



Don't worry, things are getting better: Marian Tupy explains why we are living better lives than ever before in human history

October 25, 2022

This episode features Sean Speer in conversation with Marian Tupy, a senior fellow at the Cato Institute and editor of [HumanProgress.org](https://www.humanprogress.org), about his [fascinating new book](#) (which is co-authored with Gale L. Pooley), *Superabundance: The Story of Population Growth, Innovation and Human Flourishing on an Infinitely Bountiful Planet*.

SEAN SPEER: Welcome to Hub Dialogues. I'm your host, Sean Speer, editor-at-large at *The Hub*. I'm honoured to be joined today by Marian Tupy, a senior fellow at the Cato Institute, a Washington-based think tank, and editor of [HumanProgress.org](https://www.humanprogress.org), a website dedicated to understanding and tracking human progress over the centuries. He's also the co-author of the fascinating new book, *Superabundance: The Story of Population Growth, Innovation, and Human Flourishing on an Infinitely Bountiful Planet*, which challenges the old Malthusian idea that the global population is going to overrun the world's resources. Marian, thank you for joining us at *Hub Dialogues*, and congratulations on the book.

MARIAN TUPY: Thank you for those kind words, and thanks for having me. It's a pleasure.

SEAN SPEER: Your work at [HumanProgress](https://www.humanprogress.org) and now the book stands in stark contrast with the popular discourse about decline, disorder, and stagnation in modern society. You are a rejection of this kind of doomerism, or what Donald Trump referred to as "American carnage" in his dark inaugural address. Let's start with a two-part question. One, what do you attribute your own personal optimism to? Two, why have so many of the rest of us come to interpret the state of modern life in pessimistic terms?

MARIAN TUPY: Well, with regard to the first question, I think part of it probably rests in my personal history. I grew up behind the Iron Curtain in Eastern Europe under communism. When the wall came down, me and my family we went to the West for the first time just for a visit, and then we moved around. I went to South Africa, then I went to Britain, and I ended up in the United States. Obviously, I was just flabbergasted by the amount of economic development: goods and services that Western-developed countries are able to provide their citizens. I was amazed by the health and the happy attitude of Westerners compared to what we had in Eastern Europe, the smiling faces, and things like that.

Basically, having now lived in four distinct cultures, if you are at all curious, and I hope I am at least to some extent, you cannot but start wondering about what is it that makes some countries better than others. Why is life in some places better than elsewhere? Why are some people richer than others? That leads you, obviously, toward the exploration of history, political history, economic history, trying to comprehend what is it that makes the West special.

That led me to basically zeroing in, along with many other scholars, on the 18th century and the fundamental break of that 18th century posed with the past. The rise of the Enlightenment, the rise of European liberalism, resulted in tremendous economic growth in Western Europe, and then later in Western offshoots, namely Canada, United States, Australia, New Zealand. Then later in other parts of the world as well.

One of the great things to see in the world today is that, over the past 40 years or so, the era of globalization, which is so much maligned, the rest of the world is finally catching up with the West. The massive gap which had opened up between the West and the rest in the 1800s is beginning to close, and it's beginning to close at a rapid pace as countries like India and China and Bangladesh and others are growing at a very fast pace. Life is beginning to get better throughout the world. Throughout the world, people are living better lives than ever before in human history.

Why are human beings not appreciative of that? Partly, I think it is because humans have evolved to be pessimistic rather than optimistic. Until 200 years ago or so, the world was much less hospitable, much less friendly, much more violent, and so forth. I think that the optimist probably got weeded out of the gene pool at a much quicker pace than people who saw danger at every corner. Steven Pinker and other people have discussed a variety of negativity biases that people have in their brains.

We can go to some of them. One is the availability heuristic, which is to say that the more traumatic a memory, the more likely it is to appear in your mind. People are much more concerned about terrorist attacks than, for example, dying in a car crash. Whereas the second is much more dangerous than the first. Bad is stronger than good. We feel bad news or bad things with great intensity than good things and good news. Good things happen in a gradual way. They happen incrementally, whereas bad things happen instantaneously. It may take years to build the World Trade Center, but it takes hours to tear it down in a terrorist attack.

