well, are you mapping it to the data correctly.

387

01:09:12.360 --> 01:09:26.160

David Baqaee: And I think that's exactly that's exactly the thing I want to highlight is the key sources of uncertainty in this formula because that's ultimately when you want to map things to data that's that's where you have to make that connection so and.

388

01:09:26.790 --> 01:09:28.290

Markus Brunnermeier: The other thing is it's still a local.

389

01:09:28.290 --> 01:09:36.930

Markus Brunnermeier: Approximation know it's still estimating so where the estimates coming from, because if the Lord shocks things might be very different.

390

01:09:36.990 --> 01:09:38.820

David Baqaee: that's right So if you.

391

01:09:39.510 --> 01:09:46.830

David Baqaee: So, for the purposes of this talk I limited myself to a second order approximation, we could have gone further, we could have done third, fourth order.

392

01:09:46.980 --> 01:09:47.460

David Baqaee: But while.

393

01:09:48.030 --> 01:09:48.990

Markus Brunnermeier: it's all these high.

394

01:09:49.050 --> 01:09:56.820

David Baqaee: you're you're absolutely right, but all the higher order effects are all going to depend on how quickly these expenditure shares are changing.

395

01:09:57.060 --> 01:10:11.670

David Baqaee: So that's why I think once you understand that, then you can say to yourself okay well, maybe I don't believe any given structural model so much, but I can also look at historical experiences, where there were big shots and I can look at how much these shares actually changed in practice.

396

01:10:12.390 --> 01:10:14.610

Markus Brunnermeier: So you could be 1970s.

397

01:10:14.910 --> 01:10:16.530

David Baqaee: So that's what i'm about to do on the next slide.

398

01:10:16.590 --> 01:10:17.190

Markus Brunnermeier: Okay okay.

399

01:10:18.360 --> 01:10:29.490

David Baqaee: So so Okay, so the key sources of uncertainty, are the three things that i'm going to talk about so The first one is just the shock to the size of the shock, which is the reduction in energy imports.

400

01:10:30.210 --> 01:10:39.990

David Baqaee: So that's the delta login as quantities that other big source of uncertainty is the change in the expenditure share on energy.

401

01:10:40.560 --> 01:10:51.210

David Baqaee: And that term is where all these issues about complementarities the essentialness of these goods, the nature of import substitution and.

402

01:10:51.870 --> 01:11:03.900

David Baqaee: The production networks robustness they're all going to be inside that term so any model you write down will ultimately have a implication for how that number changes and that's the thing that's going to discipline how welfare changes in your mouth.

403

01:11:04.470 --> 01:11:06.480

David Baqaee: And then the next term that I think there's.

404

01:11:06.480 --> 01:11:09.060

Markus Brunnermeier: Uncertainty assume CES or you know.

405

01:11:09.600 --> 01:11:17.400

David Baqaee: Well, in this formula I haven't assumed anything about the structural production function, this is completely non parametric formula.

406

01:11:17.820 --> 01:11:23.160

David Baqaee: So the last term that we've got in here that I think is also important and and there's a lot of uncertainty about.

407

01:11:23.700 --> 01:11:36.780

David Baqaee: The change in employment, and these are principally going to be due to things like negative aggregate demand effects and Ben is going to talk about these in more detail later, but that's what you plug that number so really, we have to just decide what these three numbers look okay so.

408

01:11:37.830 --> 01:11:45.390

David Baqaee: And so, these three things these three terms, or what i'm going to be focused on So if you can go to the next slide okay so let's first start off by doing a back of the.

409

01:11:45.990 --> 01:11:57.810

David Baqaee: envelope kind of orders of magnitude type of calculation so it's been mentioned we're going to assume that the reduction in gas in terms of quantities is about 30% that's the amount that we think.

410

01:11:59.040 --> 01:12:05.670

David Baqaee: We are Germany is getting from Russia, in terms of natural gas that it's not able to substitute to other sources.

411

01:12:07.140 --> 01:12:17.940

David Baqaee: And as been mentioned the expenditure share on gas as a share of GDP and GDP is roughly about 1.2%, and this is sort of an annual number that.

412

01:12:18.900 --> 01:12:23.820

David Baqaee: It will vary hugely from year to year unless something dramatic has happened.

