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UNIVERSITY OF MINNESOTA

Practical Issues in Public Pension Design

Welfare Implications of Alternative Pension Policies

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January 22, 2019

The transcriptions of the Practical Issues in Public Pension Design Conference sessions represent the views of the presenters and not necessarily those of the Heller-Hurwicz Economics Institute or associated organizations.

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Jordan: Thank you. The title of our project is, welfare implications of alternative pension policies. The end goal for us is to provide normative answers to questions about what happens when you make certain reforms to the public pension policies that currently exists in the United States. The end goal for us is to develop a model to look at how the welfare is impacted across different constituencies and looking at particular types of reforms.

Some that Stefan has mentioned here today. I'll use an actual example today once we get into it. To build a general enough framework that we can take this and actually directly apply it to a particular state environment and a particular type of reform. To do this, we have a model and there is going to be some of the gory details in the model. For those of you who don't know what a Bellman equation is, I'm so sorry that I have to expose you to that today but while doing that, I do hope that I can properly explain fundamentally what's going on with the model because at its core it is a very simple setup for an environment that's much more complex as we've learned today.

The motivation, we've received it today, but just to briefly go through it again. US public pensions are underfunded and my numbers of it all, it's on average about 66% funded status across US public plans. Because of this large unfunded liability, many states are undergoing currently these pension reforms which often involve benefit deductions for current workers in the pension plan or complete shifts in the whole nature of the plan.

Moving away from a defined benefit pension plan towards something more like a defined contribution plan or some hybrid of the two. When making these reforms and making these policy choices, it's important to keep in mind all the constituencies involved. The way we approach it with this model, is we think of two main groups. We think of, of course, the pension recipients, those that are currently enrolled in a pension plan as well as retirees receiving the benefit. We also think about non recipient taxpayers who at the end of the day are on the hook for these large unfunded liabilities if those pensions continue to under perform.

A broad question for our research topic would be, what does the welfare impact of a particular type of pension reform on these two groups? Then an additional layer would be, within each group, how do these reforms affect different age cohorts? The young worker that just started within a program or the older workers near retirement as well as retirees. That's the broad question today as an example of how you can implement or use this model. We're going to look at what we call a hybrid DB, DC plan with wage compensation.

What we mean by this is a plan where if you're a current worker in a defined benefit pension plan, this reform would effectively suspend benefits from accruing additionally and in the wake of that give you some type of annual wage compensation for the remainder of your career. For a particular worker in this plan, they have some expectation of the benefit they'll receive in retirement. So this reform, what it'll do is actually suspend that to some extent, which is a bit of a raw deal. The way we make up for that is by seeing what type of wage compensation is required to make those workers indifferent to this policy reform.

Once we've answered that question, the next question would be that, okay, well, what happens to aggregates for the government and what happens to tax payers in terms of their welfare with this type of policy? This is a particular reform we're looking at, but in the long run we want to look at multiple types of reforms and more realism even in applying to particular types of state... [Inaudible 00:05:05]

Male 2: The wage compensation is just the way [Inaudible 00:05:08] utility, what change in wages will make you be indifferent?

Jordan: Correct.

Male 2: Who pays? Because no one is actually compensating them.

Male 1: Tax payers.

Jordan: Tax payers. Yeah.

Female 1: Yeah. But then what's the difference? It's wage compensation plus IRA versus say the federal thrift plan?

Jordan: Could you restate the question?

Female 1: Are we comparing the wage compensation plus you set up your own IRA versus say the federal thrift plan?

Jordan: Yeah. What I mean by wage compensation here...

Male 2: [inaudible 00:05:40] after tax wages are changing...

Jordan: Correct.

Male 2: ...because the determinants are changing, the [Inaudible 00:05:47]

Jordan: Correct.

Female 1: Well, if you're indifferent then you're not really effectively changing?

Male 2: Yeah.

Jordan: Well, we're looking at the perspective from a person enrolled in the program and then also alternative effects that happened to people who are not receiving the defined benefit plan. What does this do to taxpayers? Effectively in a current system now you can think about taxes to non recipients as having two components there. They're funding other revenues of the state and they're also funding the pension plan if it under performs.

That tax is volatile and they're on the hook for that. If we did this type of reform from a defined benefit to a DC plan, then that would effectively in the long run eliminate that moving tax that's attached to the pension fund for taxpayers. That's the type of trade off we're looking at.

Female 1: I'm confused. We could escrow a bunch of money and regardless... I'm wondering from the taxpayers thinking, do they care which one it is?

Jordan: They do.

Female 1: Okay.

Jordan: Yeah.

Female 1: Then it's not an indifferent?

Jordan: No. Yeah. Let me rephrase. We want to look at what's the level of wage compensation to make the previous pension recipients indifferent and then given that, what's the impact on taxpayers? Is there a way to make current pension recipients well when they're neutral, and then what's the impact on the taxpayer? If the model framework we use to look at this problem is we employ a lifecycle model with portfolio choice and a fixed retirement age. The three main agents that are in this model are the two groups I mentioned.

We're going to look at two groups that we're just going to call private sector and public sector workers. We're

going to make the assumption that for public sector workers, they are currently enrolled in a defined benefit pension plan. Whereas for the private workers they're in a defined contribution plan. This is a simplification, but by and large, this is...holds in the data when you look at US employees.

Then thirdly, what's attaching these two groups of workers is going to be a state government. In this model, the government's not making any decisions or trying to maximize welfare on its own. It's just a policy that we're going to specify in the model for how to manage the pension fund and fiscal policy of the state. I say state again because we are thinking about this in terms of state level pension plans.

Male 3: These distinctions are [Inaudible 00:08:29] policy? What if people want to switch?

Female 1: Yeah.

