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HOW LARGE ARE GLOBAL ENERGY SUBSIDIES?

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Welcome:

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Key Findings: How Large Are Global Energy Subsidies?:

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Panel Discussion:

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P R O C E E D I N G S

MR. WESSEL: Good morning. I'm David Wessel. I'm Director of the Hutchins Center on Fiscal and Monetary Policy here at Brookings. Our mission is to improve the quality of fiscal and monetary policy here and abroad and to improve public understanding of it. And climate change may seem, and energy subsidies may seem a bit outside the perimeter of what most people think of as fiscal and monetary policy, but as you'll learn today, they're actually very much at the heart of good fiscal policy. The report which Vitor Gaspar from the IMF is going to discuss will, among other things, raise your eyebrows about the size of global energy subsidies. But also, it's become increasingly evident that the challenges of global climate change are going to pervade every aspect of government economic policy and certainly that of fiscal policy. So I'm very glad to provide a forum this morning for the International Monetary Fund's Fiscal Affairs Department to present the refinement of their original studies on global energy subsidies which impressed me when they came out for two reasons. One is, I had no idea how big they are and we're going to learn today they're even bigger than I thought they were, but secondly, I think there's a kind of knee jerk sense that if you cut energy subsidies, you hurt the poor and one of the things I've learned from the IMF is, it's not quite so simple. It turns out rich people have more air conditioners and cars than poor people so energy subsidies may actually not be as distributionally the way we think they are.

But also, unfortunately, there seem to be very few policies that we can discuss and pursue that seem to constitute win-win-win strategies. And I think what makes this report so interesting and encouraging is that we could actually improve the quality of the environment and reduce fiscal deficits by doing something that reduces the risks of global climate change. So in a town where everything seems to be trade-offs,

this report I think gives us a bit of hope that there are some things that can move us forward without having a lot of losers.

Our program today will begin with Vitor Gaspar, who is head of the Fiscal Affairs Department at the IMF, formerly at the ECB and the Portuguese Central Bank among other things. Vitor is going to speak for about 13 minutes, according to our time sheet. He has precisely 13 minutes. (laughter) He has some slides and of course you all have copies of the report and the blog post as well, and following that I'm going to be joined by Adele Morris, one of my colleagues at Brookings and Phil Sharp, the head of Resources for the Future. I'll introduce them later. Unfortunately, Nancy Birdsall of the Center for Global Development can't be with us. She has a health issue but she's with us in spirit, so Vitor, the floor is yours.

MR. GASPAR: So, many thanks to Brookings, for hosting this event and special thanks to David, for his kind words of introduction, and thank you all for your interest and for your participation today. I will be presenting our update estimates of global energy subsidies and I will be doing that in 13 minutes or less (laughter), as David said.

Now the presentation draws from a new IMF working paper, which is available immediately after this presentation. The presentation and the working paper rely on quite a lot of work done recently at the IMF. We have published two books, one in 2013 entitled "Energy Subsidy Reform", and a second one in 2014, entitled "Getting Energy Prices Right". The methodology has been presented in a 2014 journal article published in Economics, Energy and Environmental Policy.

The size of energy subsidies crucially depends on how they are defined. Our focus here is on a broad notion. Our energy subsidies capture three elements -- first, the failure to recover the cost of supplying energy, second, the failure to fully charge for

the environmental damage from energy consumption, and third, the failure to tax energy consumption in the same way as other consumption goods.

This broad notion of energy subsidies captures, in our view, the policy relevant question, and the policy relevant question is, what is the right level of energy prices? The paper also provides estimates of environmental fiscal and welfare impacts from eliminating energy subsidies. Our findings need to be interpreted with caution. This estimate are approximations based on a partially equilibrium analysis. That is because cross price demand effects between different energy products are not taken into account. That makes it partial equilibrium. However, we also make the further assumption that supply costs are fixed and hence, our approach focuses only on the demand side, and therefore, partial equilibrium. We also disregard second round effects, and dynamic effects of adjustment. However, sensitivity analysis indicates that results are qualitatively robust. This allows us to safely conclude, and this is the bottom line, energy subsidies are very large, and their reform will generate substantial benefits.

We find, and you see it in the slide, that energy subsidies are big and they are rising, given that energy subsidies increase from 4.2 trillion dollars in 2011, to 5.3 trillion in 2015. In percent of GDP, global energy subsidies are estimated to have increase from 5.8 percent of global GDP in 2011 to 6.5 percent in 2015. These numbers are shocking. They exceed global public health spending estimated by the World Health Organization at 4.3 trillion dollars, albeit for the different year of 2013. This is one of the largest externalities ever to have been estimated.

Now energy subsidies are not only large, they're not only increasing, they have been shown by our research to have various adverse effects. Energy subsidies exacerbate environmental damage. This includes local pollution, traffic congestion and accidents, road damage and global warming. Energy subsidies benefits are, as David

kindly referred, mostly captured by reach households. There are much better ways to help the poor. Energy subsidies penalize growth by distorting the allocation of resources and last, but from the view point of the Fiscal Affairs Department of the International Monetary Fund, definitely not least, energy subsidies are fiscally costly.

Now moving on, this line shows the share of the various components in global subsidies in 2015. Less than one fourth can be attributed to global warming, which means that 75 percent reflects local factors. It is something that has some significance in what follows. This slide in turn shows the share of global subsidies attributable to each energy product in 2015. Most subsidies, as you can see, are from coal. Coal is the dirtiest fuel and thus has the largest environmental damage. Ironically, coal is also one of the fuels that have been rarely taxed in any country.

Now this slide has a lot of information. It shows the geographic distribution of global energy subsidies in 2015. And what you see from this distribution is that energy subsidies are sizable in nearly all countries. Regional averages are all above 2 percent of GDP. In percent of GDP, energy subsidies are highest in emerging and developing Asia, and in the Commonwealth of independent states, both at over 15 percent of regional GDP. This is largely because of their high use of coal and high population exposed to emissions.

In dollar terms, emerging and developing Asia accounts for about half of the global energy subsidies. Advanced economies account for about one quarter -- about 25 percent. The top five subsidizers are, in order, China, United States, India, Russia and Japan. Subsidies for the European Union as a whole are similar in the aggregate to those of India.

Now eliminating energy subsidies can generate substantial environmental fiscal and welfare benefits. For example, it could reduce fossil fuel

emission related death by over 50 percent on average, and in this slide, you have not only the global average of 57 percent, you also have the distribution by region.