413

01:12:24.630 --> 01:12:30.480

David Baqaee: So how are we going to discipline the form you love what i'll first starting point is to do exactly what Marcus said, which is to look at.

414

01:12:31.080 --> 01:12:39.780

David Baqaee: The oil shock in the 70s and try to use that to discipline, how much we think the expenditure share on oil on energy might change in German.

415

01:12:40.230 --> 01:12:50.100

David Baqaee: So during the entire period of the 1970s, the expenditure share on oil increased at the world level from about 2% to.

416

01:12:50.460 --> 01:13:08.130

David Baqaee: About 8% so first after the first oil oil shock in the mid 70s, they jumped from 2% to about 4% and then after the Iranian revolution in 1790 jumped again to 8% and then it slowly came back down as we went into the 90s, so there was a quadrupling off the.

417

01:13:09.240 --> 01:13:14.070

David Baqaee: off the expenditures on oil during that decade, if you can accumulate it all.

418

01:13:14.580 --> 01:13:22.470

David Baqaee: And so we can say okay let's imagine just as a back of the envelope that we have a similar thing happened in Germany, where there's a quadrupling of expenditures.

419

01:13:23.040 --> 01:13:30.030

David Baqaee: On on oil in response to this shock and if you do that, then you can just kind of plug and chug and see what you get out the other end.

420

01:13:30.240 --> 01:13:38.820

David Baqaee: So the first order effect is 1.2% times the log of point seven because this is a log approximation so log of point seven is roughly about.

421

01:13:39.300 --> 01:13:51.480

David Baqaee: minus point three like 30% and then on top of that you've got these nonlinear these that come from complementarities which to add it on is going to be the changing the expenditure share, which is going to go to 4.8%.

422

01:13:51.810 --> 01:14:04.590

David Baqaee: minus 1.2% that 3.6% times a half, because this comes from a second order or Taylor expansion and then the size of the show, and if you add all of that out, you get something that's close to minus 1% and so.

423

01:14:05.490 --> 01:14:15.900

David Baqaee: This sort of gives you a ballpark figure of what you should expect from a model that's able to match what happened in the 70s, in terms of the oil price shifts to go further and put.

424

01:14:15.900 --> 01:14:18.180

Markus Brunnermeier: And it's only it's only the buys shock no.

425

01:14:18.450 --> 01:14:23.040

Markus Brunnermeier: it's not the redistribution of the energy within the company, this is fair to say.

426

01:14:23.700 --> 01:14:25.620

David Baqaee: And so, what do you mean by that it's just.

427

01:14:25.710 --> 01:14:35.250

Markus Brunnermeier: I have oil supply coming from suddenly costs three times as much an expenditure, she has a shooting up but i'm still able to read, is to build the whole thing efficiently within Germany.

428

01:14:35.550 --> 01:14:40.260

David Baqaee: So, when you say i'm able to redistribute everything efficiently with in Germany.

429

01:14:41.370 --> 01:14:54.990

David Baqaee: It has to be the thing that has to be true is that the equilibrium has to be constrained efficient, so what that means is, if you have some kind of quantity adjustment costs that you have to pay in order to shift resources or if.

430

01:14:56.340 --> 01:15:01.680

David Baqaee: For example, factors or a mobile across sectors or things like that those would be taken into account.

431

01:15:02.760 --> 01:15:13.740

David Baqaee: What wouldn't that would kind of influence, your the final number you get for the change in the expenditure ship what we're not taking into account is something if you have.

432

01:15:14.730 --> 01:15:22.380

David Baqaee: Like genuine in efficiencies like market power or something like this, where we're abstracting from those kinds of frictions.

433

01:15:23.400 --> 01:15:34.620

David Baqaee: Okay, so this is the back of the envelope now to give it a little bit more color we can use specific structural models to basically try to fill in the numbers here, so if you go to the next slide.

434

01:15:34.950 --> 01:15:44.850

David Baqaee: So this table sort of shows you different ways of getting at the same object, which is that changing the expenditure share, which is going to be really key for thinking about how costly, this is going to be.