Jordan: Oh, across sector?

Male 3: Or across these DC and DB plans?

Jordan: Yeah. In this environment we're assuming that there's no sectorial shifting in your job. You have different wage processes but your prior record you stay private and if you are born into that then you are enrolled in a defined contribution plan. Okay. What are the results? We want to be able to apply this model to a particular state to evaluate policy. Today, just for illustrative purposes we're going to look at Minnesota when we calibrate the model.

For this particular type of reform I've outlined where pension benefits are suspended from accruing for the current workers in the public sector. The question is what is the wage compensation they require to be indifferent to this reform? We're going to find that for public workers, young public workers, they require about 5% increase in their annual wage for the remainder of their career.

Male 4: Is it pre-tax or post tax when you talk about regional position?

Jordan: Post tax.

Male 4: You're not giving them money to throw into a defined contribution?

Jordan: Yeah. The policy...whatever pension benefits you've accrued to date through there, and those are suspended. You're immediately enrolled into a defined contribution plan and just using your own wages plus the additional compensation, you now choose how much to save and how to invest.

Male 4: So what are we...we're throwing the money...we're throwing into the defined benefit. What do they call it? A fund pool. We're throwing that in, we're just giving it directly to them. Those are pre-tax dollars. And then we're giving them 5% wage in taxable dollars, 5% wage increase in taxable dollars to compensate for the risk.

Jordan: I'm sorry, 5% post tax increase in annual wages.

Male 4: You need to do that because they're now shouldering...

Jordan: Yeah. Exactly. When they started working, they said, "I have a defined benefit for me in retirement of some number of dollars." This reform suspends that to some extent...

Male 4: Okay.

Jordan: ...depending on how long you've worked.

Male 5: The tax on their extra wage, the federal taxes are also a state tax that goes to the state?

Jordan: Yeah. We're going to look at this as a state tax. This model will have...will be social security benefits in there and we kind of abstract from how those, that budget constraint works with the federal government. We're going to go through the kind of necessary wage compensation for public workers to be indifferent to this type of program. Then we asked the question, if we were to make them in fact indifferent to this reform, how do the...and provide full compensation, how does the private sector respond to this?

We're going to find that there, which may or may not be surprising, are significant welfare losses to doing this type of policy reform in large part because the private sector realizes a higher tax in order to compensate this wage.

Male 2: What's the game for the private sector?

Jordan: The trade off which you'll get born out a little more is that in the status quo, if you're a private sector worker you don't receive these pension benefits but you're on the hook to pay taxes, if that plan goes under funded. Further, that tax is going to fluctuate over time and so that's going to introduce potentially a higher tax and volatility into the private sector workers life cycle problem. Now... Yes.

Male 5: There's a demographic issue too, right?

Jordan: There's also a demographic issue. When we evaluate the cost of the pension, we do allow for demographic changes to impact the cost of providing benefits. So as baby boomers retire, they are going to see some type of increase in their tax. That's the tension. Yes.

Female 2: I'm wondering if you also even venture out to determine other ways that taxpayers will [Inaudible 00:12:57] in terms of as these public workers [Inaudible 00:13:01] are going to be prudent and save their money and buy annuity and some of them won't spend it so in their later years they may be less equipped and more dependent on other welfare so to speak.

Jordan: Yes. There are some institutional micro features and some complexity to this environment that is not going to show up today. And these are things that we are keeping in mind though.

Female 2: Okay.

Jordan: Just to illustrate before I get into some of the technical detail, the main agents and how they're connected in this model, I have this graph. The environment we're thinking about is a state government and that government oversees a population of some size and observes a distribution of that population by age cohort. Further, there are two different sectors in the economy. There's a private sector and the public sector. As I said, if you're a private sector worker, you're enrolled in a defined contribution and public sector are enrolled in pension plans.

The main role of the government here is going to be two main functions. One is to manage that pension fund and so that's going to be setting an actual portfolio for that fund, setting contributions to be raised and maintaining some type of funded status plan. Secondly and related, is what I'll call a fiscal policy and that is just setting a labor income tax to properly fund the contributions and public sector wages.

Male 5: The line going from government to the public sector that says, "Pension and wages." Is that wages plus the... That's the actual pension payments to the retired public?

Jordan: Yeah. You could...I could split this up into current workers and retirees. Right. Let me start with the

public worker and the type of problem they solve and face. First, all agents, private or public in this model, we're assuming they're born at age 20 when they first start working. They work for a fixed number of years and retire at age 65 and we can of course adapt this retirement age if we're looking at a particular state.

During their life cycle of the working and retirement period, they have three sources of risk in this model. One is mortality risk, the probability that you'll survive each year to the next. Second is market risk. Agents are saving money and they're choosing how to invest it with the portfolio.

They're exposed to a risky risk free asset decision. Third, there's going to be labor income. Your wage is going to have some randomness just to cast a components to it, which leads to the actual wage equation we use. The labor income process for a public worker at age T , is going to follow this equation. All this is saying is that your labor income is a function of three components. There is a comment or deterministic component, which is a function of your age and other observables like gender, education plus two random components, one being a...we call it a transitory shock and the other being more persistent.

That's the income process for a public worker during the working period. As they enter retirement, they receive a transfer in retirement which has two components. They receive their pension benefit, which for now we're just assuming as a number as a simplification. There's no formula plus some social security benefit which is unique to public workers. This is in essence the problem. The full blown problem is as follows for an HT public sector worker.

Male 2: Can I ask, what's NC? The common problem. [Inaudible 00:17:08]

Jordan: Here we're going to look at, you can condition on number of household. We're just going to look at individuals. We're going to just look up males.

Male 2: Common for want? What is the word common?

