

# Discussion of “Inflation and misallocation in New Keynesian models”

By Sharon Kozicki<sup>1</sup>

## Abstract

*Inflation and misallocation in New Keynesian models*, by Alberto Cavallo, Francesco Lippi and Ken Miyahari, enhances our understanding of the costs of price setting and the welfare costs of inflation. The costs of inflation are broader than those associated with relative price dispersion. My comments explore three of these. First, businesses always incur costs when they set prices, and these costs are higher when inflation is higher. Second, the leisure and productive capacity of households are hindered when inflation is higher because households must dedicate more time to budgeting, shopping and financial planning. Third, financial system participants always have to manage risks. Higher inflation comes with more uncertainty, meaning risk management requires more resources when inflation is higher. All of these costs weigh on productivity, broadly defined, and lower consumer welfare.

## 1 Introduction

*Inflation and misallocation in New Keynesian models* makes two distinct contributions. First, this important research by Alberto Cavallo, Francesco Lippi and Ken Miyahari argues that understanding inflation dynamics requires a model of the price-setting decisions of a large number of firms. The model they build is very successful at capturing the state-dependence of the distribution and frequency of price changes. Second, they provide estimates of the welfare costs of inflation.

Their contributions give us a deeper understanding the costs of price-setting and how those costs may depend on the level of inflation. However, there is more to welfare costs than the model can explain.

## 2 Costs to businesses

Observation: Price management always incurs costs, and costs are higher when inflation is higher.

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New Keynesian models have tended to assume that prices are adjusted at a fixed frequency or with a fixed probability, and that fixed costs of changing prices are incurred only when prices are changed. But ultimately, activities related to price setting will always incur costs, even if the prices themselves are not actually being changed.

A 2004 study by Zbaracki, Ritson, Levy, Dutta, and Bergen looked at a large U.S. industrial manufacturer and its customers. It found that businesses face a variety of costs when they set prices. These include physical, or menu, costs; managerial costs associated with activities such as information gathering, decision-making, and communication; and customer costs associated with activities such as communicating and negotiating prices.<sup>2</sup> And while menu costs are most directly tied to price adjustment, these are not the most significant costs. Managerial costs are more than 6 times as much, and customer costs more than 20. In total, the price adjustment costs comprised 1.22% of the company's revenue and a little more than a fifth of its net margin.

While that study looked at an intermediate goods producer, it provides concrete evidence that “price-management” activities are part of the ongoing cost of doing business. Macro-economists should have taken note long ago, and I applaud Professors Cavallo, Lippi, and Miyahara for having done so.

I very much liked their model and their use of micro data. By allowing firms to choose how much to spend on price-management as part of their profit maximization problem, their model can evaluate how these costs and the price-setting behaviour of firms may change with the state of the economy.

This also helps us develop a fuller understanding of the mechanism behind the propagation of economic shocks. Their analysis shows considerable state dependence in price-setting decisions, with higher inflation accompanied by higher costs. Importantly, these higher costs can be thought of as implying lower productivity—which means they will weigh on consumer welfare.

And, they have illustrated why large shocks are passed through to prices more quickly than smaller ones. This result is clearly important for monetary policy.

Before moving on to a discussion of additional factors that are likely relevant in assessing “welfare costs” of inflation, I’d like to make one additional point.

In a flexible-price environment, the “efficient” or “desired” price is an artificial construction. It may be meaningful in models, but it is less so in the real world.

In New Keynesian models, “efficient” or “fully flexible” prices play an important role in how we evaluate the welfare costs of inflation. The “efficient” price is the optimal price that a firm would choose if there was no price stickiness. But prices can never be totally flexible and setting them always incurs costs. As I’ve been discussing, in

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<sup>2</sup> Zbaracki, M.J., Ritson, M., Levy, D., Dutta, S., Bergen, M. (2004) “Managerial and Customer Dimensions of the costs of Price Adjustment: Direct Evidence from Industrial Markets,” *Review of Economics and Statistics*, Vol. 86, No. 2, pp 513-533

the real world, businesses need to allocate resources to optimizing prices, and there are inevitably costs associated with doing this.