435

01:15:45.150 --> 01:15:57.180

David Baqaee: The first column is just a sufficient statistics approach that I showed you where we calibrated using the oil price shock in the 70s and we got something on the order of about a 1% loss in GMT.

436

01:15:58.080 --> 01:16:15.900

David Baqaee: which works out to be about 400 per capita per year for German consumers or German households then on, then the next three columns are using different structural models specific models with calibrated elasticities and so on and so forth, so the.

437

01:16:16.980 --> 01:16:29.430

David Baqaee: The last two columns are the CES model that then showed you which are kind of very simple models, where you just pick an elasticity of substitution that's very small like point 04 and then you feed into shock and you see what happens.

438

01:16:30.300 --> 01:16:35.760

David Baqaee: And you can either do it to energy as a whole or to gas as a specific input inside that co sponsor.

439

01:16:36.420 --> 01:16:58.080

David Baqaee: The second column is a big structural model that comes from a paper that I have with Emanuel Ferrari, where we try to match exactly all the data on the world input output network, so our model has 40 countries every country has 30 sectors.

440

01:16:59.190 --> 01:17:05.250

David Baqaee: We match expenditure shares in terms of how countries and sectors are connected to one another, we.

441

01:17:05.730 --> 01:17:13.380

David Baqaee: Use elasticity estimates for the domestic economy that are very, very low so across sectors within the domestic economy.

442

01:17:13.620 --> 01:17:25.320

David Baqaee: across different kinds of consumption goods between value added and materials we pick very low, as the cities, and then we big trade elasticity that match what the literature has been estimating in terms of trade elasticity.

443

01:17:25.800 --> 01:17:34.740

David Baqaee: And we just run that model just sort of, if you like an off the shelf model with complementarities that matches the whole structure to see what kind of number two we get can we get something.

444

01:17:35.010 --> 01:17:42.150

David Baqaee: Where we completely off somewhere and we find numbers that, if anything, are actually smaller than what the standard CES calibration shows.

445

01:17:42.390 --> 01:17:54.270

David Baqaee: Or the back of the envelope suggesting, and the reason there is because in the model actually that substitution effect, the fact that there's lots of connections all over the place, and everybody can adjust across different margins.

446

01:17:54.660 --> 01:17:58.650

David Baqaee: Actually winds up making the numbers, if anything, smaller rather than bigger.

447

01:18:00.360 --> 01:18:16.140

Markus Brunnermeier: David, can I trust so first off, I would like to do a different exercise, you would say, if you want to achieve a 30% reduction in energy or gas how much does the price have to go up did you do an exercise like this too yeah.

448

01:18:17.040 --> 01:18:21.480

David Baqaee: Essentially you know we didn't do an exercise like this.

449

01:18:22.500 --> 01:18:28.350

David Baqaee: So in in the big model, I mean so that it would come down to the effectively the.

450

01:18:29.280 --> 01:18:38.790

David Baqaee: elasticity of demand that you're assuming for gas, I think the question has to be spelled out very precisely because in these markets.

451

01:18:39.540 --> 01:18:54.630

David Baqae: There is no such thing as just sort of gas in this model there's different sources of gas and different people feel differently, because they're buying it from different places and but but we haven't done that that's certainly something that we can we can experiment with.

452

01:18:54.660 --> 01:18:56.700

Ben Moll: Can I sorry sorry.

453

01:18:56.910 --> 01:19:08.280

Ben Moll: No, no, we did actually do this exercise in these simple CS type models here in the in the end it's in the appendix where we didn't do it is in your model David yeah.

454

01:19:09.300 --> 01:19:24.180

Ben Moll: And, and then it depends just on the analysis use substitution obviously right, so, in particular, with a very low lcc of substitution, the price has to go up a lot there's an appendix figure, if you if you look at the appendix I put in the.

455

01:19:25.230 --> 01:19:38.910

Ben Moll: In the chat you you'll find it, I think, for the very, very low studies which are probably too low, where we want it to be really conservative we put a I think the price has to go up by a factor of like nine or something like this.

456

01:19:38.940 --> 01:19:40.380

David Baqae: yeah I think that's a factor.

457

01:19:41.160 --> 01:19:52.200

Ben Moll: it's a huge price increase, but the point there is that we think it's actually you know unrealistic and to large why because the other cities are so low and it comes back to this point that David made.