Jordan: Given your age and the particular type of person we're looking at, they all receive at that given age this amount of labor income.

Female 2: He's specific about what Z could be in the data.

Jordan: Specifically in the data and today we'll be looking at people with a college education.

Male 2: The time varying characteristics.

Jordan: Correct. Oh, the time varying characteristics.

Male 2: [Inaudible 00:17:51]

Jordan: Yeah. In particular Z for us today is going to be college educated individuals, male head of households and household of size of one. We're not going to consider a family problem.

Male 2: Is there any correlation between the labor income risk and the market risk?

Jordan: That's a great question. The baseline model we use comes from a paper by [inaudible 00:18:17]. Using PSID data and their paper, they find a very low correlation. That can be in the model but for now we set it to zero. Just in words to walk through this problem. For a typical public worker, if they have an HT, they enter a given year with their HT. They know the amount of wealth they've accumulated to date X_T and then ADAT is the persistent shock to their labor income.

Given this information, they're going to make two decisions between...they're going to make a consumption savings decision and then also a portfolio decision alpha. They do this to maximize their utility of consumption stream over their lifetime. Now, in making these decisions, that's going to induce the law of motion on your wealth from year to year. That's this second line. Your wealth next year is going to be a function of your labor income next year, which is subject to some randomness plus the portfolio return on what you saved this period. Your wealth minus consumption this period is your savings and then your portfolio return here, it's just a way to combination of a risky return and a risk free return.

We're going to assume normality of returns on the risky asset. Then lastly, PT here is the mortality risk in the model. PT is the conditional survival probability that, "I'm alive at HT and I'll be alive at HT plus one."

Male 3: All the taxes that transferred are subsumed in a way?

Jordan: Yeah. For the public sector workers, this is after tax income. In the baseline model, the wage tax and social security tax are already incorporated into this.

Female 2: And ADAT is also, right?

Jordan: Correct. Okay. That's how public sector workers behave. They make consumption savings decisions every period. They make a portfolio decision and they know that in retirement they're receiving some defined benefit pension. Now, for private workers, they actually solve a very similar problem with three key differences here. We're going to assume that private workers have a different wage process and to be very simple today we're just going to assume that the wages of private sector worker takes in or are just a scaled version of the process that public sector workers have. In fact, when we look at Minnesota annual labor income's about 15% higher for private sector workers.

Male 2: Do you know what the risk is?

Jordan: The risk will scale up as well.

Male 2: Unemployment rates are very different here than in public [Inaudible 00:21:13]

Jordan: Yeah. This is a future type of realism we do want to add. Today it is very simple to scale process. A second key difference here is that private workers are enrolled in a defined contribution plan and so, the responsibility for retirement savings will fall on them to make those savings decisions as well as portfolio investment decisions. In retirement, they still receive a social security benefit which because of their higher labor income is actually going to be a larger benefit, slightly larger benefit in retirement.

Then lastly, there is a labor income tax that the private sector workers will pay to fund public sector wages and also pension insurance costs. This tax, the private sector worker phases has two components here which I've just mentioned. Most of the attention we're going to pay to is the second component, which is when the pension is underfunded and the government must raise contributions. That will translate into a larger tax on non recipient taxpayers.

Male 2: Excuse me but even the pension is underfunded. There's a budget constraint for the government...

Jordan: Yes.

Male 2: ...which has to be satisfied and [inaudible 00:22:32] It is never underfunded. If you do some change...

Jordan: There is a budget constraint but then there's also, we're going to specify a funding constraint which says that the state government will not let its pension policy...I'm sorry. It's a pension funding status fall below or

above certain bounds. And so when the pension assets get hit with a large enough negative shock that it goes below the bound, that period, the government will have to raise contributions to get them above.

Male 5: They don't do that now?

Jordan: Yeah.

Male 5: But this is setting up the structure to configure out what happens if you deviate.

Jordan: Yeah. When we specify the government policy in this model, we're going to make some heroic assumptions about the government's ability to commit to managing a pension and keeping it funded. That comes in total contrast to what we observed in the data and the historical track record here in the US.

Female 1: You're also making heroic assumptions about movement between these sectors. If these guys could forecast under funding, they'd switch.

Jordan: They'd get out. This is true. There is reason also to believe that there is substantial... There are some potential barriers to just simply switching between the public and private sector. If they're thinking about police officers or firefighters.

Female 1: Private security guys.

Jordan: Yeah.

Male 4: Sorry. I'm not understanding that. None of the tax [inaudible 00:24:11] compensation goes to the federal government, but if you did that it would be a leakage out of side of the system and they really require a higher wage compensation to account for it?

Jordan: Correct. Yeah. All the additional taxes in this model when we do the pension reform, whether they relate to the pension plan itself or the increased wage compensation have to do, they stay within the state system.

Male 4: Okay.

Male 2: Jordan. I'm still confused. The tax, the policy.. First of all, its not just a [inaudible 00:24:40]. It's a [inaudible 00:24:41] and then [inaudible 00:24:43] if something else happens?

Jordan: Correct.

Male 2: The state contingent tax rate here...

Jordan: Yeah.

Male 2: ...this depends on some other things that you haven't said it yet, right?

Jordan: Yeah.

Male 2: Or tax. Its not just tax?

Jordan: Yeah. I'll break it out in a couple of slides into multiple components so you can think about it. But, yes.

Female 3: [Inaudible 00:25:02]

Jordan: That's fine.

Female 3: When you're talking about sentiment in terms of them not caring, are you talking about actual fiscal evidence?

Jordan: I'm not sure I understand.

Female 3: They get a higher wage...

Jordan: Right.

Female 3: ...for them not to care.

Jordan: Correct.

Female 3: Are you talking about that's an artifice, right that they don't care?

