WILLIAM BONVILLIAN: So class 1 as you all will recall was about direct innovation factors. And we looked at the growth economists, Solow and Romer in particular. And they essentially gave us two direct innovation factors that you really can't account for in an innovation system unless those are inputs. So what we could translate Solow as saying, you need to do R&D. And we can translate Romer as saying, you need to-- it's the talent in the system that's working in this system that's a critical input. So that gives us our first two innovation factors.

Class 2 brought us our third. And we began to consider innovation as not just factors, but as a system. And Liz Reynolds' discussion earlier this afternoon was a good reminder of a systems approach to innovation. So we read Richard Nelson, and he introduced the idea of looking at national innovation systems. He wasn't the first to use that term. Chris Freeman at the University of Sussex was, but he really explored the dimensions and taught us to look at the innovation institutions and the strengths and weaknesses of those institutions. And with that concept then, you can begin to explore any innovation system.

Our third direct innovation factor, then, is really all about innovation organization. The strength of the actors, the connections between the actors, and then the gaps in that innovation system. You can analyze all of those and understand a lot about the strength of a particular innovation system, whether it's national, whether it's regional, whether it's local. And Liz gave you a reading of her study of the state of Massachusetts, which is a good glimpse into those issues.

So classes 3 and 4 I won't recap because Liz gave us a good reminder of those issues. But we studied manufacturing, and how it evolved in two different periods-- both the 1980s competition period and the current decline of US manufacturing in the first decade of this century, the early 2000s. And that was a good case study for us on how to take these ideas of innovation system and look at a system, the manufacturing system.

Class 5 pulled back and got us into the framework again, looking at innovation at the institutional level. How does R and D and prototype, how do those stages operate in

innovation organizations, R and D organizations? And then, how does the handoff occur in an innovation system and the strength of those actors as well? So that got us into thinking about looking at innovation at the institutional level.

Class number six was about the Valley of Death problem. The gap that was in effect built in into the US innovation system because we focused the federal role on research, it didn't really focus on the follow-on later stage development in subsequent stages, right? So it guaranteed a gap between our innovation actors, between the research world and the implementation world.

And we talked about innovation at the face-to-face level. So innovation doesn't just occur at the institutional level, it occurs amongst people. People innovate, not institutions. Institutions help organize an innovation system, but in the end it's people. And what are the rule sets that govern the way innovation looks like at the face-to-face level? And we got deeply into great group theory.

Class number 8 was about DARPA, which is a very different innovation model than the bulk of the US system, organized around-- predominately around they end of the World War II time period. It's an organization that attempts to combine capabilities at both the institutional level, but also the great group forming innovation at the face-to-face level. Working on breakthrough technology is what DARPA calls a right/left model. It wants to think about what it gets out of the end of the innovation system. It's not just curiosity-driven. So what do they want, and then how to go back to the early stages and develop the breakthroughs to get there? So a very different organizational model.

Class 9 was a case study on NIH. And again it brought home to us how to look at an innovation system, in this case, in the life science research world. And what are the institutional barriers and problems in that system? Class 10 was around energy technology, we introduced the idea of the difficulty of innovating in a legacy economic sector-- and established, complex, existing legacy sector that builds up its own paradigm to protect its models that are technological, they are economic, they are political, they are social.

And they build barriers to disruptive threats from the outside, from new entrants that would attempt to disrupt that model. And how do you begin to think about bringing innovation into these legacy sectors is a really important question, because most of the economy is legacy sectors. And if you're walling off 80% or more of your economy from innovation, then you're

going to dramatically affect your ability to grow, and your growth rate, and your societal well-being. So in effect that's the problem with legacy sectors, and that's the need-- that's the reason why we need to figure out how to innovate in them.

Class 11 was all about education. Again, another legacy sector. And we talked about a whole set of ways to think about science education, technology education, and then education for innovation itself. Could we ever attempt to think about that as a teaching approach? And today will be all about the future work, which I think is an issue that is going to affect all of you, and will kind of dominate a lot of your time over ensuing decades. So we're going to try and sort this one out and try and figure out what it means by reading some of the leading thinkers in this area.

And then Liz was great by doing the whole-- innovation is like real estate. It's location, location, location. So it really forms in these geographic regions. You really need to understand it in geographical region. We didn't have time for everything in this class, but that's certainly one of the classes I would have added if I had the time. So Liz walked us through some of those initial concepts in that field, which she does really important work in, by the way.

All right you've got Brynjolffson Johnson and you've got the first David Autor piece. So why don't I do those together, because they're they critique each other, right? And this is a big debate that's going on, on the MIT campus with different perspectives here as we're going to see, about what's going to happen to work here.

And so after the Great Recession, the economy went through a very slow period of putting people back to work. Now, we're now back to 5% or lower employment, but we still have a large number of people that never went back into the workforce. A shockingly high number. So this problem-- we're not past this problem.

So this is an early piece by Erik Brynjolffson and Andrew McAfee.

AUDIENCE: Sorry. Brynjolffson.

WILLIAM BONVILLIAN: Brynjolffson. Forgive me, Tom.

AUDIENCE: Just in case--

WILLIAM No, I appreciate it. I'm glad we're going to get that right.

BONVILLIAN:

AUDIENCE: Brynjolffson.

WILLIAM BONVILLIAN: Brynjolfsson. All right. Good. So Eric and Andrew-- how's that-- brought us a whole set of new thinking about this territory. And there's a debate about what their findings are. This is an early piece they produced. Their book on this topic is called *The Second Machine Age.* So they looked at this problem of why wasn't the economy putting people back to work at a rate that was more acceptable?

And they argued that the 2007, 2008 recession wasn't a typical business cycle recession. In other words, you didn't lose your job and then get it back. You lost your job, period. Right? Your job did not come back after this recession, in many sectors, particularly manufacturing as we talked about.

So one explanation was, gee, it's just not a normal business cycle. It's stagnation. And there's a long-term decline in certain sectors that you have to understand and look at. A third explanation, which they venture to set out, was that it wasn't really stagnation either, and it wasn't too little innovation-- a signal of stagnation-- it was too much innovation for the economy to manage and handle.

And so they embarked, then, on kind of a history of this concern about the end of work, which they argue started in 1995 with a growing concern at that time about technological job displacement. And they look at the surrounding technologies that are emerging-- Google's driverless cars, Watson's Jeopardy, Ray Kurzwell, in his book, *The Age of Spiritual Machines: When Computers Exceed Human Intelligence,* began to portray some of these concerns. In other words, people were going to get displaced. Their work was going to be displaced by the advent of the IT technology revolution as it moves into artificial intelligence areas.

What is clear is that there has been exponential growth in the computing sector. And computers are thousands of times better than they were 30 years ago. But there are areas that Eric and Andrew point out, where computers are not good at particularly the sort of combination of both physical and knowledge areas, and are not yet good at general problem solving, and they're not good at creative abilities. But there has been exponential progress. So there's still a significant distance here they note. But their concern is that is on the way, and it's going to disrupt a lot of employment in the economy over time.

And then they argue that given that exponential advance, there are two fundamental strategies in response. One is an organizational innovation strategy. And the core idea here is there's an opportunity for creative entrepreneurs that can create new business models that combine the growing numbers of mid-skilled workers with ever-cheaper technologies to create new kinds of value. All right? That could be one way out of this unemployment social disruption box.

