Unedited Event Transcript

Fiscal Policy, Innovation, and Productivity Growth

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March 31, 2016

Adam Posen: Good afternoon, everyone, and welcome back to the Peterson Institute for International Economics. We are kicking into the high spring macro season in the run up to the G20, G7 and IMF World Bank Meetings. And so we are very fortunate today to be having a topical, and I think, frankly, innovative discussion today – sorry for the pun – about Fiscal Policy, Innovation, and Productivity Growth.

We're delighted to have with us Vitor Gaspar, the former Finance Minister of Portugal and Research Director of the ECB, who's now director of the Fiscal Affairs Department of the IMF. He and his colleague Ruud de Mooij who is a Deputy Director in the Fiscal Department are going to be presenting Chapter 2 of the new Fiscal Monitor from the IMF, which is very much concentrating on this interesting nexus and very promising nexus of how to deal with fiscal challenges while encouraging innovation.

There is something in the air about this, because it is a question that is not just for the IMF and for the developing countries, but our esteemed colleague and friend, the honorable Jason Furman gave a speech – what was it, two weeks ago, three weeks ago at, I think, Georgetown – on this very topic. And I can assure you, Vitor and Jason are both too busy with their own departments to have coordinated, but there's actually a lot – not perfect – but a lot of substantive overlap in these kinds of innovative thinking. Again, I'm using that word sincerely, not as a pun – that they want to do, in a world where we have the productivity slow down. In a world where we are worried about doing constructive things with what fiscal room we have, and in a world where we're trying to come up with systematic responses.

So we are honored today to have Vitor and Ruud presenting, and then Jason will come in. And then our colleague, Simon Johnson, who of course is a senior fellow here at the Institute, but also the Ronald A. Kurtz – I can never remember the middle initial - Ronald A. Kurtz, Professor of Entrepreneurship at MIT Sloan. We'll be talking about it from his

perspective, as many of you know, his second best seller was on fiscal policy in the US, and has been very involved of late in some issues of technological innovation and economics within the MIT community, which we're grateful that he brings to bear here in Washington as well.

I'm sorry to sound a little rushed, but I am genuinely excited about this program, and I don't wish to take anything away from the presentations, the relevant chapter of the fiscal monitor and Jason's previous speech are available on our website, as is the PowerPoint that they will be presenting today. Obviously, both the IMF and the Scouts of Economic Advisors are making available their stuff on their websites as well. This is going out over the internet. And ideally, this is a great seeing setter and agenda setter, as we head into the spring meetings and the G20 G7. So with that, Vitor, can you please join us? Thank you very much.

Vitor Gaspar: Thanks a lot. It is a great pleasure for me to be back at the Peterson Institute. Thank you all for coming to today's session on Innovation and Growth. My special thanks to Adam for putting this together, and for moderating the panel. And also to Simon Johnson and Jason Furman, to agree to participate on this discussion on innovation and growth. Last, but not least, I want to thank my collaborator, Ruud de Mooij for the exceptional coordination of this work joint with some colleagues who are also present. And I'm very proud to be associated with the presentation of this material today.

As I normally do when I have IMF staff and the exceptional team of people that have worked on this chapter with me, I do challenge you to ask whatever you may want to know about Fiscal Policy, Innovation and Growth that either myself or my staff will be able to provide you and answer. Now let's move on.

Technology and innovation have been critical in promoting human development and higher standards of living. It is the most important force doing so. Innovation and change have determined the principle economic occupation. They have determined the principle form of population settlement. They have been key for population dynamics, mortality, fertility, health, education. And GDP per capita growth has also been determined by innovation change. And GDP per capita growth is probably the most reliable synthetic indicator of changes in economic prosperity and the quality of life.

As you, of course, know well, pessimism is today pervasive. People are very pessimistic about the future, even the normally very sanguine Adam Posen has referred to the productivity slowdown in motivating this session. Now this pessimism is to a certain extent justified by human nature. We as people are attracted by tragedy and failure. And when you

have an economic crisis, when you have a prolonged slump, this natural human tendency is naturally fed by current development. And that's why it's so important to focus on trends like innovation and growth that can only be understood with a long run historical perspective.

Now if you think about the economic history of the world, what you do see is that before the 19th century, you don't discern any pronounced trends. So from that viewpoint, the history of the world before the 19th century is very boring, it's very flat, but after the beginning of the 19th century, things started pacing up quite substantially. In the 50 years before the First World War, the GDP per capita, in the 15 leading nations of the world, broadly doubled. It doubled in about 15 years. This was a quite remarkable at the time. So, people at the beginning of the 20th century had clearly the perception that they were living in a different world of progress. But of course, at the beginning of the 20th century, a bit later, in 1929 started the Great Depression, and I thought it would be interesting for us to go back to the economic depression to get a sense of how to put the current developments in perspective.

So people in 1929 were very pessimistic about prospects, and they kept being pessimistic for a very long time. In 1931, Arnold Toynbee, a very well-known historian wrote, "Men and women all over the world were seriously contemplating and seriously discussing that the Western system of society might break down and cease to work". And ten years later, in 1941, Schumpeter in his lower lectures actually said that many reputed economists agree that depression economics are here to stay and that the problem that led to depression economics could be attributed to narrow opportunities for investment.

And it is in the context of this tremendous pessimism that John Maynard Keynes – of all people – wrote a little piece, which is very charming, The Economic Possibilities for our Grandchildren. And in that piece Keynes complained that the world is by far too pessimistic and he bluntly and very daringly predicts that in the next 100 years, the most progressive economies in the world will see their GDP per capita increase between 4 and 8 times. GDP per capita would be multiplied fourfold to eightfold. And that's what you see in the slide, what I call the Keynes' Bands; so the upper band, if GDP per capita would be multiplied by 8, the lower band is if it were multiplied by 4.