Jordan: Oh, sure.

Female 3: It's not like sentiment like they care, they mad or whatever. You're talking about the casual displacement or replacement?

Jordan: Yeah. We'll specify this models in such a way that we have how public sector workers make decisions and evaluate outcomes. We can use those preferences to basically find that the threshold point where from a choice or welfare perspective, they're indifferent. They say, "Do you want this deal or that deal?" They say, "I don't care. It's just as good."

Female 3: Well, choice and welfare perspectives are two different things. I mean, they may not fully [Inaudible 00:26:04] in our economy so they might not [inaudible 00:26:08] Are you providing that intelligence to them or assigning that intelligence to them?

Jordan: I mean, there's a certain level of rationality that we're assuming with how they make the decisions and it's uniform across the agents. Yeah. Okay. Because this tax moves around with the pensions funding status, for the private sector workers, it's actually relevant that they keep in mind what the fund assessment of the pension is today because that has implications for what their tax could be tomorrow.

An additional thing that private sector workers worry about is funded status, which I'm just going to call this symbol Chi. When I look at the private sector workers problem, it is very similar to the public sector workers and I've highlighted in blue the key points that differ. In particular for a private sector worker, you enter a year with your given age, you have a certain amount of wealth, XT that you've accumulated a shock to your labor income. Then you also observe the funded status of the pension in your state that period.

Why does that matter? That matters because next period you may be subject to a tax that in some part depends upon the funded status of that pension. You have to know the funded status today and then you have to develop beliefs about the distribution of the funded status tomorrow because that will in effect, lead to higher or lower tax given the funded status. That's the additional wrinkle for the private sector worker. Okay. The last piece...

Male 2: Are you going to talk about the funded status model?

Jordan: I'm sorry?

Male 2: Are you going to talk about the funded status model?

Jordan: Yes. Actually right about now. The last piece connecting these two groups is specifying a government with a particular policy for managing the pension fund and then also the fiscal policy. As I mentioned before, we have this life cycle problems we saw for two types of workers. In fact the government oversees a population of some size M and there's a distribution of age cohorts within that state government, age from age 20 to 100.

The government has three responsibilities within any given period. It manages a pension fund and it has to choose a portfolio share for those pension assets. If we look at Minnesota, it's about 80% is tilted to what you would call risky assets. Secondly, we're going to specify that the government commits and is able to maintain a funding constraint, which basically says that any given year the funding status to this pension won't fall below or above certain bounds. Then lastly, the fiscal policy component is that the government will properly set a tax to fund public sector wages and pay for any of these pension shortfalls that might occur within a given period.

What I mean by pension shortfall is when the value of the pension that period in terms of its funding status falls below a certain limit and they have to make that up with higher contributions aka a higher tax. You can now see that these two components of the tax will factor in to the total tax set that a private sector worker will face. One component is just revenue is raised for paying public sector wages. I'll call that [Inaudible 00:29:55] We're not looking at any type of aggregate activity in this model.

The Labor income tax for paying public sector wages is constant or fixed over time. It's the second component to the tax, which is actually going to fluctuate with the market over time. That's why I call it the stochastic pension insurance tax.

Male 5: Jordan, if they choose to put it back to, like, DB versus DC. That's describing what happens in a DB system, that they are basically exposure to the towel P , right?

Jordan: Right.

Male 5: If you get rid of the DB system to go to DC, that thing goes away, right?

Jordan: Correct.

Male 5: So, it all goes up into the [inaudible 00:30:37]

Jordan: Right. While the government is managing a pension fund, this tax component is going to exist and be used to raise additional revenues which lead to contributions to the fund.

Male 2: Let's talk about DB and DC. It's about the inability to borrow from anywhere else?

Male 5: That's correct.

Jordan: Yeah. That too. Because the pensions funded status will fluctuate with the market so will the required contributions of the government for any given period. And so therefore, will also fluctuate the tax component that private sector workers are exposed to. This last slide is just about how the funding constraint and the pension is managed. I'll just walk through it line for line here. What does the government see when it enters a given year? It observes the total value of the assets in its pension fund, capital A . It also observes the immediate liabilities it has to pay out to all the current retirees and the population, capital B .

Lastly, if you look out and discount into the future, you can sum up all of these immediate liabilities to arrive at the present value of future liabilities, we'll call capital L . What's left is the government will choose how many contributions to raise this period, capital G . This will induce a lot of motion on the assets, the value of the assets

for the pension fund from year to year. In particular, the value of the assets next year, A prime, it's just going to be the portfolio return on what was saved this period.

We had our value of assets A this period minus the contributions we've paid out...sorry, liabilities we paid out plus the contributions we raised. How do we set government contributions for that? We're going to specify a funding constraint which works as follows. We're basically going to say that in expectation, the funded status of the pension next year has to fall in between two bounds. Today, we're going to set these bounds at about 60% to 120%.

Female 1: Jordan, I'm confused. Why isn't there just the usual government budget to make everything add up? [Inaudible 00:33:03] That's not going to necessarily add up.

Male 2: I think [inaudible 00:33:06] or something. There is a budget constraint [inaudible 00:33:10]

Female 1: No. Where's the [SP] towel in there? [crosstalk 00:33:14]

Jordan: Yeah. I'm sorry. It's not on the slide, but there are...

Female 1: No [Inaudible 00:33:19]

Jordan: Yeah. There is a liability and a revenue budget constraint I don't have on a slide.

Female 1: Okay.

Jordan: Right. Any period the liabilities of the government are going to be paying out current retirees and paying public sector wages and raising any additional contributions to the pension fund and that would be mount with the tax revenue.

Female 1: But that isn't G just the residual of that thing?

Male 2: Yeah.

