2025 Financial Stability Conference, Financial Stability in a Time of Rapid Economic and Technological Change

Paper Session: Institutions

Host: Joe Haubrich, Federal Reserve Bank of Cleveland

Presenters:
Camelia Minoiu, Federal Reserve Bank of Atlanta
Karl Schulz, University of Munich

Discussants:
Felipe Saffie, University of Virginia, Darden School of Business
Pab Jotikashtira, Southern Methodist University, Cox School of Business

Joe Haubrich:

Well, welcome back, everyone. We're ready to now start the next paper session on financial institutions, and our next presenter is Camelia Minoiu from the Federal Reserve Bank of Atlanta with her paper bank financing of global supply Chains, which will be discussed by Felipe Saffie from the University of Virginia.

Camelia Minoiu :

All right. Well, thank you so much for having our paper on the program and for the invitation. It's an honor to be here, so I'll present today our recent work on bank financing of global supply chains, which is a story about trade and finance. I can tell it in many different ways. I'm going to kind of place it squarely at the intersection of international trade and international finance in order to give everybody a little bit of color, regardless what angle you're going to approach it from. This work is with Laura Alfaro, Mariya Brussevich, and Andrea Presbitero. We are all affiliated with policy institutions, so the usual disclaimer applies. So, by way of motivation, let me start from the observation that is absolutely no surprise to anyone, that in recent years we have seen a rise of trade tensions, geopolitical risks, and even risks to global health, and these risks have manifested in large shifts in trade flows.

While overall global trade has sort of held up in terms of volumes, we see a large reallocation of trade portfolio shares over time. This great reallocation, as was dubbed by the international trade literature, is reflected here in the figure on the right where we see US maritime import shares, so imports of US firms from China in blue, Asia outside China in red, and the rest of the world in gray. So, from now on, whenever I say Asia, I'm going to mean Asia without China. And so, what we see here is that if we look at sea trade, which is about 80% of global trade, we see an incredible reallocation of trade portfolio shares. We see a decoupling from China and a reorientation, reconfiguration, or reallocation of trade towards Asia and the rest of the world since late 2017, just before trade tensions started rising with the enactment of several rounds of tariffs. The US firms look like they're reshaping the geographic footprint of their foreign goods sourcing.

The reason we care about supply chain disruptions and this incredible reallocation, very sizable reallocation, is because these disruptions do have macroeconomic costs. I guess the jury is still out there as to how large these costs are, but some of the literature suggests that about half a percentage point was shave off of GDP growth in the US after the first rounds of tariffs of 2018, 2019. So, for those of you that maybe don't sort of eat tariffs for breakfast, let me just give you a refresher of what was happening around 2018, 2019. As we remember, the US imposed tariffs that were very, very wide-ranging on about 13,000 product codes and many trading partners. China was at the forefront of these trade tensions with all Chinese products, with very few exceptions, receiving tariff rates between 10 and 25%, starting around February 2018 and through the end of 2019 that we'll be sort of looking at. Importantly, most of these products were used as intermediate inputs, and they were vastly capital goods.

So, the average tariff rate on Chinese imports increased several fold by the end of 2019. Most of our analysis will stop there to sort of not have to worry about the COVID pandemic, but we will also allow our firms to sort of reconfigure supply chains beyond throughout the pandemic to give ourselves a bit more power. As you know, all of the analysis I'll present will still be sort of relevant today. Tariff hikes continued post-2020 on selected products, semiconductors, and EVs, and as of today, the average tariff rate is standing at somewhere between 15 and 17%. I'm going to also bring two ingredients to the story, a trade ingredient and the banking or finance ingredient. So, let me start with a lesson that we know from the international trade literature, which is that supply chains relationships tend to be sticky and reflecting the fact that reallocation is costly. Setting up and maintaining these trade relationships is costly.

So, finding new suppliers imposes non-trivial search costs on importers, which in turn generate durable and sticky relationships. It's a little bit like in banking, where switching across banks is a friction-fraught process, so there are costs of switching in trade relationships as they run in banking relationships. Importantly, and I think this is a stylized fact that perhaps is not very well appreciated, is that US importers on average are un-diversified. If you Google how many suppliers does Apple have, you'll see that it's somewhere a little bit more than 300 suppliers across Asia, but Apple is a very remarkable MNC. It's extremely diversified, and it's sitting in the far right distribution of the tail of the diversification distribution. Here in this chart, we look at firm product pairs, and try to understand how diversified they are in terms of the number of source countries per product that they work with.

For every firm with multiple products, we look at the median and maximum number of source countries. Those are the two columns, and once we have that number, we look at the cross-section of firms and ask, "How about the median, 75th percentile or 95th percentile, in the cross-section of firms?" And we see that to the 75th percentile, the typical US importer will only have one source country, which means that that typical importer is un-diversified. It is exposed to a lot of country risk. If that country becomes tariffed, it will have to do something about it. It will have to maybe churn suppliers. It will have to find a cheaper supplier in the same country if possible, so that it alleviates some of the tariff costs, or it will have to change country, look for a supplier elsewhere, or of course, an alternative is to also re-shore some of the production or find the alternative domestic suppliers. So, we will use these tariffs as an opportunity to study the impact of an input-cost shock that was fairly sizable on firms.

In terms of firm response, we will look at a very specific type of firm response, which is the search for new, alternative suppliers. In doing that, we'll highlight financial and information frictions in this search, and these frictions will be salient in our story because the median US importer we're going to be looking at is not Apple. It'll be a mid-sized, private firm that is reliant on bank loans. 42% of the liabilities of these firms are in bank debt and concentrated in manufacturing, more likely to be a manufacturer. So the second ingredient is specialized banks. Specialized banks are central to our story because they can help mitigate the financial and information frictions I've just mentioned, and they can, therefore, help meet lower some of the real effects associated with this large trade cost shock. Why? Well, specialized banks have advantages in producing private information about their borrowers.

Specialized banks are the banks that interact repeatedly with their borrowers in a particular industry or in a particular market or in the regards to a particular type of financial services. For instance, specialized banks, in our context, we will think about them as those banks that offer trade finance loans. Trade finance products, they support trade-oriented firms in their international trade activities. For instance, by supplying loan performance guarantees, insurance products, or letters of credit, so it's a very specialized type of service, and these kinds of services are only provided by a handful of large, US global banks, so it's a very concentrated market. In addition, a specialized bank that specializes in working in particular markets, such as Asia, will also have information advantages in supplying information about that market. For instance, it may have local offices there, as I'm showing in little picture, pulled from one of our specialized bank's websites.

This is from Wells Fargo, advertising to its potential borrowers the kind of services and the kind of presence it has on the ground in Asia, trying to attract new borrowers. So, it boasts here, having offices in Hong Kong, Seoul, Beijing, Shanghai, that kind of local presence affords this kind of specialized bank informational advantages, and it also affords it because of the production of private information, advantages in offering more advantageous loan terms, because it's able to outbid non-specialist banks in supplying credit to its borrowers. So, having set up these two components to the motivation to our story, the research question is, how does bank specialization help mitigate the real effects of a trade policy shock? And in particular, with regards to, do firms overcome financial information frictions easier if they have a relationship with specialized banks, and can they reconfigure supply chain faster or easier? And our findings are fourfold.