458

01:19:52.590 --> 01:19:55.260

Ben Moll: You know, whatever you believe about the electricity is.

459

01:19:55.530 --> 01:20:07.050

Ben Moll: it's going to have implications for what's going to happen to the expenditure shares, if you think the emphasis is a really low it's going to give you crazy movements and expenditures and where do where do those come from well from the prices, I guess.

460

01:20:08.040 --> 01:20:09.150

David Baqae: that's right I.

461

01:20:09.420 --> 01:20:12.870

Markus Brunnermeier: just want to say we have to speed up because we're running a little too.

462

01:20:13.440 --> 01:20:14.790

David Baqaee: much so.

463

01:20:15.720 --> 01:20:16.980

Markus Brunnermeier: finished in about five minutes.

464

01:20:17.010 --> 01:20:19.500

David Baqaee: Great so I just wrap up very quickly about what.

465

01:20:19.950 --> 01:20:29.880

David Baqaee: The model these numbers on the previous page or evening, so I think an important thing that i've left we left out of that previous table our aggregate demand externalities and reductions in employment.

466

01:20:30.210 --> 01:20:33.900

David Baqaee: But I think it's helpful to kind of separate the physics from the.

467

01:20:34.260 --> 01:20:46.170

David Baqaee: Macro economic stability part of this, so I think those first two terms that have to do with energy, the reduction in energy and the change in the expenditure share on energy, those are things that are determined by the physical nature of the production structure.

468

01:20:46.530 --> 01:20:52.230

David Baqaee: And then there's a different part which is the macro economic consequences in terms of employment and that's something that.

469

01:20:52.590 --> 01:20:58.080

David Baqaee: Ben is going to talk about briefly but it's also something that depends on the policy response in Germany and the amount of.

470

01:20:58.770 --> 01:21:08.640

David Baqaee: Physical support that there is nevertheless we tried to be as conservative as we could picking very know Alaska cities, having the elasticity rounding up our numbers.

471

01:21:08.850 --> 01:21:21.120

David Baqaee: Putting in adjustment costs wherever we could and, nevertheless, we can just it's it's implausible, I think, to generate numbers as big as, for example, 10% reductions and output on welfare i'm going to stop and hand it back to them.

472

01:21:21.720 --> 01:21:30.450

Ben Moll: And, just to be clear right to their headline number that we have so 3% GDP loss is essentially like the largest number here, which is.

473

01:21:30.780 --> 01:21:42.870

Ben Moll: The simplicity, as model that doesn't have any substitution via trade and then we rounded up that 2.2% to 3% exactly to have sort of a safety margin.

474

01:21:43.200 --> 01:21:53.340

Ben Moll: For these amplification effects and i'll talk about that a little bit in the second one little qualification also these numbers here they have.

475

01:21:53.970 --> 01:22:00.960

Ben Moll: The substitution via trade, we do think those are probably a bit too optimistic why because.

476

01:22:01.740 --> 01:22:14.010

Ben Moll: We think you know trade linkages and trade relationships will take longer to adjust and just say six months, so you know, probably these these numbers here, or maybe something like this, or the more relevant.

477

01:22:14.670 --> 01:22:21.840

Markus Brunnermeier: These numbers like 100 euros or is it a month or a year or so no number it's yeah yes.

478

01:22:22.530 --> 01:22:32.190

Ben Moll: yeah we just took total gross gross national expenditure in Germany and then say calculated 2.3% of that that comes out to be 900 years.

479

01:22:34.320 --> 01:22:34.560

Okay.

480

01:22:37.410 --> 01:22:38.820

Ben Moll: Okay, so.

481

01:22:40.320 --> 01:22:50.640

Ben Moll: Big so you know when we wrote the paper then essentially a lot of people said, you know, obviously you're leaving out some things which some of these criticisms were.

482

01:22:51.600 --> 01:23:09.000

Ben Moll: Fair others were not tomato just misunderstood standing basically but you know, one that that's obviously potentially important and that we did leave out in the numbers that David had just shown you this sort of a good old fashioned sort of Keynesian aggregate demand amplification.