Eliminating energy subsidies can also lower global carbon dioxide emissions by over 20 percent. Reform would lead to a large increase in petroleum prices and in the cases of coal, the deployment of emission control technologies. Again, the percent reduction in CO2 emissions vary significantly across regions and you can see the distribution on the slide.

Now I have to give you some information on the fiscal gain from energy subsidy reform and what we have in this chart is our estimate of the fiscal gain. And we compare for the three regions -- for the three groups of countries -- advanced, emerging and low income and developing countries, with the corporate income tax revenue, we do this for 2013, which is the last year for which we have this disaggregated data, and with public health spending. And as you can see, the fiscal gain is quite sizable.

And I conclude, to summarize, energy subsidies are high and reforms are urgently needed. But the reform would also contribute to global carbon emission reduction, in particular, it would help countries in meeting their pledges of carbon reductions ahead of the (inaudible) 2015 U.N. Climate Conference. Global energy prices have dropped significantly. That provides a window of opportunity for reform. Countries should act now. It is important to stress that there are many reasons why policy action should be gradual. Act now, but act in the right way. In our estimates, most energy subsidies come from damaged imposed locally on people. By acting in their own self-interests, countries, regions and cities would be contributing to the solution of a major global challenge. Nevertheless, coordination and cooperation at the global level remains fundamental. Hence, the conclusion, and the punch line- act local, save global. Thank you. (applause)

MR. WESSEL: Well thank you very much Gaspar for that disciplined -- I didn't time you, but I suspect you were right on target. I appreciate that.

I want to start with a little bit of putting this into historical context -- so basically what you point out is that countries subsidize energy. That means the price of energy in these countries is lower than it should be. And as a result people are dying, they have big budget deficits, and they're exacerbating the risks of global warming. What do we know about how we got into this situation where there's such big subsidies for energy? What is the political economy that lead us to this point?

MR. GASPAR: Probably it's useful to separate the part that has to do with the damage that energy consumption imposes on people and the environment, and what -- the part that has to do with practicing domestic prices below international supply costs. The latter basically has to do with the political economy of natural resource management in various countries and the political economy of that process.

The latter part has to do with the fact that in our economies we do not have a tradition of internalizing the damage that economic activity imposes on people and the environment. These are the facts that economists call external effects, and they have been mostly disregarded. Now it turns out -- and one of the points that we want to make with this presentation is that the size of the damage -- which is now being imposed on people and the environment -- is so large that immediate action is getting quite salient in public debate. And there is quite a momentum building up for action right now and that is likely to intensify in the run up to the Paris Summit in December.

MR. WESSEL: I see. So I meant to introduce my colleagues up here -- Adele Morris who joined Brookings in 2008 as an economist. She previously worked on the Hill and at the U.S. Treasury and is very active in the Center for Climate Energy Economics here at Brookings. And to her right is Phil Sharp who has been, for about a

decade, the President of Resources for the Future, which is a highly respected think tank on matters of environmental and related issues. But before that he spent ten years in the U.S. House of Representatives so he brings that perspective as well.

Phil, so I thought maybe I'd just start with you. So the IMF is obviously hoping that by putting some big numbers on the table and by making a strong but simple case why it's in the self-interests of countries around the world to curtail these subsidies, that they will get some action -- action now, but gradual. I wonder if you could put on your former congressman hat for a minute and say like -- does this kind of stuff actually move politicians? Is this likely to be a successful effort when we look back a decade from now?

MR. SHARP: Well I'm certain on Capitol Hill this would be well read. That was a joke. (laughter) Surely this audience doesn't buy that. (laughter) And actually I have to tell you, pathetically I was there for twenty years and so it reduces the quality of my input. But let me just say quickly first of all, I do think the value of this is reinforcing the argument that a number of global leaders are making about the issue, and getting it -- keeping it upfront for leaders of all countries to see. And I think that is a very useful thing to do, however, the calculus that economists at RFF make and the economists at (inaudible) here. But one of the welfare benefits is not the same calculus that obviously you expect in the political leadership anyway. They don't make that kind of calculus. There are major political components and so the next stage of work -- whether it's for the IMF or anybody else is, well show me how people are doing this. Show me how I would do this. You mentioned you should transition this. Well, show me -- don't tell me. Show me where it's been done. Show me that it's possible without wrecking my leadership as a political party or as a dictator or whatever I am there, so that I get some of those benefits. And I think that's not easily done but I think it's a very important step

that various people are going to take.

In the Congress I must tell you we dealt with energy pricing. Of course the price controls were on oil and gas when I got there and they're not now. And they were on electricity and we tried it all three areas and made major changes to liberalize that in terms of that kind of a subsidy through a price control that actually didn't subsidize the (inaudible) cost. But the point was that it became -- when you could show that something was working or had a positive impact it was amazing how the political sport would change radically. And so the ability to do that is extremely important.

MR. WESSEL: Adele?

MS. MORRIS: Well I think one of the values, political or otherwise, is to frame these challenges, whether it's the risk of climatic disruption or local air quality damage or any of the other external costs you talk about so well in this paper. It's the framing of the economic problem. It's not just an environmental problem. It's framing it as, we do not allocate resources efficiently in our economy and changing the way we do this through market forces could be extraordinarily powerful. And I think that's kind of the way I think this can end up being really influential then because you're talking to finance ministers. You're talking to trade ministers, you're thinking through a fiscal policy lens as opposed to a regulatory lens, or kind of a sort of collective gee, shouldn't we save the planet, type of framework. But rather hey -- exactly how are we misallocating the resource and exactly how should we fix it? And I really think that's a useful framework for this incredibly important set of challenges. And moreover you quantify the welfare benefits from doing that. And obviously the way in which different countries might implement your advice would differ. And I want to just congratulate you in going through and looking on a country by country basis, not just in this paper, but in other work that you've done looking at individual countries to give leaders the data and information they

need to understand how much better their outcomes could be if they think about the kinds of tools you're providing them.

MR. WESSEL: Vitor take Phil's challenge. Give us a couple of case studies where people -- countries have actually moved in this direction.

MR. GASPAR: If you'll allow me Dave --

MR. WESSEL: Sure.