First, that tariff hit importers after the first trade were engaged in significant supply chain realignment of good sourcing. We know this from the trade literature. We're just going to show it in super granular data to have a baseline, a starting point for our banking analysis. In second place, we'll show that tariff hit importers increase the demand for credit to meet the higher tariff and search costs. Third, specialized banks mitigate both financial and information frictions and help lessen the cost of reconfiguring supply chains. Finally, we'll be able to put a number on the value of a relationship with a specialized bank, will show that being in a relationship with such a bank helps lower the time it takes to match to a new supplier in Asia by about six months, whereas the average is about three years. We bring together two core data sets to execute this analysis. I like to think of them as two administrative data sets, but these are big words. All I can say is that they're large-scale, data sets.

On the one hand we have the universe of shipments to US ports, where we see the bill of lading, so that means we know everything about that shipment, who's bringing it from whom, what's the size of the container, what does it contain, volumes, standardized volume measures, and information on the products in that container. Then, we also have the US credit registry, which is a colloquial way of saying the Y-IVQ data with information on the universe of loans, relatively large loans from large banks to relatively medium-sized firms in the US. So, we match these two data sets, and after a painstaking matching procedure that takes a non-trivial amount of time, we're able to go to some empirical analyses. We'll set everything up as a very simple and straightforward in diff, where we examine the performance of tariff hit firms in terms of trade outcomes and then banking outcomes. And then we'll bring them together to show that finance has an important smoothing effect on trade.

We look at the probability of gaining or losing suppliers, the number of such suppliers and the import shares, and then we're going to switch to lending outcomes to try and pin down the two channels, the credit and the information channel. We'll look at how quantities and prices of credit move A tariff heat importer is a firm that is importing at least one product from China before the first rise of trade tensions and who has at least one product that is subject to tariffs during the enactment of trade tariffs. As I said, specialized banks, in our context, will be those banks that offer cross-border trade finance claims, so services to Asian borrowers just before the trade war. They are few in numbers, but they are significant in the credit registry, accounting for about one third of total loans. A standard diff in diff, which is super transparent, as I'm going to show you the tables, I'm going to have two tables on trade, just to sort of motivate, again, the story. Then, the rest of the tables will speak about the banking part.

So, let's establish, first, there was supply chain realignment. Indeed, tariff-hit firms appear to have shifted away from China and toward Asia. We see that the probability that they exit or that they subtract, they lose Chinese suppliers, and their import shares on China decline. So, the probability of exiting increases by 82% and the number of Chinese suppliers lost by about 79%. I do want to highlight that this is not a story of complete decoupling from China. Many firms stay in China, and they add foreign suppliers, or they churn suppliers inside China, suggesting that they're looking for lower-cost suppliers. But the decoupling from China is an important part of the story. Then, the same firms shift towards Asia. They're more likely to enter, meaning to acquire new suppliers in Asia. They increase the number of such suppliers, and they increase their import shares. As I mentioned before, these search costs are salient.

If they were not salient, everybody would be diversified, but for the last 15 years, the typical US manufacturer remains incredibly un-diversified, just, as I said, reliant for a particular product reliant on a single source country. And so, to give you a flavor of the search cost, let's cut the data by a couple of sources of heterogeneity, and here we show that firms with low stickiness relationships, meaning firms that import or source goods that are less customizable, more substitutable, less complex, if you will, simple products that tend to be maybe traded in spot markets, those firms have a much easier time finding a new supplier. Similarly, the firms with prior experience in China also are much more likely to find new Asian suppliers, so the odds of finding a new Asian supplier is three times larger for a firm that already had suppliers in Asia before the trade war. Now, what about bank credit? So, now let's move to the credit registry, and let's track our tariff-hit importers and see what happens to their demand for credit.

And so, to pin down this idea that whatever shifts in the quantity and price of credit are suggestive of a change in demand, we're going to look at credit line utilization loan rates, and then we'll also look at risk assessment by the banks. We see credit line utilizations increase at tariff-hit firms by about 70 basis points, so this is not too much, not too little. During a massive financial crisis like the GFC or during the onset of the pandemic, credit line utilizations increased by eight to ten percentage points, so this is not even one percentage point, but it's also comparable to what we have seen in the US, from beginning with the start of the year. Since the start of the year, credit line utilizations have increased, on average, by about one percentage point through the trade developments that have unfolded, so this number is very much in that ballpark. Loan rates have increased on all loans by about 4 basis points, on new loans by 26 basis points.

With quantity and price going up, this suggests that loan demand has gone up from tariff hit firms, so firms need liquidity. They're approaching their credit line providers, their lenders for additional liquidity. We don't see that sort of movement in term loans, which are more likely to be used for investment, so here we are talking about a little bit of a liquidity scramble. Firms need to meet the higher trade cost, which encompasses the search cost, and the same firms are also assessed, on average, as riskier. Now, let me now go straight to specialized banks. The only thing I'm going to do, relative to the previous table, is to take the diff coefficient, then split it by whether the tariff hit firm is with a specialized bank or not. What we see is no difference when it comes to credit line utilization. If I, as a tariff fit importer, have access to credit lines from a specialized bank and another bank, I'm going to draw from whichever, because these are pre-committed and most likely to at a price that's not necessarily negotiable immediately.

I'm just going to draw the liquidity available to me, but interestingly, the loan rates on all loans, the loan rates move. They go up more likely at other banks, not at specialized banks. It looks as if specialized banks are offering more advantageous terms to tariff-hit importers, again, because of the private information they have about them, and their better ability to understand the business model and to understand the kind of shock that these importers are weathering. Interestingly, it's the same for the probability of default. It's the other banks that see these importers as riskier, not their specialized banks. All right. Having established the credit channel of specialized banks, whereby these banks offer relatively advantageous terms. In terms of loan rates to importers, let's also dig into the data to pin down the information channel of specialized banks, and so I'm going to start by just establishing a baseline fact, which is that if you are with a specialized bank, then you're more likely to find a new supplier in Asia.

The big question is sort of why? How can we add a little bit of color? How can I give you a couple of pieces of evidence that will sort of pass the smell test, suggesting that an information story is happening here, of course, beyond anecdotal evidence. And so, what we do in the last two columns is to show that if you bank with a specialized bank, you are more likely to find a new supplier in Vietnam if your specialized bank is also present in Vietnam. It has local offices there, and the same for Indonesia, India, Bangladesh, South Korea, and Japan, and so these two columns at the end of the table come from a panel of stacked data, where we're stacking these destinations and we're asking, "How fast are you matching to a particular destination where your specialized bank also has local presence?" So, I can measure local presence in different ways. Here. I measure it with the local presence of offices, like subsidiaries or branches.

But I can do that by measuring local presence or knowledge of the local market by looking at ties to correspondent banks in that market or syndicated lending in that market, and the results are very similar. Then, I want to show you a second piece of evidence. Let's throw away all the data I have used so far, and let's bring a completely independent source of data. In particular, income statements of the foreign subsidiaries of US global banks, so first I'm going to ask, if you are an Asian subsidiary, are you making more money during the trade war from consulting advisory services? The first column says, "Yes, post-trade war 2018, 2019, relative to 2016, 2017, advisory fee income increases in percent of relative to assets at Asian subsidiaries of US global banks compared to non-Asian subsidiaries." So, there's business to be made in consulting advisory services in Asia, more now in 2018, 2019, than before. Where is this result stronger? It turns out to be stronger if you are an Asian subsidiary of a specialized US global bank.