Jordan: Yeah.

Female 1: Why not write that thing and then say, G is the residual of that thing?

Jordan: I could do that. Yeah.

Female 1: Rather than this bound and the [SP] Chi.

Jordan: Yeah. That's a fair point.

Male 2: But there's more to it. There's also shots to SP] Chi. I didn't understand that there was a [SP] Chi [Inaudible 00:34:03] something.

Jordan: Yeah. There's a...so [SP] Chi under bottom and [SP] upper bar are just going to be two numbers which defined the upper and lower bound on pensions funded status from a given year.

Male 2: What was capital F?

Jordan: Capital F was a conditional distribution over the funded status next year of the pension given its funded status today.

Male 2: What does it mean that the bound changes, you know, every year?

Jordan: The bound doesn't change.

Male 2: No. The Chi. Whatever that Chi was.

Female 1: Why do we even need Chi. I'm not understanding that. G is a residual...

Male 5: Yeah. Because it's a different...that basically says that the tax payer is exposed to not just the wait risk but also in the market risk because they're writing insurance on the assets.

Male 2: That has to follow from the budget tax free. [Inaudible 00:34:49]

Female 1: Yeah. It just all has to add up in the end.

Male 2: If the market value of your assets is less than the tax revenues under the constant tax under the [SP] Tao one [inaudible 00:34:59] then it's not going to add up and you have to change power. So, then just mechanically, in terms of what you did rather than what you could do, there was a process where [SP] Chi...

Jordan: Yeah.

Male 2: There is [SP] Chi bottom and [SP] Chi upper bottom...

Jordan: Right.

Male 2: Where is the [SP] Chi which is floating, is moving around?

Jordan: [SP] Chi would just be this periods, A divided by L funded status. You enter a period with the value of assets A and when you divide by the liabilities, that's [SP] Chi, the funded status. This funding constraint is with respect to next period funded status and expectation.

Male 2: That F was...is a [Inaudible 00:35:44] as a solution which comes from the equilibrium?

Jordan: Yes. Exactly. Just in words...and I'm sorry for the confusion, but in words, what this funding constraints says that if you did not use any contributions this period and the expected funded status next year of the pension was below this lower bound, then you would in fact have to raise positive contributions.

Man 1: ...other than what you could do. The chi, there was a process for chi, and there is a...there is chi bar and chi upper bar. Where is the chi, which is floating...is moving around [inaudible 00:00:15]?

Jordan: Chi would just be this period's A divided by L funded status. So you enter a period where the value of asset's A, and when you divide by the liabilities, that's chi, the funded status. And this funding constraint is with respect to next period funded status and expectation.

Man 1: So that F was [inaudible 00:00:34] in this distribution...

Jordan: Yes.

Man 1: ...which comes from the equilibrium.

Jordan: Yes. Exactly.

So, just in words... And I'm sorry for the confusion. But in words, what this funding constraint says, that if you did not use any contributions this period and the expected funded status next year of the pendulum was below this lower bound, then you would, in fact, have to raise positive contributions...

Man 1: To the whole income.

Jordan: ...and that would lead to a positive tax. Yes?

Woman 1: Is this like a lower bound [inaudible 00:01:02] upper bound or whatever the [inaudible 00:01:04].

Man 1: Exactly. Yes.

Jordan: Yeah. With respect to the pension fund assets and liabilities.

Woman 1: [inaudible 00:01:11]

Man 2: So why do you allow G to be negative?

Jordan: Well, we're being optimistic because we're saying that if the pension ever hits this... Okay. So if you could...if the government commits to this policy, actually commits, then in the long run, the market will perform well and it will run a surplus. So if we simulated this thing out with no upper bound, then the fund assets would go way up. So what we've introduced is an upper bound that says if you hit the surplus, as Charlie says, taxpayers get the goodies of that surplus. And there will actually be a negative contribution, and therefore, a tax rebate. And now, we're fully aware that this is optimistic and this is not something that necessarily we see. Yeah. But this is the first pass of the model with the...a full commitment policy.

Man 1: I've got an empirical question.

Jordan: Yeah.

Man 1: So, in principle, moments in market returns, which should affect the tax rate, right? So have you seen that in Minnesota?

Jordan: It's sticky. I mean, they don't jump around that much. Part of the reason is that a lot of these deficits or costs are amortized out, and so a lot of this stuff is smooth, I think, when you look at the data. Whereas here, we're taking a very kind of abrupt stance to it that if you have an underfunded pension this period, you must make up...

Man 1: So that's exacerbating the risk of the...

Jordan: Sure. Sure.

Man 1: ...exposure of taxes to [inaudible 00:02:42].

Jordan: Yeah.

Man 3: Could you explain a little bit the sort of lag effect? Because you have a given period, right?

Jordan: Mm-hmm.

Man 3: And then you only learn after the fact whether you had a gap or not. And then you have a budget process that goes later, so you may take some time to, you know... You know, so...

Jordan: Oh, if there's some kind of lag or... It's the timing.

Man 3: Like, yeah, to put the taxes and then you cannot really change the taxes every year.

Jordan: Right.

Man 3: You have to really sort of... So how does that work? How do you...

Jordan: Yeah. I think in reality, and this is when you look at corporate pension plans in the U.S., when there is a shortfall realized in that pension, it's not made up this year. It's made up over the course of the next several years. And so contributions are raised slowly. And I think, in principle, in general, that same principle would apply to a state government trying to fund its pension. We don't do this amortization back to slow... slowly back to the funding status because it adds, at least for now, some complexity to the model that we didn't want to pursue at this point.