MR. GASPAR: I have the benefit of having people from FAD in the room that have worked very hard on this matter that have been thought leaders. We have Dave, Ben, and Baoping on the second row. And one of the things that FAD has been doing all this time is advising countries on how to go about energy, taxation, and energy subsidy before. So what the Fiscal Affairs Department of the IMF does, most of the time is to give very specific advice to countries on how to do it. And we actually list about twenty countries around the world that have recently engaged in energy subsidy reform. In that context we have developed a number of key principals for successful energy subsidy reform that includes a comprehensive strategy, a very well thought through communication to the public, a careful phasing in and sequencing of reform. Indeed one of the key factors for success is that reform should be gradual, should be implemented with a clear sequence. One of the aspects which are important in this sequence is that the energy subsidies that benefit the reach most should be the ones to be facedown first. Another area, a very important aspect is to have mitigating measures to protect the poor. That the poor do not lose in the process and then finally one needs to have a clear commitment to carry out the process of reform to the end.

Now in our view these elements are key. Now you challenged me to give you some concrete examples. And one of the things which is absolutely remarkable, if you look around the world is how much action you see going on in all parts of the world.

And just to give you a perspective just take China, just take India. In both cases there has been not only action to tackle part of this challenge, but a commitment to take action in the longer run in according with a strategy where climate change and the local impact of externalities is clearly accounted for. So if one actually goes about documenting these processes around the world which is something that we do in our IMF research, one can find a lot of inspiration and one can be moderately optimistic about the likelihood of progress going forward.

Not necessarily at the basis we would be hoping for but action is clearly taking place.

MR. WESSEL: So you identified China and India and the U.S. as up there in the size of their global energy subsidies. But you're suggesting that for all the criticism we hear in Washington of China and India, they are actually beginning to move in this direction, to raise the prices of energy to get less consumption of the dirty fuels?

MR. GASPAR: Absolutely, if you look at India, what you see is in the last five years or so, a lot of action has taken place in terms of reforming energy subsidies. They started with a type of sequencing that I was indicating. They started by phasing out gasoline subsidies. Then they went on and liberalized diesel. Then they're now putting into place income support mechanisms for the poor so that they can move also in the area of liquefied gas. If you look at China, what you see basically is a commitment to the reduction of the pace of increase in emission and an eventual stabilization in 2030. And if you focus on coal you can probably infer that by 2020 or so that the emissions coming from coal in China will have peaked as well. So clearly both in China and in India you do see action on the ground.

MR. WESSEL: Phil, one of the big issues at the moment in the Congress is the inability to raise the gas tax which would seem to be the sort of thing that

the IMF would recommend. A number of states have done this -- there seems to be, you know, because of the way we finance infrastructure there's kind of a reason to do it. Yet it seems to be just almost impossible to get through Congress. Do you have a sense about why this has gotten so hard and what might change it?

MR. SHARP: Well, yeah I do, but I can't say so about publically. (laughter)

MR. WESSEL: Well --

MR. SHARP: I'm trying to be respectful. First of all David --

MR. WESSEL: Of us or of the Congress?

MR. SHARP: You are not alone and it's not like Brookings or the IMF discovered that it's useful to have a gas tax raised in America. Overwhelmingly everybody understands this is a very foolish position we are in to allow it to drain down, so I think it's only a matter of time till they wake up and realize they have to do it. I voted for a 40 cent raise in the gas tax in 1970 and I survived in the Democratic Republican district. Now admittedly it didn't pass, (laughter) so nobody can face that kind of thing and probably I would not have done that four years later.

But the point being, that when it is connected to infrastructure to America it is really a much more salable kind of proposition. Now timing wise, if you have prices of oil as were in 2005, 6, 7, and 8 going up, that's not a good time to be raising the gas tax as they will hit you one more time kind of proposition. Tragically they didn't catch it before it started coming down because they could have just absorbed it for multiple purposes but especially for infrastructure. So I think it really is only a matter of time. Also as you probably know, we, because of efficiency and gasoline use and ethanol and all of these things, the actual fund is in trouble as a mechanism to do what it was historically designed to do, just for transit for highways but there's also a mass transit component in

it.

So I do think we will clearly get there. I thought you going to ask about carbon tax, which my friend here and I are very much involved in.

MR. WESSEL: It's on my list go ahead. It's always good to pose your own questions on a panel like this. They're much easier to answer. (laughter)

MR. SHARP: Well this is even wilder optimism, so don't dismiss me immediately. Dismiss Adele (laughter) She comes at it as an economist. But it is the notion that a carbon tax is a mechanism to provide money into the ability to transform the tax code. And everybody that has ever dealt with this when we did in 1986 knows that the simple mechanism that will be able to stop all deductions and will be able to lower rates as a result and that's a whale of a big tradeoff, is only good in the abstract when you get down to it but we don't have volunteers for giving up their subsidy or their deduction. So you'll never get there to a pure system. You need a source of income. And the carbon tax will do that. So the possibility here is not to think that Congress is going to, and they certainly aren't now and probably not in the near future, going to adopt a carbon tax to solve the problem on climate change. What they may do however is say we really want to transform and both parties know we should, for economic and fairness reasons, we should transform the tax code and to do that we need an infusion of money and this sometimes goes as the concept of a revenue neutral carbon tax.

MS. MORRIS: I'll chime in here.

MR. WESSEL: Common tax.

MS. MORRIS: Yeah.

MR. WESSEL: Slow pitch over the plate. (laughter)

MS. MORRIS: Well, I mean we all understand that any discussion of tax reform or environmental policy takes a while. And so this is -- we're not talking about

imminent reforms. However the logic that Vitor just shared with us is unassailable. We have a system where, when I put gas in my car and the combustion gases go in the atmosphere and threaten the planet's future, I think it's absolutely clear that we have to do something about that. And the question is can we do it in the pro-growth way possible? And the economic literature is increasingly solid on this, that you take Vitor's advice, you tax carbon at your best estimate of the social cost. You implement that gradually and then you use that revenue to do something that improves the economics of the fiscal system so you can reduce other more distortionary taxes. You could reduce the deficit which will require tax burdens in the future to support. Or you could use it for pro-growth spending. In many countries that's a particularly useful option. But attacks on emissions do not necessarily mean new revenue. It can mean a better revenue system and more over you can use that tax to supplant much less efficient regulatory or other subsidies for clean energy. You can unravel some of that stuff if you've got the proper price on carbon and other greenhouse gas emission. So it's a way of rationalizing a system that, both on the revenue side and on the regulatory side that, needs improvement in many ways.

MR. SHARP: I'm just going to go back to Vitor's report here and just reinforce what Adele says. The value of this is precisely to help in advancing that debate and it just becomes a part of the general knowledge of people who have to make decisions that are in business and any leadership role. And that would be a major success. Now what you just articulated which I was very impressed with, is the way they're going at it in country by country and trying to be very practical about transition and those kind of issues. But getting that thinking -- and that is what is happening finally in America on climate. I just feel very positive. We are turning the corner here in which politically being a denier or a do nothing person is just going to be laughed out of the

room. Not quite there, but some of these people are quite laughable.