And they argue that digital technologies do create great opportunities for individuals to use their own kind of unique capabilities. They ask, are we running out of innovation? And when businesses are based on bits instead of atoms, then each new product adds to the set of building blocks that are available to the next entrepreneur, instead of depleting the stock of ideas. So this truly is an exponential growth kind of territory. There's no denying it, they argue. But it does create a new set of building blocks that are potentially available here that you can think about organizational innovation to get around.

The second argument they make is that we need to make significant investments in human capital as a way of dealing with this oncoming set of issues. So improving the education and skill sets to get the most out of our kind of racing technology, they argue, is important. And they posit that there's a third Industrial Revolution really around computing and information, which is based on information that, in effect, doesn't get used up.

So that's Eric and Andrew's picture. And it's a dark picture, right? Their concern is that a lot of people are going to get left behind. Let's frantically do organizational reforms, let's do other kinds of changes in the educational system. They argue for a set of tax changes. They really propose in the end-- not in this piece, but in later pieces-- a negative income tax to kind of redress the inequality wealth balance in the society. They're concerned that this is upon us, right?

And then David Autor, MIT economist who's been doing some remarkable work in a series of areas, we read his work on manufacturing. He writes a responsive piece. *Why are There Still so Many Jobs?* is his response. And he argues that Eric and Andrew are only taking a partial look at this phenomena. So let's do a little bit of historical material.

Historically, economics has always found that technological advance, historically, always creates net new jobs. And it's been going on since the Industrial Revolution. And every time you study one of these great ways of innovation, net, there are people affected, disrupted by

the new innovation waves, right? Buggy whip manufacturers had a real problem with the advent of the automobile internal combustion engine, right? So you can think about a lot of displacement that has occurred historically, but net, the amount of employment overall was a net gain.

And David said, is that era over, is the question. And his basic answer is no. That's not over. And what he would argue, in a way, is an assessment and counting problem. It's not that there is not going to be disruption. It's just that automation can also complement labor and can raise outputs in ways that lead to higher demand for labor. Right? So automation does indeed substitute for labor, but in this complimentary way, automation can also lead to new kinds of output, that lead to new kinds of employment. And you've got to understand and assess that-- the combination of these factors, the substitution as well as the complementarity-- in understanding what's going to happen ahead.

And he argues that commentators tend to overstate the extent of machine substitution for the human labor and ignore the strong complementarities between automation and labor, that in the end increase productivity, raise earnings, and augment demand for labor. So there's one important thing that has not changed in the economy here, right?

So if we look at agriculture in the 19th century, we employed approaching-- over 40% of our population in 1900 was employed in agriculture. Now, we employ less than 1%. Much greater output. So that's a story of intense productivity gains.

But agriculture is different than the production of goods-- non-agricultural goods. If you look at food consumption per human being in the United States, it's not very different now than it was in 1900. Even in America there's only so many calories we can consume. I mean, we're working on it. But even here there are limits.

That's not true in the production of goods. We seem to have an insatiable appetite for more goods. And occasionally a movement will hit society like, let's get rid of our stuff. But it never last very long. So it's a different world. We can't make the agricultural analogy to non-agricultural good production, right? They're different worlds. And part of the story that the David otter is attempting to illustrate here is that the limit-- there is no limit on goods, all right? So that complementarity, that combination of people and machines can lead to new kinds of technologies, new kinds of advances, new kinds of goods that fit evolving sets of needs.

And he provides an interesting example of complementarity. He notes that ATMs, the cash

machines in every bank that you know of, and all over the place, they were introduced in 1970. The assumption at the time was that, well, there's not going to be any more bank tellers. That job is over, right? And there were a lot of those.

But what ended up happening, was that by 2010, there were actually somewhat more bank tellers, but their job and been repurposed to not just doing, counting up cash and handing it to customers. Their jobs got repurposed into, frankly considerably more sophisticated, customer service kind of job. So an upgrading of the skills required in a way for that job, but no loss in employment. In fact, a very modest gain. Despite the fact that everybody thought that sector was going to go.

So he argues that that's not unique. This is going to occur in other sectors as well. So the gains in productivity have not led to a shortfall of demand for goods and services. These keep growing, which is a big offsetting factor to the substitution of automation for work.

And he provides an interesting description of how you could look at the different economies in recent decades, right, the 1940 to 1970 economy versus the current economy. His characterization of the economy that has been taking hold since 1980 through the current time, is that it's increasingly professional and technical with managerial occupations, and that they're growing pretty rapidly. Whereas skilled blue collar occupations are shrinking, and that clerical and sales occupations, which are the kind of vulnerable equivalent of production jobs in the information age, those are in decline.

There's a powerful piece in *The Economist* this week about the decline in retail sales operations overall in the United States, in light of the explosion of Amazon and online delivery ordering system. And how are those changes going to take place? What does that look like? And what stores-- location-based stores are thriving and which ones aren't, right? It's a very interesting assessment. Steph?

AUDIENCE: I'm try to figure out if this is a good time to ask it. I'm curious about like, drone technology is still not at the point in which it can take over the entire delivery system for a company like Amazon, but it seems like the Federal Government is defunding the Postal Service. So what then happens to the increase in labor, or I guess, the increase in demand of these products if there isn't an equal rise in delivery infrastructure? I guess that would be a consideration that I would hope that *The Economist* article would address.

WILLIAM BONVILLIAN: Yeah, it doesn't deal with the Postal Service question. We can kind of think it through, right? So what happened, right? I don't know about the number of letters you're writing longhand per day these days, but mine is not high. So we've shift over to online systems. So the bulk of what used to be mail is gone.

The Postal Service however, missed the revolution, right? They missed the fact that online delivery of goods was going to explode. FedEx had a better model, and they captured that marketplace. So FedEx is thriving hand-in-glove with Amazon and other similar comparable delivery systems. The Postal Service missed that revolution by-and-large-- although they've been trying to catch up-- to their own detriment over time, right?

That's kind of the story. And when you look in terms of net employment, we'll see how this sorts out. But again, this is an example of complementarity, the whole Federal Express and similar-- DHL, and other express delivery services-- that's a complimentary service that happened to compliment very nicely the evolution of the distribution of goods originating through online services. So that helps us think about some of this. Martin?

AUDIENCE: I mean, [INAUDIBLE] is like maybe that's an industry that is OK to maybe be disrupted, because probably when it began it wasn't profitable. And so you needed the government to have it, to have it as an infrastructure for-- it was a tool for communication.

WILLIAM BONVILLIAN: Right.

AUDIENCE: And there is a there's a huge societal gain from this, even though it wasn't profitable. And then with less letters, and because you have the internet, and probably what happened is all these other companies optimized their logistics really well, because they're getting better and better and they have more money, those companies became profitable, and it was probably way easier and way cheaper to send it through their way. And now you have all this kind of stagnation in innovation inside that-- you have the Postal Service, that sector. So it just wasn't viable for them to keep going because it's just it's just a huge waste.

WILLIAM BONVILLIAN: Right they? Have a whole set of disadvantages. The government handed them the task of having to deliver mail and parcels to every single neighborhood in the United States, no matter how empty your neighborhood was, right? If you were out there in rural South Dakota, you can imagine that the economic base for a strong delivery system is probably not there. So there were a lot of disadvantages they faced going into this, but in the end, they missed that

package delivery mechanism. But you make a good point, Martin.