But to your point and your point, yeah, things look quite jumpy here because the way the funding constraint is set up is that we need to raise contributions today such that...in expectation we're funded tomorrow. And if it's a large amount of contributions that need to be raised, then they are done within that year. And that does lead to a jump in the tax rate that we don't necessarily [inaudible 00:04:19]...

Man 1: A counterfactual jump in the taxes.

Jordan: Sorry?

Man 1: A counterfactual jump in the taxes. Because you have seen big, big moments and returns in the past and taxes haven't gone up.

Man: Correct.

Jordan: Right. Right. So once again... I mean, we're talking about a world with a limited commitment policy by the government to maintain its pension fund, and here, we're presenting one where there's a full commitment to that pension policy. And so that's where there's a divergence, and we're aware of that. And it does kind of bias the way you look at some of the results here. But for us, this is the first pass, and a reasonable way to... a place to start before moving into some of the complexities of how the actual state pension even works. Okay?

And so the end goal of this model is an application to a particular state plan and a particular type of policy reform that we'd like to consider. And so when you think about this model as we've written it up, you can think of all the model parameters as broken up into two groups.

The first group we're going to call universal parameters. And so we're going to assume, regardless of what state you're in, some things are the same: the market return process you can expect, mortality risk, and things like this. And then another subset of those parameters, we're going to say, are specific to a particular state environment, and these have to do with the benefit of the pension plan. It has to do with the distribution of workers across public and private sector. It has to do with the wage differential between private and public sector. And so, in that way, we can calibrate each state accordingly to the environment.

And just for the sake of time, I'm going to just move through this pretty quickly. But if you would like to go through some of those details, I'm happy to talk about it after the talk.

And so today, just...we're picking Minnesota as an application and calibrate the model to the Minnesota environment. And we can plug that in, and we can look at some of the baseline results that pop out of the model. And you could look at it in two ways. One is what does the model say about how workers behave, private or public, and two, what does it say about how the government in this model behaves, and the taxes.

So first, for workers, it's not surprising that defined contribution workers accumulate...

Man 1: I have just one question.

Jordan: Yeah.

Man 1: What was tau Y in the baseline before the [inaudible 00:06:49]...

Jordan: I think it's about 18%.

Man 1: Eighteen.

Jordan: Yeah.

Man 1: What should I compare that to? Eighteen plus some fluctuations coming from the tau P?

Jordan: Correct. Yeah.

Man 1: What should I compare that to? Like a state tax?

Jordan: Yes.

Woman 2: No. It's too high for state and too low for federal plus state.

Jordan: Yeah. I...

Man 3: Sorry. Too low?

Woman 2: It's too high for...

Man: For state.

Woman 2: ...state and too low for federal plus state.

Jordan: Yeah. I'm not sure what to make of that level of the rate, but when we calibrate it, you know, this is the after-tax. And the baseline...

Man 1: You are missing something in the budget concern of the government.

Jordan: Yeah. I'm sure there are...yeah, there are some additional components there.

Man 3: Just take the first point that you make there, private workers accumulate five times more pre-retirement wealth. The challenge you have is that, in the private sector, you have a lot more higher-income people.

Jordan: Correct.

Man 3: Is there a way for you to sort of segment instead of compare apples and oranges? Namely, can you

identify people who make, say, under \$100,000 in the private sector and compare them to the people in the public sector to see whether that's really actually true?

Jordan: So you're asking about labor income or wealth outcomes across the two different...

Man 3: Because you're saying private workers accumulate five times more pre-retirement wealth. I'm just trying to see whether that's because of... If you make, say, \$80,000 in the...working for the government versus \$80,000 working in the private sector, is it true that you would accumulate five times more? I don't know.

Jordan: Oh, I see. Yeah. So there are two differences driving that. The first is the wage difference. So when we look at Minnesota, it's about 15%. So the private sector workers in this model have about, on average, 15% higher labor income. I have a slide somewhere here on that. And the second component is the defined contribution versus the benefit. So, because of the missing pension benefit for private sector workers, they're incentivized to accumulate a lot more wealth in retirement. And we haven't really targeted the proper levels and compared that to the data yet, but that's definitely something we're keeping in mind.

Man 1: But if you measure wealth enough in an appropriate rate relative to income, that should be sort of similar.

Jordan: Yes.

Man 1: Because the preferences are similar, so the same behavior. There's a little bit difference in the... You scale up the risk. So [inaudible 00:09:29] saving higher are different. But other than that, they should be a little the same because [inaudible 00:09:35]...

Jordan: Right.

Man 1: ...properly. [inaudible 00:09:37]

Jordan: And I think a more detailed labor income process for private and public sector workers might also help pin that down better.

Man 4: If you took in the PV of the pension members, yeah.

Man 1: Yeah. Exactly.

Man 4: Yeah.

Jordan: Yeah.

Man 1: I agree.

Jordan: So just to illustrate, you know, once you've solved for this model... And remember, agents make two decisions. They choose consumption and savings, and they also choose portfolio. You can simulate out over the lifecycle for both types of agents and look at their kind of wealth accumulation. And it's the same cycle except the different levels is that, on average... This is on average. These are age groups from agents 20 years old to retirement at 65 onward and their wealth accumulation over their lifecycle. And so the trend is similar in that agents accumulate wealth until retirement, and then, on average, start to draw down on that wealth. But...

Man: Why don't you just...

Man 1: Public well does not include the present value of their defined benefit.

Jordan: Right. I'm just doing a total wealth accumulation today, not discounting future benefits.

Man 1: But for the private guys, how does the popular shares of the lifecycle compare to alpha star [SP]?

Jordan: I'll show you.

Man 1: If that is also...solve efficiency or, you know, [inaudible 00:10:53] have lost, too, right?