For a variety of reasons, through evolution we have ended up with a software package in our heads that makes us constantly zero in on the bad news rather than the good news. That is a problem when it is combined with huge political polarization, both in the United States, but we see it in Canada and elsewhere, because essentially at this particular juncture in history we don't have a single political party or a movement being committed to optimism, to a positive vision of the future.

When Republicans are in charge, Democrats are saying that everything is bad. When Democrats are in charge, Republicans are saying everything is bad. You don't want to give your political opponent any brownie points, any credit for doing anything right because that would be contrary to your long-term political interest.

Media is a part of it. If it bleeds, it leads. Media plays a huge role in this. There is simply no incentive for them to report on good news because it is bad news that sells. We know that from laboratory experiments, when people who say that they're interested in good news are presented on a split screen with good news and bad news, the eyes immediately gravitate toward the bad news because it's much more to the mind, which has evolved to focus on the bad news. It's a complicated problem, and it is a problem.

SEAN SPEER: We'll come back, Marian, to the interrelationship between pessimism and polarization later in the conversation, but I want to stay on the subject of good news. If I can ask about HumanProgress for a minute, which by the way, I strongly recommend listeners follow on social media, I have a few questions that I want to put to you. How did you and others conceive of the idea? Where do the different facts and pieces of information come from? And, most importantly, what in your view is the most profound proof of human progress?

MARIAN TUPY: I'll start with what is the most important proof, and that is that we are living much longer lives than we used to. Until a couple of hundred years ago, the life expectancy was about 30, 35, maybe even 25. That has been like that for tens of thousands of years. As late as 1900, life expectancy in the richest parts of the world was only 50 years. Now, globally, it is 72 years. In the United States, it was 78 years. Now it has fallen to about 77 because of COVID and a variety of other maladies.

There are places in the world where the average life expectancy, like in Japan, is about 80 years. That's a remarkable increase in lifespan. Lifespan is a good proxy for all sorts of other things, such as good diet, good health care, wealth, and so forth. That tells you something.

People have been collecting data throughout the world for a very long time. At around the year 2010 or so, about 20 years ago, 2012, big data became available for free from the World Bank, the IMF, other places, and also graphics became good enough so that you were able to now visualize this big data. The data that we get, except for the work that I do on *Superabundance*, all the other data is basically generated by third parties: World Bank, the IMF, Eurostat, OECD, including individual academics, people who just do papers and collect the data themselves. If those come from credible organizations and people, then we put them up.

SEAN SPEER: There's a rise of a new progress movement following in your footsteps dedicated to the proposition that progress is slowed in the past 40 or 50 years. The group is associated with Tyler Cowen's book, *The Great Stagnation*, or Peter Thiel's line about how we were promised flying cars and all we got is 140 characters. They are, in other words, fellow dynamists but have a slightly more negative view of the state of recent progress. What do you think about this development, Marian, and what's your take on their narrative that progress has slowed?

MARIAN TUPY: Well, I wish I could claim credit for them walking in my footsteps, but I think that we all walk in other people's footsteps. We walk in the footsteps of people like Herman Kahn and Julian Simon, who were the original optimists, rational optimists. I need to emphasize this. We are not blind to problems that humanity is facing today and humanity will be facing in

the future. Not at all. Nor are we arguing, and this is absolutely vital, that everything is going to work out.

We have a madman in Europe threatening to use nuclear weapons, and there are other problems, possible conflict over Taiwan, and goodness knows what other geopolitical problems that are going to arise out of the economic crisis following the COVID pandemic. We are not blind optimists. I think that the view of the world that we present is realistic and perhaps rationally optimistic, in the sense that if politicians leave us alone, and we don't kill each other, or an asteroid strikes the Earth, we'll be able to continue to improve the world.

The people who really had the courage and the vision were the people in the '60s and the '70s, people like Simon and Kahn and others who really were the visionaries. They thought everything would work out, and they had the courage to go against the mainstream which was highly negativistic following Earth Day 1970 and so forth.

Then more recently, people who preceded me, people like Matt Ridley, whose book, *Rational Optimist*, is very important and still worth reading. Steven Pinker, of course, came up with *Enlightenment Now*. You have Johan Norberg writing books, Bjorn Lomborg writing books, Michael Shellenberger. More recently and a very valuable addition to the movement is Jason Crawford from Roots of Progress. Tyler Cowen, too. There are reasons to be optimistic because smart people, people smarter than I am, are catching up to the notion that not all is lost, and that doom and gloom can be incorrect in the future just as they were incorrect in the past.