483

01:23:10.050 --> 01:23:19.200

Ben Moll: So I wanted to briefly tell you about this, and particularly as a nice paper by my co author Christian buyer with some students and postdocs anything.

484

01:23:20.610 --> 01:23:25.770

Ben Moll: Here at da w who wrote a nice sort of follow up paper, if you want about this okay.

485

01:23:26.520 --> 01:23:32.700

Ben Moll: Essentially, what they took is they took sort of a standard occasion model in this case with heterogeneous households and then.

486

01:23:33.510 --> 01:23:41.130

Ben Moll: That in sort of an aggregate supply shock that's meant to capture the type of shock, we have, in particular, they assume that.

487

01:23:41.670 --> 01:23:55.980

Ben Moll: tfp initially drove for 2.2% why 22% because that's the number, we have here, and then they additionally put in a 3% capital obsolescence shock so kind of a, this is a large a negative shock here.

488

01:23:57.600 --> 01:24:03.300

Ben Moll: The other thing that's nice about this kind of model, as you can think about inflation, which is something that's important than the debate.

489

01:24:04.230 --> 01:24:09.180

Ben Moll: So here's what comes out of their model alico go kind of fast so essentially.

490

01:24:10.020 --> 01:24:24.150

Ben Moll: The the key figures to look at here is this one here VIP is German for GDP Okay, inflation is just inflation and essentially they get that you do get some amplification in particular from 2.2% to.

491

01:24:24.960 --> 01:24:40.950

Ben Moll: Roughly 3% so that's the aggregate demand amplification that's the mechanism that you know everyone has in mind, so you know you get the numbers are higher but they're still sort of within this sort of safety margin, we left ourselves by rounding up.

492

01:24:41.970 --> 01:24:58.170

Ben Moll: The numbers from 2.2 to 3% The other thing you can talk about now is inflation here inflation in this model shoots up by a little more than two percentage points on what's really important here, obviously, is what monetary policy does.

493

01:24:59.250 --> 01:25:08.190

Ben Moll: what's the assumption here the assumption is that monetary policy operates the Taylor rule what this monetary policy do here, therefore it sort of leans against the wind and.

494

01:25:08.700 --> 01:25:17.040

Ben Moll: rises raise interest rates to sort of choke off some of the rising inflation that's probably an optimal policy response to a certain extent.

495

01:25:18.270 --> 01:25:30.600

Markus Brunnermeier: Because when you the inflation goes up only by 2% is this, for the time period is yours, or is quarters or months, this is yours i'm pretty sure and.

496

01:25:32.070 --> 01:25:38.940

Markus Brunnermeier: It goes up only by 2% and essentially only increase the intercept 25 basis points that's it.

497

01:25:39.990 --> 01:25:43.770

Ben Moll: No, no, the interest rate goes by up by 100 basis points right, so it goes from.

498

01:25:43.830 --> 01:25:47.430

Markus Brunnermeier: Boise it goes from zero that's a change in the industry Okay, yes.

499

01:25:48.480 --> 01:25:50.370

Ben Moll: yeah and let me.

500

01:25:50.400 --> 01:25:58.020

Markus Brunnermeier: go on to more Taylor principal at all essentially you don't keep up with inflation and it's assumed that the anchor never creaks.

501

01:26:00.510 --> 01:26:01.110

Markus Brunnermeier: deflationary.

502

01:26:02.430 --> 01:26:05.010

Ben Moll: there's that's definitely assumed that the anchor doesn't break.

503

01:26:06.270 --> 01:26:08.850

Ben Moll: No, no, do you do follow Taylor principle is just that.

504

01:26:09.870 --> 01:26:28.140

Ben Moll: That there's GDP in there as well, and GDP is kind of all kind of have some time okay
Okay, let me speed up and sort of work towards a conclusion and just want to briefly give you a
sense of our studies so you know at this point it's not the case that our study is the only study.

505

01:26:29.400 --> 01:26:35.880

Ben Moll: or this together with this paper by Christian and co authors at this point there's a lot of
different studies with lots of different.

506

01:26:36.510 --> 01:26:49.020

Ben Moll: Methods some much more sort of structural macro models some very different
methods, the there is a very nice overview of the current estimates of this in particular.