In a recent Liberty Street Economics article, Bruine de Bruin, Dogra, Heise, Knotek, Meyer, Rich, Schoenle, Topa and van der Klaauw (2023) reported on survey results about the factors that influenced firms' price setting.<sup>3</sup> Firms reported that the most important factors in pricing decisions were: the strength of demand; maintaining steady profit margins; wages and labour costs; competitors' prices; non-labour costs; the overall rate of inflation; problems with supply chains; and, borrowing rates and the cost of capital. Strength of demand was the most important factor in their pricing decisions, while labour costs and steady profit margins were also very important. Notably, the overall rate of inflation also made the list.

In my view, many of these factors could be seen as relevant for determining the "efficient" or "desired" price in a flexible-price environment, and not only for determining where to set a price relative to the "efficient" price. Thus, rather than using so-called "efficient prices" as the basis for cost analysis and welfare calculations, my recommendation is to compare costs across states.

In my interpretation, Cavallo, Lippi, and Miyahara did this implicitly by providing convincing, model-based evidence that costs of price-management activities are higher when inflation is higher.

But there are additional costs to inflation besides those related to price management.

### 3 Costs to households

Observation: Households always have to spend time or money to plan, budget, and shop. These costs are higher when inflation is higher.

Costs to businesses of price adjustment are certainly not the only factors to consider when examining consumer welfare costs associated with inflation.

In economic models, consumer welfare is a function of the present value of current and future utility of consumption and leisure. And it captures the tendency of consumers to prefer to smooth their consumption over time.

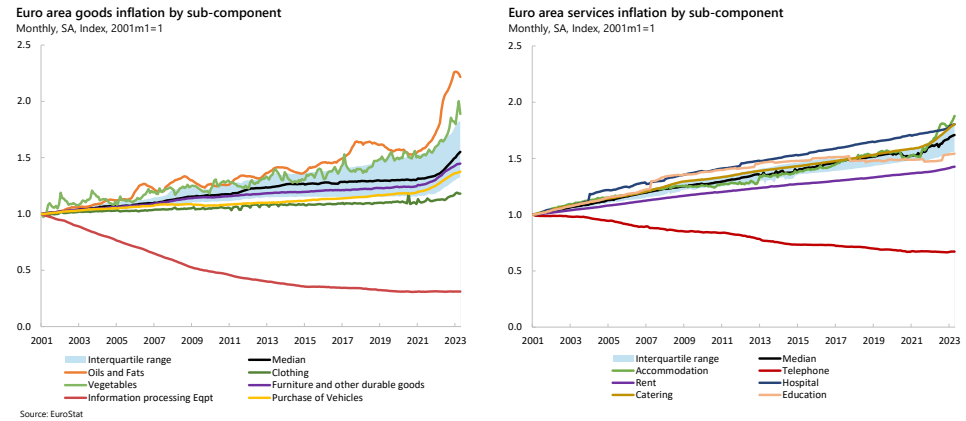
In examining the welfare costs of inflation, what happens to wages and leisure matters too. So, let me shift the conversation to talk about these issues.

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<sup>3</sup> Bruine de Bruin, W., Dogra, K., Heise, S., Knotek II, E.S., Meyer, B.H., Rich, R.W., Schoenle, R.S., Topa, G., and van der Klaauw, W., (2023) "[How Do Firms Adjust Prices in a High Inflation Environment?](#)," *Federal Reserve Bank of New York Liberty Street Economics*.

## Chart 1

Prices of individual goods and services follow different trends and some prices are volatile



In most cases, consumers take prices as given and allocate their income to consumption and savings. Their consumption of specific goods and services depends on their personal preferences and relative prices. In general, these “relative prices” are different than those in New Keynesian models. Over the long term, prices of individual goods and services follow different trends, which are largely dictated by underlying productivity trends (Chart 1).

And, over the short term, some prices can be quite volatile—especially prices of fresh food and gasoline. Consumers might not like having to deal with these types of price movements, but they adjust to them by allocating time to budgeting, planning, and shopping. They look for good deals and change their consumption patterns depending on how the prices of various goods are shifting, relative to each other.

Recognizing that consumers make spending decisions all the time in the face of prices that move around and with diverging trends, ultimately it seems that it doesn't matter so much to them whether prices are high or low relative to the “efficient” price – it matters whether they can afford what they are used to buying.