With regard to the speed of innovation, I don't know enough to be able to definitively say whether innovation is increasing or decreasing. In our book *Superabundance*, we find that abundance, meaning increased access to resources, is becoming cheaper. By resources, I mean from fuel, food, minerals, metals, et cetera, to income are increasing about three percent per year. Is that too little or is it just enough? Well, if you look into the human past, people haven't seen improvements in their standards of living sometimes for thousands of years. Now we are finding that abundance is increasing at about three percent a year. That, to me, sounds like progress.

I do acknowledge Peter Thiel's and Tyler Cowen's concern that it could be much higher. Of course, it could be much higher. It could be higher if we had the right regulatory environments rather than crazy overregulation. It could be higher if we had a good tax environment rather than spending billions of hours trying to fill out our tax receipts and hiring armies of tax accountants. It could be much higher if, instead of making energy more expensive, we were making energy less expensive. It would be much higher for all sorts of reasons.

To that end, of course, like Tyler Cowen and like Peter Thiel I am concerned about the future of innovation. Europe has already embraced the precautionary principle, which is very dangerous because it basically says that you cannot do anything until you prove that it is safe. We have an increasing environment of censorship, not just in form of political speech but also academic research. This is very dangerous because if there are certain areas of research that cannot be touched, then that obviously deprives humanity of additional knowledge.

I'm concerned about overregulation of the marketplace because that way you cannot rely on price signals to tell you what's valuable and what's useless. I'm also concerned, which really has arisen from the book, that people will become so dejected about the state of the world that they are going to stop having children. As a consequence, we are going to face a depopulation problem in the future, which has a direct impact on economic growth because it is only human beings who are capable of coming up with ideas that lead to inventions and innovations.

SEAN SPEER: That's a good segue to the book, Marian. The idea that the world's resources are becoming scarcer because of a growing global population is an old one that seems to persist even among informed people. It's something one might hear watching cable news or talking to a coworker or whatever. Why in your view is this notion so durable? Why, in other words, does a scarcity narrative seem to trump an abundance narrative in our popular discourse?

MARIAN TUPY: I think partly because it's deeply intuitive. If you just have one pizza pie and you have two people sharing it, then it's wonderful, but if you have four or six or eight, suddenly everybody's going to end up with a smaller slice of the pizza. The problem with the pizza analogy and why this very intuitive approach to population and growth is mistaken is, of course, that your friends can bring pizzas with them to the party. That is exactly what's happening. Human beings are not just consumers of pizza, which is just an analogy or a synonym for natural resources, they're also producers. Every human being comes into the world with an empty stomach but also with a brain.

What we are discovering, what we have discovered in the book, is that for every one percent increase in human population we see decreases in prices of resources by about one percent. Well, how is that possible? That's possible because human beings come up with ideas that result in making resources more abundant. What are those ideas? Well, the most obvious one is efficiency. A Coke can used to weigh three ounces of tin. Now it's weighing half an ounce of tin. Human beings can discover new deposits of resources. Do you know today we have higher levels or higher known reserves of oil than we did in 1900 even though we've been using oil and gas for the last 120 years?

Another thing is, of course, that we can recycle. The world has exactly the same amount of atoms that it did when the caveman was around. Our resources, as Thomas Sowell, the great American economist said, are exactly the same that the caveman had, but the difference between our standard of living and his standard of living is knowledge. In fact, the world has a finite number of atoms. You may tie certain atoms of copper into wires, but they haven't disappeared. They're still there. When a new and a better technology comes around, then we no longer need to put copper in wires. We'll be able to take that copper and use it in different ways.

Another way in which human brains make resources more abundant is, of course, we substitute things for others. We no longer kill whales in order to make our candles. We now use natural gas to power our electric plants, to power our lightbulbs. We can also substitute one thing for another.

You see, the thing is that whenever humanity starts using a product, like for example, right now we're using lithium-ion in order to create batteries for electric vehicles, the human brain thinks,

“Okay, we are going to need this many vehicles for this many people, and we know of this much lithium, and therefore we are going to run out of it at a certain stage.” Who is to say that in 50 years time we are still going to be using lithium in order to create our electric car batteries? It could be something completely different. I think that’s what people underappreciate. They underappreciate that the technology part of the equation is dynamic. It changes all the time with the human input of new ideas and innovations.