507

01:26:50.070 --> 01:26:58.260

Ben Moll: But, in a report by the German Council of economic experts and here's sort of this
survey table they have and what I just wanted.

508

01:26:58.980 --> 01:27:07.620

Ben Moll: To point you to is this this column over here, which has the sort of GDP reduction
from different So these are slightly different scenarios.

509

01:27:08.250 --> 01:27:17.880

Ben Moll: But the point here is essentially all these numbers here or something like you know
2% or one and a half percent so none of these numbers are like 5% or 10%.

510

01:27:18.930 --> 01:27:34.860

Ben Moll: there's also some inflation numbers here, and you can see they're like maybe two and
a half percent more generally, this is just sort of a brief reading recommendation this Economic
Council of economic experts report, I think, is really very well done, I really recommended and
they.

511

01:27:35.970 --> 01:27:46.170

Ben Moll: have both the German version and sort of a shortened English version, there you know, obviously them being the Council of economic experts, there you know quite guarded and put on lots of.

512

01:27:46.800 --> 01:27:54.240

Ben Moll: You know caveats and and qualifiers which obviously is the right thing to do in the text, they don't have a bottom line number they come up with.

513

01:27:54.930 --> 01:28:02.220

Ben Moll: But for real and it was one of the sages I guess the they're always called in Germany, gave a.

514

01:28:03.180 --> 01:28:11.610

Ben Moll: press conference, where he essentially said, you know this is means we think it would be three to 5% GDP loss of a full cold Turkey and port stop okay.

515

01:28:12.000 --> 01:28:20.340

Ben Moll: i'm just briefly again wanted to say, you know, this is very well done and and they really have a very good team of of economists there and.

516

01:28:20.820 --> 01:28:24.690

Markus Brunnermeier: They don't need to 5% for how long for permanent loss forever.

517

01:28:25.770 --> 01:28:35.010

Ben Moll: That no I think this is just the first year um I don't know what the assumption, there is, how long it's gonna last this is over the first year.

518

01:28:37.860 --> 01:28:45.810

Ben Moll: Okay, just briefly if there's time wanted to just talk about some criticisms that we've received.

519

01:28:47.040 --> 01:28:59.850

Ben Moll: That we haven't discussed it i'll go fast with this one Tom craps wrote a blog post, I guess, or newspaper little article and he essentially didn't like the fact that we have in our computational model.

520

01:29:01.080 --> 01:29:05.130

Ben Moll: which was the second column in in the in the numbers that David showed.

521

01:29:06.210 --> 01:29:14.580

Ben Moll: That we have the same Ellis disease substitution in different industries, so he thinks we should have a separate llc city of substitution for the chemical industry and.

522

01:29:15.210 --> 01:29:25.020

Ben Moll: That should be lord and the number we currently have that 0.05 and I think that's a fair point you know in fact what you can use their very nicely is the.

523

01:29:25.800 --> 01:29:29.700

Ben Moll: Sufficient statistics formula that David just showed from the buckeye firing model.

524

01:29:30.300 --> 01:29:36.210

Ben Moll: We need to think harder about to do this, but again it's going to come down, what do you think is going to happen to these expenditure shares and.

525

01:29:36.570 --> 01:29:47.160

Ben Moll: We think, unless you think something crazy is going to happen there you know you're not going to get numbers that are bigger than 3% Okay, and here we also got some criticism.

526

01:29:48.300 --> 01:29:55.230

Ben Moll: By I guess the the Chancellor and the Economics Minister, these are sort of signed referee reports, if you want.

527

01:29:56.430 --> 01:29:59.070

Ben Moll: So, so they said these kind of things here.

528

01:30:00.180 --> 01:30:08.220

Ben Moll: You know we're forgetting sort of where's the gas actually supposed to run through where the pipelines, what is the regasification capacity or hobbies that.

529

01:30:08.460 --> 01:30:15.270

Ben Moll: sheer physics stands in the way of these macro economic models, the time it takes to build these pipes and so on, and I think these are.

530

01:30:16.500 --> 01:30:19.470

Ben Moll: kinda good criticisms.

531

01:30:20.550 --> 01:30:26.910

Ben Moll: I think a large part of this is not necessarily about our macro models.