Jordan: Yeah. So, if you look at... So this is the same thing. On average, different age groups, public and private workers, and then on the Y axis is the share of the portfolio into risky assets. The private workers are in orange, and what they actually didn't have is what you can call a glide path. So generally, when they're young and still working, they're taking on a long...a lot of long-run risk in the market. And then as they reach retirement, their portfolio shortly glides into a much more risk-free composition. And so if you look at the government policy and just calibrate it to what Minnesota does now, they have about 80% risk in their portfolio. So it's not really...

Man 1: Why is the blue line at 1?

Woman: Yeah.

Jordan: So public workers accumulate so little wealth in their...

Man 1: No, no. Why is the blue line at 1? The blue line was the alpha star, right?

Jordan: Oh no. I'm sorry.

Man 1: Share of Risky Assets.

Jordan: Yeah. This is what private workers do...I'm sorry, public workers do on their own.

Man 1: Oh, I see.

Jordan: Yeah. So the public sector...

Man 1: [inaudible 00:12:11] makes sense.

Jordan: Okay.

Man 1: What is the alpha star?

Jordan: Eighty percent, I think.

Man 1: So you miss housing here, but [inaudible 00:12:20]...

Jordan: Of course. Yeah. Of course. And a quick aside that we think is relevant is that a secondary benefit of this type of model and approach is that it does spit out optimal solutions for how agents save, and what type of risk they should take on dependent of their age, and also where they end up in the wealth distribution over their lifecycle. So, when we think about some of the...understating issues that we don't model here but we've talked about today, when we think about implementing defining contribution plans, we think these types of models have a lot of insight on how to structure and define a contribution default plan to help individuals optimally invest, whether they're private or public sector workers.

Okay. So the last thing from the results in the baseline model is, well, what happens to the government policy? And remember, this is a policy that we've assumed has full commitment from the government to keep that policy, on average, funded between a lower and an upper bound. So Minnesota's funded status is, I think, 78% or so. And so when we simulate this model starting from a date 0 when this policy is implemented, we find out with full commitment, the pension plan stays within its bound, and actually in the limit, about 10 to 15 years, on average, is fully funded. And this lighter area is volatility-bound. So, of course...

Man 1: What are those [inaudible 00:13:56] in the background, only the returns?

Jordan: The market return. And so, of course, the market return is going to fluctuate the pension value assets over time. It may go underfunded. It may go overfunded. But by and large, it stays fully funded, and in fact, hits this upper surplus bound. And this relates to the tax in our model. And like I said, an optimistic scenario is here's what happens to the pension insurance component of the tax. So once again, simulating out from the years the policy started, private sector workers actually, with commitment, on average, see a tax rebate.

Man 2: And so this is what...what's GB negative?

Jordan: It's what's GB negative. There's substantial volatility here, which risk-averse people don't like. But on average, this is running a rebate.

Man 1: But it's on the good side.

Jordan: On the good side, yeah.

Man 4: Hey, you have, like, 10 minutes, so moving [inaudible 00:14:54].

Jordan: Oh, okay. We'll move it forward, Connie.

Man 5: [inaudible 00:14:56] volatility come from or they're not even bound.

Jordan: There is no volatility there. So, in any given period, the tax is...the pension tax is either triggered and on, positive, negative, or it's just flat zero depending on the calculation.

Man 5: And if you just flip back to the previous graph, it's...you would end up bound.

Jordan: Yeah. So this is like a standard deviation bound. So there are events that push it down.

Okay. So, we have a baseline model set up, and we want to be able to perform policy experiments for individual states and particular types of reforms. The one I mentioned today is we're going to look at what we're calling a hybrid DB/DC reform, and it works as follows.

So, for public sector workers, if you're currently working... When you started working, thinking your pension benefit was going to be b , once you got retirement, those pension benefits will be suspended according to an age-based accrual rule. And so the way it works is if you've worked 50% of your working life, then you get 50% of b , and immediately, you're enrolled into a defined contribution plan. By itself, this is a raw deal for pension beneficiaries because they thought they were getting b and now they're getting some percentage of that. So, to compensate...

Man 6: I don't understand though.

Jordan: Yeah.

Man 6: They didn't think they were going to get a DC plan though.

Jordan: They didn't.

Man 6: So it's true. They get a lower defined benefit, but they get an IRA.

Jordan: Correct.

Man 6: So why is it necessarily a raw deal?

Jordan: Well, if you don't look at the wage increase, if your wages stayed the same, and you thought I'm getting \$20,000 a year in perpetuity the rest of my life...

Man 6: Now, I'm getting 10.

Jordan: And hey, you're still getting paid the same and you have to do your own saving. That's going to lead to a lot of...

Man 6: Oh, the DC plan has no employer contribution.

Jordan: There's no matching.

Man 6: Thank you.

Jordan: Sorry, I should make that clear.

Man 7: And the idea of a suspension is that the retiree gets some portion, once he has retired...

Jordan: The retirees have...

Man 7: [inaudible 00:17:13]

Jordan: ...are held constant. So if you're retired, you get the full benefit that you've been receiving. If you're a current worker, your benefit will be...once you hit retirement, will be this new benefit. And then for all future workers, yeah.

So the question is, okay, how much do we need to increase annual wages throughout the remainder of the working period to make these agents indifferent. Okay? And so I have a bit of a heat map here to show you and explain, first of all, what we're measuring is the change in welfare from moving from an initial plan to this reform plan. And we measure welfare changes using consumption equivalents. And on the X axis, we're asking a 5%, 10% increase in your annual wage throughout the remainder of your working period, and then for the different age cohorts in the model, for 25-year-olds, for 50-year-olds, 60-year-olds. And so for each of these age cohorts, their pension benefit is now going to be reformed to something different. So, 60-year-olds receive pretty much almost the entire benefit they thought they had received because they have worked 40 of the 45 years.