And if you concentrate on the left hand side of the picture, you will actually see that at the time Schumpeter delivered the lower lecture. The path of GDP per capita in the US, which has been for these decades the leading economy in the world, were below the Keynes' Bands, but with the 100 years arisen that Keynes spoke about, you see the GDP per capita in the US has been consistently above the upper Keynes' Band. So Keynes

was not too optimistic; if anything, Keynes was too pessimistic. And the recent slowdown just makes GDP per capita in the US come just inside, but still very close to the top of the Keynes Bands.

So the point that I want to make with this slide is that if we look forward, if we look forward 100 years, I believe that, if anything, we have reasons to be more optimistic today than Keynes had back in 1930. Okay?

So this is my opening gambit. So what we want to do, we want to focus on a narrower topic. We want to focus on the role of fiscal policy for innovation. We are going to cover two of the three pillars of innovation. We're going to be talking about R&D, and we are going to be talking about entrepreneurship. We will not cover technological transfer. And finally, we will conclude.

In order to show that IMF staff is able to fine tune and coordinate very well, we are not going to split the presentation according to sections. We will actually pass the bat in the middle of the talk about research and development, and you will see that you it be seamless.

Now R&D is a key input into the innovation process, and R&D is crucial for the progress at the frontier. So we are going now to be focusing on data for advanced economies. That's what we're going to be doing. So I want to start with a very brief reference to basic research, and what we know about basic research is that it is mostly done by the public sector. It's 80% done by the public sector, 20% by the private sector, and the returns on this basic research are very high. They're about 20%, but they're below what is estimated to be the returns on private sector R&D, which then makes it crucial to understand whether private sector R&D and public sector R&D are substitutes or complements. And what the slide actually shows on the right hand side is that that complements. They tend to go together. And so it does seem that it works in quite a harmonious way. Let's move on.

Now the point that we want to make about R&D, private sector R&D is that it is too low, and it is too low mainly for two reasons. The first reason is that firms that want to invest in R&D are often credit constrained, and since the returns on R&D are very uncertain, it's difficult for them to carry out the R&D. And here, the role of fiscal policy is important because the more you have macroeconomic stability, the more you'll be able to dampen economic fluctuations, the less the role of credit constraints. And we show that this is important from an aggregate viewpoint.

But the point that I want to focus on is the other reason for having too little investment, and the reason is that there are important spillover effects, there are important external effects associated with R&D. The fact that a

firm makes an important discovery of a new product, a new process, is valuable for the economy as a whole, is valuable for other firms. And therefore, it's very important to be able to internalize this effect in the decision of firms. That can be done in two ways; one would be through contracts, and that's what justifies the reference to Coase or through public support, which is what justifies the reference to Pigou. It turns out that the contribution of Coase is empirically about 5%, which means that we have to leave 95% to Pigou, which is what I will do now.

So the main finding of the fiscal monitor, our punch-line comes from this slide. So what we find is that the spillover effects, the external effects are about the same size as the private returns. So the cost of investing in R&D for private firms should be reduced by half. If you go across advanced economies, what you find is that the average public support is about – it's a bit above – but about 10%. So you would want to increase the support by about 40%. Extrapolation on the cost of current schemes; that would have a budget cost of about 0.4% of GDP, and it would lead to an increasing R&D investment of about 40% again. And finally, the impact on growth on the long run; after about 20 years would be 5%, which ensures a positive return, even if you take into account the relevant discount factor and the time profile of the benefits and costs.

If you would take into account, the international spillovers, the impact would be even higher, and would go up to 8% of GDP, and the cost would also go up to about 0.5% GDP. And if you want to know the details, that's precisely what Ruud would start doing right now.

Speaker 1: Seamless.

Ruud de Mooij: Thanks, Vitor. Yes, the burden is on me to make it as smooth as possible. So what I will do is basically repeat what Vitor has said, but then in a slightly different way. I want you to make sure that we're on the same page here.

So what I will do is give a reflection on the conceptual framework that we're using, and put some numbers to the theory, which brings us to the numbers Vitor just explained.

So on the left is this conceptual framework of a typical externality, and how we can address that through corrective pricing. So here you see under the X is the R&D amount, and then the cost of doing R&D, and the green line is basically a flat cost curve, and the red line is the marginal benefit for the company. So it's declining, so every additional project you do has a smaller return; decrease of returns to [inaudible 00:19:16]. So the firm itself will go until the point A, where the marginal cost is equal to the marginal benefits. But as Vitor explained, there are positive externalities

from R&D. There's other firms benefiting from it, so the social benefits for the economy as a whole is to the right of this red curve, and that is the externality. So what society itself would like to do is go to the point where the blue line and the green line cross, which is more R&D than from themselves would chose; and how can it do that?

Well, it can do that through collective pricing. It can try to reduce the cost from the green to the yellow curve, and you see that the individual firm, which goes along the red line, will move until it arrives at point B, which is exactly the amount of R&D that society wishes to produce to be efficient. So this is the idea of the Pigouvian Subsidy.

How do we put numbers to this theory? Well, first of all, we need to know how big are the externalities. And there many studies on the size of the social return to research and development compared to the private return. And these studies typically find that social returns are two, 3, sometimes even 4 times as big as the private return. Now translating that into the price correction that is needed to achieve an efficient level, this would mean at least a correction of 50%. This comes out of this framework. So the correction should be at least 50%. Governments already do something, through their tax credits, through their subsidiaries, but the green line is only partly reduced to a lower level, and not to the full 50%, so there's a gap still of 40%.

How much extra R&D would you get if you reduced the price to 40%? For that, we need to know the slope of this red curve, which is the price response by firms with respect to the R&D, and this is about -1. This is a large literature again which we've reviewed and this is approximately -1.