MS. MORRIS: And when we get to that point where we're not denying there's a problem, we're in the mode of thinking of how to solve it in the most cost effective way possible and when we get to this question of how can we be responsible economic stewards as we seek to solve our environmental issues then we can go to the kind of ideas that you've presented.

MR. GASPAR: What Adele and Phil have said is really at the core of what we want to say. If you allow me --

MR. WESSEL: Please.

MR. GASPAR: I will start with a piece of publicity. And we are going to put out -- our intention is to put out country specific information on the IMF website so you will be able to get the estimates country by country and as we have done for the Getting Energy Prices Right book, you are going to be able to change the assumptions that we have used in the baseline to correct them to whatever numbers you believe are better. Typically we did not use our own estimates for external effects. We took those from authoritative sources. And we of course quote the sources. To give you an idea of how uncertain these things can be, the price put on a ton of carbon varies in the literature from something like 12 dollars -- that comes from North House to something like 85 dollars that comes from Stern. In our estimates we use official estimates produced in the United States and the point number that we use is 37 which is well within the range of estimates in the literature. But of course you get an idea of the range of possibilities and the uncertainties which are associated with these estimates.

But using the information that we will have online, you will be able to put there your own assumptions and play around with those assumptions and get your own estimates if I may put it this way. Now why did I think that what Adele and what Phil said

was so important? They very much emphasized that what is at stake here is a comprehensive strategy that has to take into account growth and income distribution while it tackles environmental effects. Now that's absolutely crucial. In practice in the real world in a given country one needs to go through the pain of the details of the particular case. And there one wants to do the reform in the way which is more growth friendly and that may entail either reducing taxation in a revenue-neutral way as Phil said, for example reducing corporate income taxes. We had a slide with corporate income taxes. I've been told that in the U.S., that is one of the possible balancing deals that one can consider from a political viewpoint. But one can also reduce labor taxation. And both corporate income taxation and labor taxation are forms of taxation that hurt growth especially. So in advanced economies this revenue neutral way of building a comprehensive package makes sense. In low income countries, in developing economies, the increased revenue can be used to finance expenditures which are growth friendly, for example, investment in infrastructure -- for example, investment in human and social capital. That makes eminent sense. Of course, we should never forget that the overall package has to be equitable so it's crucial to use part of the additional revenue to protect the most vulnerable. That is part of the goal. So, one needs to have a balanced comprehensive arrangement. And then as Phil very well pointed out, whatever package one has in mind must be viable politically. Only politically viable deals will be done. But there, our contribution is to make the relevant facts as salient, as visible, as transparently perceived by the public as they possibly can be. Because in the end it is what citizens will want to see done, that will in the end be done.

MR. WESSEL: Let me just pick up. I just want to expand on one little thing you said because I think it's important. So what you're saying is, you know that poor people are going to pay more for electricity or gasoline or cooking fuel, whatever.

And the idea is, give them some money to offset the costs of higher prices so that they're made whole, so that the burden doesn't fall on the poor. Is that essentially what you're saying?

MR. GASPAR: So first, a piece of evidence that you and I have quoted but we have not quantified, if one goes around the world and sees energy subsidies in low income countries in emerging market countries and we see how much of it goes to the 20 percent richest households and how much it goes to the 20 percent poorest, the proportions are 43 percent to the richest, 7 percent for the poorest. Clearly energy subsidies are benefitting the rich more. Now how you should do it exactly, depends on the specifics of the case. But typically you are spot on. One can make a transition to an automatic pricing rule while at the same time design a system of target transfers that will protect the lowest income households from the impact of the increase in energy prices. And that's precisely the type of advice that the Fiscal Affairs Department of the Fund has been giving around the world and we do have a number of successful cases.

MR. WESSEL: Now -- go ahead.

MR. SHARP: Briefly -- they deal with practical problems -- I'm not trying to tell them what to do at all, but there is this notion that we can easily transfer back to people is not even a strong one in the United States, or is not as effective as people think. Some people say, well we should have a tax and dividend thing -- we'll send everybody a check at the end of the month. I can assure you, trying to a deliver a check to everybody in my congressional district in a month when they're moving around, they didn't pick up their checks, they don't have an address, they don't have -- just multiple complications in doing it, in this country where we think we're so damn good at all this stuff, kind of thing. So those mechanisms where the institutions don't exist to make that possible, makes it very difficult. The theory is magnificent and then I'm sure they deal

with this, the IMF officers when they're in a country as to what mechanism to do it. So one of the things I -- we have a lot of economics at RFF and they are very skilled and very good, but don't tell them I said this. Is what we have to be looking for most of the time, is what is the third best alternative? This gives us the direction where we want to go. But to be honest with you, in this country it's not settled and I don't think it will be settled squarely -- well should we tax for carbon or should we regulate for carbon? I think we're going to have multiple policies and working it out is going to be a complication where you want to drive to price efficiency. But the elixir of energy efficiency doesn't taste so good when you're in politics. And so it's a hard proposition to sell when you get down to it. So we want to be very careful that we're always looking for what is the third best way. If you're going to be subsidizing, is one technique better than another, kind of proposition because chances are in many places there is some way in which you're going to subsidize. Not to mention the question, does this mean that we shouldn't be subsidizing solar and renewables and nuclear and any of the low carbon fuels because they're higher priced than coal. I don't think that's politically viable and I'm not sure that's a smart policy. We can't get cold turkey here in America or anywhere else, to the notion of oh, we're going to just let the market price these things and we'll put the right externality tax on and that will do it. It is very important to go in that direction. I'm not trying to undercut that, but I'm trying to say when we get down to cases, it's, you got to --

MR. GASPAR: Three quick remarks on what you say Phil. First of I think you get, absolutely spot on the idea that what we're pushing for is a move in the right direction. Right? We do not pretend to have the exact solution to this source of problems. Now when you go around the world and you advise countries on how to do energy subsidy reform we are confronted exactly with the type of practical problems of administration that you pointed to and indeed we advise countries to put in place systems

that will work in the specific circumstances of the country concerned. And that will in many times mean that what you would think conceptually would be the best solution, will have in a sense to compromise given the practical constraints. But the point that I want to elaborate more on is something that you said almost in passing, which was that in the case of the U.S. and other countries, you will have a combination of tax and regulatory instruments. That's always the case. But the beauty of having a carbon tax and a tax that incorporates the damage which is imposed on people in the environment -- the benefit of a tax like solution in our view is that it allows us to fix the market mechanism and to make sure that the market mechanism prices this external effects right. By doing so, not only does one gain in terms of static allocational effects but much more importantly, one has the right signals to allow people to invest in technology, to invest in innovation, to invest in the future, and by doing so one can actually induce a new industrial revolution and get quite a sizable growth dividend.