Again, this reflects the fact that there's more business to be done, more information to be provided, and more consulting services to be given to the firms in need. I am going to go over time, just one minute, to pin down and conclude, pin down the value of a relationship with a specialized bank. As I mentioned before, it takes on average 3 years, close to 12 quarters, 3 years to find a new supplier in Asia. My definition of finding a new supplier is very strict. I trace you over time. I look at your shipments, and I make sure that I see, for the same six digit product, I see a new shipments come to US shores after the last one disappeared. That's why 3 years may sound like a long time, but I have a very, very strict definition. It means you've gone through product testing. It means that you're pretty sure that your supplier is reliable. So, using the estimates I have given you, if you bank with a specialized bank with local offices in a particular country, then that cuts down the time to finding a new supplier by nearly 6 months.

That's how we think of the value of banking with a specialized bank. So, to conclude, we've exploited the trade policy shock to argue that tariff and search costs are salient. They're important. When there are disruptions, tariff hit importers need liquidity in order to adjust to the shock. Looking at the case study of 2018, 2019, we find that specialized banks are able to provide credit advantageous terms to their borrowers, and those borrowers in turn are more likely to find new suppliers in Asia. So there's an important role for specialized banks in lessening the reallocation of global supply chains. This emphasizes the importance of bank relationships during what has been dubbed as the great reallocation of supply chains of 2018, 2019, and of course, the results are relevant to today and speak to some of the challenges that the real sector is facing in the face of trade policy changes. Thank you.

Felipe Saffie:

Thank you for having me discuss this paper. It's a pleasure to be here second time this year in the Cleveland Fed, so I'm starting to feel almost at home. So this is the paper that Camelia presented. Okay, good. So, what's the question of the paper? The question of the paper is if, after the 2018, 2019 US trade war, Asia's specialized bank, in some sense, help reconfigure the trade network of US firms, and this is relevant because we have been talking a lot about supply chain resilience and for shoring. The question is, does these have any role for private intermediation, for basically a role for the network of banking? And the biggest contribution of the paper, I would say, are two.

Felipe Saffie:

... world of banking. And the biggest contribution of the paper I would say are two. So one is the level of granularity that you have in the data. There are other papers that have looked at these kind of facts, but with this level of granularity, this is the one that has the best data. But now the biggest contribution is the mapping to the finance part.

So we know that there has been a lot of reallocation. Understanding the role of the financial system, that's the new part. And on top of that, the particular part that is even more relevant is to understand if there is things that have to do with information and not only with cost. Let me very quickly tell you basically what Camellia and Kotos are running. One, they have a set of regression that have to do with the trade outcomes. If you have worked with any trade data that is full of zeros, that's why you have this funky way of estimating it instead of just putting log of one plus. But there is nothing weird in what they're doing.

And the level of granularity that they have is so huge that they can collapse these regressions with product year, firm product industry year. So this is a very granular set of regressions and they can have an identification that is pretty tight. Now of course this is, you can always find something that is not there and in this case, there was only one little thing that is not there. And I would advise Camellia to also allow for having specialized client have different trends after the treatment.

But that's the only thing that I could find on the empiric. This is a very careful empirical work and I really like the care that has come into the empirics. Then you have the loan outcomes. There you can have a regression that maybe for some of you, it's going to be more familiar.

And again, one thing that you can check is that the clustering of the standard errors is exactly at the right level. So this is again very careful empirical work.

Now, Camellia was jumping a little bit on the results. So let me organize those results for you just in case that you want to take them home. So there are four groups of results. First, there is reallocation of sourcing. This is the part of the paper that is the less new. There are many papers that have shown that there is reallocation in trade. Then there is the speed of rematching.

This is a little bit new. They are able to track the speed because they have all this achievement. This is the last thing that Camellia was explaining that's also pretty cool because you can organize the result in term of month, which is something very tangible. And then the last two parts for me are the most interesting are the part that have to do with the finance. So because they have these credit lines, they can look at the demand side of the credit because you can utilize them freely.

So you know that everything is driven by demand and they show that there is an increase in the demand that reflects on the price, but the price is only reflected when you are tied to banks that are not specialized in trade. So the other guys are able to read what is happening to you. They understand what's going on. And then they have the informational channel that for me is the most exciting part. But the one that has the most indirect evidence. At the beginning, you saw that Camellia was pushing that she had this channel coming down, but by the end of the presentation she was like, "This is suggestive. This might be this." Because it's tough to pin it down.

So some of my comments are going to go to try to give her a little bit of meat on what could be done to try to pin down this informational channel because that's the key thing that I think is going to make this paper even greater. Now, I am very happy that you picked me because I'm familiar with the topic. We have this work with Felipe and Guria where we have complementary things that in fact this was an easy job in some sense to do because Camellia had shown me this paper like a year ago and I gave her already a lot of comments and she implemented all of them.

So the thing that I'm going to show very nitty-gritty because she already did everything that for me was first order, you see? And then basically this is one example of a paper where we already show that for US exports. Now from the light of the US exporters, you go gradually reallocation and that reallocation depends in the data for us in term of finance factors. For us it was leverage and in term of relationship stickiness.

So a lot of the same forces that Camellia has. So there are common points in term of the mechanism, but even in these common points they have a contribution because our analysis was at the industry level and their analysis is much more granular than that. Remember the fixed effect that I show you, I cannot put them in the regressions of that paper that we published a couple of years ago.

But instead, the main novelty, which is something that was not in my paper or in any other paper that I have seen in this literature, has to do with the financial side, with the link between the trade and finance that come with this country-specific information networks or the speed of reallocation. And that's the part that I will be building like the claim to fame of this paper come from me for what you see in that box in the bottom.

So let me give you a little bit of comments, Camellia, but free disposal as you know. Okay? So the first thing that everybody is always going to tell you when you think about reallocation is this possible triangulation via Mexico. So remember that one of the blind spot that this data has is that it's all through sea, but 80%, 90% of the trade with Mexico and Canada is not over sea and they are aware of that. Okay?

Now, the thing is that in the data we have seen this possible triangulation. So Aaron Flaaen and Ali Hortacsu, and Tintelnot, they have a paper, the famous dishwasher paper where they show that there is a lot of reallocation that is way too fast and that seems to be just repacking. So it's the same dishwasher that now appears to come from Vietnam and it used to come from China and this takes less than a month.

So there is a lot of relabeling that we need to be able to at least personally to be on the data. So what do they do? They say, "Well, we're going to exclude all of the products that are dominant in term of Mexico and Canada and we're going to check the ownership of the flows so that there is no Chinese parent in Mexico or Canada, which is a good first step, but you can do a little bit more."

So one thing that you can do is to say, "Well, what were the things that China was exporting to Mexico before the war? Do I see a change of patterns in the things that China was exporting to Mexico?" And then what you can do is to have a measure of a bound of what are the product classes where the reduction between the US and China and the increase between China and Mexico were the biggest.

After you have that measure, you can re-estimate things taking out, for example, the top 10% of this product, which is the one that saw this biggest trick which doesn't need any new data. You have all the data that you need to do that because the trade between China and Mexico is also through C. Then there is a part of replacement accounting that I am interested in because in the paper that I show you before, we show that total trade doesn't decrease too much.