532

01:30:27.840 --> 01:30:32.670

Ben Moll: You know I do think it's important to emphasize that macro models do respect physics, you know.

533

01:30:33.030 --> 01:30:44.940

Ben Moll: what's more physical than resource constraints and production functions which we obviously have, I think the way to read this is one of three things to that are listed here, and one that mark is made me think of which is.

534

01:30:46.170 --> 01:30:50.820

Ben Moll: You know, maybe what they mean is that the gastric shouldn't really be 30%.

535

01:30:51.960 --> 01:31:04.110

Ben Moll: Instead of should be somewhere closer to 55% because maybe we can't you know substitute we can't get this extra gas from Norway and so on, so quickly, maybe we're too optimistic there, maybe we should think hard about that and.

536

01:31:04.500 --> 01:31:07.440

Ben Moll: Then the other thing that, let me actually say that first.

537

01:31:08.400 --> 01:31:18.810

Ben Moll: is maybe a good way of thinking about it is what Marcus said, maybe what they want to say is that we need sort of finer sectors and there's sort of a chemical industry in one place and a chemical industry in the other place, you need to.

538

01:31:19.140 --> 01:31:26.640

Ben Moll: move things around again what's kind of good is, we can use david's sufficient statistics formula, I like Marcus is common that we can put in some sort of a.

539

01:31:26.970 --> 01:31:44.820

Ben Moll: Safety term there under some assumptions that's a good idea, and another way to read this is, you know, maybe what they want is some sort of a spatial model with transport costs, as in like Esteban and steve's work and so that that's something interesting to think okay.

540

01:31:44.880 --> 01:31:51.180

Markus Brunnermeier: We have to come to an end, pretty soon actually because we're running already have an hour over oh sorry.

541

01:31:52.410 --> 01:31:52.680

Ben Moll: Okay.

542

01:31:52.740 --> 01:31:55.920

Markus Brunnermeier: Well, one or two words about France and other countries and.

543

01:31:56.910 --> 01:32:05.940

Ben Moll: And so you know we did this, we wrote this report here for the French Council of economic advisor with a chameleon day and Phillip Marta.

544

01:32:07.170 --> 01:32:08.760

Ben Moll: Where we essentially used.

545

01:32:10.830 --> 01:32:13.650

Ben Moll: david's computational model.

546

01:32:14.850 --> 01:32:27.150

Ben Moll: And just produce numbers for a bunch of different countries, the exercise we did there is to exercise the first one is more similar to what we did in the Germany paper, which is just introduce.

547

01:32:29.280 --> 01:32:43.260

Ben Moll: Trade barriers that basically choke off trade between the EU and Russia okay sort of a complete import stop and then you get some GDP losses and.

548

01:32:44.280 --> 01:32:57.630

Ben Moll: These numbers here the blue ones that are labeled embargo and the interesting or potentially problematic thing you get there is that there's large heterogeneity in the economic costs.

549

01:32:58.440 --> 01:33:08.160

Ben Moll: across countries in particular, this is Eastern European countries like Lithuania, Bulgaria, so essentially countries that are very integrated with Russia that would have very large.

550

01:33:10.650 --> 01:33:13.530

Ben Moll: losses in terms of the economic losses, we.

551

01:33:14.130 --> 01:33:15.900

Markus Brunnermeier: The other thing that can come to us is.

552

01:33:15.960 --> 01:33:22.440

Markus Brunnermeier: Among the European Union, this is SOS agreement to couldn't gas across the Union essentially.

553

01:33:23.160 --> 01:33:25.410

Ben Moll: Right so they're in the model so.

554

01:33:26.550 --> 01:33:40.770

Ben Moll: So in the model we let prices do their work, so you know the gas then gets reallocated through through the pricing mechanism in the model, so I guess there's an interesting question you know to what extent that would replicate what that that agreement would give you.

555

01:33:41.850 --> 01:33:59.370

Ben Moll: But the main point really that I wanted to just make here is, we did another simulation, which is what happens if, instead of doing full embargo you do a tariff okay turns out that a 40% tariff in this model at least is actually sufficient to completely choked of.

556

01:34:00.420 --> 01:34:05.370

Ben Moll: All energy imports from Russia for the big majority of these countries.