MR. SHARP: Vitor I need to be clearer or my organization throw me out, that our economists would agree one hundred percent with what you just said. But I'm a little more skeptical about the capacity to get there is my point.

MR. WESSEL: I want the people from the Fund who work with Vitor -- when we get to the questions, I'm going to ask you to help us with some case studies of places that have actually done this so that we can assure Phil that it is not completely something thought up on 19th Street. But Adele you raised in an email to me something which we haven't discussed -- and Vitor almost got there. So what about the supply side here? You said in your presentation, Vitor, that mainly it was a partial equilibrium. You're looking on the effects of demand. I'm trying to figure out since we know that the oil, gas and here in the United States particularly, the coal industries are politically powerful. Are they likely to be for this or against it? On one hand they're not interested in things that

reduce demand for their product. On the other hand getting higher prices tends to be something they like so, I'm having a hard time working out where supply side is on this. What do you think?

MS. MORRIS: I think certainly in developing countries where there are price controls that limit the ability of firms -- state owned or otherwise -- to recover their costs, there are I think potential really important investment benefits from unraveling those price controls. And in particular, a lot of countries' electricity's prices are controlled, but in part as a result, reliability is terrible. And the extent to which electricity is delivered broadly including to the poor is very limited. So I think there's a whole category of benefits that you guys haven't really quantified in this work yet that could accrue to the poor by getting incentives correct in the delivery of energy, in these areas where there are really profound factor market distortions of all kinds that derive from policy, perhaps with the intent of helping the poor but with this unintended consequence of reducing deployment of modern energy and reducing reliability.

MR. WESSEL: And so you get cheap electricity but you only get it two hours a day.

MS. MORRIS: Well exactly. So I think that when you think about what are the necessary ingredients of developing a modern economy -- reliable electricity and other forms of modern energy are essential inputs to that kind of growth. And I realize it's very tough to quantify the potential welfare benefits that could come from those more rational investment incentives but it seems like part of your overall story.

MR. GASPAR: Yeah, absolutely. When one thinks about changes in resource allocation, one should not think that the interests that are reflected in past structure of the economy are given. With the new relative prices, you will be doing something different. New opportunities will be created. Something which will be more

like sustainable and inclusive growth will be generated. In this context there will be lots of business opportunities, lots of opportunities for innovation, lots of opportunities for things to be done differently. And that's what entrepreneurship is about.

MR. WESSEL: Right but is the coal industry going to be in favor of this or against it?

MR. SHARP: Against. (laughter)

MR. GASPAR: History has already developed ways of making the use of coal cleaner. Once you have the prices right these incentives will be much stronger and that basically means that their ability to adapt, as they already have shown in the past will be even stronger going forward. And it is this dynamic adjustment that one should factor in when one thinks about change.

MR. SHARP: Vitor, you aren't recommending to the Chinese that if they just use a pricing and tax mechanism as a way to cut the conventional pollutants are you? That just hasn't been the path that anybody has taken anywhere to my knowledge. If you want to cut pollution you have to get into a regulatory apparatus now, I mean, not fifty years from now. I'm talking about where we went and this goes to the point of the welfare benefits that you're delivering by these changes is, they have to show up at some point, if it's a health benefit. It's got to show up because I can tell the smoke stack is not poisoning my children. It's not going to show up next year, but is it going to show up in five years or ten years or I'm not interested. I'm not interested in paying a tax which I can't afford and I'm sure less so in most of those people -- get what I'm saying? I'm not against the regulatory apparatus.

MR. GASPAR: So Phil -- absolutely not. We believe that tax instruments, pricing instruments, regulatory instruments are complementary and that one needs to use the right mix. We are emphasizing tax and price like instruments because

that allows one to use the market mechanism in a way that reconciles the need to reallocate resources in the economy with a viable growth path going forward because in particular, by getting this increasing energy prices that reflect the relevant damage to people in the environment, you get the prices right and by getting prices right you induce the technological change that is right to tackle that problem.

MR. WESSEL: I thought that -- the way I would translate that is -- India and China don't need any help in convincing them that regulation is a route to making things different. They need a little help in understanding that market price isn't there. And putting their -- they wind up putting their thumb on the scale of -- the market doesn't deny that regulation is important -- they just don't need to be talked into that in China.

MR. SHARP: Well actually I think they're experimenting on the tax side more than many, they've got a --

MR. WESSEL: China is, yeah.

MR. SHARP: The Chinese have got these carbon tax efforts or cap and trade efforts -- that's a pricing mechanism not the tax.

MR. GASPAR: Phil just stole my line. Indeed the thing is that we believe that the point that there is a very important potential to relying more on market mechanisms. It's a point of general relevance. It applies around the world. It's not something that applies to a restricted geography.

MS. MORRIS: To your point though Phil, not every pollutant is suited for a tax. You've got a toxic effluent with profound local effects -- that's not necessarily the right issue for a price based mechanism. But the kind of air pollutants that they're talking about in their report are actually really quite well suited to price mechanisms and specifically because in a lot of developing countries -- imposing the kind of regulations that might be typical in a developed economy might be a lot more difficult

administratively. For example, let's say you don't have the regulatory apparatus to require SO2 scrubbers and oversee them and have people come inspect them and have real time monitoring and those kinds of emissions -- you could have an excise tax on the fuels in proportion of the expected SO2 emissions that would come from combusting that fuel. So I would say that in some instances, you're exactly right -- you want that regulatory complement. In other instances a simple administrative excise tax approach could be a really good way to ramp up those local environmental benefits without a lot of burdensome administrative requirements.

MR. SHARP: When you excise tax you mean it -- not my mouth. Not --

MS. MORRIS: I mean well you can do it different ways -- but let's say you're worried about SO2. You might impose the excise tax on the sulfur content of the coal as it goes into the electricity generating unit. And then that's the unit of tax, pounds of sulfur per ton of coal, or I don't know what the right units are in that particular environment. But people have -- ultimately it might be targeted to do it on the smoke stack because that technology exists. But if you're in a developing world and you need the second best solution, you can easily do calculations what the estimated emissions are per unit of the type of fuel. And then that can induce substitution across different kinds of coal, or between coal and other fossil fuels or biomass cofiring, or whatever you want to do. And it's actually a reasonable approach.