So the underinvestment derived from this framework is an underinvestment of 40%. That's where the number comes from. Now what does that mean for growth? If we would be able to ramp up private R&D by 40%... well, if you look at, again, large literature with many, many studies that have estimated this, then sort of the average impact of R&D on GDP is that it's an elasticity of points [inaudible 00:21:51]. So if you increase R&D by 10%, GDP will increase in the long term by about 1.3%. So if you increase it by 40%, you get this around 5% increase in the long term. It takes time to get this, because the R&D capital stock needs to be built up and so on. So it can take about 40 years, but this is the long term impact.

This is only for domestic spillover. It only takes into account domestic spillover. The spillovers do not stop at borders. Knowledge spillovers cross international borders, which are also important. So if you do this whole picture from a global perspective, the underinvestment is even

larger, and the total GDP effect that you can achieve by addressing the underinvestment could be as high as 8%.

So this is where the numbers come from. Another critical aspect in Vitor's slide was the phrase effective design is critical. We need to design policies effectively to reduce the costs of R&D. Here are some examples of what countries currently do. Australia, US, China, Germany, and it shows that there's quite a number of design features that you have to choose to make these policies effective. I'm not going through all those, but for instance, some countries are closer to 50% reduction of the cost of R&D; look at Australia, Korea is also close to that.

What Australia also does is it gives a higher credit for small firms, and it makes sense, because if you look at evaluation studies, the response by small firms is 2 to 3 times as big as for large firms. They also make it refundable for small firms, and that's particularly important for new firms, because they often do not make profits, so refundable credits, which also grants it if a firm does not make profits, makes good sense in that respect.

The US, an interesting feature there, is that it is in on the increment, so there is a baseline below which you do not give the tax incentive. Only above certain amounts, so that reduces the windfall gain that you would give, and it gives you a higher bang for the buck a few months.

Some countries have no tax incentive. They focus entirely on subsidies, and these subsidies are usually much more tailored towards specific projects. So for instance, you can see where the spillovers are the biggest, and you can give a subsidy on those activities. The question is, is the government able to select the good projects for this? So there's always this ideological debate between subsidies and tax incentives. Empirically, there's no one answer. In some sectors, some instruments seem to work better, and also in the Fiscal Monitor we've done some work on this.

Something that has become very popular to stimulate innovation is so called patent boxes. There are 13 European countries that have introduced one. In Asia it's becoming more popular; it's debated in the US, and is this the right way to encourage innovation? The answer is already in the title, but we did some analysis analyzing patent boxes in various countries. So what a patent box does is it gives a lower tax burden, a corporate tax burden, an income from intellectual property. That's basically what it does.

Now does that stimulate research and development? So what we did here in this analysis is look at four cases: France, Spain, Belgium, and Netherlands. And we look at the development and research – this is private research and development – over time, from 1990 to 2013, and

then there's the point, the vertical line of the introduction of the box. Now the blue line is the country itself, and then we create a synthetic control; this is the synthetic control. So we want to control for similar developments in a control group, and we do that by constructing – it's not the country itself, but it's a mixture of countries that tries to replicate as good as possible the R&D development before the introduction of the box. So you see that attempt in these pictures.

And then after the introduction, we look at basically the treatment effects. So do we find treatment effects of the innovation box? And we see, in France and in Spain, there is no treatment effect. So the introduction of patent boxes has had no discernable impact on R&D. For Belgium and the Netherlands, there is an impact, you see? Especially for Belgium it's quite clear. So design of these schemes do matter; especially the last two schemes are much more generous than the former two, and they're also more tied to self-development of IP income, which is basically R&D.

The question is, are these schemes efficient? And an illustration of this is an evaluation in the Netherlands of the patent box, which was published two weeks ago, where they estimated the so called bang for the buck. So the government spends $1, how much extra R&D do you get for that dollar? And the bang for the buck of the Dutch innovation box was 56 cents/dollar. They also did an evaluation of the tax credit scheme, so how much additional R&D do you get from a tax credit which is focused there on labor costs for researchers? The bang for the buck of that is $1.77; so it's more than 3 times as large.

So these schemes – and this is an illustration of the broader message, these schemes tend to be less efficient as a way to encourage innovation. And in fact, these schemes also have other implications. They, for instance, create negative spillovers. Many countries have introduced these schemes primarily to attract intellectual property management to their country. And that comes at the expense of the tax base of other countries. So you create negative spillovers, rather than positive spillovers.

So design is really important. The other topic I'd like to address is entrepreneurship. Entrepreneurship is really important for innovation. To think about radical innovation, this typically comes from entrepreneurship. Incumbent firms tend to innovate too, but more in the incremental fashion. Also, the competition elements, productivity often comes from new entrance in the market.

So entrepreneurship importance, and this is a picture of the development in business entries in the United States between 1977 and more recently. So there's a clear decrease in trends. And there are still debates going on in the literature on what drives this, and whether this is good or bad. It

may be market circumstances that drive this, but the concern is that this is also driven by distortions. Distortions from regulation, distortions from lack of access to finance, or tax distortions, and the fiscal monetary primarily focus on these tax distortions.

So how important are they? Well, in theory, as usual in economics, there's always a tradeoff. So there're ambiguous impacts, because high taxes can be a punishment of success, which discourages entrepreneurship, but you can also say if there's full loads of sets, the government shares, not only in good times, but also in bad times.

So it's an insurance device, and this may encourage entrepreneurship; it encourages restating. So the empirics should tell us which effect is more important. And we did some analysis for Europe. This is based on 24 European countries over 12 year periods, and for the personal income tax, we find the personal income tax rates, or the progressivity is robustly insignificant; has no impact on business entry rate, but for the corporate income tax, we do find this negative relationship. There's the correlation that also appears from the regressions.

