

# General Discussion: More Amazon Effects: Online Competition and Pricing Behaviors

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*Chair: Lisa D. Cook*

**Ms. Evans:** A really interesting paper. My question goes to the nature of the data. I think from what you said you're scraping websites and essentially getting the sticker price, not the realized price the consumer pays which would incorporate things like free shipping, coupon codes, rewards programs, etc. In a sense, that doesn't matter, since you're looking at volatility. But if those change over time, or if they vary by geography, then it could really change your results, right? My question is about the nature of the prices. Is it sticker price, does it incorporate all these other things, and if not, how do you think that impacts your results?

**Mr. Williams:** I've got a couple of comments picking up on Yuriy Gorodnichenko's comments. One is when we talk about inflation measures, when thinking about monetary policy, an important thing to remember is goods make up a little less than a third of consumer spending. So we tend to talk a lot about the thing that we can measure, and the things that are changing, but services make up about two-thirds of consumer spending in the PCE price index. I wouldn't extrapolate so much from goods prices, in terms of inflation measures and monetary policy.

And second, my conclusion is a little different than Yuriy's. I wouldn't think about excluding things. I think the right way to think about it is the way we actually do think about it, which is like the trimmed mean inflation rate which takes out naturally the things that are volatile. I mean, that's just a pretty much neutral way to deal with the issue, that over time there's a change in the frequency that prices change. Similarly the New York Fed has a measure that basically underweights goods and services where the prices change more quickly. So we do have these price indices and we use them regularly. And what's nice about them is that over time, as these developments continue, these measures, I think, will capture that, as opposed to trying to come up with a new measure that excludes Amazon or something. But this is a terrific paper.

**Mr. Spriggs:** When you're looking at the price changes that quickly, are you also giving us some clues as to what we may be doing wrong with the CPI anyway? John Williams just mentioned one issue, which is it's very dominated by housing. Many of us have a problem because of that because housing prices are driven by people at the high end of the income distribution and therefore give a misleading picture of what inflation is really doing if you're thinking about medium people. But your indication of this quick price convergence, are you able to detect the other problem that people think, which is that people quickly go to the lower price of some sort of option, and this response on the part of consumers would mean that the current way that we estimate the CPI is probably off? We're really overestimating inflation because now consumers can react much quicker to lower price alternatives.

**Ms. Gopinath:** I think this is a terrific paper in terms of the wealth of data that is being brought to this question, and I can see there are many more papers coming out that compare online prices and brick-and-mortar-store prices. My question/kind of concern would be about the measures that you have of exchange rate pass-through. You report a number like 44 percent into these retail prices and you said these seem similar to at the dock prices. But the reason for my skepticism is the following. One is that you're looking at all prices and these are not just imported goods. So the pass-through that

you're looking into in retail prices is not just the goods that are being imported from outside, but these include domestic prices. So the U.S. imports of GDP is over 15 percent. The 44 percent number seems really large. One possible reason for that could be that besides exchange rates, you don't have any other cost control in there, and I think it would be useful if you put in a few more of those controls to absorb the effect.

**Mr. Carstens:** Excellent paper. For monetary policy, a key issue is the pass-through, even with more countries now having a flexible exchange rate. I will be very interested in hearing your answer to Gita Gopinath's question, but I have two additional questions on pass-through. Did you find if the pass-through response is symmetric to appreciation and depreciation? And second, in terms of the frequency of price adjustments, is the exchange rate development symmetric? Do Amazon and others adjust their prices with the same frequency when the currency appreciates as when it depreciates?

**Mr. Cavallo:** Thank you Yuriy for the discussion, it was very thorough. And thank you for all your questions. I will try to answer most of them. The coupons I get are the ones that apply to all consumers. When you see an item on sale, and it applies to everyone, that is something I can observe in my data. But if people have personalized coupons or loyalty cards, that is not in my data, just like it is not on the CPI data either. You are right that the frequency of that personal coupons over time could have an impact on some my results and the way we measure inflation. I will say though, for example, some of the facts like uniform pricing—there's a paper by Levine and Gentzkow looking at scanner data that does incorporate personal coupons and loyalty discounts, and they also find that there's pervasive uniform pricing even when you include them.

John Williams raises a great point. I am not claiming this applies to services. One nice thing that could be done with these data is to improve those estimates of flexible versus sticky price indexes that you mentioned. Those are calculated by taking the sectors that are considered to be flexible or sticky based on past data in academic works. We can improve them by measuring those sectoral estimates more frequently. I think it would be even better if we can take every

category of goods and say: these are the individual goods that are flexible, these are the ones that are sticky, and then build indices that can split the data at a finer level of disaggregation.

On the question about the CPI: in this paper I am not trying to solve the CPI's measurement problems. I do have other work where I discuss how this type of data could help us in things like quality adjustments. You specifically pointed out the fact that people may substitute to other goods. Pete Klenow has a very interesting paper where he uses online data and also quantities and he makes specifically the point that if you take into account quantities, our measured inflation changes. But my data only has price information.