Let me wrap up with David Autor. There is, in the end then, an interplay between people and machines. And the comparative advantage will allow computers to substitute for workers in performing routine codifiable tasks. But it also amplifies the comparative advantage of workers in supplying problem solving skills, adaptability, and creativity. So the people-like capabilities. And maybe computers will get to these some decade, but that's not happening anytime real soon.

So re-addressing the balance between those two is the key to managing the entry of these new IT-based technologies into the economy, David Autor would argue. The frontier of automation, he recognizes, is rapidly advancing. So the challenge of substituting machines remains intense. But if you focus only on what's lost, you miss a really central economic mechanism. So automation affects the demand for labor by raising the value of the tasks that workers uniquely supply, right?

So that's-- Eric and Andrew tell us about the challenge ahead from the IT revolution in substituting IT for work. David Autor begins to put us on a pathway to make an assessment of just what that's going to mean, and what the balance between people and machines is going to be, and how we need to think about that balance, right? So that's the core issue in his article, how come there's still so many jobs? His argument in the end is, in this territory, there's going to be substantial numbers of jobs. Beth, it's all yours.

AUDIENCE: OK. So there are a lot of really good questions this week. So I want to spend most of the time discussing those. Just a few points that I noted. So maybe perhaps a little differently, I found Eric and Andrew's piece more optimistic than I expected. Especially how it ends, kind of saying like we've been through these revolutions before, we'll get through this one. Which I found kind of weird, because they spent most of the beginning of the article talking about how this was fundamentally different given its exponential growth.

So that was a little hard for me to reconcile. I think they're trying to end it a little more upbeat, but maybe if I read their whole book, I'll see that it's a little bit more nuanced than that. And then, yeah, as Bill said, Professor Autor kind of portrays a different story in that, like, yes, we need to be aware of these changes that are coming, but they aren't as bleak as we might think. And then he also does talk-- I think it's in this article-- about how additional technological advances, such as machine learning could cut in a little bit to his conclusions about the skills

that humans have that are unique from machines.

But starting first with this Eric Andrew piece, Matt brought up a really interesting question that I think is worth discussing. So one of the things that they talk about is this new ecosystem will have a lot of opportunities for entrepreneurs. But Matt noted that, especially like in Silicon Valley, we see that a lot of IT entrepreneurs are kind of creating apps or other new advances that don't have a lot of value for economic growth, that might just be like making like, solving first world problems as they like to say. So what do you think the reality is with these entrepreneurs actually creating new companies that are going to be able to foster job growth?

AUDIENCE: Oh, yeah I'll put a quick point on that. I would say that right now what's happened is that because the IT revolution there were these sectors that-- it's pretty much the scaling and cycle distribution. So things that don't matter, you can scale, but you make a lot of money off them. But we're entering a period where people are going to do things that matter. And now you have the capital markets, you have the infrastructure of how you grow companies quickly, how you on board. So this whole infrastructure has already been built out, right?

So the way I would compare is like when Amazon started, they built this infrastructure, and it was just to distribute books, right? And then later, they evolved to all these other platforms. So the benefit now is that you have these capital markets. So that, say, somebody does do like a very important innovation to the-- like CRISPR-- you can get it passed on faster. So right now, I would say, like, you should think of Snapchat, Facebook is kind of like little to middle leagues. But it creates the environment that if someone does do something significant with a real innovation and creates an industry, you will get maybe a trillion dollar company. And you'll have somebody who becomes very, very wealthy.

AUDIENCE: Would you-- I'm interested in your opinion. Would you argue that those first world problem solvers are necessary steps to allow the big players to exist? Like if the market was dominated first by the CRISPR--

AUDIENCE: I wouldn't say it's necessary, but I'd say that's how it is right now. And it's just been built on. There's also a common strategy where it seems really stupid until it's not. So it can also go back and forth. If you look at Silicon Valley. Silicon Valley took 57 years to become what it is today. It really started off with Stanford using their funding from World War II, and making a decision-- which was different than MIT's-- that I don't want to keep the money inside the lab. You built something, you research it, and then you go out and make a company off of it.

But it takes a long period of time. And that was hard tech. But it was just hard to scale. Because what used to happen is-- like in the '90s-- so if you wanted to make computer science company, so like something like Facebook, there was actually 15 Facebooks before Facebook. And what happened is you'd have to buy servers, you'd have to configure them. And you'd probably spend about like $100,000 to $750,000 to buy all your servers, right? And then you got to start it with the idea.

So like if somebody had to do a Snapchat and be like, OK, I paid a million dollars, now I have to build it. It's such a huge problem. And so the issue, the reason that hard tech didn't scale before, is because you would ask for that money, and you would give up about 30%. What would happen is the founder would start the company, and then what would happen is because you don't have any management experience, they'd kick you out. So there wasn't much control in the founder.

So now what's happened is because of the funding environment, everybody has capital, but there's very few good ideas. And in fact, the moniker of VCs is that there's only really like five really great companies that we should invest in this year. So there's a lot of money. And I would say that it's more like, it's more like *E News,* right? All these companies you hear of is just like scandal, just like gossip tabloids.

There's a couple of good companies that every year will come out and create really substantial technologies, and those are the people that you won't hear about today, you won't hear about them a year from now. But they'll be around 20 years from now, 10 years from now.

AUDIENCE: Yeah.

AUDIENCE: Do you think that capital system-- I mean, I imagine it would need to change a bit once. You start having like IT companies that are matching like lot mid-scope workers with the technology. So say you have a VC person that's interested in startups right now in the software industry. They have like almost 100% profit margin, now you start hiring people and your profit margins are lower.

Do you think this system that's being put in place by what we have now will be able to adapt for that?

AUDIENCE: Can you specify that question a little bit more and give an example?

WILLIAM BONVILLIAN: So I think you make an interesting point, Matt, and this takes us back to the reading that we did about the engine and cyclotron road. And the fact that the venture capital system in the US is really focused on software companies at this point. And what Martin is telling us is early stage, the foundations are built, they'll able to move to hard technologies. We're not seeing that yet, frankly.

Again, biotech is a separate world, and they've built a system there by which they can manage the scale up with their current financial model. But I think there's-- you've given us a hopeful perspective of what could evolve.

AUDIENCE: I would say that an example of now going to the physical world from the IT world will be like in Uber and Airbnb where it's starting to filter out, and then hard tech will be a whole different field.

WILLIAM BONVILLIAN: But the model is still job displacement, right? And that's how you get your return. So it's a really difficult model. And we don't necessarily have to go that way, as we talked about in the energy class. A country like Germany is organized around manufacturing-led innovation. They're producing-- there's no shortage of demand for goods worldwide. If anything, it's growing as a lot of the developing world becomes emerging economies. And Germany is well positioned to take advantage of that. And they've just organized their innovation system very differently.

But Martin, you make a good point. This may be staging that we could move hard technologies into. Much as I mean, biotech is a separate world. But CRISPR, in a way, will result in what we could call hard, maybe they're soft technologies that could be in effect a platform off an IT base. How about another question, Beth?