So many countries are concerned with this. They introduce all kind of special schemes, special incentives for small businesses. Many countries have reduced corporate tax rates for small businesses, or rather tax preferences for small businesses. Are these good, effective and efficient ways of encouraging entrepreneurship? Well, it's probably not very well targeted, because many small firms are neither new, nor innovative, nor do they grow very fast. And in fact, you can argue that it achieves the opposite, because they create the so called small business trap. By giving preferential treatment for being small, you encourage firms not to grow, because growing means you face a higher tax rates.

And this is illustrated in many of the empirical studies on [inaudible 00:30:47]. This is just an example for Costa Rica, that you observe the distribution that firms tend to cluster before a notch or kink in a tax scheme, which is the behavioral impact that I'm just describing.

So if you want to reduce the distortions on entrepreneurship, it's probably better to favor new firms, rather than small firms, and therefore we have this slogan in the monitor, "It's new rather than small that is beautiful". And there are some good examples of this. There are good schemes that focus on innovation by new entrepreneurs; these are refundable schemes, because that's very important for new firms, and also simplification is very important. The compliance cost can be a significant barrier for firm entry.

So to conclude, one conclusion on research and development, the scope to do more and scope to do better, we emphasize the world of fiscal stabilization, which not only matters for short term growth, but it can also matter for long term growth, through the effects on R&D. With respect to R&D incentives, the well-designed incentives can play a significant role to contribute to rising R&D. We emphasize the 5%. An impact of 8% if you look at it from a global perspective, but design really matters. Design should be good. We think that the patent box is not a design that is effective and efficient.

And entrepreneurship should be focused on new, not small, and I'm done.

Jason Furman: So I want to start by thanking Adam, because there's no shortage of really urgent issues going on in the global economy right now, and there's never any shortage of urgent issues. But he has consistently focused on the important issues, and made sure that the urgent wasn't crowding out the important.

I've been at two-and-a-half so far, and it will possibly be 3 at the end of this meeting today. Great discussions on productivity growth over the last year, and all two-and-a-half of those have been here. So thank you, Adam for either convening the best discussions, or being the only one that invites me to the discussions. Either way, I'm grateful.

I second wanted to thank Adam for the free lunch, and third, wanted to thank Vitor for the free lunch. The IMF has consistently put out a set of research which has argued about the important positive role that fiscal policy can play in economic growth. And what we saw here was for less than half a percentage GDP; you can buy 5% of GDP in additional output, and you know, those aren't at exactly the same time. But I suspect if you did the present value, you'd discover that with maybe even less qualification than [inaudible 00:34:11] had around its conclusions around infrastructure investment paying for itself, where they had qualifications around monetary policy being at a zero lower bound and low interest rates. But that statement might be even more true in the case of innovation.

When I agreed to discuss this paper, my hope was that it would have at least 2 or 3 deeply wrongheaded things to say, and have missed 2 or 3 reasonably important points towards its thesis. I'm sorry to report that it has none of those deficiencies whatsoever. So in the remainder of my comments, all I can do is simply underscore all the things I appreciate about it, and the convergence on both with the speech Adam referred to, but also a chapter on our most recent economic report of the precedent, that considered this set of questions.

First point I would make is it is really great to have a discussion about tax policy that's motivated by a goal other than the aesthetic purity of the tax code. And if you get with a bunch of tax experts to talk about tax reform, you end up with a conversation that feels a little bit more like making the internal revenue code look better than about the goals you're trying to accomplish.

In terms of those goals, John Levin of Stanford recently said, "The one thing that all economists agree on that's important is Pigouvian taxes", and he was writing more on the taxing things that are bad. The opposite of course is also true; subsidizing things that are good, and just to give a sense of the magnitudes, President Bush had a really thoughtful commission on tax reform that came up with a really good plan with all sorts of great elements and problems too – on tax reform. And the Treasury Department estimated it, and said it would add between two tenths and nine tenths of a percentage GDP to output in the long run. You look at Altik Awerbuck's Meadows in the AR, simulate really detailed comprehensive tax reform plans that do dramatic things, like shift to a consumption tax with no transition relief, at a single flat rate, and after 150 years, they tend to raise GDP by one, one-and-a-half percentage points.

Here we see by remedying this positive externality, and having a subsidy, you can have effects that are orders of magnitude larger than everything else we've ever thought about in the context of tax reform, when it comes to economic growth. And so I think having our orientation around making sure that, you know, we reform the business tax system in United States, for example, just a really important thing. And you know, there's more to it than just subsidizing research to make sure that it's expanding the R&D tax credit here in the United States is a central part of that work, and potentially as impactful as anything else one could do in tax reform.

The tax reform, of course, the details matter, and I thought the IMF chapter was reasonably good. It came up with three arguments as to why a patent box wasn't the best way to go. I was able to come up with six when I did my own work on the topic. And the phrasing in the chapter itself was a little antiseptic, like an R&D tax credit might therefore be expected to provide a larger increase in R&D per dollar for gone revenue. I thought the phrasing here, no exclamation mark, came closer to what's correct, and what I think is important is to think about your motivation around externalities, and an R&D credit is in proportion to the amount of research you do, whether that research has a direct commercial application, or whether it is more basic.

An innovation box gives you a return that is proportional to how successful you've been, which is going to be highly correlated with things

that actually have more of a benefit to the firm, or more likely to have happened anyway and have less of a positive spillover.

In the most extreme case, an innovation box rewards you for research you've already did in the past, which is unless encouraged to build a time machine isn't going to result in any additional innovation, as opposed to an R&D credit, which only subsidizes you on a going forward basis.

There's a very small literature on innovation boxes. This makes a contribution and a useful contribution to that literature, but uncertainty about it also has to be a factor. And that we have R&D credits with several dozen studies conducted in different time periods and different countries which have consistently found that for each dollar you spend on R&D tax credit, you get a dollar or more of addition research. And for each dollar of additional research you get a substantial amount of growth, and that's a conclusion we can be very confident in at the very best on innovation box. The theory is relatively negative; the empirics are somewhere between inconclusive and negative. And given a choice between an uncertain and likely bad and ineffective instrument and a much more effective and well proven one. I think the choice is quite clear.