Gita, I think you are absolutely right. There are a lot of domestic goods here and relatively few controls. I am working on another paper that will look specifically at the level of the pass-through estimates, and try to see whether these high numbers are driven by the type of data or the way that I am measuring pass-through. I hope that I will have answers soon, and this also applies to the question by Agustín Cartens: I do not have any results to give you about the symmetry at this stage. Still, I want to highlight that my goal in this paper was to show how pass-through is changing over time, and connect it to the increase in the frequency of price changes. So while changing the regression affects the measured level of pass-through, it does not affect the finding that it has increased significantly over time.

**Mr. Haltiwanger:** You actually kind of partly touched upon where I wanted to go. I wanted to bring up the work of Redding and Weinstein who really have emphasized recently the importance of having the P and the Q data, and particularly they would argue that they built what they called the Unified Price Index and it differs dramatically from standard price indices with a huge product variety effect, turnover effect, and consumer valuation bias. And my sense is those terms would be very sensitive to what you are talking about today. So basically, do you think, if we're going to take into account the effects that you are talking about, we need the P and the Q data to be able to figure out quantitatively. And it's also the case, even just a more limited question, you did need to use weights in various parts of your paper today and those weights are pretty crude. So the question is how sensitive do you think your results are to those weights?

**Mr. Fischer:** This was really a very interesting and very impressive work. How much work is being done on the transformation from this to policy? We heard lots of adjectives in the description, but is there anything in which a model is being set out and your estimates are used, and if something changes by “x” percent, there is some parameter in policy that ought to change by “y” percent? Do we have that worked? Does somebody have an example of that? Because you can see this thing working by having an appendix which is, what does this do to policy, and just stick the things in and outcomes. Be a heck of a lot more wide awake for what’s happening to the cost of the university education for example. Thanks.

**Ms. Forbes:** I want to expand on one of your findings, which I think is very important, but which you passed over quickly, and which could appear to contradict the conventional wisdom. That is your finding that pass-through has increased over time in the United States. This would have first-order implications for thinking about inflation dynamics and monetary policy. The conventional wisdom cited by people in this literature, however, is that pass-through has actually decreased over time around the world. So what’s going on? Where is this disconnect? The conventional wisdom is true. If you look at cross-country data, pass-through has decreased over time. But if you look under the covers, which we learned is important yesterday, and break out composition effects, the decrease in pass-through around the world has occurred entirely in emerging markets. Inflation has come down in emerging markets, inflation volatility has fallen in emerging markets, and both of those trends are correlated with a large fall in pass-through. But in advanced economies you have instead seen an increase in pass-through. Now you have provided a potential explanation of why this has occurred. I think this is potentially very important and it also makes us think differently about the conventional wisdom that pass-through has fallen.

**Ms. Boone:** I have two very quick comments. The first—and forgive me for saying that from a European standpoint—it is very U.S. focused. I was wondering whether you have the database on the capacity of running such data for China or for Europe, but it’s particularly China I guess where the development is even higher. And

similarly, a comment to Yuriy, who I'm not really sure I fully understand what you are suggesting for monetary policy when you highlight that there will be less geographical prices variation. I understood, but correct me if I'm wrong, that you were suggesting that monetary policy should adapt to the fact that geographical price were less of an indicator. This reminded me very much of what's happening in Europe where I think we tend to think that we should look at prices in aggregate and not use monetary policy to particularly target those price fluctuations which are local or rather national, that the proper policy to address that is fiscal policy.

**Mr. Blinder:** I want to join the praise for the paper. It's a really fascinating paper. First, a very simple, straightforward question. Your basic time series graph at the end shows a big dip that looks like a recession. That's not what we're measuring there, but I'm just wondering if you have any idea of what in the world happened there? Second, near the end of your presentation, you talked about an idea that you hear a lot from businesses about they don't want to antagonize their customers. You were using that idea spatially—that we didn't want customers to find out it costs less in Detroit and more in Cleveland. I'm thinking about the same idea in a time series context, about the deltas. The survey that I and co-authors conducted decades ago, which you mentioned, quizzed a lot of companies on price changes. When we asked them why they didn't change more frequently, the answer often was—and this is a time series dimension—that we don't want to antagonize our customers. That idea was not where we started. We started with theories that came out of the academic literature, and that was not one of them. But when we pre-tested the questionnaire in the field, we found company after company saying that. And I am wondering whether you think that's disappearing because of the online influence?