So there are costs involved to this, but there is a lot of replacement. But we did it at the level of product industry. They can do it at the firm level. So it would be great to know if at the firm level you have a replacement such that no flow in some sense of intermediate goods is lost. And if that lost is going to be bigger, for example, for firms that are not connected to a specialized bank.

So what I would like to see is the dynamics of replacement because you show us the dynamic in term of getting the new supplier, but as you know, when you start dating, you don't go all the way immediately. So replacing the flows is going to take time. I would like to know when your achievements go back to the same type of level that you had before. And if they go back faster. Because one of the little weakness of the paper is that there is a lot of dummies, 1-0. Are you connected? Are you not connected? Because there is a lot of things that they don't have the intensive margin.

But in term of the volume of shipment at the product level that's an intensive margin that you have and that is going to have interesting dynamics. Then the third comment that I have, which is something that I would love for you to be able to do, but you're free to tell me that you cannot do it for some obscure reason. I'm fine with that.

I really want to pin down the information network channel. So I was trying to think hard on how can I find the smoking gun for this? So what do they do right now? They say specialized bank are going to get you that have a local presence are going to increase the speed at which you can match. They show us these advisory fees that come up, but there is not really a link between the new suppliers and the other channels of the same bank.

So for the ones of us that are a business school, we understand how the network works. Networks is typically, I know a guy like you are having lunch with somebody and that guy knows somebody. The lawyer that has specialized on this, the guy that can't do this. Now, shipment and commerce give you a network that you can exploit. So bear with me on this. So basically what I want to understand, if I can build the bank supplier overlap indicator using the shipment. So I can look at a bank for example and I can ask myself, "Does this bank lend to another US firm that has a supplier in this country that is not China? And does that impact the fact that now because we share a bank, I'm more likely to get either that supplier or another supplier from that exactly same place because basically this tells you that they know the guy that does those particular widgets in that particular market.

And then they can tell you, "You know what, John, has a guy there. Why don't you talk to John?" So basically you could try to pin down much more this informational part that is going to come from the network of the overlap of the portfolio of suppliers that the clients at that bank have at that product destination place. I hope that that was clear enough. But if Camellia is nodding, I'm happy.

All right, and last comment. So I have another set of papers that have to do with trade credit and if you're discussing you need to try to relate things. So the way I want you to think about trade credit is a bit different to what Camellia said because she was talking about letters of credit or banks collateralizing things that when you're more precise is trade finance and not really trade credit.

Trade credit is more general and it can be firm to firm. So basically I ship stuff to you and I'm a Chinese firm, and then you can pay me 90 days from now. So that has no bank that is involved on it, but you get credit that goes between firms. So whenever you lose a supplier, you lose more than just the shipment or the ability to get these cheap things coming in. What you also lose is the trade credit that those supply network were providing to you. And in the paper that I have with Brian and with Ina Simonovska, we show that there is a lot of substitution between bank credit and trade credit.

So one thing that would be interesting is to see if the trade credit actually drops whenever you drop these suppliers. And then what you should see is exactly what they see a spike in the utilization of bank credit and then over time they should go back to normal. As you get a new supplier, now you're able to get a little bit more trade credit.

So what they do is they just look at levels. So they just say, "You know what, accounts receivable over revenue is not very different, but they don't look at the dynamics of this." So what I would like to see is after you have your first new supplier, the moment of the matching, see if you see that trade credit was decreasing to that event and bank credit was increasing, which that part of the story you already have and then the other thing inverts.

So this is mostly Camellia because I understand that your story is that I need to finance a fixed cost that allow me to get a supplier, but that seems small to me. I think that the real thing that you're financing is the loss of trade credit because that's huge. For the typical medium-sized firm, a hundred percent of the short-term liabilities are trade credit. Debt only shows up outside working capital. So those kind of dynamics would be very interesting to see. And I lied to you, you had another comment, but I didn't know that I would have time to do it. So let's do it.

So at this point what Camellia has is a smoking gun if you want or smell test as she said for a price effect and for an information effect. So what's a price effect? The price effect is saying, "Look, you are going to increase your demand for credit no matter if you are tied to a specialized bank or a non-specialized bank." That is the same. Now, if you are with a specialized bank, your rates are not going to go up or not going to go up so much and your risk assessment is not going to go up or not going to go up so much. So that's a price effect.

So if you think of it either through financing a fixed cost or through the idea that I was telling you of substituting trade credit, this price mechanism makes easier the transition from a pure financial perspective. It has nothing to do with information. But then they change completely their hats, completely different data set even and they say, "Look, let me try now to wave hands a little bit in terms of what's going on with the information part."

And they look at the time to get a new supplier, they look at these advisory fees. What would be great would be to be able to have a joint specification where you can orthogonalize the effects to the change in the rate, because the benefit you can measure. And it's basically the fact that the rate is not going to go up so much. And then your regressions that have to do, for example, with the speed of matching, you could control from the part that is finance and then the residual of it.

And by finance, I mean, the gap differential in terms of the jump of the rate, then the residual of it is going to be more of a measure of what the information part coming on. So instead of just being directional, it's going to be a little bit relative and you would be able to measure it in month. So these six months of savings, three of them come from a lower cheaper thing and the other three are orthogonal to the financing part. And I choose to read them as the relationship part, but at least I know that they're not purely financial.

So in term of conclusion, this paper delivers a geography-specific expertise idea that can accelerate re-allocations. Why does it matter? Because this tell us how resilient these things are. This tell us how to evaluate a financial system in term of their ability to endure challenging times like the ones we're having. And my key suggestion, there were five comments, but there are three that, look, I'm not the referee, I'm not the editor. So free disposal. But these three things I would do. Thank you.

Joe Haubrich:

Camellia, I'll give you a moment to respond.

Camelia Minoiu :

Thank you so much, Felipe. So this was a great discussion and thank you for being patient to read through 78 pages after you had already read the first draft. So really well-meaning comments and your overriding most important comment being about us stressing the information channel as the most novel part. We completely agree. It's our favorite part of the paper. It's also the one that's not as tight as possible. And so I really appreciate your suggestions on coming up with that smoking gun evidence.

So I want to just kind of reiterate that evidence to make sure I understood it correctly and also tell you what we've tried, although not exactly what you suggested. So you are saying construct the network of potential suppliers that the bank has knowledge of by looking at the whole loan portfolio of the bank, look at the supplier network of the borrowers and pre-trade war and see if out of that potential pool of suppliers, new ones are being matched to by the shifting the reallocating tariff [inaudible 00:39:52] importers.

So something we have tried is we've tracked the foreign lending portfolios of US banks. So we have asked if you are lending directly to an Indonesian manufacturer, do we see a higher likelihood of one of your shifting reallocating borrowers matching to that particular Indonesian client? And unfortunately we had too few matches, too little power in those tests, but I think your idea will get us there. So thank you for that. And all of the other comments are really well taken and they're super constructive. So many, many thanks.

Joe Haubrich:

We have a few minutes for other questions. Well, I'll take the chair's prerogative again and say, are there any policy suggestions that you would say come out of your work?