AUDIENCE: Sure. So I think just yesterday there was an article in *The Washington Post* or *New York Times*-- I forget-- talking about how one of the downsides to a lot of the lower paying jobs that college graduates are getting, such as counseling or teaching, is that they are harder to displace by automation. So they're talking about how so many investment banking jobs have already been replaced by automation, so you shouldn't feel so bad that you're taking a lower paying job because it's a safer job.

And so this reminded me-- this question from Chris, I think, gets to that. So how do we accelerate growth in these job areas when we're admitting that they're seemingly less desirable right now for a lot of people because they pay less? And if these are the jobs that

maybe more people should be going into, how do we convince people to do that?

AUDIENCE: Well, [INAUDIBLE] there is an article [INAUDIBLE] *Washington Post* about how San Francisco is creating teacher housing. Because they felt like they were getting a lot of stories about how teachers had to commute in for several hours a day into the greater Bay Area, and then how some people were living in people's kitchens because they couldn't afford the rent. And so what San Francisco, the municipal government, you know again, the role of municipalities, decided was that they needed to build housing specifically for teachers.

This wasn't going to be affordable housing, this isn't going to be low-income housing. This is going to be housing for teachers to live in so they can teach at the schools. And I feel like perhaps there is going to have to be sort of additional incentives in terms of infrastructure and housing to support this, I guess to support that population of workers, because it doesn't seem like it's politically viable to increase salary, but it does seem like a reasonable proposition to say, so long as you're working for our schools, and so long as you are providing a public service that is going to provide a net benefit to society, then you should have access to housing and food, at a minimum.

AUDIENCE: Seems like-- remember that one article you showed me about unicorns, and how they're very masculine and immature?

AUDIENCE: That is not what it said.

[LAUGHTER]

AUDIENCE: Well, if you're going to talk about--

WILLIAM BONVILLIAN: That's an unrelated topic.

AUDIENCE: No, no. Because it has exit rounds and--

AUDIENCE: Yeah, OK.

AUDIENCE: --seed rounds.

AUDIENCE: Yeah, so I guess I can also talk about. Yeah, so I would be I would be happy to send it to all of you as well. It was an article that was written by a woman on-- or two women on Medium who had done research on the unicorn economy, that is the creation of a billion dollar company.

And thinking about how that's not sustainable in the long run. What we actually need to be focusing venture capital funds are our zebra companies, which are companies that care not only about-- they're sort of like the triple bottom line companies, right? There is going to be a benefit to the company economically, there's going to be a benefit to society economically, and there's going to be a benefit to society as a result of the product that they're creating.

And so they introduced the zebra model, because zebras are sort of mutualistic animals that travel in a pack, as opposed to these unicorns that don't exist. Right? They're not real animals that sort of promote any sort of benefit to the public. And so I'd be happy to pass it along.

AUDIENCE: I mean the article makes a really good point about how like these other companies that are unicorns are kind of like a bull in a China shop. They go and they ruin like a lot of societal structures, and they displace people, and they don't really consider it, or take any consideration. And how it kind of-- yeah, it was an interesting article.

AUDIENCE: And the one point that it doesn't hit, I will underscore for all of you, is the way in which companies like Uber, and I think some of us know this, but are essentially informalizing our economy, right? Like, one of the things that we treasure about economy in the developed world is that it is a formal economy in which people have labor protections, in which there are trade unions, in which workers have rights and protections against their employers, and have that-- they can use their citizenship as a means of leveraging against discrimination that might occur to them in the labor economy, right?

We, as wage laborers, should get protections. But the way that these companies are introducing models and perhaps, in Alibaba's case, the kind that they're bringing to the US, is that they're removing the labor protections. So what happens if you expose citizens to-- or if you revert citizens from wage laborers with protections to informal laborers who sort of are itinerant in the economy. I mean, that's an incredible consideration.

WILLIAM BONVILLIAN: Look, we went through in the 19th century. I mean, with the advent of industrialization there were no worker protections. And massive problems with the workforce. We've all read Dickens. So we went through that phase, and will more formalized protection systems evolve over time, even for the unicorn world?

Let's move to David Autor

AUDIENCE: Yeah. All right, so as we kind of mentioned, Autor seems to be slightly less concerned with the

immediate impacts of automation. But Lily pointed out that there is some really startling job loss in some sectors. So even if some of these jobs are replaced, if we see an entire sector, such as the retail sector, collapse, is that something that the economy can bounce back from? What does that mean for social order? I mean, we've already seen the effects of manufacturing downturns have had pretty dramatic effects on social ways that we are constructing ourselves. So even if we can replace some of these jobs, what do you think that means for the rest of society?

WILLIAM BONVILLIAN: Here's a trick. Ask Lilly since she wrote the question.

AUDIENCE: Well, I was just thinking about it because-- I don't know-- my husband was listing to me more than a dozen retail companies that are entering bankruptcy. I think JCPenney, Sears, et cetera. Retail stores that are huge and employ a lot of people. And we thought of as like staples in our economy and our consumer needs. Also, there is talk of the mall industry going under. Just this like-- because people don't go to the mall like they used to all the time.

So I'm just wondering if those are going to have almost a domino effect of well, a couple of retailers not that impactful, not that big of a deal. But then if you start to think about the infrastructure that's built up around malls, even the parking lots for malls, like what's going to happen to those? What are we going to replace them with? I just think it might get a little desolate?

AUDIENCE: [INAUDIBLE] I would look into vacancies in malls. The way I would do it was like, if everything was statistical analysis of the malls in the US, and if they have vacancies. Because what I'm pretty much thinking is probably would happen is like the JCPenney model was optimized for the '90s, and it didn't evolve into what the new consumer needs would turn more niche. And so they just lost their edge and are losing money. But there's probably new stores like Lush or like Kroger coming in and taking over those. That's probably what I think that the business models of the past have been disrupted, and now there's new people coming in.

Because people still go to malls--

AUDIENCE: But what if Lush, say like, you know how people-- I actually don't shop at Lush, but I know that they make the products in stores. I mean, what if machines come into Lush, and then the products, I mean the laborers become irrelevant?

AUDIENCE: [INAUDIBLE]. My little sister loves Lush.

WILLIAM BONVILLIAN: I think you're making an important point there, Martin, which is that there may well be ways to adapt a face-to-face store model to these new realities. And there's a slew of companies that are actually working hard on doing exactly this.

AUDIENCE: I mean--

WILLIAM BONVILLIAN: And then there's a whole set of companies that specialize in kind of last year's goods. Think TJ Maxx, right, that are thriving, right? And suppose you built your mall around--

AUDIENCE: H & M.

WILLIAM BONVILLIAN: --a combination of those two models. Maybe that's a more interesting mall model. So again, I'm not sure. I think we've got to keep in mind just how fast these changes are upon us, and what the strategies are. I think David Autor would argue that there's a new delivery model emerging here, right? A new kind of role for people that's just like we saw with the ATM machines, that's actually a significantly upgraded kind of occupation. And can we move on those kinds of steps, right, and then readjust some of the existing models for that?

I mean, it's an open question. In this piece in *The Economist* this week, which I recommended earlier, reiterates some of the things you were raising, Lily, which is that there's going to be a lot of grief in malls unless they get their models sorted out. And they note a number of examples of models of malls that are actually working to do that.