**Mr. Frenkel:** I find Cavallo's paper stimulating and interesting. I would like to make a point that relates the degree of pass-through to the credibility of the monetary authority. Typically, in high-inflation countries, in which the credibility of the central bank is very low, a change in the exchange rate is transmitted immediately into prices. Thus, a nominal depreciation of the currency does not

improve competitiveness (the real exchange rate) since the pass-through into higher prices and wages is immediate. In contrast, when the credibility of the central bank is high, a depreciation of the currency does not get transmitted immediately into prices and wages since the credible monetary authority is expected to take actions preventing the translation of exchange rate changes into prices. This would be the case in countries which follow an inflation targeting strategy with credibility. The data employed by Cavallo applies to the United States, which is categorized by low inflation. It would be interesting to apply Cavallo's approach to other cases, in which inflation is high and explore the dependence between the degree of pass-through and the credibility of the monetary authority.

**Mr. Furman:** Three points. The first is a potentially testable implication which is we know the Phillips curve is very strong across MSAs. You could look at how that strength has changed over time because this would say it should have become less strong over time. Second, I'm a little bit puzzled at how this fits in with the big puzzle we all have which is that the Phillips curve has become more horizontal. This would seem to imply the Phillips curve has become more vertical at the national level, and I wanted to know what you think about that. Then the third, I don't think it's hugely important, but in terms of a causal identification of the Amazon effect, you don't know if the products that Amazon lists are ones that change price more frequently versus it having a causal effect and how would you try to instrument or sort that question out?

**Ms. Cook:** I'll take the chair's prerogative and ask my own question, and I'll pile on with respect to pass-through. So, Brynjolfsson and Liu have this paper that says that eBay's exports have increased by 17.5 percent due to AI in translation search costs being reduced. So, how would this change how you think about monetary policy and its effectiveness with respect to Jacob Frenkel's comments related to declining versus increasing pass-through?

**Mr. Cavallo:** Thank you, I will have to limit some of my answers due to the time. In the case of John Haltiwanger and his question on weights: what I can tell you is I have used weights at the level that are published by the BLS. If I look at very narrow categories, I still find

these effects, so I don't necessarily think it's going to change much if we had better weights. But it will be interesting to try to combine these online data with scanner datasets to see how much individual product weights matter.

Stanley Fisher asked about use of this data for policy, particularly in modelling applications. I do not think online data is currently being used much in this context. I am certainly hoping that this conference will help me convince other people to start using this for policy type of analysis that you are proposing.

Then on pass-through, Kristin Forbes is right. I think the conventional wisdom is that pass-through has been decreasing. In this particular paper there are many things I am abstracting from, including the nature of shocks and how they have changed over time, which is something Kristin has recently written about. I am instead trying to identify one structural parameter that usually tends to move very slowly, but that I think the Amazon competition is now affecting a lot: the frequency of price adjustments. In many of our models, if you increase the frequency, no matter the assumptions we make or the shocks that we have, we can expect to see more pass-through. That is my point so far. The question on the level or nature of pass-through in different conditions is certainly something that I hope to work more in the future.

For the question about China, if we look at those scatterplots with preliminary results across categories and countries, I do find a significant increase in the frequency of changes for electronics in China. But there's certainly a lot more work that I need to do on the international dimension.

Alan Blinder asked about the big dip in the frequency of price changes around 2010. I believe the anomaly is actually the increase in the frequency that we see at the beginning of my sample, in 2008 and 2009. In the paper, you can see estimates for both price decreases and increases. The rise in overall frequency in those two years is entirely driven by more flexible price decreases, which is something we would expect to happen during a recession. So my interpretation is that the frequency went back to normal in 2010, back to a level which



closely resembles what previous papers found using historical CPI data. There is clearly a limitation here: I do not have data before 2008. On the question about antagonizing customers, I think you are right. If you take my results literally, people today are not antagonized when they see prices changing very frequently over time. Maybe Amazon has played a role in changing perceptions of fairness in pricing frequency. You can also think of the example of Uber or Lyft and how transportation prices were set in the past. It used to be a case of we were expecting prices to be always the same, regardless of whether it rained or not. Now we have become used to the idea that it makes sense for these companies to increase their prices during a storm. I believe the perception of fairness is affected by experience, and that is why in the paper I argue that we need to look at other sectors and countries to understand how this happens.

In response to Jacob Frenkel, I agree that the credibility of the central bank is important but it is not something I have explored much here. In the appendix I have removed the crisis years and then split the sample again from 2011 to 2017, and I find very similar results. But there's definitely a lot to learn from the comparison with other countries in the future.

Finally, Jason Furman asked about the horizontal Phillips curve. This is related to something Yuriy mentioned in his discussion. He has a paper where he shows that retailers do not change their prices quickly in response to policy announcements. This is likely because the retailers are not interested in the announcement per se, but rather on the actual observable change in demand and costs that they experience. My results suggest that retailers will adjust their prices quickly when those changes occur. In other words, the explanation for the horizontal Phillips Curve and the lack of inflation today is not that prices are sticky: they are in fact getting more flexible over time. Instead, I believe it has more to do with the types of shocks that some of these retailers are experiencing, such as the falling gas prices and the dollar appreciation that I discussed today, as well as other factors such as wage stickiness which I have not addressed in this paper.