Camelia Minoiu :

That's a really, really tough... It's the mother of all questions, the policy implications question. So I think there's a little bit of a macro prudential undercurrent through our story that speaks to the importance of solid, safe, well capitalized banking system, always ready to absorb shocks. And so when there are real shocks, we don't want them amplified through weak balance sheets. Now, here we're very fortunate in that the first trade war happened against the backdrop of really healthy bank balance sheets. And these changes in trade policies themselves did not manifest in a balance sheet shock at all.

We don't see non-performing loans, delinquencies, charge-offs rise. We see just a little increase in probabilities of default. And as the trade developments have unfolded over a long time, it seems that firms have had time to adapt, even despite COVID and the challenges with that. So I would say that that would be an important policy implication.

Another is that at the Atlanta Fed we have conducted an analysis that goes beyond the sample that I described here. So we traced the shipments of about 300,000 importers across the US to understand who are the ones most exposed to the increasing tariffs using the latest increases in tariffs as of early 2025 this year. We conducted this exercise to get a better understanding of which firms across the firm size distribution are most exposed. And so what we found is that small firms, small importers that are more likely to be in services industries or final goods, more consumer facing industries where they are more likely to import final products as opposed to intermediate products, they are also the most exposed to China and therefore they are facing the highest effective tariff increases.

These firms tend to be more credit constrained, but they also represent a relatively small share of aggregate employment. So if we want to think about their ability of absorbing some of the inflationary impulse versus potential impact on employment, we can keep these numbers in mind that we may see some delinquencies, some exits in the space of small firms, but in the aggregate that may not have a big impact because they're a small share of employment.

Joe Haubrich:

Thanks. Any other questions? In that case, join me in thanking Camellia and Felipe and we will move on to the next paper, which is by Karl Schulz from Ludwig Maximilian University of Munich on non-linear bank capital regulation. And it will be discussed by Pab Jotikasthira from Southern Methodist University.

Karl Schulz:

All right. Thank you so much to the organizers for including our paper. So it's a great pleasure to be here at the Cleveland Fed. So this is joint work with Max Jager from Frankfurt School of Finance. So our paper starts at the fundamental trade of bank capital regulation. So that higher bank equity typically implies greater financial stability on the one hand while at the same time distorting credit supply and potentially reducing productive investment.

Now, to address positive and negative externalities of financial intermediation, regulators around the world impose requirements on bank capital. So this is for instance in the Basel Accords that bank equity should exceed a certain share of risk-weighted assets or risk-weighted loans, right? So in principle, this leaves us with two central regulatory tools. So one is the capital ratio or capital adequacy ratio, and the other is this nonlinear risk rate schedule that maps credit default risk into certain risk weights In this capital requirement constraint.

About these risk weights, which is the focus of our paper, there are recurring debates how one should design them. So most recently there has been proposal within the Basel III Endgame to substantially flatten out this risk rate schedule. Yet, despite its first-order importance in the academic literature, relatively little is known about the macro consequences of these risk weights.

And that's the gap in the literature that we try to fill here using a new approach. So here we use a sufficient statistics approach to study these nonlinear risk weights. So why do we do that? So the sufficient statistics approach has been developed to study nonlinear tax problems in public finance, for instance, nonlinear income taxation. And here we use this methodology to speak to these nonlinear risk weights and their economic effects.

So in a nutshell, what our paper is about, so first there's a theoretical part where we build a unifying framework of bank capital regulation that nests classical models of financial intermediation. And then we develop a perturbation approach or variational approach for thinking about the positive and the normative effects of these nonlinear risk weights. So what this gives us is that we can express the effects of reforms to these risk weights in terms of a small set of empirically observed objects, so-called sufficient statistics such as credit supply elasticities or the credit distribution to understand the effects of changing risk weights.

And then since these are empirically observed objects, we go to the data and empirically estimate the sufficient statistics using the German credit registry. And then in the final part of the paper we put the theory and the empirics together for policy application, for counterfactual. So we take the risk weights proposed in the Basel III Endgame at phase value and ask what would happen if they would be implemented in the German context.

There's another part of the paper which I'm not going to talk too much today about, which is about optimal capital regulation. Here, we provide new sufficient statistics representations of optimal nonlinear risk weights. So basically we can then speak to potentially optimal policies or optimal regulatory risk weights.

Okay. So in the following, I want to quickly show you the theoretical framework that we have in mind. And this is a core strength of the sufficient statistics approach is that we can rely on minimal assumptions about the economy. So we don't have to put much structure and it goes in fact very far. So consider a standard model of financial intermediation. So there's a set mass of depositors who brings their savings to banks.

Karl Schulz:

Cost of depositors who brings their savings to banks. And then banks transform these deposits into credit supply to a set of heterogeneous firms. So these heterogeneous firms, yeah, you can think about them as having certain characteristics and they make a set of choices. So for instance, participation in the loan market, for instance, optimal risk taking, other technology decisions and so on to maximize their profits, subject to a bunch of feasibility constraints. So for instance, limited liability. Then there are depositors or households who also optimally behave. So they choose a bunch of variables. So for instance, consumption, deposit, supply and so on to maximize their own expected utility subject to some constraints. And finally, there are banks, or there's a representative bank here that chooses balance sheet variables. So chooses a credit supply portfolio. The bank chooses equity funding and a mass of other variables. So for instance, very importantly, loan prices for each unit of credit supply to each firm or monitoring intensity.

And the bank does that to maximize profits as well, subject to a set of feasibility constraints as well as regulatory constraints. So going to talk about that in a second, but it will be basically the minimal capital requirement. And finally what I want to highlight here is this third constraint, which is basically a risk formation constraint. So this basically tells us how credit supply and other contractual variables such as loan prices map into credit default probabilities that we are measuring in the bank regulation. And this allows us to nest a bunch of classical models in financial intermediation, starting from early models of bank portfolio choice to models of moral hazard, adverse selection, and costly estate verification.

All right, so, yeah, here I'm just showing you again the minimal capital requirement constraint that the regulatory authority puts. So this is just the same thing as I have said in the beginning, like equity should exceed a certain share of banks risk-weighted assets, or bank risk-weighted loans. Now this of course heavily affects the trade-off of a bank, right? That is sort of indifferent between giving an extra unit of lending to each entrepreneur for a certain type, trading that off with the additional equity capital that it has to hold for that. That's of course usually costly for the banks. So I guess it's very, very basic until now. So capital ratio is set to 8%, sometimes it's a little bit more with the surcharges, 11%. And then there is this non-linear risk rate schedule. So that maps these risks of each loan into a risk rate. So that could be according to the standardized approach or internal ratings-based approach as in Basel III, so which is our baseline in the quantitative application.

And here I'm just showing you the schedule that is highly non-linear. So basically mapping or putting weights of close to zero to these very safe and large companies that are usually blue-chip firms, right? And then if you move up in the distribution of default risk, risk weights become much larger, way above one for the risky, usually very small firms such as startups. And then the question is of course, what would happen if you change them? And this is part of the Basel III end-game proposal to basically remove, to abolish this IRBA up, and remove a lot of this non-linearity in the schedule. Effectively replacing that with a revised standardized approach with two-bracket risk weight scheme raising risk weights for very safe firms to 65%. And for the riskier firms, risk weights get cut down to a hundred percent. So this is a highly non-linear reform that we can then later on study with our approach.