SEAN SPEER: As you’ve alluded to so far in our conversation, Marian, in order to challenge this scarcity narrative, you and your co-author don’t merely make rhetorical or theoretical arguments. The book, like the website HumanProgress, is highly empirical. Help me and our listeners understand what “time prices” are and how are they relevant to the case for abundance?

MARIAN TUPY: Usually resources are measured in real prices. Your listeners are familiar with nominal and real prices. They are very easy to understand. The nominal price is what you see in the shop today. When you walk in, you want to buy a loaf of bread. That’s the nominal price. Nominal just means right now. It’s the money price. Of course, we all know, especially now in the environment of inflation, that you have to adjust for inflation to get a sense of what happened to prices over a long period of time.

To get a sense of whether something really has become more expensive or not, you have to be over a period of 10 years. You have to adjust for inflation. People are familiar with real prices and nominal prices. The drawback of nominal and real price is they are looking only at what is happening to the price of a good or commodity or a service. They are not looking at what is happening to the money in your wallet.

This is a crucial drawback of nominal and real prices because human innovation gets translated or manifests itself both in falling prices of goods and services but also in higher human wages. When you started delivering papers or having a lemonade stand when you were eight years old, you were earning a few pennies. Now that you are an accomplished individual, you are earning much more money. What does that mean? You’ve become much more productive, and therefore your salary has increased during your lifetime.

The same goes for our species. We are much richer per capita in real terms than we used to be because humanity is much more productive. Time prices mercifully are able to combine both what is happening to the prices of goods and commodities but also to what is happening to wages.

Let me give you one example. If a Hershey bar—let’s say you are now in 1980. Ronald Reagan is about to become president of the United States. Pierre Trudeau is the prime minister of Canada. Let’s say that a Hershey bar costs you \$1, and you are earning \$10 an hour. That means that the time price represents that you can get 10 Hershey bars for an hour of labour. Okay? Now, let’s assume that you are now in 2022, Justin Trudeau is the prime minister, for better or for worse, and the Hershey bar now costs \$2 a bar. In the meantime, your wage has increased to \$30 an hour. That means that now you can get 15 Hershey bars.

That's basically what a time price is. It translates everything into minutes and hours of labour. Instead of having to work, I don't know, seven minutes for a Hershey bar, now you have to work four minutes to buy a Hershey bar. The beauty, as I said, of time prices is that it allows you to account both for prices of goods and services, but also it accounts for the rise in wages. That's number one. Number two, you don't have to worry about inflation at all. We don't account for it. We don't worry about it. We don't care whether people agree or disagree on a certain definition of inflation. We don't care whether inflation is 10 percent or 100 percent. We only care about the ratio between the price of a good and the wage.

Another reason why time price is good is that it's a deeply egalitarian concept. Everybody has 24 hours in a day. The less time you have to work in order to earn something, the more time you have to spend playing sports or spending time with your family, that sort of thing. Also, time is incorruptible for normal purposes unless you are thinking about the theory of relativity. Time is a constant. For our purpose, time is just an incorruptible constant unit.

Another thing about time price is that it allows you to compare internationally without having to convert from American dollars to Canadian dollars or Indian rupees. A minute of time in Canada is the same as a minute of time in the United States. If a Hershey bar costs a Canadian five minutes of labor and American four minutes of labor, we can say that the American is better off.

Another reason why time prices are a very good way of thinking about things is that they allow you to compare your living standards across time. We can compare American living standards in 2022 to American living standards in 1980. If it costs you an hour to earn a pound of beef in 1850, but now it costs you only 30 minutes, you are 50 percent better off. Time prices are actually a very useful way in which to look at standards of living across time, across countries, and so forth.

SEAN SPEER: I want to take up another important idea in the book, and it may be the most counterintuitive one: more people is actually good to address climate change. What's the connection here, Marian? Why are the degrowthers wrong that we should stop having children in order to minimize our collective burden on the planet?

MARIAN TUPY: A great French economic historian, Fernand Braudel, said that ultimately everything is technology. What separates us from the caveman is technology, which is just a synonym for knowledge. You can think of knowledge, technology, innovation, and standards of living as being synonymous. Climate change, the state of the global environment, can be addressed through technological change in the same way that other things in the world can be addressed through technological change.