MR. SHARP: I don't totally differ with you but I suspect in China as they strengthen it I think they will because it's not so politically important. The inspection mechanism makes sure that the scrubbers are operation because some places they are not operating even though they're already on the plants required to be. They have the control mechanisms that I'm just guessing -- the carbon tax makes more sense, but I'm not -- if they're willing to try it, fine but I think the imperative of them, that they've got to

change what's happening now and they're willing do it in ways that almost nobody else is. They're going to move plants that way from Beijing after all. But what we want to try to make sure happens is that they don't just move the plants away and that is the answer for Beijing and a few of the industrial areas. It's something that happened where they're moving them to and that's where you know the tax --

MR. WESSEL: Well what are the Chinese actually doing? Do you know or --

MR. GASPAR: They're doing a -- they have a comprehensive approach. They have set up targets for the long run and they have emphasized the date 2030 as the date where their carbon emissions will be. They have some details about the path going forward. It seems safe to conclude that in terms of emissions coming from the use of coal, the peak date will be much earlier than 2030. Exactly how they're going to put together the set of instruments to achieve those goals, I don't think that we have the details yet.

MR. SHARP: I would just add, that's on the carbon pollution but they've had in several five year plans -- they have had quite specific targets on nitrogen oxides and sulfur dioxide and those kind of things which they always publicly, unlike the U.S. government, acknowledge they don't make. They miss the mark instead of redefining it, kind of proposition. So they've been at this, but they have not been very effective because they've always let economic development in a regional or provincial area trump that and they don't really have the strong EPA in the sense that it has the staffing and the administrative apparatus in Beijing that you get in the United States. They -- and their regional people tend to be more engaged.

MR. WESSEL: Emily can you bring the mike forward to the -- I want to -- we'll turn to questions in the audience in a minute but I want to give the -- Vitor's

colleagues from the Fund a chance to -- I'm really trying to get some case studies on the people there. Does anybody want to -- India, China, or anyplace else that's actually done things that we can learn from? Yep, it works. Todd.

SPEAKER: Okay, I'll try and be brief and not crowd out non-IMF conversations. I'm Dave Cody, I'm one with the office of (inaudible) and Lewis Sears here. I think I'd first -- I'll pick the big, big one India because it's a big one to take. There are a number of countries. But remember there's a history here. The history here is if you look at the 2013 book, we had a lot of case studies about countries who did many things. Those case studies breakdown into different types. Those who did fundamental change with large price increases, you know, Turkey has one of the highest price increases in the world and went through over a decade in reforms to the energy sector, and not just to pricing. But if you take in between, a big opportunity was maybe lost in the second half of 2008 when prices went down, just as they did recently. But countries went down with them. So what you observe this time around is a lot of countries didn't go down so much. So it's a passive approach, but it's still an approach which puts them in a much better position in terms of going forward. So the price increases going forward are much lower. I think the big challenge for the biggest group of countries will be, how do you move forward with this. How do you make sure you don't lose those gains, how do you make sure when the price starts going up that you go up with it? And I think that's the big challenge and we give a lot of advice on this and in particular how do you move to transitioning to automatic pricing mechanisms. Maybe with some inbuilt smoothing, but I won't get into the details there. But I'll just pick two countries because they're big. One is Indonesia. And Indonesia has learned over time how to do reform. It always did piecemeal reform when fiscally needed, it would whack up the prices and then there would be some demonstrations and so on. And this process was repeated ad infinitum.

But they learned over time was, if you actually start putting together a package of measures where the money goes into -- or some of the money goes into -- including our cash transfer program, a cash transfer program that didn't start off the best program in the world, but as a good old American colleague used to say to me, the perfect should not be the enemy of the damn good. (laughter) I'm not allowed to swear I don't think. And I think that's the message in these countries. The perfect shouldn't be the enemy. But they learned over time how to improve that program and they're still learning how to improve that program. And there is some -- there's an environment now where they may be open to more medium term better policies. India is another case in point. India liberalized gasoline prices in 2010. At that point we were in discussions with various people The idea was yes, but it will never happen for diesel. Then in 2013 they started to gradually increase by half a rupee per liter, the price of diesel. And it started to go up. And so then they got really lucky and the work price came down. And then they could impose excise taxes. And now they've liberalized the price of diesel. So one of the things I've definitely learned in my lifetime is, never say never. When people say cannot be done, forget about it. It can be done. I think so if a country like India can actually do that in terms of an environment where it was very toxic because they control prices. And now they're looking at ways in which they can hopefully -- but definitely a big momentum, to reform fundamentally their social protection system. And I think this is one of the challenges going forward.

In between you have a lot of countries in Africa who have actually increased prices when prices came down. Because fiscally they can't afford not to. Hopefully as prices go up, they will be able to continue to go up with those prices.

MR. WESSEL: Thank you. There was a question here in the front. Please tell us who you are and keep your questions succinct.

SPEAKER: Doug Hengel with the German Marshall Fund. If I understood correctly, these energy subsidies -- somewhere around 90 percent of them are due to the externalities imposed. Only around ten percent are due to the actual, it's called consumption subsidies, in other words, like the price of gasoline in Saudi Arabia being well below the market price. So the International Energy Agency has been doing a lot of work on this over the years and it's been on the G20 agenda. If countries eliminated all of their consumption subsidies, in other words gasoline was priced at the market price everywhere and electricity was the same, is there -- there's also presumably an effect on the externalities piece. But you're never going to get complete elimination of what you define as subsidies. You would have to go well above market prices. So I'd like you to comment on that, what you would have to get to in terms of energy prices to get rid of what you define as subsidies.

MR. GASPAR: You have been very clear I believe. Though it is true that what we call pre-tax subsidies, which are the difference between the reference supply costs and the price which is prefaced, it's a small share of the total estimate of subsidies that we've put forward. It varies over time, in particular because that part has sharply come down in the recent past. At this point in time it's much below the ten percent that you talked about. The rough ballpark number is more like five percent of the total amount, which means that 95 percent has to do with the other two effects that we measure. The first one has to do with the damage that energy consumption -- directly or indirectly imposes on people and environment. And the second is that we use a benchmark where energy consumption is taxed like any other good or service in the economy. So that's the bulk of it. And clearly we're talking about something which is quite sizable, because if you look at the average amount, we have this about five trillion figure and something which is about six percent of world GDP. So we're talking about

very large numbers. But I would not want you to fix so much on the magnitudes. I would want you to kind of think about this as, these effects are very large, clearly there is room to act now. That should be done gradually and that will allow economic agents to adapt to the change. It will allow authorities to learn about the behavioral responses as they go along. If this movement would be part of a comprehensive strategy going forward, you would have consistency in the price signals which would mean that the private sector could have the right incentives to invest in innovation and technological change. So that's the way I would suggest we should think about this.