The next point that I wanted to make is that to really underscore the complementarity of public R&D and private R&D. United States right now, we have the highest private R&D, as a share of the economy that we've ever had. AT the same time, public R&D as a share of the economy has been declining since the 1960s; almost nearly continuously. And there're different evidences in literatures on what the spillovers on to those two are. An IMF study cites one set of numbers, but I would observe that the majority of basic research is done on a federally financed basis. And the majority of more applied development is done by businesses. And when you have that type of imbalance, and that growing imbalance that we've seen certainly in the United States, and a number of other countries, I think that does bode badly for the future of productivity growth and rectifying that imbalances increases both of them in absolute terms.

In the case of the United States, with the goal of raising our R&D to 3% of GDP is, I think, quite important. I was also very pleased to see in the paper that when thinking about fiscal policy and R&D, you can't just think about how much the government is spending on subsidizing basic public research, or how much the government is doing to correct the incentives for private investment. You also have to think about what the government is doing to prevent what can, in certain circumstances, be quite negative for R&D, which is to say recessions, especially recessions and associated credit constraints.

There's a longstanding Schumpeterian view of creative destruction. There's a longstanding liquidationist view that you sort of cleanse yourself as an economy when you go through recessions. And then there's the fact that when you look after actual recessions, the gap between the potential path you were on and the place where you now are is proportional to the severity of the recession. And countries like the United States and Europe have gotten back to the growth rates to varying degrees that they had before the crisis, but have not made up for the gaps that emerge during that crisis. You look at those data and you find it rather hard to be enthusiastic about recessions as an instrument for encouraging innovation and growth.

Precisely the contrary, and in that circumstance, having more effective counter-cyclical fiscal policy is a way to help prevent the more severe recessions associated credit constraints with those recessions and put businesses in a better position to advance.

The final point I wanted to discuss is something that, I think, we've made partial progress on, but don't fully understand. But should make sure that we're continuing to obsess over and think about, so that we can come to a better understanding is that a lot of the challenge with productivity does seem to be tied to an economy that – and we saw this picture for several decades. It's had a downward trend in the formation of new businesses and an associated lengthening in the average age of businesses, an increase in their average size and their market share. And I think in a number of different ways, this can potentially be getting in the way of innovation. Both because a lot of ideas come from new entrance, but also because – we know this from Arrow, 50 years ago, for an existing business, the incentive to innovate when it's cannibalizing some of its own market share, is smaller than the incentive you have to innovate when you can get some brand new market share from someone else. And just, you know, monopoles in general; one of the returns to monopoly we've long known is sort of lazy idle life in which you're doing less innovating and less worrying, and the more you worry about keeping that position, the more you can avoid that problem.

So I think this new business formation on the one side, and what was highlighted in The Economist, a piece by Larry Summers and work that Peter Orszag and I did. What's going on in terms of competition on the other side I think is quite worrying in terms of what it means for the future innovation; may be related to work like the OECD's Innovation at the Frontier going quite well. But it not transmitting, work by Common Gürtler, that find that in a different type of way, and so the question is what to do about that. And as we think about any area of public policy, and certainly about tax reform, it's always a little bit easier to think about the incumbents, and how it affects them. I certainly hear from the

incumbents more than I ever hear from businesses that don't yet exist. And making sure that you redress that balance, as we think about tax policy, as we think about innovation policy. And as we think about it more broadly, and that important focus in this paper on, you know, that it's about new, not small, I think is the mostly correct. Although I think in certain cases small businesses can have some additional fix costs associated with compliance; it's something like letting them do cash accounting is maybe a sensible thing to do.

So I would conclude by saying I think this paper's great, because it's a combination of taking areas where, I think, there is a well understood, well-grounded view highlighting it, and how important it is. And then taking some of these other areas and how do we encourage innovation churn new businesses, and pushing the envelope forward a bit on them, while still leaving room for more work, at least in that particular area. So thank you.

Simon Johnson: Thanks very much, Adam, for the opportunity to speak today, and thanks Vitor and colleagues for another fantastic edition of the Fiscal Monitor from the IMF. I think it's one of IMF's great publications, and I really hope that you all read it frequently; in fact, carry a copy with you at all times.

Not too long ago I was testifying to a congressional committee. And the chairman of the committee, a very powerful person in Washington, asked a question, I said, "Well, Mr. Chairman, the good news is the answer to your question is in statistical table, Appendix Table 12.A in the IMF's Fiscal Monitor". To which he responded, "Mr. Johnson, I can assure you, the one thing I'm not going to do is ever read the IMF's Fiscal Monitor Statistical Table of any kind". So that's Washington, and that's what we should all be paying more attention, to what the IMF tells us on this and many other topics.

So this chapter has three core propositions that you've already heard some discussion on. The first is, that R&D matters for growth. It matters for productivity, it matters for total factor productivity, and it matters over long periods of time for growth. This must be true.

The second proposition is that R&D involves spillovers. So when I do some research and development, that creates benefits for me, it creates benefits for other people, and it may be hard under the standard price system for me to capture or realize all the benefits from the R&D. And I think that's true also. I think that's fairly self-evident.

And then the question may be one of a scale, which I'll come back to, and exactly the mechanisms at work there. And I think that matters because

the third set of propositions is, I think, what interests us most in this room, which is the public policy, bottom line. And the chapter makes three recommendations, which they already talked about, and Jason already reviewed from a statistical point of view. The first is that we should have more public investment in R&D. The second is that we should have a tax break or a tax incentive for private R&D in some form; and the third is – actually, we haven't talked much about this yet, except to the point about patent boxes has been made quite effectively. But to what extent we should have patent protection in general to encourage R&D? On that the chapter was more sympathetic, perhaps, than we've had the chance to cover so far.