557

01:34:06.390 --> 01:34:09.060

Here, to the to the you okay.

558

01:34:10.110 --> 01:34:19.500

Ben Moll: You can see the the tariff CEO or the red diamonds one thing that's kind of Nice about the terrorists is that the costs are much more equally distributed across countries and sort of smaller.

559

01:34:19.770 --> 01:34:31.200

Ben Moll: On average, which I guess chimes with people's intuitions Okay, so let me conclude, and you know our conclusion or messages, the cost of an embargo and import stop.

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01:34:31.740 --> 01:34:44.760

Ben Moll: would be substantial, you know 3% of GDP is obviously not nothing but not catastrophic again ballpark somewhat smaller than covert and we think these are conservative estimates, we really like.

561

01:34:45.240 --> 01:34:59.580

Ben Moll: Try to you know make all the lcs elicit the super low and the numbers, we that generate 3% have like basically no substitution by imports and we rounded in a month to allow for these amplification effects.

562

01:35:01.920 --> 01:35:07.710

Ben Moll: policy, let me just say two words and then conclude, you know i'll pick the important ones um.

563

01:35:08.520 --> 01:35:18.570

Ben Moll: You know I do think it's important to let the price mechanisms work, and you know we want these prices of gas and oil to go up to a certain extent, and we want.

564

01:35:18.990 --> 01:35:26.310

Ben Moll: People to substitute obviously discounts with political economy problems, but you know just from a purely economic point of view, I think this is important.

565

01:35:27.630 --> 01:35:36.570

Ben Moll: You don't want to have rationing plants that some are led to shark follow entirely on industry or households, we did some calculations, then it actually can potentially be much worse.

566

01:35:36.900 --> 01:35:44.760

Ben Moll: Monetary policy should raise interest rates, who control inflation you don't want to tax subsidy petrol say.

567

01:35:45.930 --> 01:35:57.360

Ben Moll: You know, again, given the size of the shocks and the economic costs we think a country like Germany, with relatively modest debt to GDP ratios.

568

01:35:58.200 --> 01:36:05.220

Ben Moll: could potentially you know use policies to alleviate some of these losses.

569

01:36:06.150 --> 01:36:14.010

Ben Moll: In particular, avoid financial spillover effect, what are the policy to as well kind of exactly the same ones we've used during kovats so.

570

01:36:14.340 --> 01:36:29.340

Ben Moll: pirlo so could survive in Germany, you may have to bail out certain companies so, for example, for the chemicals industry, I mean what it is a chance, it could get really bad, in which case, maybe you have to bail out vs, for example.

571

01:36:31.050 --> 01:36:38.100

Markus Brunnermeier: Okay okay so let's come to a close, thanks, a lot to to the band and David for outlining.

572

01:36:38.640 --> 01:36:47.040

Markus Brunnermeier: Your estimation procedure and the way to approach this thing, so we learned a lot and I think we got a much finer detail now and as.

573

01:36:47.790 --> 01:36:56.340

Markus Brunnermeier: Probably I would argue that has a lot of value to do this, quantitative macro models, but it's also has a lot of value to do some other studies and then, as we put everything together we get the.

574

01:36:56.700 --> 01:37:07.590

Markus Brunnermeier: richer picture how things play out hopefully at the end, we hope that they will will be over soon in Ukraine as people suffer and that's quite a tremendous hardship.

575

01:37:08.520 --> 01:37:18.480

Markus Brunnermeier: And for all of you who were hanging out till the end thanks for hanging out till now and adjust the quick advertising for next week, we have ELENA quba quba.

576

01:37:18.510 --> 01:37:21.090

Markus Brunnermeier: With us she will talk about other aspects.

577

01:37:21.090 --> 01:37:37.320

Markus Brunnermeier: of actually sanctions, probably more on the financial side and how things really play out and how the payments are done and how you can get around that and why the Google is still so strong and all the other aspects, and I hope to see you next week, and thanks again to David and to Ben.

578

01:37:38.460 --> 01:37:39.990

Markus Brunnermeier: Take care cheers.

579

01:37:40.560 --> 01:37:42.090

Ben Moll: Thanks everyone.