MR. WESSEL: Gentlemen, just take the second row now and then we'll go to the third. Want to save you steps, Emily, and save energy.

SPEAKER: Hi Charlie Ebinger from Brookings. Do you have any estimate that if all the petroleum product subsidies were eliminated around the world, what the impact on global demand might be?

MR. GASPAR: I'm sure we do, but I don't know it off the top of my head. Because I did not concentrate on the disaggregation across products and the numbers that I have fixed my attention on, lumped together coal, petroleum and the rest but, perhaps Dave can answer that.

SPEAKER: All right just to clarify, you're talking about global demand generally or global demand for petroleum products? I vaguely remember the demand -- yeah we know the elasticity was about minus 0.5, 20 percent reduction in. (i) So there was that that the global average was around twenty percent reduction.

MR. WESSEL: Gentlemen here?

SPEAKER: Thank you, Nick Farmer. If you look at the results, it seems to me from the numbers you have in appendix four, they're heavily driven by the post-tax subsidy, local pollution for coal. And the reason for that is you show a factor of 15

increase from 2011 to 2015. Was there some underlying science that gave rise to this huge increase, or was this simply a change in the parameter in your model?

MR. GASPAR: Perhaps my colleagues will want to add to what I'm going say. But the change in the estimates that we put forward has to do with growth that took place from 2011 to 2015. But it has a lot to do also with the evidence that we used. In the estimates that we had done earlier for 2011 we were estimating externalities at the global level on the base of information we got from three countries, United States, United Kingdom, and Chile. Meanwhile, a lot of additional information and country specific information has become available and in particular we have been able to take into account the impact on health coming from emissions of fine particulates and some additional chemicals, like sulfur dioxide and nitrogen oxides and those additional externalities do have quite significant health implications that are to a very large extent responsible for the revision in the estimates that you put.

MR. WESSEL: Gentlemen in the aisle there?

SPEAKER: Let me try to channel some of David Wessel's colleagues on the Wall Street Journal Op-ed page and ask --

MR. WESSEL: Be careful who you cite here. (laughter)

SPEAKER: On another economic model, the (inaudible) curve, these problems would take of themselves if we just allowed the societies to increase their wealth. They would begin to address the externalities that you're talking about. So why not just let them use the fossil fuels to increase their GDP so that they can address the secondary costs?

MS. MORRIS: I'll chime in on that. Just because so you want to grow your economy doesn't mean that there's not a welfare loss from your pollution, so why incur an unfettered social welfare loss from damaging your environment when you can

address that and grow your economy? The logic just doesn't hold.

MR. SHARP: Well first of all that's exactly what's happened in China over the last 15, 20 years, in which, while they did have policies trying to curb pollution, they in fact were not enforced so you had basically laissez faire environmentalism. And now they are paying tremendous costs. They will acknowledge publicly they have major investments. They have a major challenge on how to assume policies because of the poisoning of water, the poisoning of the rice, the air, and if you've been there recently, it doesn't take you -- they don't even have to open the airplane door in Beijing and you know you're in coal country. And it's very unpleasant when it gets up very high. So they're aggressively -- and they must politically respond, it may be the wonderful, as (inaudible), I never remember the -- curve, that well, yeah that explains it and let's just wait for the economy. What's happening is exactly what that theory said, was -- you're going to have major political problems if you don't get off your butts and do something about this. And that's exactly what they are doing. So I would not recommend that as a policy, in fact, I think one can now argue that their economic growth -- they're paying prices and are going to have to pay for, including the unwillingness of some business leaders to live in Beijing with their families to do business. And their products that have gotten poisoned won't sell in America and Europe and other places like this. Now those are not problems they have alone. We've had those kind of problems too. But the point is, that's where we are in a very aggressive way of a government that has made it very clear they've got a war going on pollution. Hopefully they're more successful than our war on poverty.

MS. MORRIS: What I think your question derives from is, I think that the -- and I've read the kind of editorials you're talking about. They get the economics of environmental protection completely wrong. There's this knee jerk assumption that if

you're going to do something in a more carbon efficient way or lowering air pollution, that it's devastating to the economy and they throw around these adjectives that are completely inconsistent with the peer reviewed literature on the economics of environmental policy. It's just plain wrong. So, you know, now, that's not to say you can't design a cost and effective environmental policy, but well-designed environmental policy is extremely cost effective and I think the Wall Street Journal should, you know, have a sit down with people who actually study this for a living and get their economics right.

MR. SHARP: Well just follow American history. Every claim that was ever made by the auto companies, the oil companies and the coal companies in 1970, 1977 and 1992, when we amended the act -- I was only there for two of these -- the propositions were excessively high. Of course the environmentalists said there was zero cost and they were wrong. But the reality is, there were also enormous numbers of jobs that had been created for building scrubbers and what not. Now if you were living in high sulphur coal country, admittedly you're probably going to pay a price for this, but life has changed there, so there's almost no miners there, not because of the Clean Air Act, there are no miners there because they sure as hell don't want to live in that mess of going underground and the health problems that they have. There are lots of changes, that's another part of the (inaudible), a curve says I don't want to be a part of that. I don't want to live in the poison.

MR. GASPAR: I would like to add --

MR. SHARP: Excuse me.

MR. GASPAR: Just small arguments. One is that, of course, one of the reasons why one should act early, is because carbon dioxide lasts for a very long time. Carbon dioxide lasts for a hundred years, so what you do now will matter for a long long time. You have irreversibility. And when you have irreversibility, you should act early,

not late. But the strongest argument is that you should get your measure of economic activity, your measure of economic welfare right. If an activity imposes negative effect, it imposes damage on people and the environment -- if you're a good accountant, you should account for that. And once you do that, you see that pricing energy right is actually an opportunity for sustainable inclusive growth, not a cost for sustainable inclusive growth.

MR. WESSEL: The gentleman here.