AUDIENCE: I think there's two main things happening that are probably going to be disruptive to retailers. Because I've studied retail for a bit looking at a whole market analysis. And there's a reason Amazon's going to retail, is because all of e-commerce is only 30% of what people buy. People still buy like, and go to places. It's just a lot better. They get to see it, they get to feel it. And that's why they go to malls.

Their disruption though, is that they're not going to really have workers. I don't know if you've seen how they're going to do their stores.

AUDIENCE: [INAUDIBLE]

AUDIENCE: The other-- that's one disruption where if you don't have employees. But issues like teenagers, right? Like, it's not-- I don't know if somebody expects to raise a family on like an H & M salary,

or like a Zara salary. The second disruption would be 3D printers, and what it does when you do materials, and when you do like, fashion, even.

Because if you go into a store-- because most of their cost is all inventory. And it leads to a lot of logistics. If I can make my store in such a way that you can come in and you'll get a tailored dress is probably better because it's very unique and you can make like a 3D printer for a dress, that'd be really cool. And somebody can go in and get a perfect dress based on their style, based on a picture that they have on their like, Instagram. Then you don't have inventory and they can sell it at like a decent price, and it would probably be a relatively cheap dress, right? Or if you can go and get a tailor-made suit if you're a guy, and it's like perfect for you, and it costs you like, $100, $200, and it's in the fabric that you want.

Especially with synthetic fabrics. I don't know if we talked about in this class-- well, we talked about in the industrial center. But those are the big disruptions. Or if you're like, instead of having-- being an auto store, instead of having all the inventory that cost a lot of money, and it gets old, and it gets rusty, you can build a part when somebody comes in exactly for their car because you have the data for that piece. That's the big disruption.

And it will-- and it's like-- it'll be quick toppling of a lot of core businesses that-- because all you have to do is look at their balance sheet, see where they spent all their money, and then you make that your business model as a startup completely the opposite. And then they cant' compete against you.

WILLIAM BONVILLIAN: And against this backdrop, remember, too, that the entire movement of computer-like goods was towards these big box stores in distant low-cost suburbs with gigantic parking lots. That was the entire movement of that sector. Until Apple completely reinvented the model, and decided that, let's have fabulous face-to-face, highly personal, employee-heavy, great service, beautiful designed stores. It is the most valuable retail property in the planet is an Apple Store. There's nothing like it, right?

They've managed to create more value per square foot than any real estate magnate ever dreamed of, right? Again, through a very different kind of model, and again, taking advantage of a new kind of way of looking at employees, and in effect, upskilling that whole employee base. So these are ways in which David Autor would argue are ways of creating complementarity to these new, evolving technologies. How about one more Auto question then?

AUDIENCE: Perfect. So the other kind of controversial, or thought-provoking topic that's brought up in these articles was the idea that if we reach a state where so many jobs are eliminated and automation takes over, we'll really be in a state of abundance rather than deficiency. So they bring up the idea of we'll still have to figure out how to allocate these goods, and allocate how much money people have even there's no jobs for working. So I think that's a pretty crazy thing to think about right now. But I'd be interested to hear what you think could happen with that.

WILLIAM BONVILLIAN: Right. In other words, if we're aiming at ever more efficient production, we're going to create productivity gains, which in turn generate new resources in a society that you could use for additional societal well-being. So that's the society-wide picture.

But then if you look at it in terms of a particular line of goods, or a particular region, there is more wealth potentially being created, right, for any given line of goods. And that indeed can be distributed, and that can be a part of a new kind of employee, a new kind of generation of employees, and what their return is.

AUDIENCE: Mm-hmm. So I guess, kind of what do you see as a hypothetical picture for how that would work? Is this something that the government would have to kind of regulate? Is this coming from the markets?

AUDIENCE: Are you talking about like universal income [INAUDIBLE]?

AUDIENCE: Yeah.

AUDIENCE: OK. Anybody have interest in that? No, I'm not too socialist.

AUDIENCE: I was going to make an analogy. I have heard this is a fact. I have not done research on it so I don't know if it's speculation, but the way in which the diamond industry operates, which is that there is an abundance of diamonds, but there is a control of the market, and thus they raise the price on the diamond significantly. And so the reason I bring this as an example in which to draw a parallel is because universal basic income, and the both of you, I think the place where both of you are coming from, is an assumption that people want to distribute those resources, right? And that people want other-- that we want to create those productivity gains rather than decrease, or rather if we increase our productivity gains, then we won't act upon them. And I don't necessarily-- I don't know if that's true. And that's, I think my concern.

AUDIENCE: Can you clarify?

AUDIENCE: Like, just because we can make more, say, food. Just because we will have the capacity to make more food doesn't mean we will. Just because we have the capacity to--

AUDIENCE: Or doesn't mean that everyone will be, on a whole, healthier.

AUDIENCE: Right.

AUDIENCE: Oh yeah.

AUDIENCE: Exactly. Just because we will have access to more things, and we will have more rapid access to these goods, does not mean that it will be a-- that people will have access to them, or that it will be like you were saying a good thing overall.

AUDIENCE: I mean I think the idea of giving people hope that if they lose their job their whole life isn't going to really, really suck and they'll be poor is important. I don't know if universal basic income would be the best thing, just because the incentives. And I think that will be really a question of our generation. Like, how do you make sure that these people end up having a place in society, and being productive? And not going into depression, or not spending their days just like not doing anything.

Like, how do you-- I think a big thing that will have to happen, probably, is that governments, or even private organizations, because governments now might not be adequate at this, will need to figure out key business opportunities for micro entrepreneurs that could give them sustainable income, and give them the ability to capital lines so that they'd be able to generate wealth and create businesses in areas that need these businesses.

Because I think a lot of the problem is in businesses. Like, you start a business and you don't know if you will succeed or not. But if somebody could do an analysis like they do for McDonald's, where it's like, OK, we know this area this will be successful. We know there's a need. The government probably knows where there's needs. If you can do an analysis to figure out-- data to figure out, OK, a company that does this would be really useful here, a company that does this would be really useful here. These will be the requirements. You can do a franchise model for people to start companies.

I'm not against like universal basic income. I just worry about the incentives of not having the ability-- or maybe you create an incentive that you study and you become a teacher. It's a

thing that, no matter what you say-- I can say like what it is, but it's more about how you do it. Because you could incentivize and create more teachers, but if you don't respect those teachers, or if they don't value them, then it'll be very weird. If you create it and people just use the money and build these businesses, and they're really going out and having fun, I don't know.

AUDIENCE: I think for me, universal basic income is one of those things where like economists really talk about and we can, in a sense, there's like a lot of literature and kind of journal articles kind of fielding this idea like what if we don't. But in the US, I'm trying to see, if we have this sort of widening of this barbell effect, where we had this erosion of this middle class, and kind of like this large-- like, basically the people getting rich aren't increasing in number fast enough, but like, there's a lot of people kind of regressing this way. And so I'm trying to see like, what are the conditions that will allow for us to call for a universal basic income?

WILLIAM BONVILLIAN: Rashid, I think you're really onto an important point here. If you've got a declining middle class, their incentives to, in effect, take money out of their own incomes and redistribute them, that's going to be a problem. If that's a threatened community, which increasingly it is, then politically, that is a very difficult step to take. So I would argue that we probably need to look at education, which is a great way to lead into our next reading.