So let me focus on those three aspects of public policy. How much weight should we put on these results? How much should we follow that particular recommendation, for example, for the United States? And we can discuss other countries, obviously, in a few moments. I should say that my perspective on these issues is very much affected by work I've been doing for some time at MIT. Adam already alluded to it – around some of the ideas coming out of financial technology; it's often referred to as Block Chain Technology, the idea that you can run distributed networks of computers. You can verify transactions without relying on intermediaries. In part, this idea was developed by the people who brought you BitCoin, a fairly anarchic approach to the world. It also, I think, has dawned on many people that this has much broader implications potentially for the currency system, for the monetary system, for public finance and how we organize and run public finance, but also for the organization of private business – how you run global supply chains, for example.

So this is a really profound, fascinating set of ideas. We at MIT have a pretty substantial group working at this, centered at MIT's media lab. There are other universities and other places that are also doing great work on this also. So when I think about the progress that we're making, and I think about our competition, I look around the world and I talk to governments and private companies about their interest in this technology, their willingness to experiment, their ability to adopt or run pilot projects.

I can apply and I have been thinking of late about the lens provided by the IMF study. What are the constraints on innovation around this particular new technology, and every technology is different. I worry a little bit about this [inaudible 00:51:18] R&D. It's a very aggregate and somewhat generic term. And I think it's often good to disaggregate it, including by how capital intensive the business is. And the technology I'm talking about is in the lines with many other things we've seen in software industry; not that capital intensive, at least, initially as an entry point.

Now, what do we need, what does anybody need in order to be successful with innovation and with entrepreneurship? And I like a lot of things in the report, including the emphasis on new rather than small – I think that it's extremely sound, and I think Jason already made those points.

So my colleague, Fiona Murray, who's a leading expert in innovation, and who advises the British Government and others on this topic, talks about the need to have five pieces working together. One is the people; the way people want to set up companies, the entrepreneurs. The second is venture capital, or some other form of capital willing to take the right kinds of risks and right contracts of an appropriate kind. The third is governments, because you need governments in the mix; even from a tax point of view, or from a broader public sector point of view. The fourth is large companies. Are large companies willing to buy from the startups? That's a critical piece of any entrepreneurial [inaudible 00:52:29]. Do the big companies try to keep the startups out? Do they try to gobble them up as soon as they're successful? That's really important in many parts of the world. And of course, the fifth element we like to think is very important, is the universities.

Now, what are the constraints on the speed of adoption of this block chain technology on how effectively it's used, and how quickly we figure out how to boost productivity in exactly the kinds of ways that you talk about? And also, by the way, address some of the issues of concentration that Jason has flagged for us – I think incredibly important.

Well, first and foremost, the constraint is people; the supply of researchers; the researchers who are willing to convert their work into practical applications, and the people who are willing to take those technical ideas and make them into companies. Sometimes it's the same person, a lot of times I just described three different kinds of people.

What is that about, first and foremost? It's about education. It's about human capital. It's not just about technical education, it's about training people who are willing to take that kind of risk, or willing to engage in that kind of product. That's the public investment, I think, largely aside of what the IMF is saying.

The second thing is capital. It's really fascinating, these charts of long term business entry in the United States, which I'm sure the data is right at some level; that's not at all the experience that we have in and round technology. Capital available for technology is amazing, impressive – perhaps you could say some of them successive – that is not the constraint in the United States. In some other places yes, but the Institution of Arms Venture Capital I don't think is particularly the problem.

I am struggling to think of anyone I've met – and I've had many conversations with different people about dimensions of this technology adoption around the world – I am struggling to think of anyone who said "If only I had a bigger R&D credit"; "If only I had a stronger marginal incentive, I would be doing more of this". Now, I'm sure you're right on the sign of the effect, but I'm trying to understand why this dissonance. And I think the people I meet who are innovative and working very hard on this do it for two reasons; first of all, a set of new people – this is the new not small – who think this will change the world; that they're optimistic, probably overly optimistic. They are profound believers in it – you can get into theology as quickly as technology on these kinds of materials, but they may be in it for the money, absolutely. So can you get a return on your investment, where your outside investors get well compensated, do you expect to share that in a reasonable way? Are you going to go on and be successful? And also, if you don't at first succeed, can you do it again? Can you start another company? That's really important. That's not about a little $5 more or $5 less. That's about entrepreneurial ecosystem are the startups encouraged.

The other set of people that are innovating, and this is really interesting about block chain, it's the big companies. The big companies, including banks, for example, who have a lot to lose if this kind of technology takes over; they are putting a lot of money into this kind of investment. Why? I ask this question; why are you investing so much in a technology that seems likely – based on its face value and based on what you, the bank, say – it seems likely to destroy the standard model of banking. And the answer is they also think it would change the world, and they want to be part of the change, and they want to change the business model, because they've seen so many instances of companies.

For example, take the internet. People often draw the parallel between this block chain technology today and the internet in 1994. I'm not sure if that's a correct analogy, but it's interesting, if you think about it, in 1994, when you first encountered the internet, you probably were impressed, but didn't realize the scale of the effects it would have on our lives.

Also, think back, what are the companies that were innovative or big and brand names in 1994? Those are not the companies that have been the most successful with the technology subsequently. So big companies wanting to adopt this technology, to innovate, in order to prevent themselves from being completely washed out by it. That's the major part of the incentive for this breakthrough innovation. That's what we're good at in the United States. Subject to the caveats of there are some sectors where this is not happening and people don't feel frightened; that is an important point.