Thus, while there may be some misallocation associated with price stickiness, it is likely that wage stickiness will be a bigger issue for consumers—especially if wages are stickier than prices.

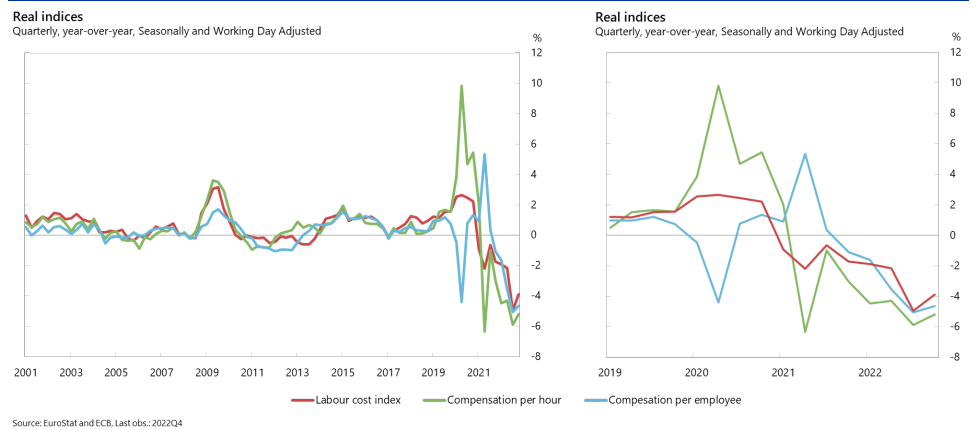
Druant, Fabiani, Kezdi, Lamo, Martins, and Sabbatini (2009) examined a cross-country survey dataset and found that firms tend to adjust wages less frequently than prices.<sup>4</sup> Wages tend to remain unchanged for about 15 months on average, prices for around 10 months..

<sup>4</sup> Fabiani, S., Martins, F., Druant, M., Sabbatini, R., Lamo, A., and Kézdi, G. (2009) "How are firms' wages and prices linked: survey evidence in Europe," Working Paper Series 1084, European Central Bank.

This matters because there can be implications for welfare when wages are not rising at the same rate or time as prices.

## Chart 2

Real wages have been declining year-over-year since 2021



Real wages in the euro area have been declining year-over-year since 2021 (Chart 2). When real incomes decline in this way, more people are likely to find themselves to be liquidity constrained. Liquidity-constrained households spend all their earnings every pay period. In other words, when an increase in inflation leads to real wage declines, fewer households will have the flexibility to smooth their consumption over time and this reduces consumer welfare.

Inflation imposes other costs on consumers. And the costs that I am about to discuss are additional costs, on top of those that firms are already paying. Let me go through a few examples.

Survey results for online shoppers in Germany from earlier this year provide examples of actions they have taken.<sup>5</sup> Across all income levels and household sizes, consumers reported they were changing their purchasing behaviour due to higher inflation. This includes actions like buying cheaper products which are often lower quality; using vouchers or coupons, which requires time to research and organize; and cutting spending on some services, such as subscriptions.

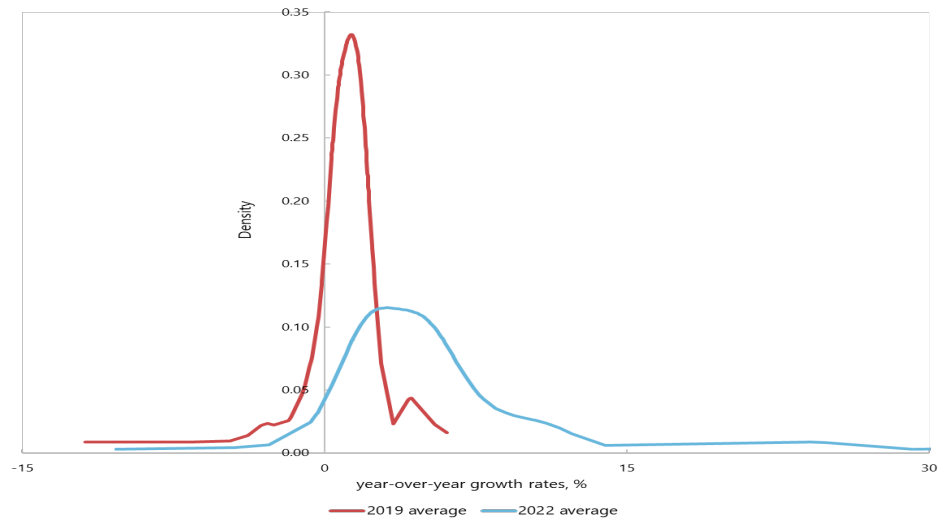
People are accustomed to seeing prices change from day to day, week to week, and month to month. And they know they need to spend time looking for the best prices across different retail outlets. But with higher inflation, they face more dispersion across inflation rates of goods and services, increased price volatility, and greater uncertainty (Chart 3).