So another terrific David Autor piece. David, for my money is doing the best work in economics anywhere. This is his-- this builds on the Goldin and Katz piece that we talked about in the last class, right, and kind of takes it another kind of step further. And this piece is all about skills, and education, and the rise of earnings inequality. And now, there is a steep and persistent rise of earnings inequality in the US labor market that has been going on for more than a couple of decades now.

And it's not just true in the United States. This is a phenomenon in the developed world in general. But why look at inequality? And what do we start to see? First, the earnings premium for education has risen very significantly as we talked about last week. So 2/3 of the overall rise of earning dispersion between 1980 and 2005 is accounted for by this increased premium that's associated with schooling in general, and post-secondary education in particular. So let me just jump to a slide of this.

So this is a projection that comes out of the quite respected Georgetown University Center on Education and Workforce, which does really first-rate work on the workforce. And they found

that looking at what projections were for 2024, they found that in terms of job openings, high school diploma and less than a high school diploma was going to be about 19.7 million job openings in that time period. Job openings for those with college associate degrees-- some college associate degrees and college plus college-- 36.5 million jobs, right? So this is a profound upskilling of the workforce that's going on.

And look, by the way, the higher education system isn't necessarily going to produce these numbers. So what that means is that the people on this end are going to be able to charge a premium because there's going to be a shortage of demand for their skill sets. That's what's going on. That's what David Autor is telling us has been going on now for several decades in the US. It's exactly that phenomena.

And the earnings gap, then, between college and high school graduates has more than doubled in the United States over the last three decades. So lifetime earnings expectation with a college degree is now very powerful compared to your lifetime earning expectation if you have a high school degree. And the skill premium concept here, offers real insight into the evolution of inequality in the US society. Now of course, this is all related to the employment issues, and particularly the future employment issues that we've just been talking about.

One more statistic that underscores this. This is the fall in real earnings. In a Hamilton project study that was done for Brookings, this is the percentage of real earnings in working age from 1990 to 2013 for men aged 30 to 45. No high school diploma, median income decline went down 20 points in that time period. High school diploma down 13 points in that time period.

So we've got a profound societal issue. This is just a big signal of an inequality problem that's a problem now, and because of the phenomenon we've just been talking about in two previous readings. Is potentially going to get significantly worse over time. So this is a big societal dilemma that you guys are going to have to figure out, right? And it looks like Autor is telling us that a lot of this has to do with the education system.

How are we going to alter the education system to move a lot of people to higher levels of education? How is that phenomenon going to work? What are we going to do in terms of designing new institutions and new mechanisms to do that?

So the rising demand for educated labor in advanced economies, including the US, it's a profound rise. And if the supply of educated workers doesn't keep pace with the persistent outward shifts in demand for the skills, then you just multiply your inequality problem. And it

forces a public policy response around upskilling, right? That's a societal task we're going to have to accomplish.

Now, Rashid pointed out, I think very astutely, that, with this barbell phenomena, which is another David Autor concept, right, that the society looks increasingly like a barbell. You've got a very successful and growing upper middle class, you've got the middle of the economy, which is being in decline and being-- we just saw the median income data-- and moving towards lower-end service delivery jobs, right? Personal service delivery kinds of positions. The politics of that make it problematic to deal with, say income distribution in the United States. It's just not going to be politically simple.

If everybody was rising together that's an easier problem to tackle. But they're not. So education is probably the way in which we're going to have to address this. All right? We're going to have to up skill that workforce. And look, by doing that, as Martin pointed out, you're addressing the underlying problem. You're helping people realize their talents and their capabilities, right? And that's, frankly, a better solution to the problem than just throwing money at people, I would argue, right? It's probably not the only thing you do, and it's not going to help everybody, but can we find strategies to do this?

So I've been working on this, and I've been thinking about it and talking to Sanjay Sarma, who runs the online education effort at MIT, and MIT has developed these new platform technologies. MITx and edX is another platform provider, pervasive online capability. But on the other hand, it's hard to envision a steelworker in southeastern Ohio who's lost their job, at being willing or able to spend a substantial amount of time in front of a computer blue screen in their basement while their kids are running around upstairs, right? Just not terribly likely.

AUDIENCE: Or, if there was a case brought up recently that somebody was worried about losing their job because they would lose their insurance, and their kid might not be able to get proper [INAUDIBLE].

WILLIAM BONVILLIAN: Yes, the problems multiply when you get into this box. And we've had two recent-- recently two very interesting books that start to portray this problem for us. And so *Hillbillology* is a very interesting story of one of the big diasporas in US history out of the South, out of the Appalachians, into industrial employment in the Middle West. And with the decline of US manufacturing, that community really got nailed. And what do you do with that community?

This book is a pay-on to that community, and how to even think about the kind of problems

they've got into. Opioids are one example cited in that book. There's a new book just out by Annie Goldstein about a town in Wisconsin. Town of about 60,000 people. The major employer was a General Motors plant that employed 9,000 people. It had survived the Rust Belt. It was a quality plant. But when General Motors went bankrupt in 2008, all those people lost their jobs, every single one of them. And it put that community-- tax revenues declined, housing values declined, everything is going down, right? Community services collapse, charitable contributions drop, right?

It's painful to watch what happens in that community. Finally, one good thing happens. Dollar store opens a distribution plant. The jobs pay way less than half of what the General Motors jobs paid. So that's the kind of problem that we're up against here. And in light of all we've just been talking about technological job displacement occurring over time, we've got a big upskilling job to do here, I would argue, in our economy.

So online capabilities are one piece, but that's not going to be the answer here. It's probably going to be a blended model. And can we think about how to enlist community colleges, and how to join them with universities developing curriculum? And how do we know what the curriculum is? What's the content education in a society that's going to change the nature of work? How do we begin to understand that? What's the changing nature of work that these technologies are going to drive? How do we educate for that?

So we've got a big task ahead. But a mix of employers, community colleges, universities, and labor organizations is probably going to be the way we try to figure some of this out. So I'm just extrapolating from David Autor's point about the underlying importance of education to this inequality problem, and emphasizing that education is probably going to be the fix we're going to use. But then, how are going to do that, right? So a big challenging problem.

So who's got this one? Sanam, you want to lead us through some questions?

AUDIENCE: Sure. Yeah, so a couple of points. I thought the focus on inequality was really interesting here, especially he touches on briefly why inequality is actually good for innovation. And this is something that we talk a lot of that in econ classes, and how, of course there are greater incentives to be more productive because the rewards and returns are better. And then also, generally in countries that have more unequal distributions of income, that attracts people from other countries with more equal distribution of income to come to that country and stay. So in terms of attracting talent for our innovation system from abroad, it's actually kind of a

benefit.

But obviously there are a lot of problems as well that she talks about. Especially the intergenerational mobility problem. So that there's a decline in wages for people who are not in college educated. And that tends to perpetuate within families and communities as well.

So one of my big questions here, which is just kind of a general question, is how do we make sure that in discussions about innovation and technological advancement, that we address these problems of systemic inequality, that still persist in the country? And kind of tying onto that, to what extent are the systems of privilege of educational and skill advancement in attainment embedded in this framework that we've been studying throughout this semester? So I kind of want to get your thoughts on that.

AUDIENCE: Can you repeat that? Just like the main question?