The main defining feature here is that young workers are much more willing to accept a wage compensation. For 25-year-olds, it's around 5%, and it becomes harder as you move up the ladder for the older cohorts. For 60-year-olds, it's about...they require a 25% increase in annual wages for the remainder, the last 5 years of their working career. And what's really going on here is that young workers are able to take this additional wage compensation, and they're allowed to compound that on the market for another 40 years while they're working. And so they can realize much higher returns on average. In contrast, 60-year-olds say, "I have 5 more years left

to enjoy this wage hike," and they require a considerably larger amount.

Man: [inaudible 00:19:27]

Jordan: And so a question then is if you made every age cohort indifferent to this reform and gave them exactly the wage compensation they required to be indifferent, what happens to taxpayers? The answer's going to be, maybe not surprisingly, that taxpayers are going to receive a large welfare loss.

So what's going on here? One, wages have increased to compensate the public workers, and that's going to translate to a higher labor income tax with respect to wages. And two, in the limit, this pension insurance tax, since it's been suspended, is going to go to zero. But if you remember, that insurance tax for private-sector workers, on average, is a rebate. So because we've specified a model with full commitment to this funding policy, this might potentially...well, it is overstating the benefit to taxpayers because they're actually getting to enjoy a lot of the surplus from this plan.

Man 4: So, if it actually worked this way.

Jordan: If it actually worked this way.

Man 4: Yeah.

Man 2: So, two big deviations from reality would seem to me, to be, one was, as we discussed, the federal tax issue, which is a big leakage, it seems like, right? The other one, b is constant, right, on slide 13.

Jordan: Correct.

Man 2: But in the real world, for young workers, b should be low, and the older workers, b should be high, right, I think...

Jordan: Given where they're at in terms of the...

Man 2: Because of the way a typical DB plan works. So that might help you if you somehow carved out the niche of workers to whom the policy change would apply. That is, [inaudible 00:21:15], you know, changing, it seems to me, by allowing b to vary with age might make sense.

Jordan: That's a good point. Yeah. I think that's something to...an additional piece of reality to add to it in terms of [inaudible 00:21:29].

Man 1: b does vary with age in the near [inaudible 00:21:30].

Jordan: Yes.

Man 1: It's proportionate.

Jordan: It does. Exactly. Yeah. So if you worked 90% of your reporting numbers, you get 90% of b .

Man: [inaudible 00:21:40] may not apply.

Jordan: So, in looking at this analysis, it's pretty clear to us that it's the transition that really hurts. If you look at an underfunded pension and you asked taxpayers, "In the limit, would you like to get to a defined contribution plan where you don't pay an additional tax that's attached to the pension fund?" there's some evidence to support that that is true. But in the transition of guaranteeing benefits and providing proper compensation for current

public workers, that's going to overwhelm a private sector, non-recipient taxpayer.

And just sort of to wrap up, it will take just a couple of minutes.

Man 4: Actually, why don't you hit the younger one? The younger worker point's important.

Jordan: Right. So if we do a separate counterfactual and just ask workers, private-sector workers, how would you prefer the current baseline system to one in which there is just no pension plan and no pension tax, that's where we see welfare gains, actually. And so that's just kind of to under...or belabor the point that it's this transition of paying off current benefits and paying for increased wage compensation which is going to be harmful for taxpayers [inaudible 00:22:55].

So, there's a considerable amount of public pension policy reform taking place, and we have developed a model, or developing a model that we want to be able to apply to a particular state plan and look at particular types of reforms. We have given you an example of a type of policy experiment we can do today to give us some notion of what it does in terms of welfare to the different constituencies involved. And moving forward, I would say we have assumed this very [inaudible 00:23:30] assumption about commitment to a funding and budget policy by the state, and working on that budget tax policy, adding some more realism to the wage process across sectors, demographic effects, and looking at a host of other actual reforms around the table in various states.

Man 4: So, just you heard like Stefan's [SP] discussion about what other countries do. This is set up so we can actually test those out, right?

Jordan: That's correct.

Man 4: Okay. So, I mean, is that when Minnesota would have said, "Gee, I really like the Swedish model. We could actually give it a rip?"

Jordan: Right. So we've taken a pretty simple approach to how these transitions can work with our policy experiment, but we can look into a lot more of an issue on the type of policy reform.

Man 4: And [inaudible 00:24:24] the idea about saying, "Okay. We're going to have a legacy system, and recognize the laws, and then do something new [inaudible 00:24:31]." That's all right?

Jordan: That's the angle and the idea I said, and these are all attached.

Man 2: And you can segment your reform analysis so that you only look at younger workers or things, you know...

Jordan: Yeah. And I think that...

Man 2: ...that it only applies to them.

Jordan: Yeah. And I think the beauty of this approach, too, is that we can identify the impact on different types of workers and at different levels or age cohorts, which can be some valuable results.

Man 2: Is there any empirical way to value the benefit of portability?

Jordan: Can you expect some [inaudible 00:25:10]...

Man 2: For the DC plan. I mean, you're locked into the DB plan, right, where you can't move to the private sector or stay.

Jordan: Some type of, yeah.

Man 3: I think that's a very interesting point because...

Jordan: Of course.

Man 3: ...historically, now, the millennials, there's a much bigger turnover in the workforce. So if you think about it, the old-fashioned systems basically got subsidized by the people who left, who never stayed there to complete their benefit. So I think there is more, you know... That's a real benefit for a person who's early in their career that they don't know that they're going to stay in the same job for a long time. So that's a very remarkable... And then there must be some empirical data as to whether there is more... I think there is, isn't? That there is more turnover in jobs today than there was...

Jordan: Sure. Yeah. Yeah.