So what are we doing here? So what is sort of the key methodology to think about these non-linear reforms in terms of expressing the effects using sufficient statistics? So here we think about this non-linear schedule is kind of a non-linear tax. And there people have developed what is called a perturbation approach. And the perturbation approach is taking an arbitrary initial risk rate schedule. So for instance, the IRBA schedule, and then think about a reform like Basel III end-game as a small perturbation, a small change to this risk-weight schedule. And then the key exercise is to kind of express the new equilibrium credit supply and the new equilibrium credit risk distribution as well as bank level credit supply or bank equity in terms of a small set of empirically observable objects. So this is sort of the methodology where this goes a long way.

So in the following, I want to show you a little bit like how parsimonious debt approach is. So here I'm showing you the credit supply response at the loan level. And this is telling you what's the percentage change of credit supply to a certain entrepreneur, say to this startup. And as you can see, there are two terms that come out of the analysis. So the first is the standard own price effects of risk rates. So this tells us that credit supply typically declines with the risk rate on that asset because bank equity capital is costly. So when we raise risk rates, then it's going to distort credit supply. So to measure the response, the responsiveness of credit supply to risk weights. Here we define the elasticity to a semi-elasticity of credit supply with respect to these risk weights. And this provides a direct empirical test of course for capital structure irrelevance, right?

So whenever we see credit supply responses, banks actually care about the risk weights they are facing at this point in the credit distribution. Now the second part is maybe more interesting because this is an entirely new channel in this literature that pops out of our theory. So this is saying that credit supply may also decrease with not only the level of risk weights, but also the slope of risk weights. And this is a channel that is present only under some market power. So when you have a monopolistic bank, this bank may internalize its effect of its own credit supply on the riskiness of the firm or the loan. And therefore the bank knows when I change my credit supply, I'm going to also change the risk weight on that very loan. So therefore credit supply may also respond to marginal risk weights. And to empirically measure that we define elasticity of lending with respect to marginal risk weights. And that's our second direct empirical test for something interesting on the loan market than we did. That's a test for monopolistic loan pricing.

Finally, once we know the adjustment to credit supply, we can then back out credit risk responses. And for that we only need one sufficient statistic, which is the elasticity of credit default risk with respect to entrepreneurial leverage, right? So this is a very parsimonious way to kind of understand the relationship between credit default risk and credit supply. And it turns out that this is informative about the economic frictions on the credit market, the following sense. So for instance, in a model of moral hazard where you have moral hazard on the credit market, of course higher entrepreneurial leverage will because of limited liability, increase the risk taking by the entrepreneurs and therefore loan default probabilities will increase. So there's a positive relationship. Vice versa, if you think about a model of adverse selection of private information on the credit market, then there's a negative association, meaning that an expansion of lending which comes typically along with a reduction in loan rates, will expand the pool of borrowers and thinking about the marginal borrower in such a model of adverse selection, that means that average risk of borrowers or average credit risk will decrease.

So depending on the sign of this elasticity, we can kind of learn something about the credit market, right? And then we have the theory with these sufficient statistics and then we go to the data to estimate them. So here we have access to great data from Germany. So that's universe of bank-borrow relationships. It's a similar data set as we have just heard, which we can link to bank in firm balance sheet data. And that allows us to disentangle these supply and demand elasticities on the credit market. So what we do here is, for instance, on the supply side, we exploit random variation in bank's risk assessment at the firm level to kind of back out the resulting supply side response. On the demand side, we use a shift-share IV design using introduction of German bank levy, which was kind of dependent on the credit portfolio of the bank to get at this risk, credit risk responses.

So what do we find out? So in a nutshell, we can reject capital irrelevance. So we find significant responses to these risk rates along the entire distribution of credit risk. So here I'm showing you how the estimated coefficients just on the right-hand side for different brackets or for different credit ratings.

Secondly, we cannot detect significant responses to marginal risk rates. So therefore we cannot, or we think that we are in a fairly competitive loan market, so banks are not able to internalize their own effects on the risk rates that they face. And finally, for at least for most parts of the credit risk distribution, we find evidence for positive credit risk responses which is, as I've just explained in line with moral hazard on the credit market.

All right, so now I've shown you the theory and the empirics. So it's time to bring together these pieces for policy counterfactual. You kind of understand what would happen if we implemented this flattened risk weights that are in the Basel III end-game proposal in the German context using these German estimates. And here I'm plotting the bank portfolio response to this type of reform. And as you can see, there's a highly non-linear reallocation of credit of course away from these very safe firms. For them risk weights got raised to 65%. So here we find a substantial reduction in credit supply, whereas for the riskier firms, it's the other way around. Risk weights are getting cut to a hundred percent and that stimulates credit supply to what these firms. Now aggregating over the entire representative credit distribution of all we find, like a moderate reduction in credit supply, but a substantial increase in bank equity.

And this is coming from a different set of response that does not, it's not due to credit reallocation as you can see here, but it's mostly driven by mechanical effects of the policy reform that when you increase these risk weights for the very safe firms, which is a large mass in the data to 65%, is it's going to mechanically increase bank equity. And then in the final part of the paper, we then go a little bit more structured to kind of understand normative counterfactuals in this environment. So there we have to take a stand on the nature and the sources of credit supply and bank equity externalities. So here we kind of follow an established approach to think about bailout financial externalities on taxpayers that come from deposit guarantees or bailouts. So what do we find in our context when we calibrate the model to the empirical moments in the German credit registry?

We find that this rise in bank equity makes banks substantially safer. And that is maybe not surprisingly helping the households a lot because they are ultimately the taxpayers that have to be at the cost of government guarantees. Banks don't like that reform too much. The average entrepreneur also doesn't like it. Of course there's highly non-linear effects throughout the distribution. And then finally, we also use our sufficient statistics formulas for optimal nonlinear risk rates. Again, I've not shown you that today, but it seems that this flatter schedule can be close to a Pareto-optimal nonlinear risk rates schedule. I think I'm running out of time. So just to wrap up, so in this paper we introduce the perturbation or sufficient statistics approach to this literature on risk-sensitive bank capital regulation, and then we go to the data estimate, the sufficient statistics, and then through policy counterfactuals we can study various reforms here, whatever comes through your mind. Of course we can also change the baseline schedule to more US context to understand policies in the US. All right, thank you very much for your attention.

Pab Jotikashtira:

All right, thanks very much for inviting me to discuss this very interesting paper. Before I even start, I'm not an expert in this area at all and I learned a lot from reading it. So I really highly recommend all of you who work in this area to read this very interesting paper. It's still developing, it's very brand new, it's a lot of math, so it takes time to digest all of its notations. But at the end it is a pretty comprehensive and sufficiently simple paper to understand. Oops, sorry. All right, so to summarize, so the paper presents a unifying framework for bank capital regulations. So it uses this perturbation approach, right? With a few calibrated sufficient statistics coming out of a very general model. To perform quantitative positive and normative exercises, right? For example, assessing the different policy proposals relative to the risk weights that we have today.

So the model is very simple and you can see here that there's even no functional forms that are specified for any functions in the model. For example, you have three classes of agents, you have entrepreneurs maximizing that utility, which is not specified by making decisions in a vector D theta, and D is not specified either, subject to the constraint, C of D and credit supply and so on. And then you can see all of these are left general, right? The same thing, the households also maximize our utility by choosing consumption subject to whatever participation or whatever constraints they may have, right? All of these are general. The key thing here is going to be the bank, right? And the bank decisions are going to affect the households and the entrepreneurs. So the bank is going to also try to maximize some sort of utility function by choosing the policy metrics, X, right?