WILLIAM BONVILLIAN: Why don't you break them into the two pieces?

AUDIENCE: Yeah, sure. So my first question was how-- in these discussions we've been having about encouraging innovation and technological advancement, how do we address problems of systemic inequality as well?

AUDIENCE: Just for the limiting down of your question, would you mind defining for us what is systemic inequality is in your definition? Because I have my own very many definitions, right, around my field in political science. And then, two, what systemic inequalities do you want to talk about? Is it race? IS it income inequality? Is it social class? Is it what durable inequalities?

AUDIENCE: Educational disparities?

AUDIENCE: Yeah.

AUDIENCE: Yeah, so I'm going to go up with Autor's piece was and talk about-- so by systemic inequality he was talking about how the educational attainment gap tends to persist within families, and then extrapolate that into like larger communities which these families are in. And then it just kind of gets perpetuated in that sense. So I think, maybe specifically talk about like when it comes to educational attainment, and then the later on how that translates into income and into wages. We can just talk about how that kind of factors in [INAUDIBLE].

AUDIENCE: Bernie had it right. Free education. That's the crux.

AUDIENCE: I think there's an important point here that you said about intergenerational mobility and educational attainment. And now that there's just this transition in this additional premium on like having a bachelors and a post-secondary degree that didn't exist, but like it's sort of too late to fix that once you've already matriculated sort of into the workforce. And now, I mean, I don't have my post-secondary or college degree, but I'm 45 and I have all these other problems to deal with. And so I think just like maybe Bill was starting to say, like there are some fixes with maybe community college and kind of night classes that are like sort of kind of segues back in to the system of like getting back that educational premium that maybe you didn't have the opportunity to previously.

And I think maybe that's a lot easier than these giant kind of skill retraining or repurposing maybe. I can imagine like a larger gym filled with like computers that kind of people come in and like take online classes of how to do better or something like that. But you really have to focus, I would say, on like there's this large subset as we saw in this last election of people who have shifted out of jobs, particularly in manufacturing, who are intergenerationally speaking on like the I've been out of school or been out of college for 20 plus years. And like, is it too late for me to go back, or switch, or gain these skills, these educational skills that I need?

WILLIAM BONVILLIAN: Right. So Rashid, I think you make a very good point here. We're going to need that steelworker I was talking about before who lost his job in southeastern Ohio. He's not going to go back and get a four-year degree in college. It is not going to happen. Whether Bernie wants to make it free or not, Lily, it's not going to happen.

We need an entirely different set of institutional models that's going to work with this community. And as we have this technological job displacement-- and I personally will talk more about this later, I don't think this is going to be something that happens tomorrow. I think we've got time to work on this, all right? I think it's going to be a more gradual process than some of the technological dystopians have portrayed.

But we're going to have to use that time, and I think we're going to have to create a whole new set of institutional arrangements to begin to cope. Otherwise, we're just leaving too many people behind. And the price in our society and the price in our democracy-- as we just learned from the last presidential election-- is pretty high. That's my case, right? That's what I

want to work on. But other of you I know have thoughts on this.

AUDIENCE: [INAUDIBLE]

AUDIENCE: Three small thoughts. The first of which is that this conversation is making me think of education as a sort of social security for young people. That's our social safety net.

AUDIENCE: Like it's our insurance policy?

AUDIENCE: Yeah, it's our insurance.

AUDIENCE: OK.

AUDIENCE: Yeah. Yeah. And I mean I-- like I said earlier in the semester, I took a course-- or I just finished yesterday, a course in computer science. And it was so hard. I mean it was really challenging and really positive experience for me, personally. But I also, as I was doing these assignments, considered what it would be like to have a family and to have obligations beyond myself, and to have to be retrained in a vocation. And that's almost insurmountable. I can't imagine what it would be like for my father who is a single income earner in the service industry, to lose his job and to have to think about the ways in which he can't help our family anymore, right?

I come from a low-income family. That's a consideration I have to have. And then secondly, about not so much inequality, but I did research for a political science course on global inequality on waste pickers in the world, and the role that they play in the economy specifically in solid waste and the recycling process in the global supply chain. And one of the things that came up a lot was social exclusion as the mechanism by which inequality happens. And I feel like we need to talk more about things in the terminology of social exclusion, because then we understand how it happens and who commits the action, and who is the receiver of the action.

AUDIENCE: What do you mean by social exclusion?

AUDIENCE: So social exclusion is preventing individuals from accessing a sector as a result of a durable inequality. And so I'll break that down further. It's essentially in the case of, say, waste pickers. The way in which they have been excluded in, say, Brazil, from accessing education because of their race. Right? So that's a very complicated picture. But what we can determine is that because families, in sort of the middle and upper class in Brazil, have always had access to education, they want to sustain that standard of living for their progeny. And so then their

progeny gets educated.

But at the same time, there's only so many spots at the national universities, right? And so those spots are never going to go to the children of the low income parents. They're always going to go to the wealthier families. And if we think about things in a process of social exclusion rather than inequality, which is the outcome of social exclusion, I think we can start rectifying some-- at least some of the dimensions by which we oppress other people. Because it's really easy to say, oh, there's inequalities, and to identify all of them. But I think it's much harder to think about the ways in which we ourselves either uphold those inequalities, perpetuate those inequalities, or benefit from those inequalities, right?

And so we have to, I think that if we talk about things in the language of exclusion, there's almost a responsibility and accountability to the effects that those exclusions have.

AUDIENCE: What's the third one?

AUDIENCE: And yeah I was just-- that was little-- I've had a lot of thoughts about that for a long time. But I think it's really important that we are accountable for the ways in which we benefit from inequalities. And I'm not an exception.

AUDIENCE: Yeah. I had a quick point, but if yours is quick. I think to Steph's point just super quick. I think there are a lot of studies that say like, inequality in a sense like we're OK with, like, it's OK that Martin makes more money than I did this week, like, we're all OK with that. But I think in the rising inequality, in this barbell effect, like, you have people-- like this growing subset of people who just aren't earning as much. And there's sort of a lot of them. And there's not really this distribution of inequality, then we get to say, we have more reason to say, like, I'm not OK with once I have less.

And then I think there's a difference between inequality and unfairness, which I think Steph was trying to get at. And it's when unfairness in a sense like, I didn't have the same opportunity that Martin did to get to that point. Like, I didn't have the same college education that Martin did to get to that point, that's sort of when these problems arise. And I think once we have this rising-- we have sort of a rising sentiment of inequality, and I think it's going to be a lot easier for us to say that these systems are sort of bringing things that are kind of on the whole.

And so the systems are unfair and causing these inequalities, and now we can have, I'm going

to say political pressure, and not kind of the social impetus to really change things.

AUDIENCE: I'll make one quick point on this paper, and then one on just inequity. So what's interesting to me about this paper is that there is another article that came out about inequality in education. On, it was like one of the major publications, like *Time* or *Wall Street Journal.*

And what they did is they looked at people who actually went to college that were minorities or from low income versus high income. Yeah. But what they did is they mapped where they were like in the future. And it turned out that it was pretty much the same, right? So they don't go up the ladder.

And so what I question when I see something like this is like, OK, well if you actually go and get a college education are you better off financially? And is that the metric of success? You might get personal fulfillment, better lifestyle. But I think it's a flawed idea to say if you go to college you will end up making more money that way. Because it might have been based on the paradigm then in the '50s, yeah, you'd get a really good job, and you have great benefits.