Let's take one example. Right now, by far the best way to power human civilization is natural gas. It's cheap. It's relatively clean. Let's say that you have an absolute abhorrence to natural gas, that you just cannot stomach possibly having human civilization powered by natural gas. Well, we also have an 80-year-old technology, it's called nuclear power, which doesn't produce any CO₂ into the atmosphere, so that could be a solution to our problems. What is nuclear power? Nuclear power is an outcome of human mind, human innovation.

The same goes for fusion. There have been, in recent years, some very exciting developments in fusion technology, and I hope that we get there and can make it affordable. Now, if that happens, then that's an even safer way of producing plentiful energy for the human species without producing any CO2 into the atmosphere. What is fusion? Fusion is knowledge. Fusion is technology. Fusion is innovation. How is this connected to population? It's very simple. There is a small fraction of humans of any size who actually innovate. We are not all innovators. I wish we were, but we are not.

A study suggests that it's somewhere in the neighborhood between three percent, maybe six percent. Let's assume that only five percent of the human population innovates anything in their entire lives. If that's the case, then, of course, a population of 14 million people, which is how many people there were in the world when the Bronze Age started in 3000 BC, then taking that population, five percent of 14 million is much smaller than five percent of eight billion. With every billion of additional human beings, we are getting tens of millions of people who are capable and willing to innovate and come up with solutions to human problems. The bigger the population, the more brains who are willing and capable of innovating our way out of the problems.

SEAN SPEER: At its core, the book is something of an ode to Schumpeter's insight about creative destruction. Yet a lot of voices, Marian, including on the Right, seem to be questioning the social benefits of such dynamism. They point to the "destructive" part of the process, including deindustrialization, job losses, community decline, and so on. Why are they wrong? What are they missing?

MARIAN TUPY: Yes, you've zeroed in on a very important point, and that is the distinction between Smithian growth and Schumpeterian growth. Smithian growth is important. It's about the division of labour, it's about free trade, and that's a very important part of the global economy. Schumpeterian growth is driven by innovation and especially sustained innovation, which is the world that we have lived in over the past 200 years.

Yes, on both Left and Right, you have voices that are not particularly keen on new technological developments. One very famous American TV show host was recently asked whether he would ban autonomous trucks because they would put truckers out of work, and he says that, "Yes, in a heartbeat." The problem with that, of course, is that the whole point of creative destruction and the whole point of productivity gains is that we always try to accomplish more with less. Cheaper the input, the smaller the input, the bigger the output. That's the definition of productivity gain.

Now, obviously, there's no way of getting around the fact that every time you have a new innovation, some people get displaced and have to look for work somewhere else. Now, when it comes to truckers, who I know are a very important part of the Canadian economy, autonomous trucks wouldn't happen overnight. It would probably be a process over a very long period of time. During this time, people can retrain or look for other careers. Other careers will open because, of course, every time that you are saving money in the production process, that money

has to flow into creation of jobs in other parts of the economy. That's the essence of a growing economy. [laughs]

Instead of spending \$80,000 paying a trucker to drive around the country for a year, you can now have an autonomous vehicle. You are saving \$80,000 which can then be applied to something else in the economy. Grow the economy in some other place. Let's not forget that this kind of concern would have been had by people throughout history. For example, when computers replaced typing machines, hundreds of thousands of secretaries were displaced because they were no longer needed. Bosses could now simply send an email from their desktop computer rather than dictate to their secretaries.

You can take it even further, and the opposition of people in the Ottoman Empire to printed books was driven primarily by scribes who were faced with redundancies once you had printed books. As a result of which, the Ottoman Empire got printed books much later than Europe. Similarly, in Venice there was massive opposition to the introduction of Arabic numerals because Roman numerals were much more complex and needed many more people to try to calculate them than Arabic numerals.

Throughout human history, there was always this problem that whenever you had a new technology, somebody's going to get it in the neck, and that's not pleasant. Then there raises a question, when should we have stopped? Should we have stopped before the introduction of Arabic numerals? Should we have stopped before the introduction of printed books in order to save the scribes? Ultimately, the argument in favour of what I'm arguing is that through this productivity gain process, through increasing productivity in the economy, you are making everybody better off in the long run.