SPEAKER: Hi Gary, Washington correspondent for Euro Politics. I have a Europe related question. I was curious when I saw the figure, 0.2 trillion or .3 trillion for the E.U.'s energy subsidies, because I know I was taught that the E.U. is renowned for a very high energy prices compared to the rest of the world. So I'm just curious what are the sort of countries and energy sources that are subsidized within the E.U.? And then another E.U. related question -- you were talking a lot about carbon pricing, but, as I'm sure you know this centerpiece of the E.U.'s climate policy is its mission trading system and that itself has had some bumps along the road. But just from your knowledge, does that achieve the same ends as the carbon tax type systems that you were talking about?

MR. GASPAR: Again, perhaps my colleagues will want to add, but if it's true that if one looks at the world, Europe has been at the forefront of this type of environmental friendly policies. If you look at say, the 1990's, it was in Scandinavia that pricing of carbon actually moved earliest, and so there is no doubt whatsoever that your perception that there is a lot of action in Europe, is correct. Moreover, if on top of the cap and trade scheme that you referred to, you would think about carbon taxes around Europe, you find quite a number of countries that have that form of taxation over and above the cap and trade scheme. Quite a few European countries have decided to do that on their own. Still, the damage imposed on people and the environment is so large

that even in Europe, if one uses the broad concept of energy subsidies including this indirect damage in the estimates as we do, you still have that the prices do not fully reflect this damage.

Now cap and trade and carbon taxes would be exactly equivalent in a world of certainty, right? If you could estimate exactly right, the goal that you want to have in terms of carbon emissions, and if you could estimate exactly the marginal damage, you could have a quantity and a price that deliver exactly the same allocation of resources.

Now it turns out that the world is very uncertain and the estimates of this effect vary a lot in accordance with the assumptions you make. It's very clear that in the case of the E.U. cap and trade system, the price of carbon that was delivered in this context was too low, and that is recognized by the European Commission itself. So the cap and trade in practice, did not deliver the type of out turn that one would have expected to have from it.

MR. WESSEL: Do you guys want to add anything? Do you want to finger any European countries? (laughter)

MR. GASPAR: No, I will not. I have in my desk a map which had prices on which country, and I purposely didn't bring it with me. (laughter)

MR. WESSEL: But it surely will be on line.

MR. GASPAR: I think this is what I wanted to flag. I think our attention will switch very quickly now to making the country specific data available on line. The reason we kept back from it a bit, was to focus attention partly on the big issues. It's not a country specific issue. It would not degenerate into who's high and who's low, but the onus is on us to do that and we're aware. We want to do it in such a way that we can be very transparent and of course, the IMF have certain standards before we put a data

base on a web site. We want to make sure we meet those. But we want to do it in a way in which people can actually see the work and you know, just like we want to decentralize the market prices for energy, we want to decentralize the database. And if we decentralize the database, then people can do what they want and see what they want. I think that's the objective here. It's what we try to do with the getting energy prices right database, where you can go in there and say, I don't believe this, what if. Our objective here is not to say the number is 5.2 and that's it, no more conversation. It's just to say, okay, you should go and have a look at it. Do some sensitivity analysis beyond what we've done. So that's really what I would point rather than pick out specific countries, in which I'd probably get wrong anyhow.

MR. WESSEL: Okay, I think one more question -- the gentleman back there with the yellow shirt.

SPEAKER: I'm Mark Carr, Channel Design Group. I work in fuel transportation policy and I think that -- I'm not sure I have a question here or a comment. The value judgements that are implicit in externality in general, not just on this issue, but on all kinds of things, transportation infrastructure projects and all that -- I don't think that the value judgements of the values are teased out enough in this, because if you reject your thoughts about an externality of this is legitimate, that isn't, what I think a lot of times your rejecting is the value judgement behind it. And I'd like to have more focus on that going forward.

MR. WESSEL: I'm not sure I follow what you mean. So if I estimate that X number of people will have lung disease and will die early, and I put a number on that and I can defend the number, where's the value judgement?

SPEAKER: I'm not sure you can defend the number. That's what I'm saying. The value --

MR. WESSEL: It's not a question of values, that's a question of whether the estimates are accurate or not.

SPEAKER: Hyped.

MR. SHARP: It's a question of how much you value your life.

MS. MORRIS: Well, I mean you don't even have to monetize it to know it's a big deal, right? So in your report, you talk about how, if we internalize these external costs, then deaths associated with air quality impairments could fall by over 60 percent, if I remember the number correctly. So -- and yeah, more than 50 in many of the individual countries that I saw the data for. So I don't even have to put a value of its statistical life or whatever to know that that's a lot of people. And that's something worth paying close attention to. And if I'm a finance minister and I have to choose where I'm getting my revenue, maybe I should look for sources of revenue that reduce deaths. I mean, when you think about all my options in front of me, right? So it just stands to reason and yes, there's no question you can quibble about the social cost of carbon or the value of statistical lives or any of that stuff, but just by pure logic and good governance, it makes no sense at all not to look very carefully at a reasonable defensible approach and its magnitude.

MR. SHARP: I would just really reinforce that. I mean this drive which I fully understand to try to statistically analyze these things is very important. But anybody who thinks we have discovered full truth in value, in my judgement, is making a radical mistake. And what Adele has just articulated, the ultimate value and direction of these things that is so important as we judge which actions to take and what things to protect, and to do, but if you were a believer and the models tell us exactly how human beings behave, I'm not on your team. But let me suggest to you, that does not deny the intellectual importance of trying to drive there. There will be lots of discussion by our

economists and others of the specifics of this, these reports, and the magnitudes. But the point is, it's the direction and the real issues that we have to deal with, that lots of people would like to deny.

MR. GASPAR: So let me try to persuade you, that given what you said, you should be a very big supporter of our work. In order for us to have a conversation about value judgements, one needs to be explicit about the assumptions that one is doing, and that's exactly what this work does. This work will tell you exactly where each assumption comes from and why we think that that assumption is reasonable, typically, because the source of the estimate is a credible one. And all the sources are identified and the argument you use, it is made explicit.

But then we go further. We make the database available, and in case you have different views, a different judgement about what the best estimate looks like, you can plug in your favorite number and see what that implies for the overall analysis. And that allows you and I to have a conversation about what kind of numbers we believe should be the ones to inform policy, going forward. And that's exactly how a policy conversation should look like. It should be evidence based.

MR. WESSEL: With that, please join me in thanking Vitor, Adele and Phil and the staff. (applause)

MS. MORRIS: Thank you Vitor. It's been a real pleasure. Thank you.

MR. WESSEL: As my colleagues remind me on the screen, if there's paper, cups, at your feet, we'd appreciate it if you pick them up and put them in the waste basket in the back, and there are of course, copies of the report as you came in.

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