But to start to say that, OK, if you go to college then you'll be set. And then to say, OK, we just need to get everybody through college. That's a very big bubble mentality. And I think we'll be paying very heavily for it. I just recently saw an interview on like Goldman Sachs, and how they saw the financial crisis. And they explained it in terms of, well, we built the road, right? But when we were giving out these securities, we didn't make decision put our money into them. It was all these people were trying to-- they thought that this was the factor to success and kept buying them and buying them.

Every time they bought one they would crack the road, crack the road, crack the road. But we had the duty to give certain kinds of bonds, and other people sold them again, which we didn't do. And so ultimately we get-- it's easy to point the finger at us because the road was broken. But it's because the actions of individuals buying, and buying, and buying, going into grief. And so I think that's an interesting point.

WILLIAM BONVILLIAN: So that is an example of a bubble economy [INAUDIBLE].

AUDIENCE: A bubble economy, yeah. And also this point-- and I think Stephanie's point-- I forget which one-- on, oh, the insurance policy was made by Peter Thiel in 2010 about why-- he questioned if you go to college would you be better off? And so that's not an inequality of education.

On the issue of inequity what I find really interesting is that we talk about equality, but we're living in a relatively prosperous time. Also, the US, it is a land of opportunity. And so I thought it was really interesting, or even ironic during the 1% movement, that it was like the 1% of the world getting angry at the 1%. And it is this thing that we have this kind of social contract that in the US you will be able to advance and move forward.

But I think inequity is a big issue. Like, how do you make it so that people can move up? Warren Buffett talks about the lottery of life. That say you were about to be born in five minutes. If you had to design the world any which way, and you don't know if you're going to be born a woman, a man, if you're going to be born disabled, if you're going to be born mentally retarded.

AUDIENCE: With a mental disability.

AUDIENCE: Or if you're going to be born-- you know what I mean. If you would be born somewhere else in the world where you don't have an opportunity and you have to pick up scraps for the rest of your life. What kind of world would you want to create, and how do you go building about that world? And I think that's a really interesting way of looking at it.

Because really, I don't think equal outcome I don't think will ever be a thing. And to say that that will be a thing is a very flawed idea and would just lead to self-anger, and you will get jealousy of other people. There's also things in life that you can't buy. If you focus on building that, if you build great relationships, if you're good to people they'll be good to you. Because there's a lot of billionaires that everybody hates them. You can look at the President, right?

And so I think that's a big issue. And there's just been that-- well, there's also the idea of a capitalist society where we have to have these figureheads that made a lot of money. And we have to have the proper incentive to want to become like them. And we have to push that-- that's why the system is built for us to want to revere people on the *Forbes* list, so that we can continue growing capitalistically.

But I think definitely what will happen-- especially my generation-- is people are going to start to question capitalism, especially the issues that Marx brought up. So that we'll say, how do we build a better capitalist system where we can be better humans? Or there might be a lot more assholes, I don't know.

AUDIENCE: Also to Martin's point about your college degree may not be the right path, or it's kind of

hazardous to say that if we just give everyone a college degree and kind of subsidize that, they'll just make higher incomes and like everything will be fine. I think there's-- and I can't remember which slide it was. Like, what percent-- like what degree level and like how it affects your income.

AUDIENCE: The change in real earnings?

AUDIENCE: Yeah, the change in real earnings.

WILLIAM BONVILLIAN: This one?

AUDIENCE: This one.

AUDIENCE: Seems uneven.

AUDIENCE: It seems uneven. But I think there's something to be said about kind of generational nobility here. So like those who had a bachelors degree coming out in maybe 1970 or a little bit earlier, that income level was relative to the time. Like, it allowed me to live comfortably, whereas my bachelor's degree now, and whatever bump in income level I get, like, am I living comfortably? Am I going to be able to subsist?

And that might be like an indicator where it's like, yeah, it's unequal in here, but like there's actually a bigger social problem here. So even though I might be making more than I was in 1990, like is my 1990 salary, at that level is it enough for me to live in 1990? And like, is my 2013 salary, is that enough?

AUDIENCE: These are real earning, right? So these are inflation adjusting. Yeah.

AUDIENCE: Yeah. Inflation adjusted, but like cost of living.

AUDIENCE: There's also one factor I think is really important. And I think the recent election showcased-- were you done with your point?

AUDIENCE: Yeah. No, I'm done.

AUDIENCE: Which is, I think the real issue happening right now is that we are in a stagnation in terms of actual real term prospect-- like real prosperity growth. The numbers can say we grew, but everything costs a lot more. The way the system is created to show that, oh, we're doing well. I

think like the poverty line, right, is flawed the way we're calculating it now, because it's not really showing what people can buy with what they have. And that's how we create it. Because everything costs a lot more, but they've adjusted it and they've fudged the numbers in such a way that it seems to be kind of a big picture.

WILLIAM BONVILLIAN: So we're going to-- Martin, we're going to get into this when we get to the last reading and lay out this whole issue of secular stagnation, and what the implications of that historically low productivity rate we're at, and historically low investment rates that we're at. And that may be-- I think you're about to drive at this-- that may be a really, big time, near time problem.

Whereas the technological job displacement maybe a little further off.

AUDIENCE: Yeah.

AUDIENCE: Well, yeah, I was going to finish with when people don't see like what is going to be the next step, they kind of start to lose hope and they start fighting over things that really are non-issues. This happens in a lot-- it's a common organizational thing. When you lose your vision, people start fighting over really like-- very intensely-- about things that maybe don't matter as much, or wouldn't have been an issue when they had vision. And I think that's one of the reasons we see such intense infighting right now. Because we're really starting to question like what will-- well, not really question, but we should just see America as it is, and no one has said this what America will be 50 years from now and we'll start working towards that. And I think that's a big factor that I saw in the last four years.

WILLIAM BONVILLIAN: Sanam, you want to give us a closing point after all of our discussions on this?

AUDIENCE: There's a slight point, I think. We might be able to talk about later, but like the GI Bill as like-- I wanted to mention it as like the last big, kind of governmentally-subsidized, like, real movement towards kind of educating en masse a large subset of the population for the sake of education and all the other reasons. But there's [INAUDIBLE] if I didn't say, there's a whole subset of like social inequities that exist within the GI Bill that we don't have to get into, but--

WILLIAM BONVILLIAN: But you're right. I mean, the two mass higher education bills that the US did-- so the Land Grant College Act that created, in effect, the institutional base, and the GI Bill that took this huge population returning from World War II and stuck them in college, those created gigantic returns for the society.

So I understand your point, Martin, which is that just getting a college degree doesn't necessarily fit you for the life worth living. I think we will all agree on that. But it sure helps. It sure moves you a step up.

AUDIENCE: Better than [INAUDIBLE].

WILLIAM BONVILLIAN: And gets you closer in range. Sanam, how about a closing thought from you on this, and we'll take a short break.

AUDIENCE: I think it's a lot of good points, definitely. And I think that when we're thinking about policy and how to move forward, the discussion about systems of privilege and exclusion are really important as well. And also to think about kind of like what can we define as success both individually and as a system is also an interesting and problematic thing that we should continue to talk about.