So the bottom line, I would take… first of all, IMF encourages physical stimulus. That must be the headline from this chapter. Surely, we've got to be in favor of that. The demonstrators outside were not protesting against the IMF. I always check carefully. No problem at all. This is a great message, and I agree with Jason. I think you're onto something. I would prefer, instead of this jumping straight to the R&D tax credit, I would prefer a little bit closer to where Jason was going, which is let's have a conversation about business tax system in the United States. If I was to have a conversation about public finance in the United States, with a view to better growth, stronger middle class over a 20-30 year period – let's not get caught up in arbitrary 10 year rises, for example, which is a little bit too much what we do in DC. And I think that an IMF contribution would be fantastic to have exactly along these lines. And in that context, if your bottom line is when we weigh the costs and benefits of these different elements, the R&D tax credit comes out as a winner, I have no problem with that.

I think a broader assessment would make me more comfortable. I think this reliance on [inaudible 00:57:57] – here's the lever, let's pull this lever – I'm a little bit nervous about that; particularly the emphasis on the tax credit part which I'm less than fully convinced.

Oh, and the Panel of Protection, just last minute, Adam, if I may; I think the chapter is a bit dissonant regarding the state of our knowledge on panel protection around the world, and how good that is for emerging markets. I think we've learned post-Uruguay round; that extending a full system of panel protection to many other countries is not necessarily to their advantage. The issue of a photo of Madison is obviously pretty salient, these days also. But I think that the emerging markets would not agree with you particularly, and with good reason, on the patent issues; and that's one point where we might want to talk further. Thank you, Adam!

Adam Posen: Thank you very much, Simon, thank you, Jason, thank you, Vitor, that was terrific. Just apropos of Jason's generous words, we were very grateful to have Peter Orszag, Jason's co-author, present that important paper by Peter and Jason on how network industries, winner take all industries and rents may be part of what's driving both in equality. And then I pushed them to talk about it in the context of productivity. As I said at the time, I'm quite amazed that with Jason's day job he manages to make such important research contributions. So we're grateful we're continuing that discussion.

We are getting closer to our ending time that I hope, so unless Vitor, you have something specific you want to respond to from either Jason or Simon, or even Jason also?

Vitor Gaspar: If you allow me just one remark. Jason was kind enough to emphasize our punch-line, that if we give a little in terms of public support, we actually get quite a significant impact in terms of added innovation and added growth. And Jason did emphasize the fact that the timing of the effect, the 0.4% of GDP cost and the 5% GDP impact do not occur simultaneously, and he conjectured that if one would do the present discounted failure computation, one would still get quite a significant impact, and that's absolutely correct.

If you use a 1% discount factor, the benefits outweigh the cost by 10 to 1. We have done the computation. Of course, if you change the discount factor, you're going to have different numbers, but typically, the benefits are much beyond the cost, and that leads me to precisely the same point, coming from Simon.

Simon was emphasizing that for him, the headline must surely be that IMF advocates fiscal stimulus. That would not be the headline that I would suggest. What I would suggest as a headline is that a little public support can deliver quite important dividends in terms of growth and innovation. And as you said right at the beginning, we have been trying to persuade people that focusing on the long run, focusing on fiscal policy and growth, is actually a very worthwhile agenda going forward.

Adam Posen: So targeted, but not necessarily timely; targeted and long term. Jason.

Jason Furman: So Simon is the only one up here who actually did his job of generating any disagreement through debate. So I just wanted to take you up on that in terms of tax policy and can you know fiddling with these little instruments really lead to gains.

And I think there's a limit to how much introspection, or even talking to people can answer that question, because certainly every business decision maker I've ever met with on the topic of taxes has two things to say. One is really grave offence at the thought that they were making any decision whatsoever based on taxes; it was all for really good reasons. And then number two, or a an absolute insistence that absent changing the tax system they're going to be destroyed and not be able to make any good decisions. And often those two propositions are in the same paragraph.

On the R&D credit, we have a lot of research on this question. We have Bronwyn Hall, John Van Reenen, Mcbroom, and many others, and I think it has very consistently found quite high bang for the buck in terms of the fiscal and the impetus. Maybe that's not as important as getting the ecosystem right and we're being a little bit like the drunks looking for keys under the lamppost, because that's where the light is. On the other hand, if you've ever talked to anyone about what Lessons for Israel has for

an innovative ecosystem for the rest of the world, they'll always tell you be a small country in a hostile region with an universal conscription and a certain culture. And you're left wondering whether or not you can reproduce that, as opposed to say the R&D tax credit, which is probably more reproducible across countries.

Simon Johnson: I would argue possibly a little more desirable to reproduce, but anyways.

Jason Furman: Try not to get [inaudible 01:03:45] here.

Simon Johnson: Just on Israel, and the remodel of success of the public sector in stimulating private development of venture capital.

Jason Furman: Which may be effect as well as cause, but has also proved very hard to replicate…

Adam Posen: And because we live in a world of stupid things being said by politicians, a country that is big on immigration. So as we know, immigration has contributed to innovation in the US. Anyway, that's not the topic today, but every instance to get something, and I have to. Thank you all very much.

I'd like to open up briefly for questions. This is on the record. We have a floating mic upfront – traveling mic, not floating – with Jessica, people near the back; Gary, do you want to just go to the back mic there, and we'll recognize you for a question. Please.

Gary: Thanks very much, Gary Hufbauer here at the institute. I have a question and a comment. The question is, when I listen to Robert Gordon, he tells us for the next 25 years it's 1.25% growth in the US. It's baked in the cake. It doesn't go beyond the next 25 years, and he never mentions fiscal policies. So has Robert Gordon, with his 800 page book, missed it all? That's the question. The comment is this, and I'm weighing in on Simon Johnson's side of the tax debate; I think I am.