<sup>5</sup> ecommerceDB, (2023) "Consumer Responses to Inflation in Germany: An Examination of Household Income and Size"

### Chart 3

The distribution of inflation rates by HICP component shifted higher and dispersion increased (2019 to 2022)

Kernel distribution of year-over-year euro area HICP inflation rates



Thus, consumers need to spend more time to do this. And that comes at the expense of their leisure. One way of thinking of this is that consumers have a production function for leisure where the input is time not spent at paid employment. Spending more time planning, budgeting, and shopping reduces their “productivity” in producing leisure.

If consumers allocate more time to planning, budgeting, and shopping they have less time for everything else and their current leisure and utility go down. If they buy fewer real goods, their current consumption and utility go down. If they work more so they can pay the higher prices, their current leisure and utility go down. And if they save less or borrow more, their future utility could go down.

These costs might also be comparable to the “cognitive costs” in the recent article by Agarwal and Kimball (2022).<sup>6</sup> They used consumer confidence to measure such cognitive costs and found that between 1980 and 2021, higher inflation is associated with lower consumer confidence.

The bottom line is this: just as firms need to allocate time and resources to “price management”, consumers need to allocate time, effort, and funds to planning, budgeting, and shopping. These factors are not generally modelled, so they are not usually considered in model-based evaluations of the welfare costs of inflation.

<sup>6</sup> Agarwal, R. and Kimball, M. (2022), “How Costly is Inflation?”, International Monetary Fund Finance and Development Analytical Series.

## 4 Costs to financial system participants

Observation: Financial system participants always have to manage risks. With greater uncertainty when inflation is higher, costs of managing risks are also higher.

As we consider at the costs of inflation to individuals and businesses, it is important to also consider the implications for the financial sector.

As illustrated in Chart 3, the recent higher inflation episode has been accompanied by a wider distribution of inflation rates across categories of goods and services. This wider distribution is indicative of greater uncertainty. More generally, drawing on the discussion from the first session of this forum, the recent and current economic context has been characterized by a multiplicity of parallel supply shocks and structural changes. All of this also raises uncertainty.

Increased uncertainty impacts the economy, whether it's a single household considering a major purchase, a business that is contemplating a new investment project, or a financial institution that's considering whether it should lend to them.

I won't spend a great deal of time on this because the logic is similar to what I have already discussed. Greater uncertainty forces all economic agents to put more resources into risk management. In addition to managing risks, the possibility of tail-event outcomes increases. These issues are particularly relevant for financial institutions.

To make this concrete, higher inflation can lead to higher inflation risk premiums in bond yields, resulting in higher borrowing costs for governments, businesses, and households.

## 5 Conclusion

Inflation is costly, but not just because price dispersion may increase. Higher inflation tends to raise price-management costs for businesses and reduce productivity and consumer welfare. Higher inflation also tends to raise planning, budgeting, and shopping costs for consumers, and reduces consumer welfare. And higher inflation tends to increase uncertainty, raising the costs of risk management.

Price stability is important because it is a key ingredient to a prosperous economy. Low and stable inflation strengthens the competitive forces in an economy and allows households and businesses to plan and invest with confidence that their money will hold its value.<sup>7</sup>

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<sup>7</sup> Macklem, T., (2023) "[Staying the course to price stability](#)".

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