And some sort of price that somehow kind of diff out in the final version. But the price is sort of left out because the price is set in a way such that it sort of calibrates perfectly to whatever default probability given the other decisions that the bank make, right? Which is the second part of this objective function, this constraint. And then the bank is also subject to very general sort of constraint plus the capital regulation, right? So the capital regulation R is specified generally, but also kind of realistically as we would think in the Basel framework as the bank has to have a risk-weighted asset that cannot exceed, right? The asset capacity given its own capital. So from there the authors then derive a set of propositions and lemmas and so on showing that under some assumptions about no cross-asset elasticities or some sort of decisions. Then the model could be described by four sufficient statistics, right?

So the first one here is a sensitivity of credit supply to the risk weight, right? So K to omega. The second one is the sensitivity of credit supply to the derivative of omega, right? So basically the marginal or the slope of the risk weight. Then the third one is a sensitivity of credit supply to the default probabilities, right? And then the last one is these externalities where credit supplies could change, right? The firm's behavior and hence change the default probabilities in the market. So, these are all we need, right? And we are going to try to quantify them to perform our quantitative exercise. But in order to get at the normative side of it, you also need a little bit more about the welfare, right? So the others then came up with a few other welfare externalities that we also need to estimate in order to think about optimality, right? And so the first one is the sensitivity of the household welfare to bank capital.

The second one here is the sensitivity of household welfare to create supply. And the last one is the sensitivity of entrepreneur welfare to create supply all normalized by the shadow price of equity mu, right? It comes from the capital constraints of the bank. Okay. So, and then do this estimation with the German credit registry data, right? The first panel show you the sensitivity of default risk as estimated by the bank to the shock in credit supply, right? And you can see that as for at least for the safe to medium safe firms, right? As banks lend more money to them, they become a little bit riskier, right? This is not true for the riskiest firms and the others argue that that might be because they hit financial constraints. And so more credit held to relax financial constraint and actually reduce the default risk of these firms.

And then they also perform similar reverse sensitivities where they look at the sensitive credit supply to the change in default probability of the entrepreneurs and also the risk weights, right? And the sensitive risk weights are very important because they're going to be driving a lot of what we see in the quantitative exercise. And then they perform this exercise, right? The top two graphs are positive studies, right? Where they evaluate. So the solid line on the top left panel is the current risk weights as a function of default probabilities, right? And the dash lines are basically the Basel end-game, right? Which is much more flat, right? 65% risk weight for very safe loans, and then a hundred percent for everything else, right? And then from this change from the solid to the dash line, right? Then the authors then come up with given the sensitivities of the supply to risk weights and so on, right?

Then you can evaluate how much of the safe loans, right? Will contract and how much of the riskier loans will expand, right? So we have the result on the top right panel, right? Whether zero is in the middle, and you can see that on the left of zero we have a negative amount, right? Meaning that the credit supply for safe loans decrease. And then on the right we have the credit supply to the riskier loans actually expand, right? And then from there you can calculate the aggregate amount of credit supply across all of them, right? And you can calculate also the amount of equity that the banks will have. Then with additional estimations of marginal welfare externalities...

Pab Jotikashtira:

Marginal welfare externalities. You can also perform some optimal sort of risk weight exercise. And you can see on the bottom left that the optimal risk weights, the first base, the dotted lines and the second base, the dashed lines, they both look flat. Very similar to the endgame, right? Now, my suspicion, of course, I don't know for sure, reading the paper, is that because they find that the sensitivity of credit supply to the marginal risk weights are all very close to zero, which in my mind imply that because the risk weights here are designed to correct the Pigouvian wedge between the banks cost of risk weight versus the society cost of risk weight. So because across this risk spectrum, this wedge is about the same and hence... The wedge is about the same and hence the risk weight that are supposed to be there in order to correct the wedge should be also about the same, right?

I don't know that that's the right interpretation, but at the end you have something that is very similar to the proposal by the Fed. So my thought is that, and I spent already 10 minutes doing this, but it's a very ambitious and very interesting paper. It use a very interesting technique to get around otherwise very complex theory. If you impose the real functional forms, it's almost impossible, intractable. And so using just a few sufficient statistics so that you can perform analysis of policies and so on in the observed equilibrium. Now, of course, generality like these come at a cost, right? So first, I feel that although the authors talk a lot about different estimates being consistent with different mechanisms, but overall, if you take them all together, it's not very clear what economic mechanisms are driving the whole exercise. The model that we are looking at here. And in particular, while price was there and the model is kind of silent at the end, but it was diff-out somehow. And I would love to know more about price and some other missing ingredients.

And second, it feels like when you take the model is very general to the data. It is hard to map something too general. You don't even know what the welfare looks like to the data. And so when you go to the data, you have to assume, "Oh, maybe the profits are entrepreneurs welfare or the cost of bailout is a household welfare." So you have to have assumption that maps something very general to the real world. And some of these assumptions can be in my mind quite strong and somewhat ad hoc. And finally, the results for this type of exercise are generally local because we're talking about derivatives, the sensitivity around the current equilibrium. When we change some of these parameters so far from the local area, is not very clear that what we infer still is going to be correct.

Okay? So economic mechanism, as I said, is relatively silent. A couple of things I want to highlight that I think are very important. The first thing is that I don't see a lot of cross-loan spillover correlations here at play, but I think loan correlations are, in my mind, quite important. I'm going to show you why that's the case. So in the derivation, there's some sort of a cross-thing substitution going on and you can see here in the equation with the marginal rate of substitution between different loans of different types. But I don't see some of these being provided as sufficient statistics or even estimated in the data. So I'm not so sure what's going on. Risk pricing is a little bit missing. So although in concept it's there in the model, but I don't see it being play up as much. But in reality it is actually quite important because when you think about default risk change.

So the first thing that is going to change following default risk, it's going to be the price of the loan. It's not the quantity. And then because price has to adjust such that the marginal profit is zero and the quantity comes after that. And so as a result from the perspective of bank regulators, they think of the two tools they use. So the first two to address the average default probability is to price it to cover that expected loss. And then the second two is to use a risk weight of capital regulation to absorb any unexpected losses beyond the average. And so in this case, one, two is kind of silent or missing and the other two play up a lot. And so the model looks almost like the bank decide how much to lend to the entrepreneur. And then when the default probability of entrepreneurs change, then they change to quantity.

So everything else look a little bit silent. Now, I think this is important because I show you here, it's a plot of two loan portfolios with the exact same expected default. Okay? And so the price of these two portfolios are exactly the same. However, you can see that one portfolio with a little bit higher default correlations has a much longer left tail and hence a much bigger amount of unexpected losses. And hence the blue portfolio would require a much bigger amount of capital to absorb unsuspected losses compared to the orange portfolio. And so this kind of very important conceptual thinking that bank regulators think a lot about to me is a bit missing in the current framework. Second, the calibration issue. So when you bring things are very general to the data, you have to make assumptions. For example, some of the assumptions are, I'm not so sure and not so sure how sensitive the conclusion, especially when it comes to the normative analysis is to this, right?