The big tax incentive for companies like Google and Apple, and you go right through the list, is not the R&D credit. It's the fact that in this country, capital gains are taxed at low rates, that they can put a lot of their intellectual property income abroad, and tax it at very low rates. And therefore they get the return on the output side, not the input side. You guys, or the IMF, that's talking about the input side, usually it's thought that input subsidies are not as good as the output subsidies – results rather than cost. But this administration is attacking these big founts of tax incentives. That's the comment.

Simon Johnson: Thank you. I think now we have something to disagree with for both Vitor and Jason at a minimum.

Vitor Gaspar: So on Robert Gordon, I highly recommend Robert Gordon's book, since you just quoted; it is an excellent book, in particular when it describes the technological progress that delivered the very impressive growth performance of the US economy during the 100-year golden years that he does describe. And he does agree with the view that we have, I believe, all in common, which is that innovation is highly endogenous, as is the propagation of innovation through the economy.

Now, Robert Gordon has a view that he can actually forecast innovation, and you can reasonably precisely conjecture the propagation mechanism of innovation throughout the economy. I tend to be much more optimistic than Robert Gordon is, because in my view, you should think about digital technology. You should about information and communication technology as an all-purpose technology; as the technology that has the potential to affect everything that we do. And that makes the propagation of this technology, to a certain extent, unpredictable. And in my view, that leaves Robert Gordon to underestimate the potential for transformation that we have in the pipeline.

Just one example; Simon referred to the possibility of having this block chain innovation transform public administration. And if you think about the possibilities that are open to monitor the expenditure site, target the expenditure site of the problem, to control expenditures in real time, you see that there is potentially a revolution in the making. If you think about a tax site, if you think about the information that a tax administration can have on taxpayers, again, you may realize that there is potential for fundamental rethink of the tax system.

And it turns out that there are very exciting transformational process already going on in some places of the developing world. So it does seem that some countries which are not now defining the frontier of prosperity are leapfrogging the process and are defining it in some very important dimensions the new frontier of best practice. And I don't think that we should underestimate this. It's a very big thing, and I would leave it at that.

Adam Posen: Please, Jason.

Jason Furman: If I could disagree with your comment, I would say, in this area, there's a large logic for subsidizing inputs rather than rewarding outputs. And the problem is the output is a function of four things. It's the return to the investment and innovation, it's the amount of luck you had, it's the amount of monopoly power you have, and it's a function of things you did

in the past. Actually, there's a fifth, and it's a function of how good you are at tax planning.

Those are the five things that your return consists of. We at most want to subsidize the first of those five, which is the return to your innovation. We don't want to subsidize your monopoly power, your luck, tax planning, or decisions you made in the past. And when you got the innovation box rewarding outputs in any form, you're rewarding all five of those proportionally. When you just do the input, you're focusing on the first.

The second thing I'd say is if we had had some rational coherent way of getting to the system you described, I think it might make sense, but we have extremely variable tax rates on different industries, on different activities within those industries, on different industries within those industries. And so having something that's more uniform – so you're taxing [inaudible 01:11:15] income, but taxing it in a flat uniform manner, as opposed to… you can do this type of tax planning as this rate, that type of tax planning as that rate, your domestic gets that rate. I think again it's the way to go, because it levels the playing field so you're not having a tax system tell you to invest more here than there. Tax system tells you it's all the same, and you're doing that for business reasons.

Adam Posen: Okay, thank you. One last question at the back; please identify yourself, and then we'll have to close.

Speaker 2: [Inaudible 01:11:46] Antenna TV. A question from Greece. According to the Greek Minister of Finance, Mr. Tsakalotos, if Greece completes the first review in the upcoming weeks, Greek government believes that the growth shock, growth period will follow right after. With your experience and your recent reports, do you share this positive approach?

Adam Posen: I assume, though, you didn't specify, you mean Minister Gaspar. I guess I'll take that as a yes. Vitor, do you want to respond? Do you want to stick to today's topic?

Vitor Gaspar: No, I would definitely skip to the next topic. I don't see the connection between this question and innovation and growth.

Adam Posen: I agree, so Nicolai, you get the last one.

Nicolai: [Inaudible 01:12:44] for the subsidiaries avoiding the small company trap and giving tax breaks for new firms rather than small firms, but which is the possible downside of the [inaudible 01:12:59] and the possibility for example that it could trigger corporate behavior [inaudible 01:13:09] and transferring activity to another firm, et cetera. Is there any experience we have about this sort of challenge?

Vitor Gaspar: Thank you.

Adam Posen: Sorry about the mic.

Vitor Gaspar: That's a next… so what we do in this chapter is that we look at whether the incentive schemes that are in place and support small firms are effective means of boosting entrepreneurship. And from that viewpoint, having a benign impact on the type of dynamics that we care about. We conclude that's not the case, because many of the small firms are indeed not innovative. And because if you go for small, you may create a problem that firms will not grow. You will have a situation in which in your ecosystem of firms you will have basically large old firms and new firms, and in many European countries, this idea that the landscape of large firms is completely dominated by old firms is a big problem. Now if you target new, innovative companies, you don't have necessarily solved the design problems. And indeed it's important to have strong administration of these schemes, so that the schemes cannot be gained in the sense of having opened the possibilities that you mentioned. That's something that one has to go through the pain of looking at incentives in the real world. It's not this type of thing that we can simply discuss in terms of broad concepts.

Adam Posen: Great. Which leaves us with… while I like Simon's interpretation of Vitor's bottom line, it leaves us with what, I think, was the other message coming out of the Fiscal Monitor that Ruud and Vitor gave us, which is design really matters. And I think, this is something Jason and Simon… I hope, I know Jason would agree with, that we get often very caught up in "Is there fiscal room? Should we do fiscal policy? Is fiscal policy good or bad?", whereas it's more "There are good and bad fiscal policies, good and bad tax policies, and we'll try to figure those out". And, I think, that's a key message as well to take away from today. Please join me in thanking our all-star team of participants.