SEAN SPEER: There are also voices similarly, including on the Right, who argue that the West needs to adopt the Chinese model of central planning in order to keep up in terms of technological progress and industrial development. Why are they wrong?

MARIAN TUPY: Well, because the Chinese have done a great job in terms of mimicking our economic growth and our technology up until now. The big question is whether China is capable of producing new knowledge in a country that is clamping down on intellectual and economic freedom. It's one thing to mimic or mirror economic development in the West, which is what China has been doing, building roads and new cities and hospitals and universities and what have you since seen as a form of economic liberalization. The key is that future progress depends on the generation of new knowledge which you can only get on a large scale in a free society.

There was some scientific growth in the Soviet Union under communism, but that was usually done in a very narrow area, which was military development. Let's not forget that Russian scientists always had a much higher degree of freedom than other Russians did precisely because even the Soviet communists understood that to generate economic growth you need to allow people a level of intellectual freedom. China is moving in the opposite direction. Since 2012, Xi has been clamping down on innovation in the marketplace. He's been clamping down on the private sector, on economic freedom, and also on intellectual freedom.

In a situation like that, you cannot, I don't think, in the long run breach the gap between the West and where China is today. So, GDP per capita on average, I think it's a household income in the United States, is about \$70,000. In China it is \$10,000. To get from \$10,000 to \$70,000, you cannot get that without generating your own knowledge and that requires freedom.

SEAN SPEER: I want to come back to something you raised earlier about the political economy implications of the persistence of this scarcity narrative. How much in your view, Marian, are our current political tensions fundamentally about a zero-sum understanding of the economy and society? In other words, is an abundance narrative an antidote to modern day political polarization?

MARIAN TUPY: This is a complicated subject, and I'm not a specialist in this. I'm not a political scientist by any stretch of imagination. George Will, the famed American commentator in *Washington Post*, likes to say that the difference between America in despair and happy America is the difference between a two percent annual growth rate and a three percent annual growth rate, because the difference between two percent annual growth rate and three percent annual growth rate is actually 50 percent. [chuckles]

Yes, obviously, the slower the growth, the more zero-sum the society becomes because if you are accustomed to your annual increases and the economy grows at a slower pace, then it has to come out of the pockets of somebody else. Somebody else has to get a small raise. To the extent that our government is making it more difficult for the economy to flourish and for the economy to grow, then, of course, they are the ones who are responsible for the political polarization.

I read recently that Europe is facing a crisis because of climate, but not climate change, but climate policies. Climate change has not created an energy crisis in Europe. It was climate policies, the insane policies which the Europeans have implemented over the last 20 years, which have massively increased energy prices. They became dependent on Russia. Now their economies are collapsing because energy is too expensive, but that was a political decision.

We have to make it absolutely clear that there is nothing about capitalist economy or nothing about global resources which are preventing us from growing at a faster pace. This was a political decision made by mad people who run Ottawa and Washington and London and Berlin. The point of the book is that there are no physical constraints on growth. There are no physical constraints because we have exactly the same number of atoms that the Stone Age man had. Ideas that can turn finite resources into infinite value, ideas are not subject to physical laws. They're not. We can have as many ideas as we want. Yes, I would say that I blame politics first.

SEAN SPEER: Let's wrap up by looking forward. You've been a champion of progress, as you mentioned earlier, for more than a decade, and you've been out promoting the book, *Superabundance*, now for some weeks. Do you sense that things are changing? Is there reason to believe, Marian, that there is some momentum behind an abundance narrative?

MARIAN TUPY: I think it's too early to tell, but I'm cautiously optimistic because I see a lot more smart people embracing the abundance agenda. Only yesterday, I learned that Derek Thompson from *The Atlantic* and Ezra Klein from *New York Times* are going to write their own

book on abundance. More power to them. They come from the centre-left. It's probably going to be a very different book from mine. I'm a libertarian coming from a libertarian think tank. When you even have the centre-left embracing what they call supplied-side progressivism, then it's better than if they didn't embrace supply-side progressivism, if you see what I mean.

SEAN SPEER: The book is *Superabundance: The Story of Population Growth, Innovation, and Human Flourishing on an Infinitely Bountiful Planet*. Marian Tupy from the Cato Institute. Thank you so much for joining us today at *Hub Dialogues*.

MARIAN TUPY: My pleasure. Thank you very much.