For example, we say that the entrepreneur utility can be proxy by profits, right? Profit in one period or how do you think about the streams of profit? What about risk, right? Does risk enter the utility function at all? The same thing with the externalities of the household can be captured by the losses in the state of bailout. Is that the only thing? And all these assumptions you have to assume when the bailout occur and the probability that is going to occur I think is a little bit hidden within all this writing. Now, even the proper estimation, I have to say, is a little bit incoherent. And since I don't have time, it is quite out a couple of things. For example, in the top equation here, this is a first-stage equation when you think about the shock to the credit and how it might affect the probability of default in the second equation.

But you can see here that first equation exactly the same as the equation that they use to estimate the sensitivity of credit supply to the risk weights and the probability of default. So if they're the same thing, they are within the same system and they should look exactly the same. That's an example. A second thing that is also important is the green thing. So you can see in the first and the third equation that the probability of default is very important determinant of the credit. But now when you reverse the equation to look at how credit affects the probability of default, you leave it out. And so as a result, the variation in the predicted credit there could also be the part that is driven by this probability of default in the past that actually drive the probability of default today. So in that case, it's not really exogenous any more than it become problematic.

And finally, as you know, all these things are done around the local area of the current equilibrium. And so when the proposed change is very big, for example, in the case of the endgame, right? If you think about these risky loans, you reduce the risk weight from almost 200% to 100%, is the same estimate of derivatives still apply? That kind of thing, I think, it need to be discussed in the paper. But overall, very interesting paper, very ambitious, and I learned a lot from reading. I suggest all of you read it. Thank you so much.

Joe Haubrich:

Karl, we'll give you a chance to respond.

Karl Schulz:

Yeah, thank you so much, Pat, for very nice and thoughtful comments. And also thank you very much for also covering the normative part of the paper, which I have not done too much in my presentation, so appreciate that. So on the economic mechanisms, I fully agree that I'd love to get some price data. So in the German credit registry, we only have them at the firm level, not at the loan level, but I agree that we could do much more to maybe capture price responses, which are ultimately an important mechanism in the models in the background. So we should know a little bit more about that. We try to estimate cross elasticities, like basically coming from portfolio reallocation of banks and there we didn't find much evidence for like spillover effects from across assets, which we, here we are very cautious to... Non-evidence is not evidence for absence. So we cannot really say that these things are not there because we don't get significant coefficients.

So on the calibration, I agree that, I mean whenever you go to normative analysis, it's clear that there must be more assumptions about the underlying economic structure. And here, the bailout and profit timing is just at the annual level. How we measure the responses is such a way that they would be contemporaneous. And we are discussing that a lot, whether we should do that more of a long-run analysis that because these models are static models or this is more about interpretation of these marginal welfare externalities that create the wedges, at which point in time or for which time span we measure them.

So the demand side equation is set up, the estimation equation is set up such that we measure the effects of changing credit supply on the average risk of a given entrepreneur. So here we kind of did two analysis in the paper is currently only the one that aggregates the impact at the firm level.

Pab Jotikashtira:

Operate across bank.

Karl Schulz:

Exactly, exactly. But we could also do that at the loan level. So I'm very sympathetic to doing that as well. And sorry, in the supply side equation, we just dropped the marginal risk rate from the equation in the paper, but of course it is there in the estimation. Finally, I think you are pointing to a very important question about non-linearities. Of course, sufficient statistics are only measured around current policies, and that's a huge problem. It's a similar problem when you have a structural model that we would estimate to the data that we also are evaluating such a model at the current policies. And here it's the same thing with the sufficient statistics.

So what we're doing in the paper currently is to estimate the sufficient statistics not only in the German context, but also in the US context using syndicated loan market data where the regulatory regime is maybe a little bit different. But I agree, whenever reforms become large, we basically have to keep track not only what are the sufficient statistics evaluated at the current policies, but how do the sufficient statistics change with respect to these reforms. Because for instance, some credit supply responses may fade away when we say would completely abolish any capital regulation. But thank you so much for all the comments and I appreciate that because currently we are writing up the paper, so gains are very high from these comments.

Joe Haubrich:

Any questions from the audience?

Speaker 5:

I think it's very interesting, very ambitious. So when you're thinking about deviations from Modigliani-Miller, you didn't say anything about what is the deviation and how this is going to affect your results. So for example, if banks want to have more debt and less equity because of the tax benefit, that's a very different implication for welfare and for optimal capital regulation. So I don't know, I didn't come across from the presentation how you think about that.

Karl Schulz:

Thank you so much for the question. Obviously, this is an important point asking where does the wedge, where does basically the shadow cost of the bank come from? Why do we have deviations from Modigliani-Miller? So in the estimations or estimations of sufficient statistics, we're kind of agnostic about that. But once we move to the structural model, then we have to take a stance where the shadow cost of bank equity comes from. And there it's really the deposit insurance or government guarantee that creates a wedge in terms of prices or the interest rate on equity and deposits. But of course there could be other reasons why we would like to think about departures from capital structure relevance and tax advantages is certainly also something very important.

Speaker 6:

So this is a two-part question, and let me open by saying I'm struggling to figure out how to think about how to use the results of the paper and also implicitly about the local versus global effects. Okay, so how to use it is it looks like implicitly capital is costly and therefore higher risk weights are costly. However, of course we're just looking at how the bank is optimizing within the current regime, and it doesn't really say very much about welfare because the current regime is doing whatever it does with regard to protecting society and the bank is going to do what it does. But it's not necessarily true that if one reduces risk weights, welfare gets better, right? At least if you reduce risk weights materially. Second, I learned today that at least over the last 10 or 20 years, there's been a handful of episodes where there were substantial reductions in de facto capital requirements for large banks.

One would kind of expect from your results that the implication is that lending should expand, right? But what actually happened is the banks just increased their stock buybacks or their dividends and they just gave all the capital back to the shareholders and they did nothing to lending. Now this is not a marginal effect, it's a big effect, but it somehow calls into question how, if it's true, right, this is just anecdotal. Maybe lending did change somewhat, I don't know. But it calls into question, how do I use these results, right? When is it okay to use your results to, in effect, make predictions about what would happen in the world if policy changed? So sorry to be confused. Help me out, please.

Karl Schulz:

Yeah, thanks so much. I think this is a bigger picture question that is almost philosophical, right, what should be the objective function of the policy maker. When we look at risk rates, should we consider the entire set of policies along with debt? And here, to be very blunt, we are just focusing on a certain subset of regulatory tools that are ultimately in the background. So on that, I think this is more informative about changing the existing regime as it is currently in place. So therefore, we cannot really say much about the regime change. So we can say staff about what would happen if we change risk rates starting from the current policies, current regime. Then we can, like welfare externalities are informative about questions, whether we should change them in a certain fashion to maybe try to increase credit supply or try to increase financial stability.

But I mean, it's also not clear what to do. That depends on how do you weigh the well-being or the profits of firms versus consumer welfare. So this becomes ultimately also a matter of specifying a welfare objective function. So in the paper, we make this very easy, everything enters in the same way. So we put a dollar value on all welfare effects, and then we just sum up across firms, banks, whatever, households, and then we come up with optimal policies. But I'm not saying that one should do this necessarily. So for instance, if you place very high weight on firms, then Basel III endgame or the risk rates in the Basel III endgame would be actually very detrimental. So therefore, I think, our paper is more about providing a toolkit to think about these questions in a structured way, the underlying trade-offs, the underlying welfare externalities.